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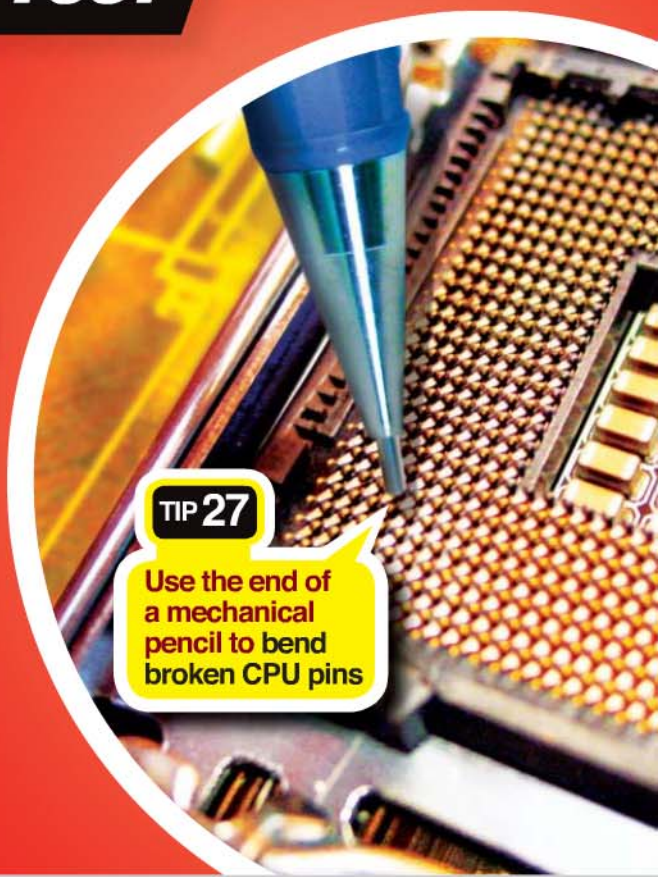

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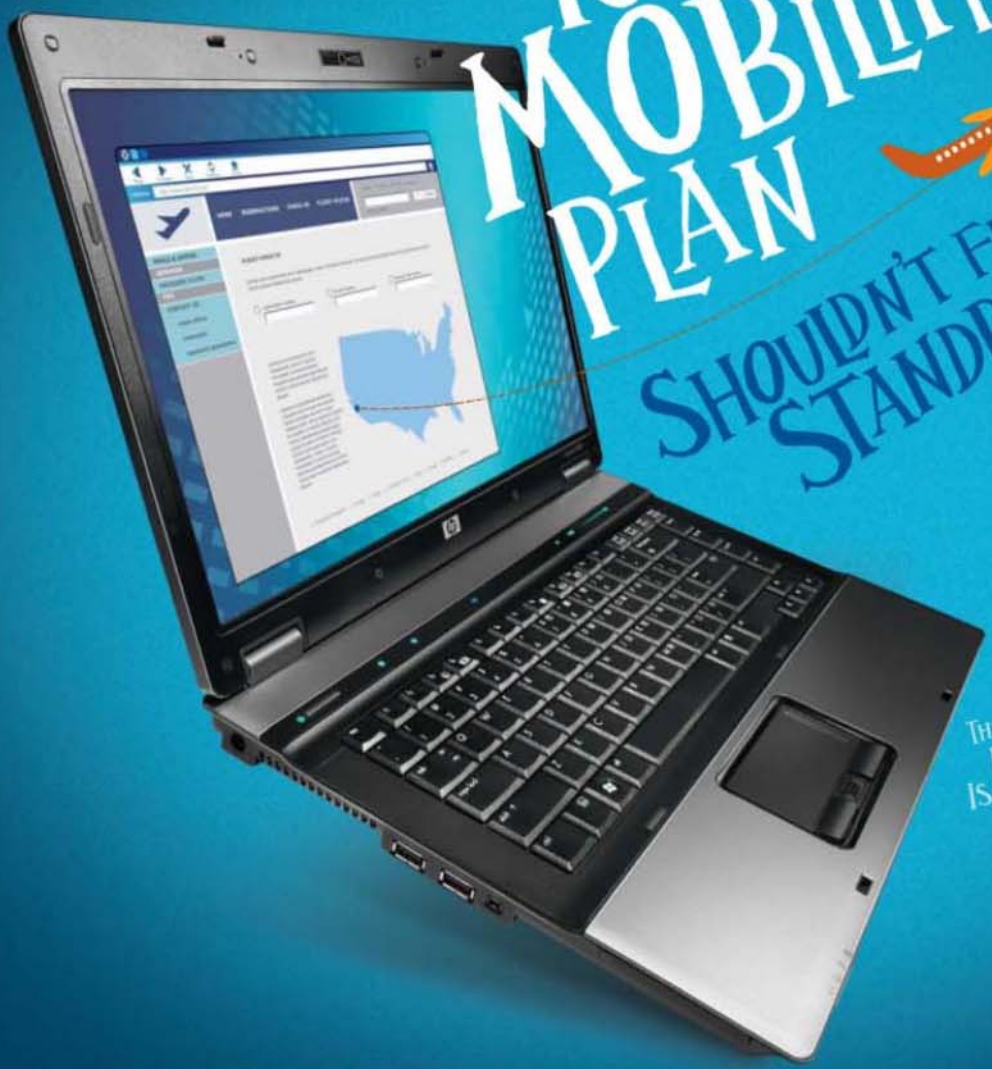

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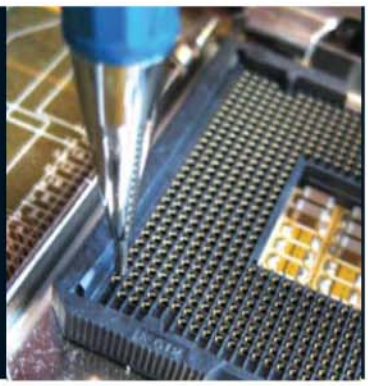

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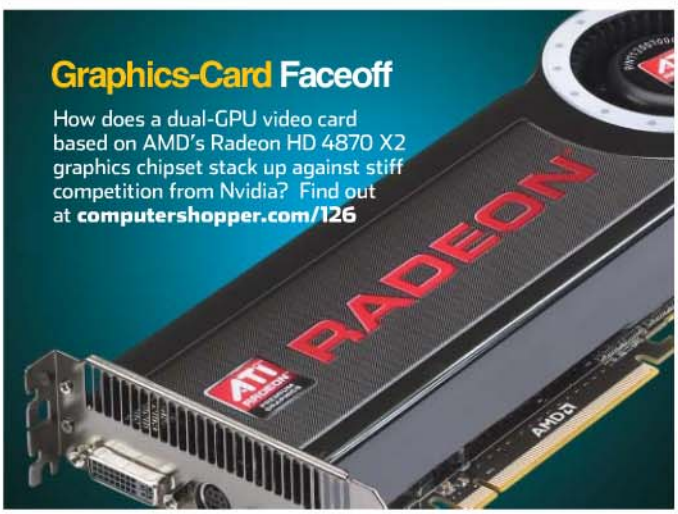

Graphics-Card Faceoff

How does a dual-GPU video card based on AMD's Radeon HD 4870 X2 graphics chipset stack up against stiff competition from Nvidia? Find out at **computershopper.com/126**

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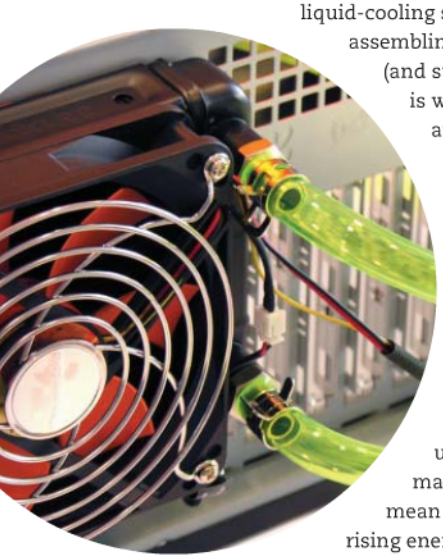
EDITOR'S NOTE

WHETHER YOU LIKE TO DO IT because it's a fun challenge, or because it can help save you some money, building your own PC is like any other complex task: It's a learning process. As with any process, each project presents another opportunity to improve your knowledge and pick up new skills, and no one knows this better than Contributing Editor John Burek, who has put together countless builds over the years. For our cover story, "Building on Success" (p. 53), John distilled the best of what he has learned into 75 great tips and tricks—from must-have tools to advice on organizing cables and the myriad screws you'll collect over time—that can help you build smarter and safer. (We didn't have enough space to illustrate each one, but we've included photos for every tip at **computershopper.com/128**.) There's something here for every builder—whether newbie or expert—and we hope you'll return to our guide with each new project.

One way to prove your PC-building chops is by installing a liquid-cooling system in your desktop. If you're assembling a new system around a super-fast (and super-hot) processor, liquid cooling is worth a look as an alternative to fans and heat sinks. Installing one may appear complicated, but it only takes a few steps to set it up right. For this month's Weekend Project (p. 94), Senior Editor Matthew Murray takes us through the whole process of setting up a liquid-cooling system, from installing the waterblock to making sure the tubing is placed correctly.



Although putting together a PC is usually about getting the most performance bang for your buck, that doesn't mean you should disregard concerns about rising energy costs. The green movement, in fact, has finally reached the PC world in full force. Our "Green Gear" feature (p. 70) highlights some of the latest tech products that help conserve energy and reduce waste, and believe it or not, these new products even include components like hard drives, motherboards, and power supplies.

PCs are also getting the green treatment. A quad-core desktop with a pair of graphics cards isn't going to be particularly energy efficient, of course, but if you're willing to trade performance for power savings (and a lower price), check out two new desktops that are small in almost every sense. The Asus Eee Box (p. 14) can hide behind a piece of paper, uses just 20 watts of power, and costs $349.99. Dell's new Studio Hybrid (p. 20) is a little bigger and pricier, but it comes with green features such as a system-recycling kit that can help you get rid of your old PC in the environmentally friendliest fashion. Neither is really suited to be your primary desktop if you do anything more than the basics, but as secondary systems for checking e-mail and surfing the Web, they're viable options that can help the planet out a bit, too. —*Sean Portnoy, Executive Editor*

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Quad Q9550 2.83Ghz ..... $ 935
(6MB Cache, 1333Mhz FSB)
Quad Q9400 2.66Ghz ..... $ 885
(8MB Cache, 1066Mhz FSB)
Quad Q6600 2.40Ghz ..... $ 799
(6MB Cache, 1333Mhz FSB)
E8600 3.33Ghz ..... $ 879
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- NVIDIA® GeForce® 9800 GT 512 MB DDR3
- LG 22X DVD+-RW Drive & 16X DVD-ROM
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Quad Q9550 2.83Ghz ..... $ 1115
(6MB Cache, 1333Mhz FSB)
Quad Q9400 2.66Ghz ..... $ 1059
(8MB Cache, 1066Mhz FSB)
Quad Q6600 2.40Ghz ..... $ 985
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Quad Q9650 3.00Ghz ..... $ 1655
Quad Q9550 2.83Ghz ..... $ 1435
(6MB Cache, 1333Mhz FSB)
Quad Q9400 2.66Ghz ..... $ 1379
(8MB Cache, 1066Mhz FSB)
Quad Q6600 2.40Ghz ..... $ 1305
(6MB Cache, 1333Mhz FSB)
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E8500 3.16Ghz ..... $ 1289
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www.usr.com/CS/56k

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New Hydra Graphics Technology To Boost to GPU Scaling

GAMERS ARE A PICKY bunch. No matter how powerful graphics cards get, they're never powerful enough to satisfy hardcore fraggers. A new graphics technology, however, may help them get even more from their video cards.

Designed by Israeli startup company Lucid Logix for multi-GPU environments like ATI's CrossFireX and Nvidia's Scalable Link Interface platforms, Hydra is a novel real-time distributed processing engine. It sits between a computer's chipset and multiple GPUs, balancing the graphics information flow from the CPU to the GPUs and the screen, allowing for optimal performance.

The engine offers near-linear to above-linear performance with multiple graphics cards—in other words, the Hydra engine will allow all of your chipsets and graphics cards to play nicely together.

The Hydra engine works by using system-on-chip technology to load-balance graphics processing tasks. Put simply, the engine decomposes an image and decides how best to get it to the screen, eliminating bottlenecks in the process.

Lucid says it's working with major graphics companies to ensure easy integration of the Hydra into the graphics world. According to Lucid, the Hydra requires no modification to existing applications, and it supports most graphics standards, such as DirectX. It's compatible with all gaming applications and chipsets, as well as with GPUs from any vendor, and it can be used on a motherboard or as an add-on board.

The Hydra will be available in the first quarter of next year. Pricing information was not available at press time. —*Jonathan Rougeot*

STATS

Watching Videos On the PC

89%
Consumers who watch video clips, movies, DVDs, and TV shows on their computer

29%
Consumers who watch videos on a PC more than six times per month

5%
Consumers who watch videos online because they don't have access to cable or a television

19%
Consumers who watch videos on the PC to get away from their families

Source: July 2008 Harris Interactive study conducted for AMD

Google Increases Its Search-Engine Dominance

GOOGLE CONTINUES to dominate its search-engine rivals, accounting for almost 70 percent of all U.S. online searches in June, according to statistics by Hitwise. That figure is up 5.25 percent from the same time last year.

Google's gain is MSN and Yahoo's loss. Yahoo Search is down to 19.6 percent of search traffic from 21.3 percent last year. Microsoft, which runs MSN, is down to just 5.5 percent from 9.9 percent a year ago.

Google has risen nearly 10 percent since 2006, when it held about 60 percent of the search market.

In other parts of the world, Google has even more of a stronghold. In the United Kingdom, Google accounts for 87.3 percent of all searches, with MSN and Yahoo coming in at about 4 percent each. In Australia, Google dominates at about 88 percent.

These findings come just months after Yahoo-Microsoft talks broke down when Yahoo balked at Microsoft's offer to buy them for $33 per share. Yahoo demanded $38 per share, and talks resumed with hopes of a combined search engine that could better compete against Google. The two companies failed to come to an agreement, however.

Google wasn't the only search engine to post a gain in the past year—Ask.com's market share rose from 3.4 percent to 4.2 percent. —*J.R.*

For more: computershopper.com/shoptalk

Survey Zooms in on Which Digital Cameras Consumers Rate As the Best

CANON, FUJIFILM, Nikon, Panasonic, and Sony are the top manufacturers named in the J.D. Power and Associates 2008 Digital Camera Usage and Satisfaction Survey, which is based on responses from more than 8,000 consumers who purchased digital cameras between April 2007 and March 2008.

The study looks at four body-style categories: point and shoot, premium point and shoot, ultraslim, and digital single lens reflex (dSLR). In each category, four factors are used to determine customer satisfaction: picture quality, performance, ease of operation, and appearance and styling.

Coming in at the top of the point-and-shoot category was the Fujifilm FinePix S series, which scored 757 out of 1,000. Consumers particularly liked this line's picture quality, performance, and ease of operation. Kodak's V, Z, and M series also placed well, scoring anywhere from 727 to 739.

Tied for tops in the premium point-and-shoot category were the Canon PowerShot G series and the Panasonic Lumix DMC-TZ series, each coming in with a score of 773. Picture quality and ease of operation were noted as winning features of the Canon line, and the Panasonic was highly rated in performance.

Fujifilm FinePix S8100

The Sony Cyber-shot T series led the ultraslim category with a score of 794, and Casio's Exilim Zoom wasn't far behind, at 766.

The Canon EOS Digital SLR and Nikon D series were the highest ranked among dSLR users, each scoring 823. The Canon placed particularly high in picture quality.

The study found that weatherproofing was rated as the most desirable feature with point-and-shot and premium point-and-shoot camera users. Ultraslim owners looked most often for internal memory capacity, whereas dSLR owners wanted waterproofing. *—Jonathan Rougeot*

New Instant-Messaging Client Offers Real-Time Language Translation

THE INTERNET—and tools like instant messaging (IM) and e-mail—have revolutionized the way people communicate with each other around the world. No matter how advanced communications software has become, however, it's been useless if the communicators don't speak the same language—until now.

New translation services such as MeGlobe, a free Web-based IM client that recently launched a beta version of its service, could allow people to talk to each other, regardless of their native tongue. MeGlobe, based on the Jabber chat client, translates messages from one language to another in real time.

Users register for MeGlobe by filling out a quick form with their basic info and their native language. Once registration is complete, users log into a Flash-based interface, where they can invite friends to chat. (They can also search for other users based on location, country, primary language, gender, and activities.) During the chat, the user sees the respondent's translated message above the original untranslated text. MeGlobe, which works within users' Web browsers, can currently translate 15 languages.

The system isn't perfect, but unlike similar services that use language-translation bots, such as Google Talk (which is also based on Jabber), MeGlobe is asking its user community to help improve its software—users who notice incorrect translations are encouraged to alert MeGlobe. *—Les L. Shu*

iTunes Tops Music Sales Chart Again

Apple's iTunes Store continues to be the top music retailer in the United States during the first half of 2008, staying ahead of traditional brick-and-mortar chains such as Best Buy and Wal-Mart. The results are based on the NPD Group's MusicWatch survey of consumers, age 13 and over, who purchased physical CDs and digital downloads from retail stores and Web sites.

In June, Apple announced that customers have purchased over 5 billion songs since it first started selling music online.

Although physical CD purchases continue to slow, they still make up a large percentage of sales. According to Russ Crupnick, NPD's entertainment industry analyst, CD buyers tend to be older.

NPD suggested that Amazon.com is a company to watch in the online music space. The mega-mart Web site overtook Target when it jumped from fifth to fourth place in music sales, thanks to its recently launched AmazonMP3.com store. Crupnick says that the new digital store will help Amazon improve its position. *—L.L.S.*

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AMD Opteron 64

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*Based on IDC, Worldwide Quarterly Server Tracker, February 2008. In Calendar 4Q '07, IDC reported worldwide HP ProLiant server shipments at 681,445 units, well ahead of Dell PowerEdge's 499,715 units at #2. IDC also reported ProLiant factory revenue at $2,743 million vs. $1,580 million for Dell's PowerEdge family. Prices shown are HP Direct prices; reseller and retail prices may vary. Prices shown are subject to change and do not include applicable state and local taxes or shipping to recipient's address. Offers cannot be combined with any other offer or discount and are good while supplies last. All featured offers available in U.S. only. Savings based on HP published list prices of configure-to-order equivalent ($3125 - $850 instant savings = SmartBuy price of $2,275). 1. Financing available through Hewlett-Packard Financial Services Company (HPFS) to qualified commercial customers in the U.S. and subject to credit approval and execution of standard HPFS documentation. Prices shown are based on a lease of 48 months in terms with a fair market value purchase option at the end of the term. Rates based on an original transaction size between $3,000 and $25,000. Other rates apply for other terms and transaction sizes. Financing available on transactions greater than $349 through September 30, 2008. HPFS reserves the right to change or cancel these programs at any time without notice. AMD, the AMD Arrow logo, AMD Opteron, and combinations thereof are trademarks of Advanced Micro Devices, Inc. ©2008 Hewlett-Packard Development Company, L.P. The information contained herein is subject to change without notice.

BY SERGUEI SERVIANOV

Tecra-tonic

Based on Intel's new Centrino 2 Platform, the Toshiba 15.4-inch **Tecra M10** and 14.1-inch **Tecra A10** laptops make it easier to take care of business. Each portable includes Intel vPro business-friendly technology, a Webcam that doubles as a business-card reader, an external Serial ATA/USB 2.0 combo port, and Sleep-and-Charge USB ports for juicing up smartphones. Both notebooks come with fingerprint readers and spill-resistant keyboards, and they use Toshiba's EasyGuard technology, which protects hard drives from falls. The Tecra M10 starts at $1,399, but pricing for the A10 was not available at press time. *Toshiba, www.toshiba.com*

Welcome to the Rapture

Biohazard's **Rapture Skulltrail Edition** eats lesser systems for breakfast and induces vertigo at the mere sight of its price, which starts north of $12,000. You get two Core 2 Extreme QX9775 CPUs—eight cores of processing power—and Biohazard's unique Cryosphere phase-change cooling system, which is powerful enough to keep the processors running at ice-cold temperatures. The rest of the unit is customizable, of course, with plenty of hard drive, optical drive, and RAM options for those with enough cash. *Biohazard Computers Systems, www.biohazard-computers.com*

Instant overclocking

MSI may have been busy with its **Wind U100** netbook (see review on p. 20), but we're happy to see that the company has found time to introduce the GX620 and GX720 gaming laptops. The 5.6-pound GX620 comes with a 15.4-inch display, 2.4GHz Core 2 Duo P8600 CPU, 4GB of RAM, Nvidia GeForce 9600M GT (512MB) graphics, and a Blu-ray player/DVD burner. The GX720 bumps the display up to 17 inches and offers an option for a 2.53GHz Core 2 Duo P9500 processor. Both notebooks offer quick-launch buttons that activate MSI's on-the-fly overclocking technology and its battery-conserving ECO Engine Management function. *MSI, www.msimobile.com*

For more: computershopper.com/new-systems

X marks the spot

The **Poly X4800-Extreme** from Polywell is not a system for the faint of wallet, but if you have $4,799 to spend on a top-tier gaming package, this is it. The Extreme comes with 4GB of DDR3 memory, an Intel Core 2 Extreme QX9770 processor, and an Nvidia GeForce GTX 280 graphics card; a pair of 300GB 10,000rpm hard drives takes care of all your storage needs. The unit also ships with a 24-inch LCD monitor and Logitech's X-530 5.1 speaker system with subwoofer. *Polywell Computers, www.polywell.com*

Tablet twins

Fujitsu's 4.5-pound **LifeBook T5010** and 5.3-pound **LifeBook T1010** tablet PCs both pack 13.3-inch displays, but the T5010, based on the Centrino 2 platform, comes with vPro business-friendly technology and a modular bay that can fit either an optical drive or a second battery. The T1010 also uses new Centrino 2 processors, but it has a fixed optical drive and eschews most of the high-end security features of the T5010. Pricing for the LifeBook T5010 begins at $1,769; the LifeBook T1010 starts at $1,299. *Fujitsu, www.fujitsu.com*

It means business

Acer's **Veriton S461** is the perfect small-form-factor PC for companies seeking affordable, secure desktops. Loaded with vPro technology—which helps IT departments wirelessly diagnose, repair, and manage their systems—the S461 also comes with a respectable selection of components, including a Pentium E2200 dual-core CPU, 2GB of DDR2 memory, 80GB of hard drive space, and a DVD burner. The best part about it is the price: $549. *Acer America, us.acer.com*

Asus Eee Box

Tiny PC ideal only for those with tiny computing needs

WHEN IT COMES TO PERFORMANCE, the diminutive (1x8.75x7 inches HWD) and low-cost ($349.99) Eee Box is like its laptop counterpart, the Eee PC: Its performance is almost entirely dependent on what you want it to do. If you're looking for the most basic of budget and space-saving desktops, you'll be able to cope with the Eee Box. Otherwise, you might be in trouble.

Based on a 1.6GHz Intel Atom processor and bearing an 80GB hard drive, Windows XP Home Edition, and just 1GB of RAM (though this is upgradable), the Eee Box is little more than a make-do solution for someone who doesn't want to shell out even $500 for a budget desktop.

Its scores in our productivity tests were, to be kind, underwhelming. The 828 it clocked in Cinebench 10 is the lowest we've seen. Requiring 27 minutes and 3 seconds to finish our Windows Media Encoder test, 19 minutes and 5 seconds to trudge through our iTunes conversion trial, and scoring a measly 68 in Futuremark's 3DMark06 benchmark test, the Eee Box is invariably at the rear of the pack. 3D gaming is pointless.

EDITORS' RATING 6.2

0 BETTER ›› 10

PROS Incredibly small size; low power usage, noise levels; Express Gate software lets you quick-boot into Linux for basic tasks

CONS Poor overall performance

SPECS 1.6GHz Atom N270; 1GB DDR2 RAM; 80GB hard drive; no optical drive; no monitor; integrated graphics; Windows XP Home Edition

AsusTek Computer, 888-678-3688
usa.asus.com

Mfr. Est. Price $349.99

But if your needs never stretch beyond the most elementary computing, the Eee Box could be quite a deal. There's no built-in optical drive, but you do get integrated 802.11b/g/n Wi-Fi, a DVI port, four USB ports, an Ethernet jack, headphone and microphone connectors, and even a multiformat memory-card reader for expediting media moving. (A keyboard, mouse, and preinstalled StarOffice and MS Works software packages are also included.) For the impatient, the inclusion of Asus' proprietary Express Gate software lets you boot swiftly into Linux, so you can view Web sites or photos, use Skype, or do other minor operations without the hassle of booting into Windows proper.

Because the Eee is so small, you can store it almost anywhere (horizontally or vertically). Because it doesn't pull much current or move many fans, Asus estimates it will seldom need to suck down more than 20 watts. (In one demonstration, the Eee topped out at 17 watts even when playing 720p high-definition video.) It also won't get much louder than 26 decibels—we had to strain to hear it even in a quiet environment.

Advantages like these are nice plusses to the budget-friendly price, and as long as you're not interested in doing much more than Web browsing, word processing, or flipping through digital photos, the Eee Box will live up to your expectations. Just don't push it much farther. —*Matthew Murray*

For more: computershopper.com/desktops

What's the Deal?

Looking for a tiny desktop to fill a similarly small hole in your home-computing schema? Then the Eee Box, which can be hidden under an 8.5x11-inch sheet of paper, might be for you.

What it's for: Simple tasks like viewing photos, surfing the Web, instant messaging, and other non-intensive applications

Who it's for: College students, the budget-conscious, or anyone looking for a second (or third or fourth) PC that doesn't need to be a powerhouse performer

What's included: A keyboard and mouse; StarOffice and MS Works software packages; a stand for supporting the system vertically; and a wall-mounting bracket

The bottom line: If your needs are modest, the Eee Box's price is definitely right; just don't expect too much and you won't be disappointed by this pint-size PC.

Casio Exilim Pro EX-F1

Prosumer camera captures 60 photos per second, HD video

EDITORS' RATING 8.0

0 BETTER ›› 10

PROS Captures as many as 60 full-resolution photos per second; records video up to 1,200 fps; prerecords up to 60 photos, 5 seconds of video; HD-resolution video recording; 12x optical zoom

CONS Expensive; bulky; high levels of visual noise; slow when saving burst-mode photos to memory card

Casio, 800-836-8580
www.casio.com

Mfr. Est. Price $999

THE 6-MEGAPIXEL Casio Exilim Pro EX-F1 is a groundbreaking camera. It can snap 60 full-resolution photos in just one second and capture video at a staggering 1,200 frames per second (fps), albeit at a reduced resolution. Throw in HD-resolution video recording and a 12x optical zoom, and you have a truly one-of-a-kind camera. But it's also expensive ($999) and bulky, with less-than-inspiring image quality—which doesn't make it an ideal everyday single-shot shooter.

Most of the new photo capabilities are handled by a dedicated Continuous Shutter (CS) mode dial. In Prerecord mode, you can rapidly snap a set number of images just by pressing the shutter button halfway; this continually refreshes the buffer with new imagesand makes it easy to capture critical events even after they've started. The High-Speed CS mode similarly captures up to 60 images for as long as you press the shutter button.

The Casio Exilim Pro EX-F1 can shoot a staggering 60 photos per second.

The Exilim records video in standard, high-definition, and high-speed (up to 1,200fps) modes. There's also a Prerecord Movie function that lets you prerecord five seconds. Unfortunately, the high-speed video has a serious drawback—as the frame rate increases, the resolution decreases.

Startup time was a below-average 3.62 seconds, and the single-shot shutter lag time was a moderate 0.65 second. The biggest frustration was waiting for the camera to transfer the 60 burst-mode photos from the memory buffer to a memory card. Even with a fast SanDisk Extreme III 8GB SD card, it took 17.25 seconds to save the photos.

Image quality was mixed. The sharpest photos weren't as sharp as we've seen with other small-sensor cameras. Color fidelity and shadow detail, on the other hand, were very good. The main problem was visual noise, which was clearly noticeable on many ISO 400 shots; at ISO 800, it was often a significant distraction, and at ISO 1600, darker objects were frequently obscured in a snowstorm of color flecks.

Although its individual shots could be better, the Exilim's ability to take 60 images per second was impressive. Sports action, children playing, and a dog chasing a ball became studies in motion. Remarkably, the time-lapse images were equal in quality to the camera's single-shot images, and while the H.264-saved video recordings did have some compression artifacts, the quality was superior to footage from other hybrid cameras we've evaluated.

As a single-shot camera, the EX-F1 is overpriced, oversize, and a subpar performer. As a rapid-fire, time-twisting hybrid, however, it's head-and-shoulders above the competition. This model is particularly well-suited for sports and wildlife enthusiasts, parents of active children, and YouTube devotees. —*David English*

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ZT Affinity 7221Xa

Budget PC packed with extras, not performance

LIKE MOST BUDGET PCS, ZT Systems' 7221Xa is not a desktop you buy for its power—its primary attraction is its $599.99 price. But, as is the company's wont, ZT heaps on lots of extras to ensure you won't be left wanting much from this modestly priced desktop.

Powering the system is a three-core AMD Phenom X3 8450 processor rated at 3GHz—not exactly tops among systems in this same general price range. The 4GB of DDR2 RAM helps, but it didn't lead it to outstanding results in our productivity tests. The lack of a discrete graphics card also hurts performance—the integrated ATI Radeon HD 3200 is suitable for most tasks and all the expected Vista eye candy, but gaming or other heavy-duty 3D chores are mostly out of the question.

There's also a PCI Express x1 slot and a regular PCI slot free—a modem occupies a second PCI slot—as well as one front-accessible 5.25-inch drive and four 3.5-inch drives (one front-accessible and three internal). You can augment the 500GB hard drive's storage with a multiformat memory-card reader, and should you want to pipe video to your HDTV, there's an HDMI port on the rear panel (along with FireWire and eight-channel audio).

But it's the additional incentives that really pump up the value. After you purchase the system, you can visit ZT Systems' Web site and claim a rebate for a free 80GB Maxtor OneTouch 4 Mini portable hard drive, the PCmover migration utility (for moving files, programs, and settings from your old computer to your new one), and D-Link DGL-4300 GamerLounge wireless gaming router.

All told, that piles some $200 on top of an already decent deal. —*Matthew Murray*

EDITORS' RATING 7.9

0 BETTER ›› 10

PROS Strong selection of rebate extras; HDMI, FireWire ports included

CONS So-so performance; no discrete graphics

SPECS 3GHz Phenom X3 8450; 4GB DDR2; 500GB hard drive; DVD±RW; no monitor; integrated graphics; Windows Vista Home Premium

ZT Systems, 866-984-7687
www.ztsystems.com

Direct Price $599.99

For more: computershopper.com/desktops

MaxForce Revolution GTX

A no-compromises gaming PC to grow with

IF YOU'RE IN THE MARKET FOR a more-than-capable PC with good gaming muscle, MaxForce PC's Revolution GTX is worth a look. This $1,497 computer will get you there, bring you back, and keep you smiling in both directions.

There are two keys to the Revolution GTX's prowess. The first is a 3GHz Intel Core 2 Duo E8400 processor overclocked to 3.6GHz; the second is a huge Cooler Master heat sink with a horizontally mounted 120mm fan that keeps the CPU cool.

MaxForce unlocks the gaming arena for you with an Nvidia GeForce 9800 GTX graphics card, which gave us strong 3DMark06 DirectX 9 (DX9) scores of 14,387 at 1,280x1,024 resolution; 12,088 at 1,600x1,200; and 8,456 at 2,560x1,600—not the best we've achieved, but impressive for a system in the Revolution's class.

In the world of DX10 gaming, we found the Revolution best suited to 1,280x1,024 venues. At that resolution, frame rates on our demanding tests were very playable: 34 frames per second (fps) in World in Conflict, 30.4fps in Call of Juarez, 57.8fps in Company of Heroes, and 46.7fps in Supreme Commander. Those titles were still decently playable at 1,600x1,200, though there was a little bit of visual stuttering. The only thing that survived when we pumped the resolution up to 2,500x1,600, however, was Supreme Commander, which held up at 38fps.

On the back panel and the top of the spacious Cooler Master CM-690 midtower case, you'll find 10 USB ports and a pair of FireWire ports. We'd probably opt for a second Western Digital 640GB Serial ATA 3.0Gbps hard drive, and there's plenty of expansion room inside the case—10 bays in total, split evenly between those for front-accessible 5.25-inch and internal 3.5-inch drives. —*Bill O'Brien*

EDITORS' RATING 8.1

0 BETTER ›› 10

PROS Good gaming performance for the price; superb general computing ability

CONS No DDR3 RAM support; resolutions higher than 1,600x1,200 tax the single graphics card

SPECS 3GHz Core 2 Duo E8400 (overclocked to 3.6GHz); 2GB DDR2; 640GB hard drive; DVD±RW (LightScribe); no monitor; Nvidia GeForce 9800 GTX (512MB); Windows Vista Home Premium

MaxForce PC
www.maxforcepc.com

Direct Price $1,497

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Dell Studio Hybrid

Environmentally friendly PC lacks processing punch

HOW MUCH ARE YOU WILLING TO PAY for a green PC? Or, for that matter, a green PC that *comes* in green, as well as black, blue, orange, red, yellow, or even bamboo? Dell is betting you'll put down about $874, the price of its new Studio Hybrid desktop, which comes with a 19-inch wide-screen LCD monitor. Whether it's worth that price to you depends greatly on your own commitment to the environment: For all of its eco-friendliness and spectrum-spanning color palette, the Studio Hybrid is otherwise fairly unexceptional as a computer.

The Studio Hybrid is most successful in terms of its design, which melds desktop and laptop philosophies into a uniquely unified look. It's ovoid-rectangular in shape and, laid flat, measures just 2.75x7.5x8.25 inches (HWD) inside its swappable plastic color sleeve, making it the second-smallest PC we've seen in years. (Asus's new Eee Box, which we review on p. 14, is the smallest.) The optical drive (a DVD±RW), headphone jack, USB ports, and multiformat memory-card reader are strategically positioned to all but disappear within the curved grooves that grace the front panel. The rear panel, if similarly compact, is more conventional in design, and it makes less of an attempt to hide the power jack (for hooking up the AC brick the Studio Hybrid uses for juice) and the host of other connections: one each for headphone, microphone, Ethernet, S/PDIF digital audio, four-pin FireWire, DVI monitor, and HDMI, and three USB. Our configuration also came with built-in 802.11b/g/n Wi-Fi.

EDITORS' RATING 6.9

0 BETTER ›› 10

PROS Compact size; monitor included; HDMI port; environmentally conscious design, packaging

CONS Unexceptional performance; small size limits configuration options, practically precludes upgrading

SPECS 2.1GHz Core 2 Duo T8100; 2GB DDR2; 250GB hard drive; DVD±RW; 19-inch LCD; integrated graphics; Windows Vista Home Premium

Dell, 800-915-3355
www.dell.com

Direct Price $874

As the port selection suggests, the Studio Hybrid is aimed at general-purpose, living-room usage, so it's not destined to satisfy those looking for top-tier performance or inside-and-out customizability. There are, for example, no drive bays or expansion slots, even of the half-height variety; though you can open the system by removing a screw, the cramped interior isn't easy to navigate. And although the 2.1GHz Core 2 Duo T8100 processor, 2GB of DDR2 RAM, 250GB hard drive, and Intel 965 Express integrated graphics can power the Windows Vista Home Premium operating system, they're not capable of much more.

Aside from 3D (an unimpressive 525 in Futuremark's 3DMark06) and gaming—a terrible 4.6 frames per second (fps) in Company of Heroes at 1,280x1,024—the Studio Hybrid acquitted itself decently in our performance tests. But other, cheaper computers have done better recently: The Gateway GT5692, priced at just $549.99 (with a monitor), trounced the Dell in our Cinebench 10 (5,040 versus 4,289) rendering test, as well as in 3DMark06 (1,480) and Company of Heroes (13.1fps). The Gateway did take slightly longer, however, to make it through our Windows Media Encoder (7 minutes and 33 seconds, compared with the Dell's 7 minutes and 19 seconds) and iTunes conversion (4 minutes and 18 seconds versus 4 minutes and 49 seconds) trials. The $749.99 ZT Affinity 7225Xi didn't come with a monitor, but it bested both systems in all our tests.

What the Studio Hybrid has that other machines don't is its G (for green) factor—something we can see being a tipping point for the more ecologically focused. In addition to being much tinier than traditional desktops (Dell says it's 80 percent smaller than average), the Studio Hybrid also sucks up very little energy (70 percent less than full-size desktops, again according to Dell) and comes with minimal paper documentation and packaging—all of which is up to 95 percent recyclable. You even get a system-recycling kit to make it easier to dispose of your old PC properly. (We're not sure how environmentally responsible the system's colored plastic covers are, but no matter.)

But will all that—or any of the Studio Hybrid's other features—appeal to mainstream consumers? With lower-leaning performance even at this price, cheaper models (the series starts at $499) won't be especially attractive, and the system's deficiencies and limitations will become only more noticeable at higher prices. Sure, the green overtones are nice, but we're not sure there's a compelling reason for most people to sacrifice more of their own green to get such a poor selection of features. —*Matthew Murray*

For more: computershopper.com/desktops

Panasonic recommends Windows Vista® Business.

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Dell Studio 15

Midrange notebook offers better brains than looks

OFFERING MORE-FLEXIBLE OPTIONS than Dell's budget-minded Inspirons—but still priced well south of the more upscale XPS line—the company's new Studio line (starting at $749 and available in 15- and 17-inch varieties) hits a midrange sweet spot, delivering everything the mainstream consumer could ask for.

Dell offers the Studio in a wide assortment of colors (our Studio 15 test system came in midnight blue), though the Dell designers got too artsy with the drip-like imprint design on the glossy wrist rest. A recessed lid hinge and clean lines rescue the Studio line from aesthetics hell, however.

The Studio 15 delivered solid marks on our PCMark05 test suite, but it did even better on our Windows Media Encoder and iTunes-encoding tests. Our unit came with a 256MB ATI Mobility Radeon HD 3450 discrete graphics card, which wasn't as strong a performer—if you want to play the latest games, look elsewhere. The included six-cell battery lasted a respectable 2 hours and 6 minutes on our DVD drain test.

At our test unit's $1,299 price, you get 2GB of RAM to go with a top-shelf 2.5GHz Core 2 Duo T9300 processor; in its current configuration, unfortunately, the Studio misses out on Intel's recently launched Centrino 2 technology.

The ample connection options include an HDMI port, five USB ports, FireWire, a multiformat memory-card reader, and a PC Card slot. Wireless connectivity comes courtesy of built-in 802.11b/g Wi-Fi. You also get a built-in 2-megapixel Webcam residing above the screen. —*Asa Somers*

EDITORS' RATING 8.0

0 BETTER ›› 10

PROS Good overall performance; decent battery life; solid connectivity

CONS Lacks Centrino 2 technology; out-of-date case design; wimpy gameplay

SPECS 2.5GHz Core 2 Duo T9300; 2GB DDR2; 250GB hard drive; DVD±RW; 15.4-inch TFT; ATI Mobility Radeon HD 3450 (256MB); Windows Vista Home Premium

Dell, 800-999-3355
www.dell.com

Direct Price $1,299

For more: computershopper.com/laptops

MSI Wind U100

Tiny system delivers big value

EDITORS' CHOICE

IN THE NEW BUDGET ultraportable laptop class, the $499 MSI Wind U100 strikes the best balance yet between portability and performance.

Powered by Intel's 1.6GHz Atom N270 processor, the 2.3-pound Wind performs better than netbook competitors like the early Asus Eee PC models and HP's 2133 Mini-Note PC. It includes 1GB of RAM and currently ships with Windows XP Home Edition; the company's planning a lower-cost SUSE Linux version, as well. Storage comes from an 80GB hard drive—roomy compared with the solid-state drives used in some budget netbooks—but as with those other systems, there's no optical drive on the Wind.

The keyboard doesn't feel quite as sturdy as that of the 2133 Mini-Note PC, but its sculpted keytops are more comfortable to type on. The 10-inch screen, meanwhile, features a 1,024x600 wide-screen resolution. The Sound Blaster-compatible audio is fine when using the headphone jack, but the built-in speakers are poor, adding lots of distortion to the Wind's output.

Due to battery shortages, MSI shipped the first Wind units with a meager three-cell unit; at press time, MSI said that a larger six-cell battery would soon be available. With the three-cell unit installed, we were able to use the Wind for 2 hours and 22 minutes with Wi-Fi and power saving enabled.

As for connections, there are no PCMCIA or ExpressCard slots, but the Wind does include three USB 2.0 ports, headphone and microphone jacks, an SD/SDHC memory-card slot, and a VGA connector. Wireless connectivity includes 802.11b/g Wi-Fi and Bluetooth. —*Denny Atkin*

EDITORS' RATING 8.7

0 BETTER ›› 10

PROS Small, light; roomy hard drive, large keyboard for its class

CONS Mediocre battery life with three-cell battery; poor speakers; no PCMCIA, ExpressCard slots

SPECS 1.6GHz Atom N270; 1GB DDR2; 80GB hard drive; no optical drive; 10-inch TFT; integrated graphics; Windows XP Home Edition

MSI Computer, 626-913-0828
www.msimobile.com

Mfr. Est. Price $499 (three-cell battery), $549 (six-cell battery)

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Cyberpower Xplorer X5-3400

Budget machine offers impressive performance

AT $999.99, the Cyberpower Xplorer X5-3400 is on the low end of new Intel Centrino 2 notebooks. Its lackluster 3D capabilities are typical of its price range, but its impressive performance and battery life suggest that even budget laptops can get a boost from the chipmaker's new platform.

The Xplorer X5-3400's design approach is understated, with the case wrapped in cool, gray-blue plastic from the top cover to the palm rest and touch pad. It's virtually smudge-proof—something that can't be said of some of the shinier machines we've looked at this year. Thankfully, Cyberpower's commitment to plainness did not extend to its LCD, a bright, gorgeous 15.4-inch wide-screen display that runs at a native resolution of 1,280x800.

For a budget laptop, the 6.5-pound Xplorer X5-3400 comes with an impressive set of connectivity options, including two USB 2.0 ports, an ExpressCard slot, external Serial SATA (eSATA) and VGA jacks, 802.11a/b/g/n Wi-Fi, and an HDMI output. It also includes a Webcam and a fingerprint reader. It lacks any multimedia controls, however.

In terms of performance, the notebook's 2GB of RAM and its new 2.4GHz Intel Core 2 Duo P8600 processor worked wonderfully, though its 256MB ATI Mobility Radeon HD 3470 graphics chip is ill-equipped to deal with the graphical flourishes of most new games. For a midsize system, the Xplorer X5-3400's battery life is very impressive—the six-cell battery lasted 2 hours and 15 minutes in our DVD rundown test.

—Serguei Servianov

EDITORS' RATING 8.2

0 BETTER ›› 10

PROS Great general performance for the price; good battery life; bright display; smudge-proof exterior

CONS Lackluster gaming performance; plain case design; lacks media controls

SPECS 2.4GHz Core 2 Duo P8600; 2GB DDR2; 200GB hard drive; DVD±RW; 15.4-inch TFT; ATI Mobility Radeon HD 3470 (256MB); Windows Vista Home Premium

Cyberpower PC, 888-900-5180
www.cyberpowerpc.com

Direct Price $999.99

Sony VAIO VGN-FW198U/H

Entertainment laptop could deliver a bit more

THE SONY VAIO VGN-FW198U/H is the first entertainment laptop we've seen using Intel's new Centrino 2 platform. We expected more from the system, but its Blu-ray burner and $2,099 price mostly make up for its performance issues.

The attractive 6.8-pound system comes with a matte-silver finish and shiny silver around the keyboard and palm-rest area. Sony includes a 16.4-inch, glossy Xbrite-HiColor screen with a resolution of 1,600x900—good enough to play Blu-ray discs at 720p HD resolution but not at the full 1080p that Blu-ray natively supports. Nonetheless, movies on the VGN-FW198U/H look fantastic. The on-board speakers sound decent, though they fall short in the bass department.

Connectivity includes 802.11a/b/g/n Wi-Fi, Bluetooth, VGA and HDMI out, FireWire, and a trio of USB 2.0 ports. There's an ExpressCard/34 slot, SD card slot, and Memory Stick Duo slot with MagicGate functionality. The VAIO also integrates a 1.3-megapixel Webcam into the LCD bezel.

The VGN-FW198U/H uses a Core 2 Duo T9400 CPU, running at 2.53GHz, with a front-side bus speed of 1,066MHz. Sony equips the notebook with 4GB of RAM and a 320GB hard drive. The system's discrete graphics come courtesy of ATI's Mobility Radeon HD 3470 with 256MB of dedicated video RAM.

The VGN-FW198U/H turned in solid numbers on most of our benchmark tests, but the VGN-FW198U/H's Achilles heel is its 3D performance. Despite the unit's discrete graphics card, it delivered poor gaming scores for the class. The VGN-FW198U/H's battery life is also slightly low for its class at 1 hour and 25 minutes. *—Shane McGlaun*

EDITORS' RATING 7.5

0 BETTER ›› 10

PROS Great 16.4-inch screen; Blu-ray burner; attractive design; HDMI port

CONS Disappointing 3D performance; mediocre battery life; lacks 1080p HD screen

SPECS 2.53GHz Core 2 Duo T9400; 4GB DDR2; 320GB hard drive; Blu-ray burner/DVD±RW; 16.4-inch TFT; ATI Mobility Radeon HD 3470 (256MB); Windows Vista Ultimate

Sony Electronics, 877-865-7669
www.sonystyle.com

Direct Price $2,099

For more: computershopper.com/laptops

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Lenovo ThinkPad X200

An ultraportable suited for business travel

THE $1,859 THINKPAD X200 ultraportable replaces the business-oriented ThinkPad X61 in Lenovo's line, and it delivers good power in a compact form factor.

The X200's matte-black body is unassuming—some might say bland—and the slip-resistant finish makes toting the 3-pound machine (including a four-cell battery) feel comfortable and secure. As with many other ultraportables, you'll have to make do with a smallish 12.1-inch display; the 1,280x800 screen is bright and crisp, though default font sizes in some apps and Web sites are a touch small on a panel this size.

EDITORS' RATING 8.0

0 BETTER ›› 10

PROS Good performance; very compact, lightweight; excellent keyboard

CONS No onboard optical drive; no touch pad; typical bland ThinkPad look

SPECS 2.4GHz Core 2 Duo P8600; 2GB DDR2; 160GB hard drive; no optical drive; 12.1-inch TFT; integrated graphics; Windows Vista Business

Lenovo, 866-968-4465
www.lenovo.com

Direct Price $1,859

The keyboard has the excellent tactile feel and feedback we've grown accustomed to with ThinkPad keyboards. Touch-pad fans, however, are out of luck: The only pointing device is Lenovo's responsive TrackPoint stick, though we were happy to see a scroll rocker switch nestled between the mouse buttons.

We were impressed with the performance of the X200's new Intel Centrino 2 underpinnings. The 2.4GHz Core 2 Duo P8600, 2GB of RAM, and Centrino 2's faster front-side bus—1,066MHz versus 800MHz for the original Centrino platform—helped the X200 outpace other ultraportables we've tested. With no optical drive onboard the system, we couldn't run our DVD battery-rundown test, but Lenovo claims the battery is good for more than three hours of runtime.

Ports and connectivity include 802.11a/b/g/n Wi-Fi, three USB ports, a VGA connector, and a PC Card slot. Options include a fingerprint reader, a Webcam (our test machine had both), a multiformat memory-card reader, integrated wireless USB (coming later in 2008), and integrated WWAN with GPS support. —*Jamie Bsales*

For more: computershopper.com/laptops

OCZ DIY Gaming Laptop

Build-your-own kit makes assembly a breeze

THE OCZ DIY GAMING LAPTOP is a $699 bare-bones system that includes the case, motherboard, graphics chip, nine-cell battery, and LCD screen. The CPU, hard drive, RAM, operating system, and networking chip are all sold separately, though OCZ included these parts with our $1,343 review unit.

Thanks to OCZ's richly detailed documentation, assembling the laptop was a breeze. You have the option of replacing the bezel touch controls and optical drive, though the documentation doesn't mention anything about the latter—a pretty big selling point if you ever want to upgrade to a Blu-ray drive. All told, we had the laptop up and humming in about two hours (including OS installation), using only a multi-head screwdriver.

You'll find a healthy mix of ports on the 7-pound DIY Gaming Laptop, including four USB inputs, FireWire, S-Video, and VGA jacks, and SD memory-card and ExpressCard slots. The glossy 15.4-inch, 1,440x900-resolution display looked very sharp, but color fidelity was a bit bland and viewing angles left much to be desired. The keyboard felt sturdy, and the touch pad, while a bit small, was accurate.

EDITORS' RATING 7.6

0 BETTER ›› 10

PROS Easy assembly with thorough instructions; solid performance; good battery life

CONS GPU is not upgradeable; poor color fidelity, viewing angles on LCD; documentation omits optical-drive upgrade info

SPECS 2.4GHz Core 2 Duo T7700; 2GB DDR2; 120GB hard drive; double-layer DVD±RW; 15.4-inch TFT; Nvidia GeForce 8600M GT (512MB); Windows Vista Ultimate

OCZ Technology, 408-733-8400
www.ocztechnology.com

Mfr. Est. Price $1,343

As a gaming notebook, the OCZ DIY performed on par with pre-built systems with similar specs, though many newer laptops with the same 512MB Nvidia GeForce 8600M GT video card will pack faster GDDR3 memory (instead of GDDR2) for better performance. The battery provided ample working time, lasting 2 hours and 22 minutes in our DVD rundown test, easily besting nearly all of the 15.4-inch and 17-inch gaming rigs we've reviewed. —*Mike Spitalieri*

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Asus P5Q Deluxe

Powerful foundation for PCs with one video card

THE $209 ASUS P5Q DELUXE is one of the first motherboards to use Intel's new P45 chipset. Similar to the P35 it replaces, this midrange chipset is built on a 65-nanometer (nm) process, which reduces heat and power consumption while supporting a 1,600MHz front-side bus and the latest 45nm processors. It makes a good basis for a solid motherboard that's a full-featured, fine performer but isn't overly blinged out.

Though the P5Q Deluxe includes the P45, it still relies on DDR2 memory, supporting DDR2 speeds up to DDR2-1200. This makes it an attractive choice if you're bringing over components from an earlier PC or trying to save cash.

Asus' Six Engine Power Saving technology, which features five power-consumption modes, significantly cuts the P5Q Deluxe's power usage—at the expense of some performance—making the P5Q an excellent choice for home theater PCs, home media servers, and other systems that are always on.

The board has three PCI Express (PCIe) slots with x16 connectors that support multiple ATI graphics cards using CrossFireX technology. Note, however, that if you install two video cards, each slot drops to x8 mode, and the third slot only runs in x4 mode. Motherboards using Intel's X48 chipset can run the first two slots in x16 mode, which offers a performance increase in some games and makes the X48 a better choice for CrossFireX users.

EDITORS' RATING 8.6

0 BETTER ›› 10

PROS Stable; highly overclockable; excellent power-saving features

CONS Only supports PCIe x8 when used with dual graphics cards; SATA port placement not optimal

AsusTek Computer, 502-995-0883
usa.asus.com

Mfr. Est. Price $209

The P5Q Deluxe's BIOS is loaded with overclocking features, allowing users to tweak processor and memory speeds—as well as voltages—with exacting detail; its 16-phase power promises extra system stability. And though full-length graphics cards will block one of the Serial ATA (SATA) connectors, the overall board layout is good. —*Denny Atkin*

NZXT Tempest

A low-cost wind-tunnel for high-heat PCs

WE'VE SEEN GREAT GAMING CASES cost $200, $300, or even more, but it's rare that we come across one that offers most of what enthusiasts crave without even breaking the $100 barrier. NZXT's $99 Tempest is just such a case.

The Tempest contains six larger-than-average fans (handsomely equipped with the ever-popular blue LEDs), two 120mm intake fans (with filters for dust control) in the front of the case, two 140mm exhaust fans in the ceiling, a 120mm exhaust fan in the rear, and a 120mm intake fan on the windowed side panel.

EDITORS' RATING 8.0

0 BETTER ›› 10

PROS Lots of fans, airflow-enhancement features; eSATA port on the front panel; tool-less drive implementation

CONS Won't support advanced video-card setups; unusual power-supply layout not ideal for everyone

NZXT
www.nzxt.com

Mfr. Est. Price $99

Other key features include the ability to route cables behind the motherboard tray, along with a layout that places the power supply at the bottom of the case, rather than at the top. That may take a little getting used to, and if you're planning on powering a device in one of the uppermost drive bays, you might have trouble making the cable reach. But it certainly makes for a cleaner, more circulation-friendly design.

If you want to add even more cooling, two grommeted holes drilled in the rear panel make it easy to route liquid-cooling piping into and out of the case. The raised grate on the exterior exhaust port, however, might make it a bit of a challenge to install a radiator there.

The Tempest has space for only seven expansion cards, which means you might run into trouble building systems with three- or four-card graphics setups, but otherwise there's more than enough room. There are three 5.25-inch bays and two hard drive cages, each capable of holding four hard drives (all drive bays are tool-less), as well as an external Serial ATA (eSATA) port on the front panel simplifies connecting external storage. —*Matthew Murray*

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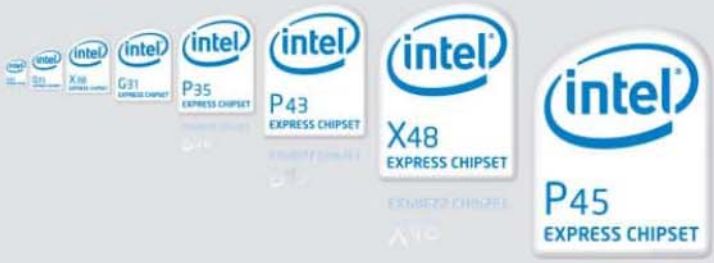

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- Dual channel DDR2 1200 for remarkable system performance
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VIA Artigo Pico-ITX PC Builder Kit

Build a tiny PC—but expect performance to match

VIA TECHNOLOGIES' $319.99 Artigo Pico-ITX PC Builder Kit lets you assemble a tiny desktop (1.8x5.9x4.3 inches) you can stash almost anywhere—even inside a 5.25-inch bay in a PC tower. Just expect performance in proportion to its size.

The kit comes with everything you need except a hard drive (only one 2.5-inch drive can be used) and RAM (you're limited to one laptop-style DDR2 SO-DIMM of 1GB or less). The 1GHz VIA C7 CPU is no match for Intel or AMD chips, and the graphics are unimpressive integrated VIA VX700.

Because these modest components were designed for embedded systems, the computing power on hand simply isn't comparable with that of a general-purpose desktop. But if basic productivity tasks are all you run, and multitasking and Windows Vista aren't on the menu (Microsoft's latest OS isn't supported), you might be fine.

The build process shouldn't exceed a half hour, thanks to VIA's clear documentation and the relatively few parts that need assembling. You'll need an external optical drive to install any disc-bound software (at the very least, your OS), and the only integrated ports for hooking up input devices are the four USB 2.0 ports on the box's front; the company includes dongles for PS/2 input devices or a DVI display, though you'll have to drill or Dremel-tool the enclosure to employ them.

In anecdotal testing, office apps worked serviceably, though application load times felt sluggish. One upside of the minimalist performance: The Artigo runs almost silently, the only moving parts being the hard drive internals and the petite cooling fan. Apart from a brief whoosh at bootup, it's a low-key operator. —*John A. Burek*

EDITORS' RATING 7.0

0 BETTER ›› 10

PROS Smallest desktop PC we've seen, by a long shot; easy to build; quiet operation

CONS Accepts only SO-DIMM DDR2 RAM; RAM limited to 1GB; no Vista support; only minimally customizable; no optical drive; included dongles can't be used without modifying the case

VIA Technologies, 510-683-3300
www.via.com.tw

Mfr. Est. Price $319.99

For more: computershopper.com/components

OCZ Core Series SATA II SSD 64GB

Affordable solid-state drive best for notebook owners

IF YOU'VE BEEN CONSIDERING a solid-state drive (SSD) in your desktop or notebook but are put off by the high price, the OCZ Core Series may be affordable enough to change your mind. Though $279 is a lot to pay for 64GB, this drive is significantly faster than a traditional 5,400rpm notebook hard drive.

The Core Series uses a standard 2.5-inch notebook form factor and has a Serial ATA (SATA) connector. It will slot right into most late-model notebooks, but if you plan to use it in your desktop, you'll have to buy an inexpensive 2.5-to-3.5-inch mounting kit. The drive comes preformatted, and it offers roughly 60GB of available space. The manufacturer claims a mean time between failures (MTBF) of about 186 years—longer than any traditional hard drive. It features a SATA II interface, which allows burst rates up to 300MB per second, but this figure is largely irrelevant, since the entire drive is similar to a regular hard drive's buffer.

Setup is as simple as connecting the drive to a SATA port on your motherboard. In our tests, we ran it without any active cooling, and the drive never got even slightly warm.

The Core Series' performance during our tests was excellent compared with 10,000rpm and 7,200rpm desktop drives—and simply phenomenal compared with traditional 2.5-inch notebook drives. In our 10GB file-transfer test, the Core Series scored on par with a 7,200rpm hard drive, taking 5 minutes and 13 seconds to write the file, then 4 minutes and 44 seconds to read it.

In our opinion, the biggest benefit of SSDs isn't their speed but their durability. That's a key concern for most notebook owners, and they would benefit greatly from upgrading to a Core Series drive. —*Josh Norem*

EDITORS' RATING 7.5

0 BETTER ›› 10

PROS Fast; quiet; long-lasting; relatively affordable for a solid-state drive

CONS Expensive, given its capacity; not the fastest drive out there

OCZ Technology, 408-733-8400
www.ocztechnology.com

Direct Price $279

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Sapphire Radeon HD 4870

Video card sets new standards—in performance and price

EDITORS' CHOICE

AMD MUST BE CAUSING some headaches in the halls of its chief competitor, Nvidia. First, AMD ships the ATI Radeon HD 4850, a $199 card that ran neck-and-neck with the Nvidia GeForce 9800 GTX, resulting in Nvidia significantly dropping the price of its own card. Now, AMD's $299 Radeon HD 4870 offers even greater performance, putting the card in competition with Nvidia's new GeForce GTX 260—which sells for $100 more.

Our review card came in the form of Sapphire's Radeon HD 4870. Along with the usual accessories, Sapphire bundles CyberLink's PowerDVD 7.0 and DVD Suite, a registered copy of Futuremark's 3DMark06, AMD's Ruby sampler DVD, and a 2GB USB flash drive containing a number of videos and wallpapers.

Although its HD 4850 little brother is a single-slot, single-power-connector card, the bigger HD 4870 has a thicker cooler-and-heat-sink combo that blocks an adjacent slot, and it requires a pair of six-pin PCI Express (PCIe) power connectors. Like the HD 4850, the HD 4870's RV770 GPU chip runs hot, idling at about 78 degrees Celsius. Its larger cooler vents air out the back of the case, however, so the hot GPU shouldn't have as much effect on overall system temperature. The fan is very quiet while idle but noticeably louder than the HD 4850 when it gets up to speed at high loads. It seems to cool things down quickly, however, and doesn't stay loud for long periods.

EDITORS' RATING 9.3

0 BETTER ›› 10

PROS Fast; includes HDMI adapter; excellent hardware video playback acceleration; DirectX 10.1 support

CONS Blocks an adjacent slot; can get loud during extended gaming sessions; requires two power connectors

Sapphire Technology Limited
www.sapphiretech.com/us

Mfr. Est. Price $299

The card has a pair of dual-link DVI outputs, an analog output that supports S-Video and component video, and HDMI and VGA adapters. The HDMI connector has its own integrated digital audio device, so you don't need to connect a pass-through cable to your motherboard sound card like you do with HDMI-capable Nvidia cards. The card, which uses a faster version of the DirectX 10.1-capable RV770 GPU introduced on the HD 4850, gets some of its increased performance from its 512MB of cutting-edge GDDR5 memory.

The card's performance is groundbreaking for its price. With 3D effects and details maxed, the Sapphire HD 4870 turned in playable frame rates at 1,920x1,200 pixels in all our tests, clocking 35 frames per second (fps) in Call of Juarez, 36fps in World in Conflict, 39.9fps in Company of Heroes, and a whopping 100fps in F.E.A.R. This is something none of the previous-generation ATI cards could manage—not even the dual-GPU HD 3870 X2, which turned in a pokey 12fps at that resolution in World in Conflict and 26.9fps in Company of Heroes. The HD 4870 significantly outpaced Nvidia's 9800 GTX in all our tests except the two lower-resolution Company of Heroes tests; though admittedly, at its new price, the 9800 GTX now competes with the less expensive HD 4850.

The HD 4870's performance doesn't match that of Nvidia's high-end GTX 280 card, of course, but for the price of that model, you can buy two HD 4870 cards. You can drop up to three additional HD 4870 cards into a system that has a CrossFireX-compatible motherboard and additional PCIe slots, boosting performance even further.

Image quality is excellent, and ATI's Avivo HD technology enables hardware decoding of the H.264 and VC-1 compression used by HD DVD and Blu-ray discs. New in the HD 4800 series is the ability to hardware-decode two streams at a time, allowing the card to accelerate the picture-in-picture mode present in Blu-ray 2.0. The card supports HD audio over the HDMI cable.

Its bundle of useful PowerDVD applications might make Sapphire's version sound like a better pick than something you already own, but though the company offers a two-year warranty on its video cards, all service requests must be handled through your place of purchase—not with Sapphire. (The company offers support via e-mail or a toll call.)

Given the Radeon HD 4850's already impressive performance, the $100 more you'll spend on an HD 4870 will net you about a 30 percent speed increase at higher resolutions. That additional speed might be overkill unless you're using a 24-inch or larger monitor; at lower resolutions, the HD 4870's additional performance is more of an investment in the future—something that used to be the domain of more expensive cards. —*Denny Atkin*

For more: computershopper.com/graphics-cards

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Color Options

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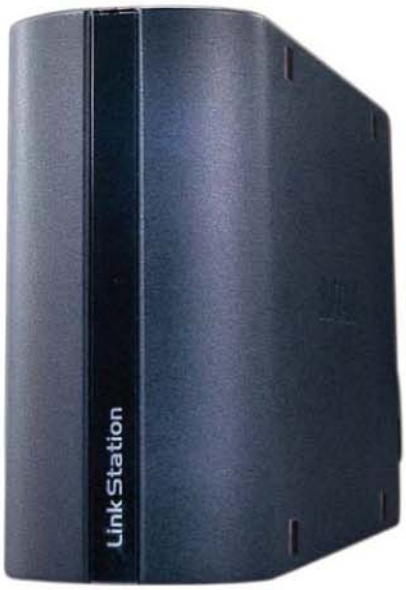

Buffalo LinkStation Mini (1TB)

Tiny storage unit needs better interface

THE BUFFALO LINKSTATION MINI is different from other network-attached storage (NAS) drives because it uses 2.5-inch hard drives instead of the larger 3.5-inch drives typically found in desktop PCs. Aside from its diminutive stature, the Mini is a rather run-of-the-mill NAS device with decent features. It's held back, however, by an archaic interface—and a high price ($599.99).

Weighing just 1.1 pounds, it includes two 5,400rpm 500GB hard drives inside its fanless chassis. A lone USB port can be used for adding storage or a printer to your network. You can run the Mini's hard drives in a striped RAID Level 0 array for full capacity, or a RAID Level 1 array for better data security. There doesn't appear to be an easy way to access the drives, though, so if one fails, you'll likely have to crack the chassis open—not an ideal situation.

Setup was simple, but administration is handled via a cryptic browser-based interface. Despite its dated look and feel, the interface does offer a host of useful options that make it easy to set up online access and create users and groups, though backup software is notably missing. The Mini can also stream content to any PC or a Digital Living Network Alliance (DLNA) device such as a set-top media box.

In our 10GB read/write test, the Mini placed at the low end of the NAS scale: 23 minutes and 20 seconds to write the file, and 15 minutes and 16 seconds to read it. —*Josh Norem*

EDITORS' RATING 7.0

0 BETTER ›› 10

PROS Tiny; supports both RAID Levels 0, 1; includes media, print server capabilities; Web access is easy to configure

CONS Very expensive; cryptic interface; no conventional backup software; slow read/write times; no easy way to remove drives

Buffalo Technology
800-456-9799
www.buffalotech.com

Direct Price $599.99

D-Link RangeBooster N Dual Band Router (DIR-628)

Fast, cheap dual-band device

EDITORS' CHOICE

D-LINK'S NEW RANGEBOOSTER N Dual Band Router (DIR-628) is available from online retailers for less than $100, making it the least expensive dual-band model we've ever tested. Despite its low price, it's also the fastest Draft N router we've ever tested, and it has all the high-end features one would expect from a unit that costs twice as much.

The DIR-628's setup wizard is flawless and very easy to follow; we had no trouble replacing our old router. Once you've finished setup, you can administer your network via a Web browser. While we prefer a program like the one Linksys uses, the D-Link tools are easy to handle, and they provide wizards for almost everything (unless you want to manually configure your settings). And though you can't run 2.4GHz and 5GHz networks simultaneously, you can run a "mixed" mode that works with 802.11b/g/n adapters.

EDITORS' RATING 9.0

0 BETTER ›› 10

PROS Fastest router we've tested; easy setup; fantastic range; incredible value

CONS Doesn't broadcast 2.4GHz, 5GHz simultaneously; can't add storage, a printer; no Gigabit Ethernet ports

D-Link Systems, 800-326-1688
www.dlink.com

Direct price $119.99

For a budget-oriented router, the DIR-628's extraordinary speed is amazing. At 50 feet in 5GHz mode, we transferred a 100MB file in 17 seconds, and a 500MB file in 1 minute and 22 seconds, which is record-breaking. It was equally fast in 2.4GHz mode, and its range of 175 feet is top of the charts, too.

The D-Link does have a few flaws: It doesn't offer print-server capabilities, Gigabit Ethernet ports, or the ability to add USB storage to the network. Despite those drawbacks, however, the DIR-628 still exceeded our expectations by a country mile. —*J.N.*

For more: computershopper.com/networking

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Plustek OpticBook 4600

Great for scanning books and documents

PLUSTEK'S OPTICBOOK 4600 is a flatbed scanner equally adept at handling documents and photos. The steep $699 price will keep most home users away, but it's a solid choice for offices, libraries, and anyone else who needs to digitize hard-copy documents, especially books.

The 4600 takes up quite a bit of space. Its engine features 1,200-dots-per-inch (dpi) resolution and a 48-bit color depth, and the scanning speed is around 3 seconds for 300dpi monochrome and color scans.

Setup was a snap, but we were annoyed that the familiar InstallShield wizard launched several times during the driver and software installation—once for each bundled app. An integrated, one-click install would have been better.

EDITORS' RATING 7.5

0 BETTER ›› 10

PROS Easy setup; accurately captures text from books, even print near spine; fast scan times

CONS Pricey; no scan-to-USB function; each bundled application has its own install routine

Plustek, 714-670-7713
www.plustek.com/usa

List Price $699

Once the lamp warmed up, however, we were able to quickly capture text documents at 300dpi; scanning an 8x10-inch photo at full resolution took only a few seconds longer. Book pages turned out very well, with accurate recognition even for words near the spine. The 4600 had an accuracy rate of 98.8 percent, and images reproduced well, too, although we noticed some loss of subtlety and detail in a challenging high-contrast test photo with lots of shadow. Still, compared with less capable (and less costly) flatbed scanners we've seen, the results were good.

One other quibble: We wish we could have scanned directly to an attached USB flash-memory device, an option that would help the scanner more fully live up to its billing as a photocopier replacement. *—Jamie Bsales*

For more: computershopper.com/peripherals

Iomega Rev 120GB Backup Drive

Removable-cartridge alternative for backup

THE IOMEGA REV 120GB BACKUP DRIVE is a hard-disk-based storage device that uses removable cartridges. It's an alternative backup solution to traditional external hard drives or tape (like DAT), but for users with either very little (or conversely, too much) data to back up or archive, it's not cost-effective.

Besides the $499.99 drive-and-cartridge bundle that we reviewed, there's also the $699.99 Rev Server Backup Kit, which is ideal for businesses running a server; it comes with five cartridges, along with CA's BrightStor ARCserve Backup and Disaster Recovery software.

Like tape-based cartridges, Rev cartridges allow the archival backups of servers, but Rev drives are faster. The drive heads aren't on the cartridge, so if a cartridge does fail, you won't have to replace an entire unit, as you would with a hard drive. But if you're an individual user, the Rev drive is overkill. Compared with portable hard drives, the Rev is severely limited in capacity, not to mention expensive.

EDITORS' RATING 7.5

0 BETTER ›› 10

PROS Easy to set up, use; includes Retrospect Express backup software; fast transfer times; expandable storage solution through removable cartridges

CONS Pricey for individual users; no server-backup software with $499.99 version

Iomega, 888-516-8467
www.iomega.com

Direct Price $499

Operation-wise, the Rev works just like a portable hard drive, and it's easy to set up and use. You can drag and drop files to it from your Mac OS X desktop or Windows' My Computer. Transfer times were also quite good: It took 8 minutes and 43 seconds to write a 10GB folder to the Rev cartridge, and 7 minutes and 58 seconds to read the same folder. The included Retrospect Express backup software is a basic, easy-to-use app that lets you back up individual folders or an entire drive, as well as schedule backups at a more convenient time. *—Les L. Shu*

Samsung SyncMaster 2053BW

Very good despite the small size

EDITORS' CHOICE

THE SAMSUNG SYNCMASTER 2053BW ($279.99) is a modest 20-inch LCD monitor that delivers great color, excellent text readability, and a wide-format 1,680x1,050 resolution.

The 2053BW's specs include a pixel pitch of 0.26, a pixel response of 2 milliseconds (gray to gray), a brightness of 300 candelas per square meter, and a contrast ratio of 1,000-to-1.

The monitor is a beauty, but the architecture has one big, misleading feature. That thin acrylic ledge is etched with the legends of the monitor's onscreen display (OSD) controls, and at first glance, they seem to be the "buttonless touch controls" that Samsung promises in the documentation. As it turns out, they simply serve as a roadmap for the actual controls, which are tucked away behind the bar and up the bottom of the bezel. It's not devastating, but it's a peculiar design choice. To use the buttonless touch controls, you'll have to install Samsung's MagicBright and MagicTune utilities onto your computer, which will allow you to adjust monitor settings with your keyboard and mouse. That only applies, of course, if you feel a compelling need to adjust anything: Our 2053BW test unit needed no tweaks whatsoever.

EDITORS' RATING 8.2

0 BETTER ›› 10

PROS Wide screen in a small space; great color response; overall good looks

CONS Ordinary OSD buttons despite high-tech-looking acrylic ledge

Samsung, 800-726-7864
www.samsung.com

Mfr. Est. Price $279.99

In the DisplayMate **(www.displaymate.com)** tests, the 2053BW was absolutely perfect in the gray-scale test, displaying the full range. In white saturation, the monitor lost detail at the upper end of the scale, but that loss occurred well beyond what's considered acceptable for a consumer-grade display. A quick press of the monitor's Auto button cured some jitters produced by the VGA connection during the pixel-tracking test. Color, geometry, and overall performance were just as good as with the digital connection. —*Bill O'Brien*

For more: computershopper.com/lcd-monitors

Asus VW223B

Quick and easy display connection

THANKS TO ITS DisplayLink technology, Asus's 22-inch VW223B wide-screen monitor offers a quick and easy solution for creating a multiple-monitor setup without the need for additional video cards. Although tje $289 VW223B lacks a digital DVI connector, it provides generally good performance—as long as you're not working with video.

The VW223B has a native resolution of 1,680x1,050, but you won't be able to watch protected HD content since the monitor doesn't support a DVI connection with High-bandwidth Digital Content Protection (HDCP). Even though that's a con in our book, we do acknowledge that Asus markets the VW223B as a secondary display, not as a user's main monitor.

Its other specs, meanwhile, are standard for a monitor of this size and price: a pixel pitch of 0.28mm, a brightness of 300 candelas per square meter, a contrast ratio of 3,000-to-1, and a response time of 5 milliseconds.

The real attraction here is the DisplayLink technology (Asus calls its version EZLink), which lets you connect multiple monitors to a PC using USB, rather than an often-costly multimonitor graphics card. Once you install the DisplayLink software driver on your Windows PC (a Mac OS X driver is available in beta), you can connect the VW223B as a secondary display to your computer using a standard USB cable.

EDITORS' RATING 7.6

0 BETTER ›› 10

PROS Generally good performance; DisplayLink support; great for multiple-monitor setups; built-in USB hub

CONS Below-average video playback; no digital connector

AsusTek Computer, 888-678-3688
usa.asus.com

Mfr. Est. Price $289

The VW223B did well in our DisplayMate tests via both VGA and USB, but the monitor actually performed better through USB than VGA in the extreme dark end of both the gray-scale and color-scales tests. Both connections demonstrated a problem with video noise in the pixel-tracking and phase-lock tests, although fonts as small as 6 points were impressively legible. —*Les L. Shu*

HP Photosmart C4480

A great all-in-one for photos and text

HP'S $99.99 PHOTOSMART C4480 is a fine multifunction inkjet that's easy to use and pumps out great-looking photos and crisp text. It's equally adept at printing, copying, and scanning, making it a well-rounded printer with just a few small flaws.

The C4480 is geared toward local photo printing (networking is not an option), with a multiformat memory-card reader on its faceplate and an optional "photo" tank that improves photos and saves black ink for documents. You don't need a PC to print either—just stick a card in and use the integrated 1.5-inch LCD to print pictures or to start a scan or copy job.

The C4480 is capable of producing high-quality 4,800x1,200 dots per inch (dpi) prints, and we were very impressed by its color accuracy and overall quality. Text reproduction was equally rich.

Scanning at 1,200dpi (either to PC or to a file) is easy; simply press the buttons on the unit's faceplate. It takes about 25 seconds to scan a document, then another 25 seconds to print it.

The printer comes with two stingy introductory tanks, so we recommend HP's high-yield tanks for a wallet-friendly 4 cents per page for black and 6 cents per page for color.

Print speeds are slow, with a 10-page mixed document of text, photos, and graphs taking 2 minutes and 49 seconds to print. The upside is that the printer is quiet while printing. We also had problems with the included software, which requires a lot of legwork to print photos. *—Josh Norem*

EDITORS' RATING 7.8

0 BETTER ›› 10

PROS Beautiful photo prints; quiet operation; simple to set up, use; low cost per page with high-yield tanks

CONS Relatively slow print speeds; small included ink tanks; no networking support; unwieldy photo-printing software

Hewlett-Packard, 800-752-0900
www.hp.com

Direct Price: $99.99

Kodak ESP 5

Well-rounded but unpredictable unit

KODAK'S NEWEST ALL-IN-ONE inkjet printer, the $169.99 ESP 5, is a decent all-around unit with better-than-average print quality. It was extremely unpredictable during testing, however. Once we ironed out its issues, we found it to be easy to use, with intuitive controls and long-lasting ink tanks that almost made up for the hassles.

As a multifunction unit, the ESP 5 can copy, print, and scan, but not fax or network. Aimed at photo printing, the ESP 5 features a snazzy 3-inch LCD, as well as a multiformat memory-card reader. It also has Bluetooth support (you'll need an adapter, though), along with a PictBridge USB port on the front of its bezel.

Cost per page is pleasingly low at just 2 cents per page for monochrome text, 6 cents for graphics and text, and 10 cents for photos. The tanks are long lasting, as well.

Print quality was adequate and color reproduction even, despite generally muted colors. Text was sharp and readable all the way down to the smallest font sizes. Plus, the scanner produced acceptably accurate copies in both color and monochrome.

Print speeds were slow: It took 3 minutes and 52 seconds to print a 10-page mixed document of text and photos, and 4 minutes to print a 20-page text file. Photos were fast, though, requiring just 21 seconds for a 4x6-inch print.

Sadly, during testing, we experienced numerous software crashes, as well as many failed print jobs and random errors. It's a shame as the ESP 5 is genuinely easy to use and produces decent photo prints at an affordable price. *—J.N.*

EDITORS' RATING 6.4

0 BETTER ›› 10

PROS Decent photo print quality; large 3-inch LCD; easy to use; long-lasting ink cartridges; fast photo printing

CONS Multiple technical problems; muted color reproduction; no networking options

Kodak, 800-421-6699
www.kodak.com

Direct Price $169.99

For more: computershopper.com/printers

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Nikon Coolpix P60

Easy to use, but too bulky to pocket

THE 8.1-MEGAPIXEL Nikon Coolpix P60 ($229.95) with a long 5x zoom is the perfect camera for people who like a reliable shooter they can master quickly.

With a rubber grip on its right side, the P60 is very easy to hold and stabilize, but it's also bulky and hefty—this isn't a camera you can slide into your pocket and take on the go.

For such a large camera, the P60 has a surprisingly small 2.5-inch LCD. And images aren't very easy to see through the electronic viewfinder. The control layout, however, makes the camera amazingly easy to use. The buttons are in all the right places, which makes it easy to quickly access the functions you use most. Helpful features include optical image stabilization and face detection, although the face detection isn't always successful. More-advanced users who require greater creative control will want to use the P60's manual mode, which allows you to adjust the camera's aperture and shutter speed.

Startup time was an acceptable 2.2 seconds, and when shooting, the camera performed respectably. Shutter lag was 1.2 seconds, and shot-to-shot time was 2.3 seconds without flash, 2.5 seconds with.

As for photo quality, outdoor shots captured the subjects with crispness and clarity, and color representation was spot-on. Photos shot indoors without a flash were inconsistent—some were clear, others blurry; photos shot with flash were much better, even though there was the requisite shadowing.

The P60 lets you shoot up to ISO 2000. Unfortunately, most of the shots we took above ISO 800 tended to come out a bit grainy. —*Jonathan Rougeot*

EDITORS' RATING 7.3

0 BETTER ›› 10

PROS Easy to use; optical image stabilization

CONS Bulky; inconsistent photo quality in low light; small LCD for a camera of this size

Nikon, 800-645-6687
nikonusa.com

Mfr. Est. Price $229.95

For more: computershopper.com/digital-cameras-camcorders

Canon PowerShot SD890 IS

Excels at zoom and photo quality

CANON'S $399.99 POWERSHOT SD890 IS, which performs competently and features a 5x optical zoom, will appeal to buyers who are looking for a long lens in a short package.

The 10-megapixel SD890 features a 2.5-inch LCD and Canon's DIGIC III image processor. The lens' zoom range is impressive, but it would be better if Canon gave it a little more range at the wide end. The camera offers optical image stabilization, which helps reduce blurring from camera shake (particularly at the longer end of the zoom range).

The user interface on the SD890 is good but not exceptional. Nevertheless, compared with most point-and-shoots, the menu system is intuitive and relatively easy to navigate. There are no manual exposure controls, but casual users won't miss the omission.

The camera started up in about one second, and shutter lag was minimal. Shot-to-shot times with the flash off averaged 0.5 second; with flash, they were often as long as 2 seconds. Without the flash, the SD890 performed about average compared with the competition, but with the flash, it was slower than many comparable cameras. The camera's autofocus was fairly swift, though it did slow noticeably in low-contrast and some low-light situations.

The SD890 takes very good photographs. At low ISOs, the images were sharp and gave a natural color rendition. Outdoor shots had accurate, properly saturated color, though images were sometimes slightly soft. Most shots using the flash were properly exposed and quite acceptable. Noise was very low until ISO 400 and higher, when the images started to soften and noise crept into the image. —*John B. Stafford*

EDITORS' RATING 8.0

0 BETTER ›› 10

PROS 5x optical zoom, optical image stabilization; good image quality

CONS No manual exposure controls; noise in shots taken at ISO 400 and higher

Canon U.S.A., 800-652-2666
usa.canon.com

Mfr. Est. Price $399.99

Asus R700t

Instability overshadows unique features

THE $315 ASUS R700T GPS NAVIGATION DEVICE offers an array of features in an attractive yet portable package. There are too many glitches, however, to make this a compelling product, especially when there are far better options in this heavily saturated sector.

The R700t comes preloaded with Tele Atlas maps, and offers real-time traffic updates via the Traffic Message Channel (TMC) service.

Once you get a GPS signal and enter a destination, the unit displays easy-to-follow 3D maps (including 3D representations of landmarks) on a large 4.3-inch touch screen in crisp 480x272 resolution.

The unit offers many useful points of interest (POI)—not only the closest gas stations and airports, but also nearby railroad/subway stations, sports stadiums, and concert halls. This came in handy during one road trip. When we missed a turn in our route recalculaton test, the R700t caught it quickly and gave us a new direction in a very timely manner. The navigation system also offers a helpful feature; upon approaching a turn, the angle of the map automatically changes so that it's easy to tell exactly where the turn is to occur.

Overall, the interface is very user-friendly. On the downside, the R700t doesn't have text-to-speech functionality, a feature found in many competing GPS units. Reliability is also a problem: Although many navigation units lose their GPS signal when passing through tunnels, the R700t managed to conk out while passing under a highway overpass. It's a bit frustrating to lose the signal so easily, especially when it takes 5 to 10 minutes to regain it. The device also crashed occasionally when we simply zoomed in on a map. —*Shawn Calo*

EDITORS' RATING 6.0

0 BETTER ›› 10

PROS Large touch screen; easy-to-follow 3D maps

CONS No text-to-speech functionality; issues with finding, maintaining GPS signal; crashes occassionally

AsusTek Computer, 888-678-3688
usa.asus.com

Mfr. Est. Price $315

Motorola ROKR E8

Haptic keypad makes phone shine

AT $199.99 (with a two-year T-Mobile service agreement), Motorola's music-playing ROKR E8 lacks some of the bells and whistles of its similarly priced competitors. But thanks to a handful of unique features, including an innovative, touch-sensitive keypad, this slim cell phone is hard to resist.

The E8 doesn't have a traditional keypad. Instead, the haptic surface digitally morphs into phone, music, or camera mode. Only the relevant "keys" light up, depending on which mode the phone is in, and it's very responsive. This feature makes the E8 very intuitive to use, eliminating the guessing game most users must play when browsing through the features of a new phone.

EDITORS' RATING 7.5

0 BETTER ›› 10

PROS Slim design; intuitive controls; responsive touch pad/keypad

CONS Scroll wheel overly sensitive; slow Web browsing on EDGE network

T-Mobile, 800-866-2453
www.t-mobile.com

Direct Price $199 (with two-year T-Mobile service agreement)

At the center of the phone is the FastScroll wheel, a semicircle designed to quickly navigate menus, contacts, and songs. Unfortunately, we found the wheel to be overly sensitive.

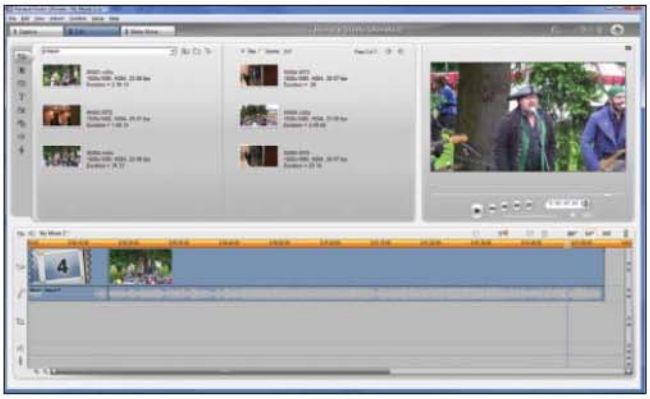
As a music player, the E8 makes listening to tunes on a phone enjoyable. You can transfer tracks to the phone via a USB cable and Windows Media Player 11 or by loading tracks onto a MicroSD card and inserting it into the included slot. The sound quality's default setting should satisfy most, although it can be tweaked through the equalizer. If you have a music collection smaller than 4GB (the maximum memory this phone supports), the ROKR could easily replace your MP3 player.

In our tests, the E8's battery lasted an impressive 8.5 hours, with a mix of voice calls, moderate Internet usage, and the occasional snapshot. But don't expect to get a lot of intense Web surfing done—the browser uses T-Mobile's slow EDGE network. —*Louis Ramirez*

For more: computershopper.com/reviews

Pinnacle Studio 12

Easy-to-use video editor now supports HD



PINNACLE STUDIO 12 is an easy-to-use video-editing program that strikes a good balance between simplicity and flexibility. It breaks the video-creation process into a simple Capture/Edit/Make Movie sequence, while still giving you full control over your edits, along with a wide variety of transitions, effects, and titling options.

Studio 12 can import video directly from Digital 8, DV, or HDV cameras; it can also import Advanced Video Codec High Definition (AVCHD) video files directly from a camera or memory card. Besides supporting a wide variety of output formats and media, it can automatically create files for playback on an Apple iPod or Sony PlayStation Portable. Plus, the app makes it easy to directly upload files to YouTube.

EDITORS' RATING 7.5

0 BETTER ›› 10

PROS Flexible editing interface; excellent HD support; inexpensive entry-level version; extensive print manual

CONS Reliability issues; some unhelpful error messages

Pinnacle Systems, 866-446-0833
www.pinnaclesys.com

Direct Price $49.99 (Studio); $99 (Studio Plus); $129 (Studio Ultimate)

Unlike some entry-level editors, Studio 12 isn't wizard-based, but between the intuitive, timeline-based user interface, the online help, and the well-written 300-page print manual (remember those?), it's easy to master the program's features.

We experienced no crashes during testing, though we did encounter some stability problems. The program failed in the middle of a high-def Windows Media Video render, and we ran into other issues, such as the unhelpful error message "Sorry, Smartmovie has failed" while we were attempting to create a music video; a pointer to why it failed would have been appreciated.

The basic $49.99 package offers all the necessary standard-def editing and DVD-creation tools, but it lacks advanced features like HD support and picture-in-picture. The $99 Studio Plus package adds these, as well as Chroma Key and Blu-ray authoring. The $129 Studio Ultimate package has all of these features, along with six-channel audio support, more effects and titling plug-ins, and additional helpful tools. —*Denny Atkin*

For more: computershopper.com/software

ZoneAlarm Forcefield

Browser virtualization a helpful security tool

BY CREATING A VIRTUAL BROWSER inside your PC—an area that's completely isolated from the rest of your data—ZoneAlarm's Forcefield prevents file downloads, Registry changes, or requests for private information from being passed along. When you close it, everything related to that session vanishes forever.

In our tests, Forcefield caused some occasional stability issues in Internet Explorer 6 (and even more in 7), with a few application-stopping crashes. We were able to close out our browser and reopen it, but we lost any work in progress except downloads, since the previous virtualized area was effectively gone. Unfortunately, Forcefield supports only Firefox 2 and IE6 or higher, and it caused major conflicts with Altiris Software Visualization Solution; removing Altiris was the only way to solve the problem.

EDITORS' RATING 6.5

0 BETTER ›› 10

PROS Good site-loading times; easy installation, operation

CONS Crashes occasionally in Internet Explorer, not fully supported in other browsers; limited help system requires active Internet connection; incompatible with other virtualization-software tools

ZoneAlarm
www.zonealarm.com

Direct Price $29.95

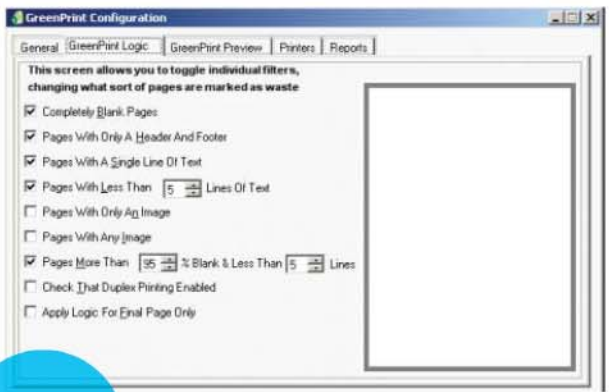
Forcefield performed well in its browsers of choice. It blocked a variety of attempted downloads from dangerous sites, though its own reported "successfully blocked threat" numbers appeared much higher than our tests indicated. (Perhaps it counted quickly repeating threats.) It also used additional, non-anonymizing technology that watched for and warned against sites featuring spyware, keystroke loggers, or phishing activity. We wish the help system could be examined offline and that it was far more detailed, though; it provided only very generalized, basic information.

Don't abandon your current security package, especially if it provides robust firewall and antivirus modules, since ZoneAlarm's package does not include them. Think of Forcefield as an extra line of defense alongside these other measures and a properly patched browser. —*Barry Brenesal*

Save Some Trees with GreenPrint World

Plus, five more great freeware utilities to improve your computing life

OUR FEATURE "GREEN GEAR" (p. 70) shows you several environmentally friendly tech products, so we would have been remiss if we didn't let you know about a free download that's also eco-friendly—and not just because it doesn't come with packaging. Despite claims made long ago that computers would usher in the "paper-free" workplace, it seems that we're using more paper than ever—thanks in no small part to the printers attached to our PCs. The worst part? The final pages of



GreenPrint World 1.1

Web site printouts—the ones with a single site link, copyright info, or other information you won't read.

GreenPrint World 1.1 helps you avoid those wasted pages by deciding whether a given page is worth printing. You can finetune the criteria to determine what should be considered a wasted page, and the program gives you positive feedback by keeping track of how much money you've saved and the number of trees you've preserved by using the utility.

Even if you don't have the money to upgrade your PC at the moment, there are other ways to improve your system's performance. Try freshening up your Registry, for example, by getting rid of traces of apps that you've uninstalled and deleting extraneous programs that load on startup. A utility like **Wise Registry Cleaner 3 Free 3.6.2** helps you prune that list without the risks of working with RegEdit. It shows you invalid entries you can delete to speed things up, while including Registry backup-and-restore options that help you avoid making mistakes that could permanently damage your system.

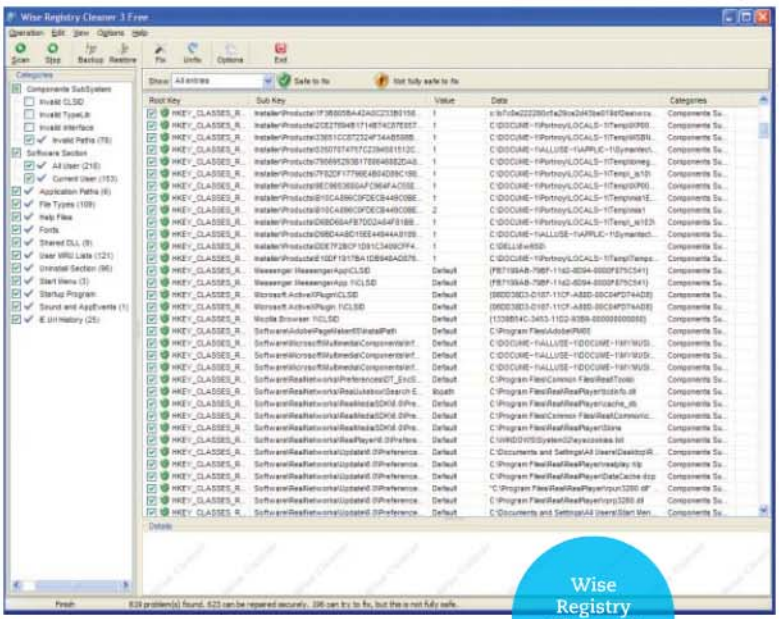
If you're hesitant to muck around in your Registry, there are other ways to tweak system performance. **Process Lasso 3.02** targets all the processes that are running while you're using your PC, letting you prioritize the bandwidth of your processor(s) so that the largest resource hogs are throttled down when you need to use other apps.

Nothing can bring Firefox to its knees faster than clicking on a link to open a big PDF file. You can thank Adobe Acrobat Reader for that, but you can also thank **PDF Download 2.0** for giving you a better alternative for handling online PDFs. As a Firefox extension, it has a small footprint, yet it still gives you control over how you open and save PDFs. Besides letting you view PDFs as HTML files, the app also allows you to save any Web page as a PDF, retaining the page's look and even its hyperlinks.

Most snapshooters have given up film for the convenience of digital photography, but digital image files come with their own set of issues. We've probably all experienced the duplicate photos that litter our hard drive, somehow evading capture and deletion. Enter **VisiPics 1.3**, which can automatically hunt down doubles, even if the same photo is in two different formats or two different resolutions—it can even detect, for example, whether a photo that's been rotated has an unrotated duplicate without the rotation. Advanced shooters will appreciate that VisiPics supports several image formats, including RAW.

Have you ever wanted to make a ringtone from a line in your favorite movie or put your favorite TV theme song on your iPod? The first thing you'll need to do is isolate the audio from the original footage, which is where **AoA Audio Extractor 1.2.2** comes in. It can grab sound from a video file and save it to popular audio formats like MP3, WAV, and ACE. Whether you're trying to snatch sound from AVI, MPEG, FLV, or WMV files, AoA Audio Extractor has you covered.

You can download all these free apps, plus many more, at **computershopper.com/downloads**. — *Sean Portnoy*



Wise Registry Cleaner 3 Free 3.6.2

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TOP 5 BUDGET DESKTOPS

THESE WELL-CONFIGURED PCS DEFINE SYSTEM SAVINGS.

1

HP Pavilion a6560f
www.hp.com
$750
Editors' Rating: 8.0

Specs
- 2.6GHz Core 2 Duo E4700
- 3GB DDR2 memory
- 300GB hard drive
- DVD±RW drive
- Nvidia GeForce 9300GE graphics (256MB)
- One-year warranty

Bottom Line
The Pavilion a6560f may lack strong 3D performance, but it packs a lot more media muscle than we're used to seeing in a system in this price range, as well as a TV tuner and an HDMI port. The tuner makes it a super-affordable TiVo replacement that also comes with plenty of space to store your shows.

2

Shuttle KPC
us.shuttle.com
$229
Editors' Rating: 8.0

Specs
- 1.8GHz Celeron 430
- 512MB DDR2 memory
- 80GB hard drive
- No optical drive
- Integrated graphics
- One-year warranty

Bottom Line
If all you need is a small system to take you online, the KPC will bring you there at a bargain price. Shuttle keeps the costs down by preloading the Linux OS, but it's fine for handling basic computing tasks.

3

ZT Systems Affinity 7225Xi
www.ztsystems.com
$599
Editors' Rating: 8.0

Specs
- 2.4GHz Core 2 Quad Q6600
- 4GB DDR2 memory
- 500GB hard drive
- DVD±RW drive
- ATI Radeon HD 3450 graphics (512MB)
- One-year warranty

Bottom Line
The Affinity 7221Xi comes with a respectable list of components, but its main draws—besides its low price, of course—are the included online rebates for a free 80GB Maxtor OneTouch 4 Mini portable hard drive, the PCmover migration utility, and a D-Link DGL-4300 GamerLounge wireless gaming router.

4

Cyberpower Gamer Infinity 1000
www.cyberpowerpc.com
$785*
Editors' Rating: 7.9

Specs
- 2.83GHz Core 2 Duo E8300
- 2GB DDR2 memory
- 320GB hard drive
- DVD±RW drive
- ATI Radeon HD 3870 graphics (512MB)
- Three-year warranty

Bottom Line
It's not really expandable, but the Gamer Infinity 1000 has the components—a Radeon HD 3870 graphics card and 2GB of RAM—to deliver solid performance at a bargain price. Plus, it comes in a stylish, compact case with a handy temperature display.

5

eMachines T5254
www.emachines.com
$599
Editors' Rating: 7.3

Specs
- 2.1GHz Athlon 64 X2 BE-2350
- 2GB DDR2 memory
- 300GB hard drive
- DVD±RW drive
- 17-inch LCD
- Integrated graphics
- One-year warranty

Bottom Line
Gateway's eMachines lines have long been as unremarkable as they are dependable, but the machines are a great way to stretch a buck—assuming your needs aren't too extensive. The T5254 continues this tradition, offering a full-featured Windows desktop and monitor for less than $600.

* = Configuration changed from original review

For more: computershopper.com/top-products

TOP 5 MIDSIZE LAPTOPS

THESE POTENT PORTABLES HIT THE SWEET SPOT ON SIZE AND FEATURES.

1

Sony VAIO VGN-FZ485U/B
www.sonystyle.com
$2,199 (as tested)
Editors' Rating: 8.2

Specs
- 2.1GHz Core 2 Duo T8100
- 4GB DDR2 memory
- 300GB hard drive
- Blu-ray burner/DVD±RW
- Nvidia GeForce 8400M GT (256MB)
- 15.4-inch TFT
- 6.1 pounds
- One-year warranty

Bottom Line
With its Blu-ray burner, stunning 15.4-inch screen (featuring Sony's color-boosting Xbrite-HiColor LCD technology), and 4GB of RAM, the VGN-FZ485U/B is full-featured enough to serve as a home entertainment centerpiece—yet mobile enough to take on the road.

2

Cyberpower Xplorer X5-3400
www.cyberpowerpc.com
$999.99 (as tested)
Editors' Rating: 8.2

Specs
- 2.4GHz Core 2 Duo P8600
- 2GB DDR2 memory
- 200GB hard drive
- Double-layer DVD±RW
- ATI Mobility Radeon HD 3470 (256MB)
- 15.4-inch TFT
- 6.5 pounds
- One-year warranty

Bottom Line
The Xplorer X5-3400 is a great budget system for those who don't mind a plain-looking, laptop that's suited for basic productivity and media playback rather than gaming. There's nothing about the exterior that will make this system a showpiece, but Intel's new Centrino 2 platform delivers where it counts the most: performance and battery life.

3

Toshiba Satellite A305-S6845
www.toshiba.com
$1,299 (as tested)
Editors' Rating: 8.0

Specs
- 2.1GHz Core 2 Duo T8100
- 3GB DDR2 memory
- Two 200GB hard drives
- Double-layer DVD±RW
- ATI Mobility Radeon HD 3650 (512MB)
- 15.4-inch TFT
- 6.5 pounds
- One-year warranty

Bottom Line
Built around ATI's new mobile GPU, the Toshiba Satellite A305-S6845's features and performance make it a good mainstream system for gaming, productivity, and media chores—at a price well-within the range of most budget gamers.

4

Dell Studio 15
www.dell.com
$1,299 (as tested)
Editors' Rating: 8.0

Specs
- 2.5GHz Core 2 Duo T9300
- 2GB DDR2 memory
- 250GB hard drive
- Double-layer DVD±RW
- ATI Radeon HD 3450 (256MB)
- 15.4-inch TFT
- 6.1 pounds
- One-year warranty

Bottom Line
Designed to carve out a sweet spot between Dell's budget-minded Inspirons and higher-end XPS notebooks, the new Studio line delivers a healthy mix of features and options at a great price. The company's attempt at a stylish design seems a bit behind the times, but otherwise, the Studio 15 is a winner.

5

Fujitsu LifeBook E8410
www.fujitsu.com
$1,509 (as tested)
Editors' Rating: 7.6

Specs
- 2.2GHz Core 2 Duo T7500
- 2GB DDR2 memory
- 100GB hard drive
- Double-layer DVDffIRW
- Nvidia GeForce 8400M G graphics (128MB)
- 15.4-inch TFT
- 6.1 pounds
- One-year warranty

Bottom Line
The LifeBook E8410 is not the most travel- or multimedia-friendly business laptop available, but it has classy looks, solid application performance, and abundant security features (including Intel's Centrino Pro technology). Together, they make the laptop worth considering for corporate and small-business users.

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TOP 5 WI-FI ROUTERS

BUILD A WIRELESS HOME NETWORK AROUND ONE OF THESE CAPABLE DEVICES.

1

D-Link RangeBooster N Dual Band Router (DIR-628)
www.dlink.com
$117.99
Editors' Rating: 9.0 ✓

Specs
- 2.4GHz/5GHz dual-band support
- 300Mbps rated maximum throughput
- 802.11a/b/g, Draft N
- Two external antennae
- WEP, WPA, WPA-2 security
- Hardware firewall

Bottom Line
D-Link's RangeBooster N Dual Band Router is not only the fastest dual-band router we've ever tested, but it's also one of the most affordable.

2

D-Link Xtreme N Gaming Router (DGL-4500)
www.dlink.com
$219.99
Editors' Rating: 8.3

Specs
- 2.4GHz/5GHz dual-band support
- 300Mbps rated maximum throughput
- 802.11a/b/g, Draft N
- Three external antennae
- WEP, WPA, WPA-2 security
- Hardware firewall

Bottom Line
The Xtreme N Gaming Router offers fast performance, easy setup, and handy security features. Thanks to its GameFuel mode, which prioritizes game traffic, it's also great for gamers.

3

Belkin N1 Vision
www.belkin.com
$199.99
Editors' Rating: 8.0

Specs
- 2.4GHz single-band support
- 300Mbps rated maximum throughput
- 802.11a/b/g, Draft N
- Three external antennae
- WEP, WPA, WPA-2 security
- Hardware firewall

Bottom Line
Featuring a bright LCD with critical info about your network settings, the N1 Vision looks snazzy. Plus, the router's performance is among the best we've tested, and setup is super-simple.

4

D-Link Xtreme N Gigabit Router (DIR-655)
www.dlink.com
$179.99
Editors' Rating: 8.0

Specs
- 2.4GHz single-band support
- 240Mbps rated maximum throughput
- 802.11a/b/g, Draft N
- Three external antennae
- WEP, WPA, WPA-2 security
- Hardware firewall

Bottom Line
Besides its good wireless throughput and above-average broadcast range, the DIR-655 also offers four high-speed Gigabit Ethernet ports. Its Quality of Service (QoS) configuration tools can help you prioritize bandwidth usage for specific applications.

5

Linksys Simultaneous Dual-N Band Wireless Router (WRT610N)
www.linksys.com
$199.99
Editors' Rating: 7.9

Specs
- 2.4GHz/5GHz dual-band support
- 270Mbps rated maximum throughput
- 802.11a/b/g, Draft N
- Three internal antennae
- WEP, WPA, WPA-2 security
- Hardware firewall

Bottom Line
The dual-band WRT610N performs well, offers good range, and is easy to set up. It's especially good for newbies—its Linksys Easy Link Advisor software makes monitoring and tweaking your network a snap.

Belkin N1 Vision

D-Link Xtreme N Gigabit Router (DIR-655)

Linksys Simultaneous Dual-N Band Wireless Router (WRT610N)

✓ = Editors' Choice

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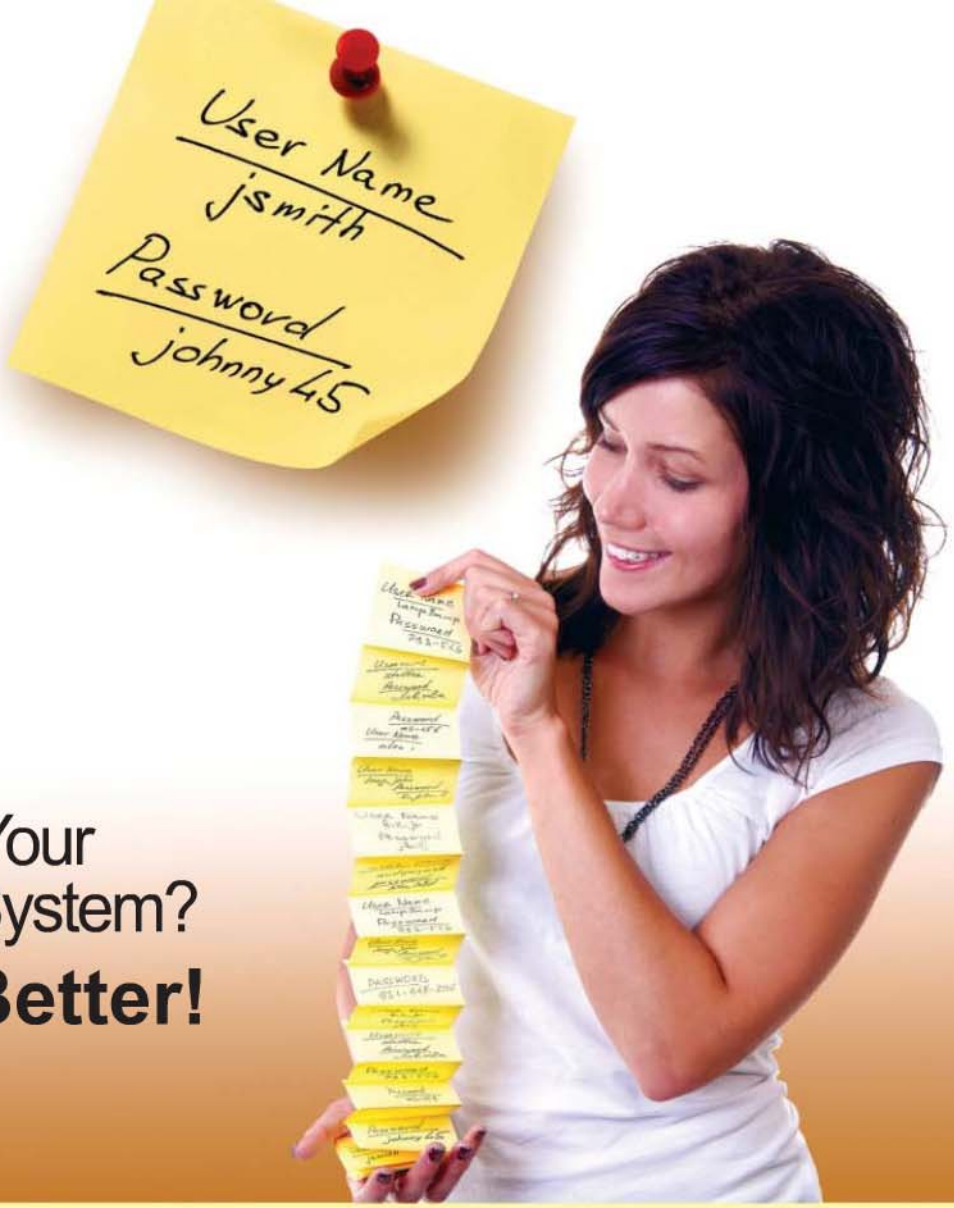

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These 75 can't-miss tips will **ease your next PC build**—and help you better understand your current desktop.

Building On Success

By John A. Burek

Ready to Build Your Next PC?

Get ready for an adventure. Don't get us wrong: Assembling your own desktop is plenty fulfilling and worthwhile. But even for veteran builders, it's rarely a straight-line journey from A to B. Each time you take the walk, you find new shortcuts and faster routes to your destination.

We here at *Shopper* have built (and dismantled) more than our share of desktops over the years. This collection of tips, tricks, and advice is only a sliver of the wisdom we've acquired poking around dimly lit alleys and dead ends. But indeed, we've found that's the royal road to becoming an expert PC builder: Take the walk, and don't be afraid to get a little lost.

Our tips won't explain how to build a PC from first screw to last cable—they assume some experience in the PC-building arena. But if you're new to the process (or just a little rusty), we can help there, too. Visit **computershopper.com/build-your-own** for comprehensive how-to guides to building different types of PC. We bet that once you've built your own desktop for the first time, you'll be confident enough to do it again—and again.

Sections

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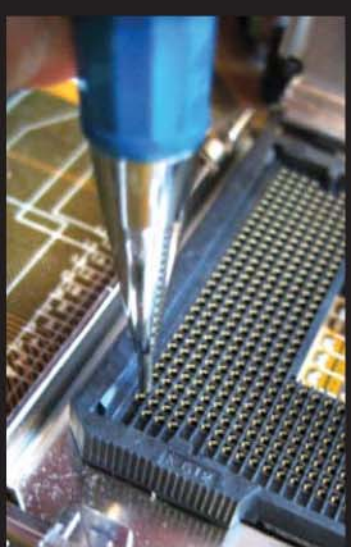
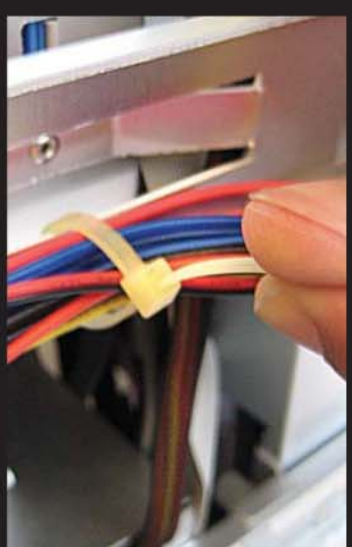




75 PC-BUILDING TIPS

Tools & General Advice

1 File Under: Don't File

Metal shavings can doom your PC. Use caution!

Making minor modifications to a PC case can sometimes leave a jagged edge in the metal chassis. Never file or drill anything metal on your case, however, once the motherboard is installed. Tiny metal shavings or filings lodged anywhere on the board can wreak mysterious havoc. Some cases have metal plates that cover unused drive bays, held in place by thin bits of metal. To use the bay, you have to clip or wiggle off the plate, severing the actual metal and leaving jagged edges. Don't file them if the motherboard is installed; instead, blunt them by bending them out of the way with needle-nose pliers, or use a metal-nibbling tool (for example, RadioShack part number 55010716, **www.radioshack.com**) to minimize the debris.

2 Static Quo

Do you need an antistatic wrist strap?

One of the most contentious debates among PC builders is whether using an antistatic wrist strap is necessary when assembling a PC. Any static electricity that builds up on your body before you handle PC components can be a major problem—even a tiny discharge can kill those delicate electronics.

That said, we've built several dozen PCs without a strap and haven't lost a component yet. Then again, we live in the temperate Northeast and we never build a PC in a carpeted room—rugs greatly increase the likelihood of static buildup. Also, to help dissipate any charge, we touch a bare-metal portion of our PC's case before picking up any electronic parts.

If you want to play it safe, have rugs, or live in an arid clime, check out a strap like RadioShack's Anti-Static Wrist Strap with Cord (part number 276-2397, **www.radioshack.com**). Simply fasten one end to the case metal with an alligator clip and the other around your wrist with elastic or Velcro, and conductive fibers in the wrist-wrap portion will leach away any charge.

For more tip photos: computershopper.com/128

3 Don't Be Standoff-ish

A household tool makes installing motherboard mounts easy.

In the PC-builder world, a standoff is a simple bit of metal (usually brass, with a threaded bottom and hexagonal top) that screws into the bottom of your PC's case. Standoffs elevate your motherboard a half-inch or so off the metal case bottom—you place the board on them and screw it down.

Most cases come with the standoffs in a baggie, and you need to install them according to your motherboard's layout. (See Tip 9.) It can be tricky to tighten them without the proper tool, however. Pliers will suffice if you're careful, but a better tool is your tool-kit socket set. The 5mm metric socket in the set fits most standoffs, making it easy to tighten them all quickly.

4 Hard-Boiled Advice

Sort your parts eggs-actly how you need them.

A PC build involves keeping track of many different screws and other small parts. An essential accessory: a multi-compartment tray into which you can sort various screws, washers, standoffs, and jumpers. One good dollar-store possibility is a pill sorter, the type with little lids over the compartments. A muffin tin works in a pinch, too.

Even better, though, is a tray you can write on for reference. Our low-tech, no-cost solution: a foam or cardboard egg carton. You can mark up the cups with a Sharpie, labeling each with the source of the screws it contains.

5 Tool Time

Gather the right tools ahead of time.

Certain tools—such as a Phillips screwdriver—are essential for any PC build. But a few other items can make things go a lot smoother. In addition to an antistatic wrist strap (see Tip 2) and cable ties (see Tip 19), handy household items include needle-nose pliers, a small flashlight (the compact LED type is great for placing inside the case, hands-free, while you work), paper and a pencil (see Tip 9), and a pair of clippers (even nail clippers will do).

Also useful, but less likely for you to have around the house: a "parts picker." Commonly provided in electronics tool kits, it's a little retractable claw for grabbing screws dropped into inconvenient places. Search **www.hmcelectronics.com** for "parts picker" to see a $7 example.

6 Do the Twist

Stay loose—don't tighten PC screws excessively.

Few items inside a PC case are liable to rattle themselves loose over time, so there's no need to hyper-tighten any screws when fastening a motherboard, drive, or other component. (Indeed, extreme overtightening can cause damage.) Use the "finger-tight" method of applying just enough torque: Grasp the screwdriver with three fingertips, apply just enough grip force to keep it steady while screwing in the screws, and stop when the screw head's underside touches the metal surface and your fingertips meet resistance. Then a tiny turn more—and that's all.

7 Fastener Primer

PC screws aren't all interchangeable—here's why.

When you buy a PC case for a from-scratch build, lots of screws come with it, as well as with your other components. The kinds used for different purposes vary from case to case (and you'll want to keep them sorted—see Tip 4), but we've observed a few constants.

Hex-head screws, which usually also have Phillips grooves on top, are mainly used for installing optical drives and screwing down the I/O brackets of expansion cards to the back of the case. These screws have thicker heads than other PC case screws. Dome-headed screws tend to be used for installing hard drives, while small flat- or dome-headed screws may be used to mount the motherboard, depending on the case. All these screws may come in different lengths and thread coarsenesses, however, so never force a screw if you meet resistance—you probably should be installing a shorter or differently threaded one in its place.

Your case may also come with flat-headed screws with, relative to the others, a very thick shaft and coarse threading. These are "self-tapping" screws used for fastening the case fans to the chassis. They won't come close to fitting any other screw hole.

Motherboard & Case Installation

8 Brass-Roots Support

Install your standoffs strategically if you don't have enough.

Sometimes a case doesn't come with enough brass standoffs to accommodate your board. You can get by without installing a required standoff or two, but choose any that you omit strategically, making sure there's enough support for the board underneath areas you'll press down on when installing hardware—for example, under the PCI and PCI Express (PCIe) slots, the IDE and Serial ATA (SATA) ports, and the CPU socket region.

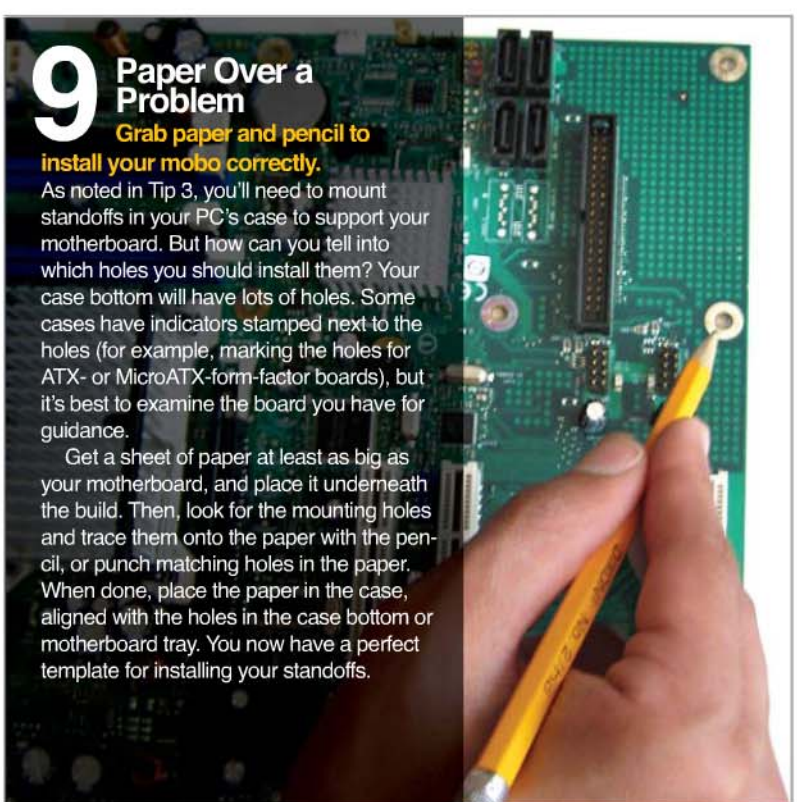
If you can get your hands on some identical extra standoffs—salvaged from an old case, or for a few cents from a local PC shop—install those missing ones. (Just make certain they're exactly the same height.) By the same token, if your case has standoffs preinstalled, don't leave any in place that don't match a hole in the board—it can lead to a short circuit and board damage.

9 Paper Over a Problem

Grab paper and pencil to install your mobo correctly.

As noted in Tip 3, you'll need to mount standoffs in your PC's case to support your motherboard. But how can you tell into which holes you should install them? Your case bottom will have lots of holes. Some cases have indicators stamped next to the holes (for example, marking the holes for ATX- or MicroATX-form-factor boards), but it's best to examine the board you have for guidance.

Get a sheet of paper at least as big as your motherboard, and place it underneath the build. Then, look for the mounting holes and trace them onto the paper with the pencil, or punch matching holes in the paper. When done, place the paper in the case, aligned with the holes in the case bottom or motherboard tray. You now have a perfect template for installing your standoffs.



75 PC-BUILDING TIPS

Motherboard & Case Installation

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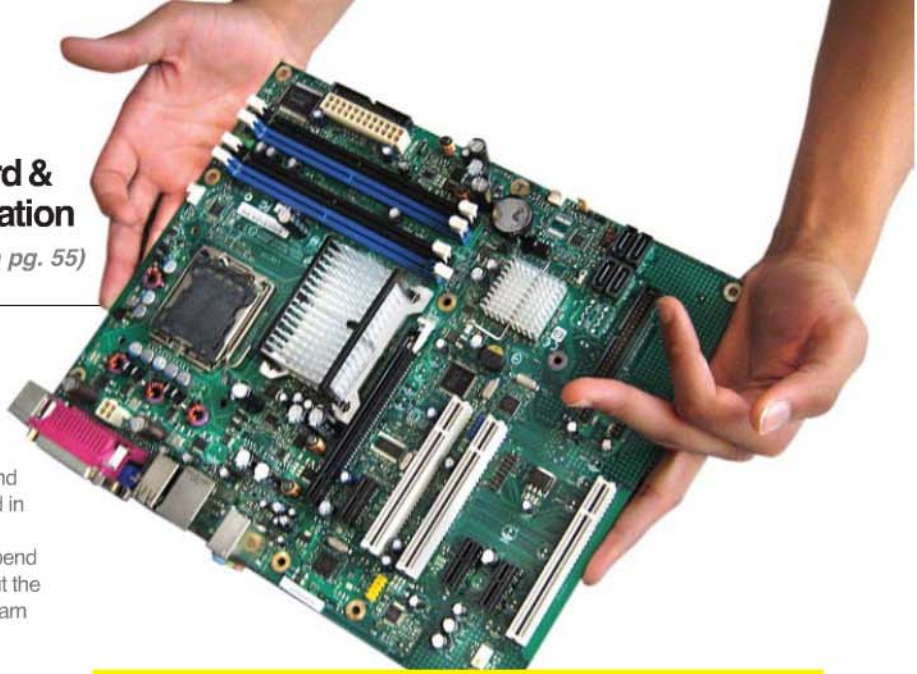


10 Watch Your Fingers

Motherboards are delicate—mind how you hold them.

When installing any motherboard, handle it gently and grasp it only by its edges. Boards today are swathed in fragile pins, pin headers, and capacitors, as well as precariously mounted heat sinks. Any of these can bend or break off with careless handling. If you need to put the board down outside the case, rest it on a sheet of foam padding, back in its box, or, at the very least, on the antistatic bag in which it came.

For more tip photos: computershopper.com/128

11 Whither Washers?

What are those mysterious cardboard washers for?

Some motherboards come with a sheet of cardboard washers and scant explanation for their use. We've left them off in our builds with no apparent consequences, but they do serve a purpose, albeit a waning one. Any mounting holes in the motherboard that have a metal rim are intended to host their mounting screws as they are. You can feel confident screwing these holes down straight to the case standoffs. But any holes without the metallic rimming—though increasingly uncommon these days—should have a cardboard washer above and below the hole.

The metallic-edged holes make contact with the screws for grounding purposes, so no need to worry about the metal-on-metal contact there. But the washers, when needed, serve to isolate their holes electrically, as well as to protect the board from the abrasion of the screw.

12 Port Plate, Part One

Swap out the PC's I/O plate with care.

The "I/O plate" is a crucial item to address before installing your motherboard. It's a removable, rectangular panel in the back of your PC case; many of the PC's expansion ports jut out of it through its matching holes. The plate is usually made of thin metal, and any new motherboard will come with one designed for it.

Sometimes, though, not all holes in the I/O plate are fully punched out for the actual ports your motherboard has. Compare the plate with your board's ports, and prepunch any necessary holes in the plate using a screwdriver or other blunt tool—the slugs are harder to remove later, when you're installing the motherboard. Then, swap out the I/O plate for the one installed in the case. (Sometimes the old one will be screwed in, but usually it's just snapped into place.) Use a tool (the end of a screwdriver works well), not your bare fingers, to push on an I/O plate for installation or removal—the metal has wickedly sharp edges and a tendency to pop or spring into or out of place. Also, make sure you install it right side up—it will only match your board in one direction.

13 Port Plate, Part Two

Keep ports and plates in line along your PC's back end.

On the I/O plate, you'll notice some "bendy bits" (for lack of a technical term) around most of the port openings, little tabs of excess metal that extend inside the case. These springy tabs apply pressure to the ports to align them with the plate openings, as well as perform a grounding function. Make sure none of these tabs gets jammed inside a port when you install the motherboard, however—they tend to do so.

Also, make sure the I/O plate snaps all the way into the case when installing it—a misaligned or half-installed I/O plate is the most common reason a motherboard won't line up with its standoffs when you try to screw it down.

14 Make Way for Mother

Clear out cabling before motherboard installation.

Your average PC case has a mass of cables cluttering up the interior before you even start installing the motherboard (especially if your case has its power supply preinstalled). Untangle and drape all cables outside the case before starting the build; don't try to install around them. Power-supply cables, especially, tend to spring back and not stay where you put them. If needed, restrain them temporarily using rubber bands or Velcro wraps to keep them out of the way while you work.

15 Speaker Up

The internal PC speaker may be fading out, but it's still handy.

Many PC cases no longer contain a built-in speaker, but most motherboards still provide the header pins to accommodate one. (Some boards, on the other hand, have a tiny piezoelectric speaker built in.) If your board has a speaker header, it may be a four-pin header or a two-pin one, but in either case only two pins are actually active, so any case speaker should work. And if your case lacks a speaker, you can leave these pins safely unused.

The internal speaker can be invaluable, however, for troubleshooting a failed bootup via its bleeps and bloops. For a speakerless case, you might scavenge a speaker from an old, disabled PC and mount it inside the case. Another option: The $14.99 ATX Control Kit from HighSpeedPC **(www.highspeedpc.com)** includes a piezo-type four-pin speaker you can plug directly into the motherboard.

16 Header Off at the Pass

An innovative connector makes finicky case wires easier to install.

Once your motherboard's in, your first task should be to attach the tiny wire leads for the case's front-panel connectors (for power and reset switches, drive and power LEDs, and possibly an internal speaker) to the appropriate motherboard header. (A "header" is a grid of fine pins to which you attach various wires or cables—your motherboard will be peppered with them.) This is sometimes tricky, though the motherboard manual should have a schematic that shows where the pins are. You may need a flashlight to see the pin markings on the board.

We like Asus motherboards that employ Asus's Q-Connector technology, which puts these connections on a removable block. You plug the wires into the block outside the case (where visibility and accessibility are much better), then plug the block into the motherboard header. Asus does have a Q-Connector kit it sells separately (part number 12G05100040F, $10 from **estore.asus.com**), with Q-Connectors for the main LED/power header, USB header, and FireWire header, but there's no guarantee your motherboard's headers will be compatible. Check carefully for correspondence, pin by pin, before using this.

17 Bleat Sheet

Those PC-speaker beeps are telling you something—but what?

Now here's why that speaker in Tip 15 is so important. On a successful bootup, you should hear a single beep from your PC's internal speaker at POST (power-on self-test, your PC's initial memory- and hardware-checking routine). If bootup fails, however, and you hear a series of beeps, like Morse code, from your PC's internal speaker, you've heard a fault code. Visit the invaluable BIOS Central **(www.bioscentral.com)** to decipher the beep series. Beep codes vary, depending on who made the BIOS on your motherboard, so check the manual to identify the manufacturer.

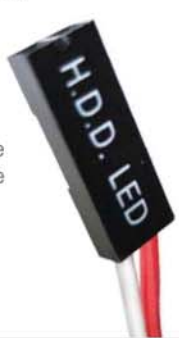
18 Lead Time

Which way do those front-panel wires go?

When plugging in those front-panel connectors, it can be tricky determining the positive (+) and negative (-) orientation of each lead's connector. Sometimes, the case manual will tell you which is which, or (less often) the polarity will be printed on the connector.

The leads for the switches (power and reset) can be installed in either direction, without regard to polarity. Direction does matter, however, for the LED leads (hard drive and power). The colored wire is usually the positive, whereas the white is usually the negative.

Note also that some boards have a two-pin and three-pin version of the header for the front-panel power switch. Use only the one that matches the cable from your case; it's safe to leave the other unused.



19 Cable Ties That Bind

Run and restrain cables for maximum airflow and neatness.

As you attach each wire lead to your motherboard, route it carefully around the perimeter of the board, or failing that, along cross braces or other structural members of the case. Be creative, and try to keep the wiring from obstructing fans, heat sinks, or high-traffic areas inside the case. Plastic cable ties—available from any hardware or electronics store (RadioShack sells a variety in many lengths and styles)—or Velcro loops (see Tip 46) are essential for this task. Snip off any excess with wire or nail clippers.

Common household twist ties are also handy for restraining cables, but many of them have a wire core that's ever-so-slightly exposed at each end. Don't use these if there's any chance a stray end might touch the motherboard or other components with exposed circuitry. Stick to pure plastic, instead.

75 PC-BUILDING TIPS

Motherboard & Case Installation

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20 All Thumbs Is All Right

Thumbscrews are a cheap, highly handy upgrade.

If you're a frequent hardware upgrader, it's well-worth fitting out your case with thumbscrews for the case lids and expansion cards. They cost only a few cents each and eliminate the need for a screwdriver. Look for large-headed, easy-to-grasp thumbscrews for the case exterior, along with smaller ones for the expansion-card bracket. (Bigger ones won't fit there.) They also come in a variety of colors to match your case.

Good sources include Directron **(www.directron.com)** and Jab-Tech **(www.jab-tech.com)**. Various PC-modding-gear shops, such as Xoxide **(www.xoxide.com)** and CrazyPC **(www.crazypc.com)**, also sell decorative thumbscrews if miniature Viking helmets or alien heads are more your thing.

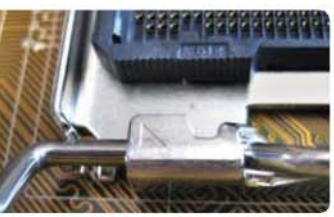
CPU and Heat Sink Installation

For more tip photos: computershopper.com/128

21 Orientation Session: CPUs

Make sure that processor is rotated properly!

Proper processor orientation within its socket, whether it's an AMD or Intel chip, is crucial. Be especially careful any time you're dealing with the Intel LGA775 socket, which contains 775 delicate pins ripe for bending. Place your Intel CPU into this socket carefully, lowering it in parallel to the board, and make sure the two notches in the socket and chip fit each other. Also, a pair of arrows, on the socket and chip, must point to each other. Never force the load plate (see Tip 23) and its locking lever down onto the chip—if it takes more than firm pressure, something's not installed properly.



The current AMD CPU sockets, Socket AM2 and Socket AM2+, have holes, with the pins resident on the chip. AM2 and AM2+ use a similar arrow scheme for orientation, but—as with LGA775—the chip simply won't drop into its socket any way but the right way, so don't force it.

22 Chicken or Egg; Cooler or Mobo

Which to install first?

Should you install the processor and CPU cooler onto the motherboard before installing the motherboard in the case? That depends on the design of the cooler. We find it easier to mount most coolers with the motherboard outside the case, since cooler-mounting hardware tends to require frustrating gyrations to get installed. (We're looking at you, Intel LGA775 posts.)

That said, having the board mounted on its standoffs gives it a stronger, more stable base to counteract the sometimes brutish pressure required to install a cooler. Examine the room available for installing your cooler inside your case; if you'll have a hard time reaching or seeing the cooler's base, install it with the board outside.

23 Ditch That Lid

Yes, that CPU-socket cover needs to go.

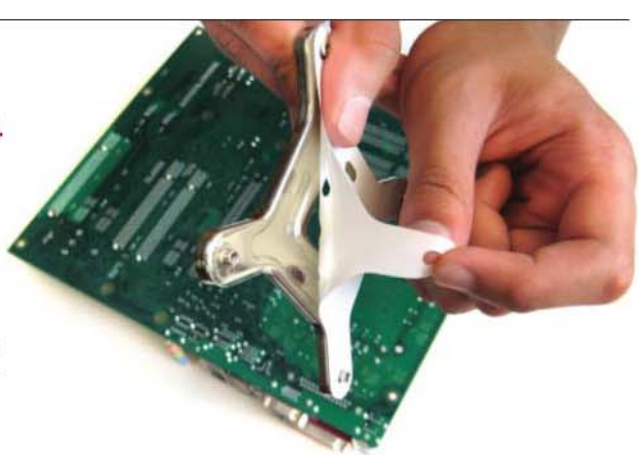
Before you can install the CPU cooler, of course, you'll need to install the CPU. If you're installing an Intel CPU into an LGA775 socket, the socket will have a protective plastic cover shielding the pins inside the socket from damage. The cover will be clipped to the hinged frame (or "load plate") that surrounds the socket. This might be unfamiliar to PC-build veterans for whom LGA775 is the first "pinned" socket they've seen. (The norm has been for the pins to be on the chip.) Remove and discard the protective cover before installation—never install the CPU with the cover in place.

24 Getting to First Plate

A CPU retention plate can throw a curveball at your install.

At the start of your PC build, and especially before you install your motherboard, check the CPU cooler's documentation. Some coolers require you to fasten a retaining plate underneath the board before you install the motherboard in the case. If you install the motherboard first, you'll just have to take it out again.

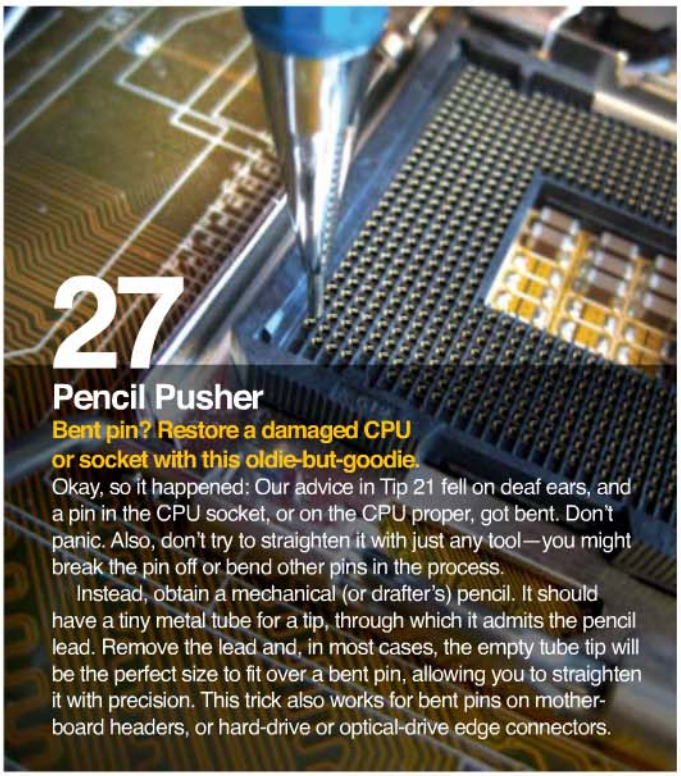
This plate contains screw holes that accept the posts or screws from the CPU cooler's heat sink. The motherboard is essentially sandwiched between the heat sink and the plate, with the plate helping accommodate the weight of the heat sink while reinforcing the board. Often, the motherboard comes with a piece of double-sided tape for holding the plate in place until you mount the heat sink—use it.



25 Fitting Room

Matchmake your cooler and motherboard before the big install.

Before installing a CPU cooler onto your motherboard—especially if it isn't the stock cooler that came with the chip—test-fit it, checking for clearance around the edges. Some CPU coolers and motherboards simply can't coexist, despite the fact that they support the same socket type. Depending on the motherboard design, capacitors, heat sinks for onboard chipsets, and the like can obstruct some particularly large cooler designs. If so, exchange the cooler for a different model—never bend onboard components to accommodate it.



27 Pencil Pusher

Bent pin? Restore a damaged CPU or socket with this oldie-but-goodie.

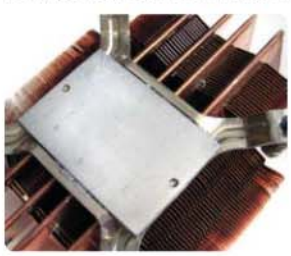
Okay, so it happened: Our advice in Tip 21 fell on deaf ears, and a pin in the CPU socket, or on the CPU proper, got bent. Don't panic. Also, don't try to straighten it with just any tool—you might break the pin off or bend other pins in the process.

Instead, obtain a mechanical (or drafter's) pencil. It should have a tiny metal tube for a tip, through which it admits the pencil lead. Remove the lead and, in most cases, the empty tube tip will be the perfect size to fit over a bent pin, allowing you to straighten it with precision. This trick also works for bent pins on motherboard headers, or hard-drive or optical-drive edge connectors.

26 Smooth Operator

Check the bottom of your CPU cooler for faults.

A CPU cooler's bottom surface, often copper, should be perfectly smooth; if the cooler is a used one and the area is scratched or marred, heat transfer in those spots will be imperfect. Some enthusiasts "lap" their new coolers (polishing the bottoms with fine sandpaper atop a hard, flat surface, such as sheet glass) and even the tops of their CPUs to ensure perfect contact-surface smoothness, but we don't recommend this; simply return to the seller any new cooler that has a defect visible on this surface.



Don't forget to remove any plastic protective film from the cooler bottom before installing. The bottom of the cooler should touch the top of the CPU, metal to metal (with, of course, thermal paste between them—more on that in Tip 29).

28 Clean Start

Old thermal paste can hinder cooling performance.

If you're reusing a CPU cooler, it probably has remnants of old thermal paste on it. Also, if you botch installing your cooler and need to reseat it, you should clean off the old thermal paste and apply a fresh coat. (You want the layer between chip and cooler to be even, without blobs or bare patches.) Remove the old stuff thoroughly using rubbing alcohol and either a lint-free, nonabrasive cloth or paper towels. (Naphtha, which also evaporates quickly, works well, too, but use it sparingly.)

If the old cooler you're going to use is still installed in a working PC, you might first run a PC-stress-test app like Prime95 to heat up the CPU. (Prime95 is widely available by Googling; once you install it, choose Options > Torture Test and run a "large FFT" test.) This can help soften up the old paste and make removal easier.

Also, clean the old cooler's fins and fan while you're at it—an old toothbrush and canned air work well. Dust caked into the heat sink will impede cooling performance.

29 Cut the Paste!

Don't overapply thermal paste—less is more.

Unless your CPU comes with thermal material preapplied to its base (usually in the form of a waxy, square pad), you'll need to apply thermal paste to the CPU's top before installing the cooler. (The paste fills any microscopic grooves in the cooling surfaces, improving heat transfer away from the chip.) Some paste typically comes with the cooler, in a squeeze-out packet or tiny plunger-style applicator.

Start with a BB-size blob. Spread it with a stiff card and try to apply an even, almost transparent layer, removing any excess. (Don't slather it on like SPF30 sunblock.) Leave a millimeter or so around the chip's edge to prevent any excess from squeezing out when you press on the CPU cooler, and make sure the chip's core—the center area, which is the hottest-running part—is covered.

75 PC-BUILDING TIPS

CPU and Heat Sink Installation

(continued from pg. 59)

For more PC-building tips: computershopper.com/build-your-own

30 Paste Special

Third-party thermal paste has its ins and outs.

Don't expect miracles from aftermarket thermal paste, as opposed to the generic goop that comes with most coolers—you won't shave off more than a few degrees, tops, with the premium stuff. Also note that some pastes are electrically conductive, while others are not; if you're buying some, we strongly recommend the latter, in case any stray blobs find their way onto motherboard circuitry.

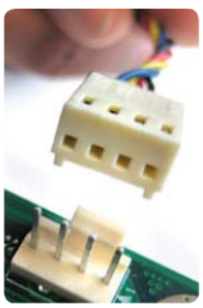
Also, be very aware of the difference between thermal paste and thermal adhesive. (Arctic Silver, maker of the most popular aftermarket thermal pastes, makes both.) Thermal adhesive, which is essentially a combination of thermal paste and superglue for sticking heat sinks onto chips, is not recommended for CPU coolers. (Not to mention, the bond is permanent.)

31 The Rule of Diagonals

Always fasten down a four-poster CPU cooler crosswise.

If your CPU cooler locks down onto the motherboard or retaining plate using four press-down posts (à la an LGA775 socket) or via four screws, attach or screw down the first post or screw, then the one diagonally opposite it—don't fasten two adjacent ones in a row. This will make installation vastly easier and also help spread the thermal paste more evenly.

Also, it helps, if the cooler uses screws, not to screw them down all the way the first time around. Screw in the first one just far enough so that it grips, and do the same for the rest. Once they've all gained purchase, tighten them down again in the same order as you attached them, this time all the way.



32 Pin Header Mismatch

Your CPU fan's plug might not match its motherboard connector. No worries.

It could be an alarming discovery: Your CPU's fan has either a three-pin or a four-pin power connector, but the "CPU Fan" header on your motherboard doesn't have the same number. But it's okay—either way, it will work.

The fourth pin is used for fan-speed control, so if you use a three-pin fan on a four-pin header, the fan will simply spin at a constant rate. (Same deal if you plug a four-pin fan into a three-pin header.) You'll only get the potential to activate variable speed control through software if both fan and motherboard employ a four-pin interface.

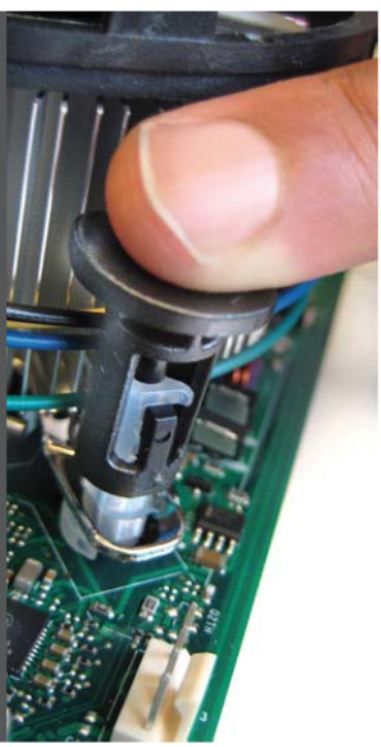
Even more important, though: Don't forget to plug in this connector, regardless of how many pins. You don't want your CPU to overheat, and it probably will—quickly—if the fan isn't running.

33 Post Practices

Read on for the secret to installing LGA775 CPU-cooler posts.

Some LGA775 CPU coolers—most notably, Intel's stock cooler that it provides with its processors—use push-and-twist "pop-in" posts that can be infuriating to install. Make sure the post's pegs are all in the "up" position before installing the cooler, with the arrow atop the posts rotated away from the cooler; when down, the peg will push through the hole in the motherboard, spreading a set of prongs and locking the cooler into place.

The problem is that you may have to use an alarming amount of downward force and twisting to get these pegs to engage. If you're installing the cooler with the motherboard outside the case, place the motherboard atop a wooden board or other hard surface with a hole drilled in it, centering the motherboard mounting hole over the hole in the board. This will give the motherboard some supportive backing while you force these pegs into place. Be sure to install them crosswise, per Tip 31.



34 Silent Service

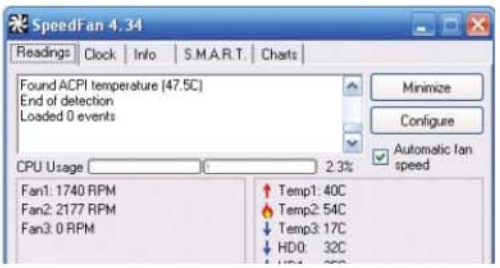
Throttling your CPU fan can reduce noise but have unintended consequences.

Some CPU fans come with a "throttling adapter," often identified as a "low-noise adapter." It's an inline cable that runs between your CPU fan's power line and the "CPU Fan" motherboard header; the adapter forces your CPU fan to run slower and thus quieter. Consider installing it if you'd like to reduce your PC's noise output, but monitor your PC's operating temperature (see Tip 35) to make sure it's not throttling the fan too much. If you hear the CPU fan cycling alternately fast and slow in normal operation, a software or BIOS function in the PC may be adjusting the fan to compensate for the hamstrung speed and inadequate cooling performance—try removing the adapter.

35 SpeedFan's Biggest Fan: You

Download this handy utility for tracking PC temperatures.

SpeedFan, a piece of freeware written by Alfredo Milani Comparetti, is an invaluable tool for checking the hardware health of a newly built PC. (Grab it from **computershopper.com/downloads**.) It reports temperatures from hardware-monitoring chips within your PC, such as your CPU die or hard drive. You'll have to do some sleuthing to determine which sensor governs which component, and SpeedFan doesn't support every piece of hardware out there, but it's good for a quick-and-dirty read on how hot or cool your core components are running.



Case Cooling

36 Big's a Better Bet

Larger fans can cool more quietly than smaller ones.

If your PC's case gives you a choice, opt for larger, slower-spinning 120mm case fans in place of 92mm or 80mm models, all else being equal. A slower-spinning 120mm fan can move the same volume of air as a smaller fan that needs to spin at a higher rate to achieve the same end. The faster a given fan needs to spin, the noisier it will be, so the larger fans can help you reduce operating noise.

Also, you can replace the case's stock fans with better-quality ones. Models with sleeve bearings tend to run quieter than same-size, same-speed fans with ball bearings; serious anti-noise jockeys favor fans from EBM-Papst **(www.papst.de)**. Panaflo-series fans from NMB and Panasonic are also quiet-enthusiast favorites, but some retailers sell these industrial-model fans "bare wire," leaving you to attach a PC-compatible power connector yourself. Check before buying.

37 Filtered for Your (PC's) Protection

Outfit your case with fan filters to keep the interior clean.

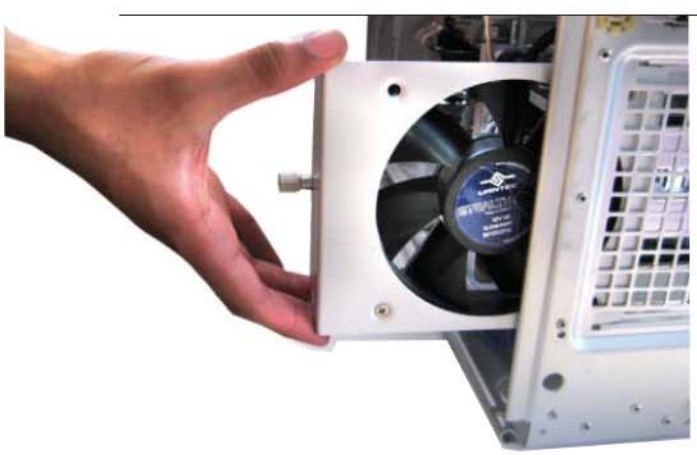
Most cases don't come with fan filters, but at assembly time, it's a great idea to retrofit yours with them to keep the inevitable dust bunnies out. (Cleaning your case in a year's time can be a bother, and dust clogging the CPU heat sink can impede performance if the CPU starts to run too hot.) You can fashion your own filters from air-conditioner filter material, but it's much less trouble to buy premade, washable filters (under $5 each) from one of the PC-modding-gear sellers mentioned in earlier tips (CrazyPC, Directron, Xoxide). The filter comes in a premade plastic frame for easy mounting; just make sure to match the correct size of the fan in question. (The three standard sizes for chassis fans are 80mm, 92mm, and 120mm.) You only need to install filters on the intake fans.

38 Unwavering Fandom

Mount fans properly to reduce operating noise.

When mounting your chassis fans into the case (usually using the self-tapping screws discussed in Tip 7), make sure those screws are fastened all the way to avoid rattling when the fans are spinning. Though in our experience they don't help much, you can buy rubber grommets (tiny donuts) that buffer between the case and the fan to further reduce noise.

We haven't tried aftermarket versions, but a better prospect is the anti-vibration "screw"—not a screw at all, but a rubber push-in mount for your fans that replaces the screw entirely. We've used PC cases that came standard with these, to good effect. Try FrozenCPU **(www.frozencpu.com)** for a selection of these mounts in various sizes and colors.



39 Flow Motion

Plan your fan scheme for maximum chassis cooling.

When installing your case's chassis fans, take note of the intake and exhaust orientation of each fan and plan your case's airflow pattern accordingly. Don't leave fan orientation to chance—it matters greatly which direction you install fans, because you don't want them working at cross-purposes. The usual airflow scheme in a tower case is to draw cool air in from the front using an intake fan or fans, push it across the hard drives and CPU-cooler region, and send it out the back or top via exhaust fans.

75 PC-BUILDING TIPS

Case Cooling

(continued from pg. 61)

40 Splendid Isolation

Give your graphics card breathing room.

In recent years, with the advent of PCIe slots and the subsequent reduction in old-style PCI slots, PC builders have less flexibility with the location of their expansion cards. Given the choice, however, leave as many slots as possible between your graphics and sound cards. This can help reduce radio-frequency interference (RFI) from affecting the audio signal and allow for better cooling of the graphics card. (It's best to leave as much room as you can around the graphics card, period, as it runs hotter than most other cards.) Likewise, if you're installing a TV-tuner card, situate it as far from other cards as possible, particularly graphics and sound cards.

PC Cabling: Installation & Routing

41 Molex Muscle

Inserting and removing power connectors can take elbow grease.

Molex connectors are the rectangular four-pin plugs that extend from your power supply, and they can require surprising force to insert into or pull out of a component. When inserting one, check that the cylindrical metal contact inside each of the four pin receptacles in the connector isn't bent or misshapen—this happens sometimes after a crooked insertion attempt. When detaching, check that the connector doesn't require squeezing first (a few do). Gentle side-to-side wiggling will dislodge most stubborn Molex connectors, but pulling one straight out with pliers is safer—sometimes the jack is flimsily mounted on the device and you don't want it broken.

42 Secret Cable Storage

Stash excess wire out of the way for neatness and airflow.

Unused drive bays make excellent storage areas for excess cable and power-supply leads, allowing for better airflow inside your case. Before stowing any cable slack into a bay, use a cable tie or twist tie to restrain the excess. Don't just stuff them haphazardly out of the way; extracting them later could require some major untangling.

Other overlooked places to stash excess cabling include behind or atop the power supply, beneath a removable motherboard tray, or running inside any hollow structural cross-members within the case. Also, removing the case's opposite-side panel (the one behind the motherboard) can uncover lots of additional storage crevices. This area is invisible, so you can hide lots of cable excess here without regard to aesthetics.

For more tip photos: computershopper.com/128

43 Ay, There's the Rub

Use caution when routing cables under your motherboard.

Stashing cables under the motherboard—in the space between the board and the case bottom—as you install them can make for a clean interior appearance. But bear in mind that some boards have sharp solder or other contacts on their underside that can nick a cable and lead to unpredictable operation, a short circuit, or fried hardware. If you do this, make sure there's plenty of clearance for your cable and no possibility of chafing. A safer bet: Route cables under the motherboard tray, if your PC uses one.

44 Reserved for Fans

Those two-wire power connectors are good only for fans.

Some power supplies come with Molex power leads that have just two wires, not the usual four, labeled "fan only." Use these connectors only for case fans, never for items such as drives or graphics cards. On some supplies, fans connected to these "fan only" power leads have their speed automatically controlled for an optimal balance of noise and cooling.

45 Ribbon-Cutting Ceremony

Replace clunky, flat drive cables with rounded IDE cables.

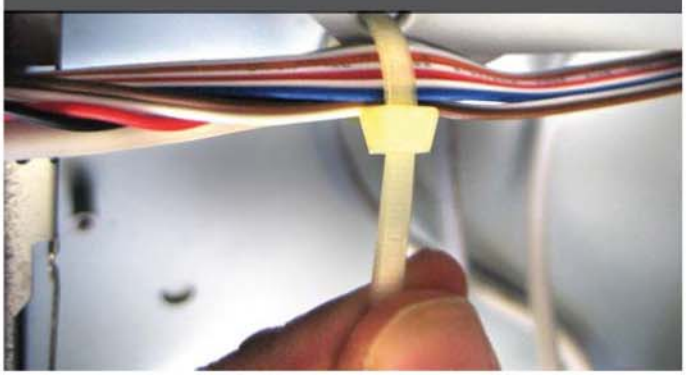
Your hard drive and optical drive most likely came with a classic flat ribbon cable for data transfer between drive and motherboard. You can upgrade this cable, however, with an inexpensive (under-$10) rounded IDE cable. Rounded cables are much easier to route, and they block airflow less. They come in a variety of lengths and in versions that accommodate one or two IDE devices. If you buy a two-device cable, however, make sure you have enough cable length between the two drive-end connectors to reach both IDE drives.

46 Restrain From These Restraints

Certain fasteners don't fare well in PC cases.

You'll do a lot of cable routing and restraining if you're building a complex PC, and there are two materials you should avoid using: rubber bands and adhesive tape. The interior of a PC tends to be warm, with constantly running air, and rubber bands deteriorate more quickly than usual in this environment. Plus, when one gives way, it can go flying and foul a case fan or, worse, the CPU-cooler fan. Some types of tape also lose their adhesion in heat and leave sticky residue when removed.

Use plastic cable ties, plastic twist ties, or Velcro, instead. (See Tip 19.) Hint: Buy a large patch of Velcro from a craft or fabric store, glue the fuzzy and hook sides back to back, and when dry, cut into small strips to use as excellent, easily adjustable cable restrainers.



47 Sound-Jack Sermon

The front-panel audio jacks on your case require special attention.

The single cable for your case's front-panel audio jacks (usually headphone, microphone, and line) can be one of the trickier cables to deal with. In most cases, the cable has a rectangular 10-pin connector (with one pin missing for keying) that complies with one of two front-panel-audio standards: HD Audio or AC '97. (We've also seen cases that provide dongles for both standards on the cable.) The case manual or printing on the connector itself should tell you which type you have.

Your motherboard must support the same standard for the jacks to work. Some motherboards support both standards via a single set of header pins; if yours does, you need to specify in the PC's BIOS which standard your connector supports. Look for a BIOS entry governing onboard audio. (Note that in some PC cases and BIOSes, HD Audio is called by its early code name, "Azalia.")

On a few Intel motherboards, you may see a 16-pin connector confusingly labled "HD Audio Link." This is not equivalent to HD Audio—don't plug your HD Audio cable to it! We made this mistake—just once. The result: scorched wires and smoke.

48 Power Protectors

Don't leave unattached Molex power connectors unattended.

The unused Molex connectors that extend from your PC's power supply carry current whether they're attached to a device or not. Leaving stray connectors hanging around is generally safe, but there's a remote chance the metal contacts inside the plastic connector could come in contact with some projecting metal in your case, with nasty results. Molex-connector covers—small plastic caps that cover the live ends of the connectors—are a good idea in a cluttered case. Directron **(www.directron.com)**, one of the few sources we've seen for these, sells them for under a dollar each. Although we're not keen on tape inside PCs (see Tip 46), electrical tape can also serve the same insulating purpose, albeit less elegantly.

49 Make Sport of Ports

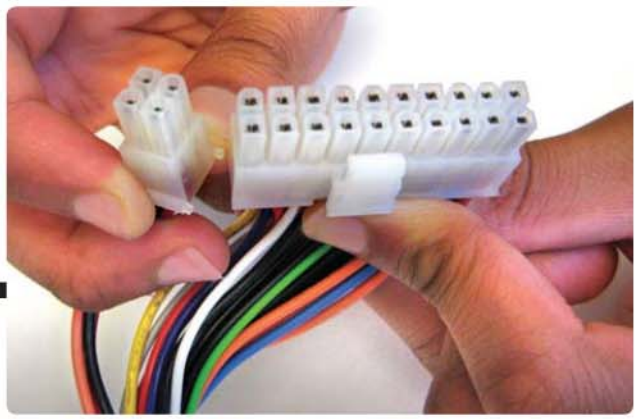
Decipher the quirks of front-panel USB and FireWire ports.

Some PC cases provide the cables for their front-panel USB or FireWire ports as a bouquet of separate connectors, each wire fitting onto one pin of a USB or FireWire header on the motherboard. Other cases terminate these cables in a solid 10-pin block (which supports two ports); others end in a one-piece, five-pin connector that carries the signal for one port. Only the 10-pin block is foolproof to attach to the motherboard—one pin is missing to help you orient it. In all other cases, double-check the pin matchups, and never attach USB cabling to a FireWire header, or vice versa—you can damage the motherboard.

Note that if your USB-port cable terminates in a five-pin block, you can attach it to either side of the 10-pin header—one side of the header will have four pins, the other five. The missing fifth pin on one side is for keying, and the fifth pin on the opposite side is a dummy.

75 PC-BUILDING TIPS

Power Matters



50 The Big Feed

Your main mobo power cable doesn't match its jack. What to do?

For a long time, the main power line into the motherboard—the fattest cable branching off the power supply—was a standard 20-pin ATX connector. In recent years, it has evolved into a 24-pin connection. If your power supply has a 24-pin plug but there's a 20-pin receptacle on the motherboard, you can plug in the portion of the plug that fits and leave the extra pins hanging over the edge of the socket—as long as the motherboard design allows it. (Some power supplies employ a "20+4" design that lets you snap on or off the extra four pins—if yours does, don't use the extra four pins for anything else; there should be a separate four-pin connector to be used as the supplemental power for the board.) Otherwise, 24-to-20-pin adapters are available; they'll often come bundled with the power supply.

Note that the reverse is partly true—you can plug a 20-pin power supply connector into a 24-pin motherboard power jack—but stable operation is not guaranteed, and there's the possibility of overload if the PC's power demands max out the connection, with dire consequences for the board. We don't recommend it.

51 Seize the Lead

Make use of all those extra SATA power lines.

Many power supplies are providing more SATA power leads than you'll ever make use of—and fewer of the older-style, four-pin Molex type. (The SATA type uses a thin, L-shape connector; Molex has four round holes at the end.) You've probably seen Molex-to-SATA power adapters bundled with any SATA hard drive you've purchased, but the opposite kind exists, too. You can make use of your power supply's extra SATA power leads with SATA-to-Molex converters from sellers such as Performance-PCs.com. Expect to pay around $2 each; Google "SATA-to-Molex adapter" for more sources.

For more tip photos: computershopper.com/128

52 Escalation of Power, Part One

Power connectors for graphics cards keep morphing—make sure you have the right ones.

Most recent-model PCIe graphics cards require a direct, dedicated connection to your PC's power supply. Sometimes a card will require a standard four-pin Molex power lead, but increasingly, cards demand one or two six-pin PCIe connectors, which are arrayed 2x3. And the latest graphics cards have begun demanding an eight-pin PCI connector. Usually these leads say "PCIe" right on them, or occasionally "PEG" for PCI Express Graphics.

If you're shopping for a power supply (or for a case with one preinstalled), make sure it has the correct PCIe connector for any graphics card you're considering buying. You can get adapters, but a direct connection is always preferable. Some supplies come with only six-pin or eight-pin connectors; others use "breakaway" or "6+2" connectors that let you snap two extra pins on or off a six-pin connector. Make sure you know what you're getting.

53 Escalation of Power, Part Two

Some power connectors look just like PCIe ones—but don't be fooled.

Don't assume that any power-supply connector that resembles the dedicated PCIe ones will work the same. There's the eight-pin EPS12V connector, for example, which is intended to supply certain motherboards with extra power (see Tip 55). You can't plug it into a graphics card that requires an eight-pin PCIe lead; with their 2x4-pin connector, they may look much the same, but their keying and wiring differ. The connector won't fit unless you force it into the socket, and the result of that would be, shall we say, unpleasant.

Likewise, some power supplies provide a pair of four-pin (2x2) connectors—intended to be used as a pair, side by side—to feed the eight-pin EPS12V motherboard power jack on motherboards that require it. Alternately, one of these connectors can be used singly to provide the familiar four-pin 12-volt power connection that most other motherboards require. You can't use these two four-pin connectors, however, as a substitute for an eight-pin PCIe power connector to a graphics card. They're physically and electrically incompatible.

54 Backplate Quandary

That metal plate in your power supply's box might serve a purpose. Don't ignore it.

Here's another power-supply install wrinkle we've encountered. It's generally impossible to install an ATX power supply upside down—the screw holes simply won't match up. Do check, however, that the switch at the back of the supply and the socket for the AC power cord are free and clear of the case rim, and that all four of the screw holes line up. A few supplies we've seen include a converter plate to fit the ATX-standard case back. If you're used to just dropping in your supply, screwing it down, and moving on without a glance at the documentation, such a supply may leave you scratching your head for a while. (It did the first time we saw one.)

55 Invaluable Auxiliaries

CPU power connectors vary from board to board. Here's the difference.

When you connect the power supply to the motherboard, don't forget to attach the easily overlooked four- or eight-pin supplemental connector, which provides power to the CPU. The four-pin version is often (and misleadingly) referred to as the "Pentium 4" power connector, but it's actually the "auxiliary" or "ATX12V" connector. The pins are laid out in a 2x2 square, and the connector fits in its corresponding motherboard jack in only one orientation.

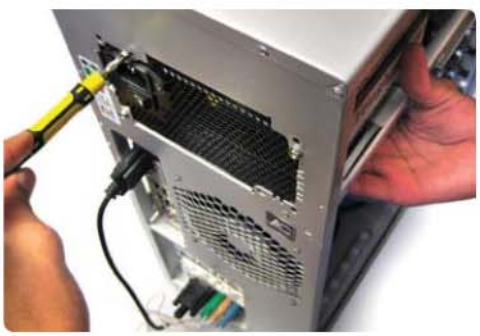
Don't confuse this connector with the extra four pins that some motherboards let you snap off a "20+4" main motherboard connector. (See Tip 50.) Though they're both laid out in a 2x2 square, they're not the same.

Few boards nowadays require the eight-pin connector, known as the EPS12V, so it's uncommon to see it on power supplies. Although a few power supplies still provide the connector as a single 2x4 plug, you're more likely to see it as a pair of 2x2 plugs to be used in tandem.

56 Currently Checking

A power-supply tester is an inexpensive, invaluable tool.

Troubleshooting a PC build can be tricky enough; determining whether the problem lies with your power supply is even harder, usually requiring you to swap out the supply in question for a known-good one—no trivial task. Frequent PC builders might want to invest in an inexpensive power-supply tester for their tool kit. Examples include Coolmax's PS-224 **(www.coolmaxusa.com)** and Thermaltake's Dr. Power **(www.thermaltakeusa.com)**; each cost around $20 and can give a quick check of whether voltage output at various levels is present. The Coolmax tester uses a small LCD readout, the Thermaltake audio cues and LEDs.



57 Supply Support

A teetering power supply can be dangerous!

Be careful when installing a power supply. If your motherboard is already in place, always support the supply by hand until you've tightened at least one of its mounting screws; better yet, install the power supply with the case lying flat on its side. The case's support brackets might look secure, but not all designs balance the entire supply without the help of the screws—and you don't want a 5-pound brick crashing down on your delicate motherboard. (In our haste to assemble PCs, we've had a couple of near-misses over the years.) If you can, install the power supply before installing the motherboard.

Drive Installation

58 Drive Elbow Room

Leave space between hard drives if you can.

Hard drives give off significant amounts of heat, so if you have enough room in your case, leave one or more bays empty between drives for better cooling. This will allow air from intake fans to flow through the case more freely, since most case designs allow for scant clearance between adjacent hard drives.

59 Not Cool

Position your drives to get the best benefit from your case fans.

Remember that there's something of a dead spot at the center of any cooling fan, near its hub. (Put your hand in front of any room fan and move it around to see what we mean.) If you're installing a hard drive directly behind an intake fan, and you have a choice of bays in which to install it, use the bay adjoining the top or bottom edge of the fan, not one that's dead-center, to maximize airflow over the drive.

75 PC-BUILDING TIPS

Drive Installation

(continued from pg. 65)

60 Order in the Port!

Use SATA ports in sequence to minimize config hiccups.

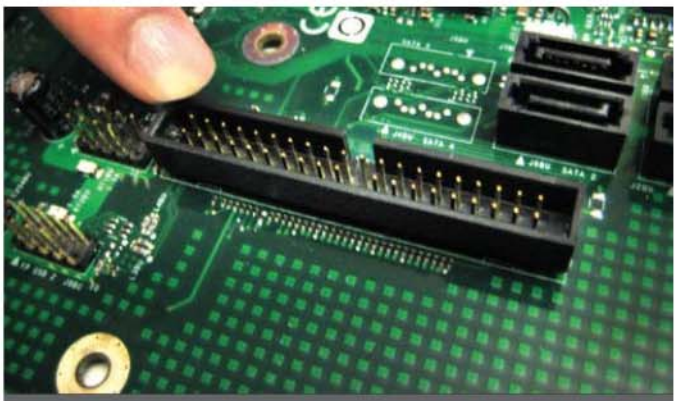
Each SATA port on your motherboard is labeled with a number; sometimes the sequence starts with SATA 1, sometimes with SATA 0. If you have more than one SATA drive to install, use your motherboard's SATA ports in order, with the boot drive plugged into the lowest-numbered one. It's not always necessary, but some PC BIOSes can fail to recognize a drive if ports are skipped in the numeric pecking order.

61 SATA Gains Supremacy

Buying a drive? Go for SATA drives and respectable spin rates.

When purchasing drives for your PC build, favor SATA drives over IDE models, given the choice. SATA drives use thinner data cables, which means easier cable routing and less obstruction to cooling. Plus, if your drive and motherboard both support the latest SATA specification (commonly called SATA II and allowing for up to 3Gbps transfers), expect better performance, too.

Also pay attention to drive spin rate. Although 7,200rpm drives are now the mainstream choice and speedy enough for most purposes, a few 5,400rpm desktop drives are still on the market—avoid them. (Don't confuse these with physically smaller 2.5-inch drives for laptops, for which the 5,400rpm speed is much more common.)



62 Make an IDE Arrangement

Here's how to untangle IDE drive configuration.

Each motherboard IDE port supports two IDE drives, chained off the port using a cable with two drive connectors. If you're using more than one IDE drive in your build, check whether you have one or two IDE ports on your motherboard. Older motherboards always had two, but recent boards tend to provide just one, since SATA has partly supplanted IDE.

If you have a choice of IDE ports, maximize the hard drive's performance by putting hard drives and optical drives on separate IDE channels. If you must, make sure to designate the hard drive as the Master drive. (See Tip 66 for more.)

63 L-Egant SATA Solution

SATA cables with a built-in bend are better than creasing your own.

Sometimes you need to install a SATA drive in a tight spot (say, adjoining an oversize graphics card that bumps up against the hard drive bays). Or, sometimes, motherboard SATA ports are located in tight corners that keep you from using them all because of the position of other cables or components. Don't twist a SATA cable to the limit—consider buying aftermarket SATA cables that have a right-angle bend at one or both ends. Sellers such as SATACables.com carry these for under $4 each.

For more tip photos: computershopper.com/128

64 Face-to-Face Meeting

Prefit your optical drive to spare yourself extra work.

Removing the front face of your PC case is often necessary to install an optical drive. When you do this, however, it's easy to incorrectly install the drive, since most drives feature several sets of screw holes on their sides. (The different sets let you leave more or less of the drive protruding from the case front, depending on the case design.) Test-fit the drive against the case face before screwing it in to save yourself some trouble.

Also note that you'll usually have to remove a plastic cover blocking the drive bay you're planning on using. In most cases, these covers unclip from inside the case, but occasionally they're held in place with a hidden screw or two. If you can't remove the cover easily, look closer and don't force anything, lest you crack the face or the bay cover. (We speak from experience.)

65 Twist Finale

That floppy cable's twisted wiring is actually okay.

Few PC builders do anymore, but if you happen to be installing a floppy drive, you'll notice that it uses a special 34-pin ribbon cable that looks similar to an IDE ribbon cable, but smaller. The cable has a small twist on several of the discrete wires near one end; the end with the twist is the one that goes into the floppy drive. Like an IDE hard drive, floppy connectors are often keyed with a small tab that only lets you install them in one direction.

66 IDE-ological Differences

Making the correct jumper settings on your IDE drives is crucial to proper operation.

If you're installing two IDE drives on the same IDE cable (the cable will have two drive connectors), you'll need to brush up on the rapidly fading art of Master/Slave/Cable Select settings to get the drives to work together properly. You have two possible ways to configure the drives' jumpers. (The jumpers are bits of plastic that bridge a pair of pins on the drive's back.) Both drives can be set to Cable Select (in which case, it doesn't matter which drive is in what position on the cable), or you can set the drive at the end of the cable to Master, with the drive on the middle connector set to Slave. Bottom line: You can't have both drives set to Master or both to Slave. If the first drive is already installed in the case, you may have to remove it to determine how it's set.

If you're installing only one drive on the IDE cable, connect the drive to the end of the cable with a black connector on it (see Tip 67) and the IDE port on the motherboard to the other end (the blue connector). Use the middle connector only if you're installing two drives.

67 Conductor Training

Make sure your IDE cable is the modern type.

If you're reusing an IDE ribbon cable from an older drive or PC, note that recent drives require a cable with 80 "conductors," as opposed to older cables that employ just 40. The physical connector is identical—both use 40 pins, so you won't be able to tell them apart by fit—but if you look closely, an 80-conductor cable uses many finer wires (80, to be exact) in the ribbon portion than a 40-conductor cable does.

You can also identify an 80-conductor cable by its color-coded connectors. A 40-conductor cable tends to have connectors that are all the same color, but on an 80-conductor cable, you'll see a blue connector at one end (for the motherboard port), a middle gray connector (for any slave drive), and a black connector at the other end (for the master drive or a single drive).

Slots and Cards

68 Avoid Second-Banana Graphics

The second PCIe graphics slot isn't always as capable as the first.

If you're planning to build a Scalable Link Interface (SLI) or CrossFireX dual-graphics-card system, carefully check the specs of the motherboard you're considering. Not all SLI and CrossFireX boards can get top-speed (x16) bandwidth from the second graphics-card slot. That's because the second x16 slot has a physical x16 interface but is sometimes electrically wired only for x4 or x8 bandwidth.

By the same token, if you're installing just one graphics card on an SLI or CrossFireX board, make sure you install the card in the x16 slot with the greater actual bandwidth if they differ. Check the manual.

69 Express Backing

Some PCIe slots accept several classes of card.

It's a little-known fact that some PCIe slots are backward-compatible, supporting several types of PCIe card. There are four types of PCIe card: x1, x4, x8, and x16. The first and last are by far the most common, and the physical interface with the motherboard increases in size the higher the number. (Graphics cards are almost exclusively x16 cards, while x1 cards tend to be relatively low-bandwidth cards such as Ethernet adapters.) On current motherboards, you'll primarily see x16 slots (which support all four types of card) and x1 slots (which support only x1 cards). There are x4 slots (which support x4 and x1 cards) and x8 slots (supporting x8, x4, and x1 cards), but they're far less common.

75 PC-BUILDING TIPS

Slots and Cards

(continued from pg. 67)

70 A Bridge to Sell You

Make sure you get a connecting clip for your dual-card graphics.

If you're installing a pair of graphics cards in a CrossFireX or SLI arrangement, the cards need to be physically connected to each other. (You should first check with the card maker, of course, that the two cards are compatible.) Early pairable CrossFire cards required a clunky, multi-headed external cable that connected the cards from outside the case; nowadays, the physical connection between cards is usually a small ribbon-like internal connector called a bridge clip. If you buy your graphics cards as bare OEM system-builder models, the clip probably won't come with them, so be sure to order one separately.

71 Bending Backwards for Cabling

This handy trick lets internal cables out, while shunning dust bunnies.

Sometimes you need to pass an internal PC cable from a header, a front-panel device, or another source out the back of the case for connection to an external port (most often, USB). This arrangement is called a "loopback" configuration, but few cases have a ready-made outlet through which the cable can pass, requiring you to leave a PCI-slot back-panel cover off to give the cable egress. Our quick, cheap workaround: Instead of leaving the slot cover off, bend back the bottom quarter to block most of the unsightly gap—but still give the cable room to exit. It will help keep dust out of the case, too.

72 Lever 2008

Don't force a PCIe card out of its slot—look for the hidden lever.

If you need to reseat your PCIe graphics card and are having a hard time removing it from its slot, note that most motherboards employ a locking lever on the PCIe x16 slot—and it's hard to see once a card is installed in the slot. It's at the back of the slot, the end farthest from the monitor connectors. You may have to feel around to disengage it; sometimes it's a push-up, push-down lever, whereas on other boards it's a springy tab that needs to be pressed sideways.

Installing RAM

73 Locked-In Memory

Make sure your RAM is seated properly.

Before installing RAM, push the levers on either side of the motherboard chip slots you intend to use into the down position. Grasp your RAM only by the edges—never by the contacts along the bottom edge—and match up the notch in the bottom edge with the bar in the slot. (The module will insert only one way.) Press the module evenly into place, using the grooves that bisect the levers as a guide to center it; the levers should rise and lock into the cutaways at either side of the chip. Sometimes, you'll get the "click" feel of a properly seated chip even when only one side is actually locked in, so make sure your RAM is fully seated in the slot and that both levers fully engage the ends of the DIMM.

Have a great PC-building tip? Send it to: GeekSpeak@computershopper.com

74 RAM Matchmaker

Watch the slots to get the best RAM performance.

When installing your RAM, it can make a difference which banks you choose to use. Many modern boards support dual-channel memory architecture, which can speed memory transfers if RAM is used in matched pairs and inserted in designated "paired" slots.

"Pairable" memory comes as a set of two modules with identical specs; the paired slots, if present, are usually color-coded. If you're using pairable RAM, be sure to put the two modules in the matching-color slots. And if you're shopping for RAM, bear in mind that two sticks of dual-channel memory adding up to a given capacity can provide better performance than a single stick of that capacity.

75 Bank Job

RAM banks are distinguished by number—which to use first?

As mentioned in Tip 74, many current motherboards support dual-channel memory architecture in which RAM slots work in pairs. An additional hitch: On motherboards with four memory slots, these pairs are sometimes labeled "memory bank 1 and 2" or "memory bank A and B," with each label indicating one of the pairs. Whatever the case, if you're not using all of the slots, always use the lowest-numbered or -lettered bank first.

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GreenGear

In an age where it's more important than ever to be eco-conscious, give Mother Nature a break with these environmentally friendly tech products.

The tech items usually featured in the pages of Computer Shopper—massive gaming desktops with multiple power-gulping graphics cards, for instance—don't exactly scream "energy efficient." Now, however, computer manufacturers, as well as parts and accessories makers, are embracing the green movement in a big way. They're releasing energy-sipping products that limit power waste, and some are even building their devices with recycled materials. But don't assume everything labeled green is actually environmentally beneficial: Read our "Green Doesn't Always Mean Go" sidebar for some buying tips, and check out "Star Power" to learn how a tech product qualifies for the U.S. Environmental Protection Agency's Energy Star certification.

Dell Studio Hybrid

Dell estimates that its new $699 Studio Hybrid is 80 percent smaller and uses 70 percent less energy than a standard desktop, but the company didn't stop there: It has also reduced the amount of printed documentation and packaging for this PC, and 95 percent of what remains is recyclable. There's even a "system recycling kit" for safely disposing of your old computer. Replaceable colored enclosures mean you can go green with a PC clad in green—or black, blue, orange, pink, red, or bamboo. (For more information about the Studio Hybrid, check out our review on page 18.)

Dell, www.dell.com

APC Back-UPS ES 10 with Master Control

APC's Back-UPS ES 10 ($99.99) offers surge protection and backup power for your computer, completely turning off power to three controller outlets when it senses that the master outlet has shut down—so when you turn off your computer for the night, energy-wasting peripherals like your monitor, speakers, and printer will go to sleep, too.
APC, www.apc.com

Targus Grove Messenger

Eco-friendly bags aren't new, but Targus is one of the first major manufacturers to introduce a line of environmentally friendly computer bags. The $49.99 Grove Messenger doesn't use harmful polyvinyl chloride (PVC) materials, which are difficult to recycle and release toxins when burned or otherwise improperly disposed of; instead, Targus added nickel-free metal and recyclable plastics. The Grove line also includes a sling backpack ($59.99), a convertible messenger bag and backpack ($79.99), and a top-loading laptop bag ($59.99).
Targus, www.targus.com

D-Link Green Ethernet

Why would networking products need to go green? Because Ethernet switches, for example, continue to draw power through their cables even when a computer is turned off. D-Link's Green Ethernet desktop switches reduce the power you use when connected equipment is idle, and they automatically deliver less power when you use shorter-length cables. The company's Xtreme N line of wireless routers, such as the $239.99 DGL-4500 (pictured), includes a Wi-Fi Scheduler feature, which shuts down the wireless radio at a user-set time of the day, like during sleeping hours.
D-Link, www.dlink.com

Asus P5Q3 Deluxe

Asus' P5Q line of Intel-based motherboards features a unique Energy Processing Unit (EPU) with six monitors for everything from the CPU to your case fans. It intelligently measures and rations power consumption, even if you're overclocking.
AsusTek Computer, www.asus.com

Star Power

If it's energy-efficient computing gear you're after, look no further than the U.S. Environmental Protection Agency's (EPA) Energy Star certification program. Updated in July 2007 for the first time in 15 years, the new Energy Star guidelines take a tougher stance on the energy use of desktop and notebook PCs, game consoles, integrated computer systems, desktop-derived servers, and workstations. To qualify for Energy Star's seal of approval, systems must meet certain consumption requirements while idle and during operation, as well as tap into an internal power supply that converts at least 80 percent of incoming electricity for use by the PC. (Multicore CPU and high-end graphics processors get a bit more leeway, however.)

With the new parameters, the EPA estimates that only the top 25 percent of PCs will be able to wear the Energy Star badge, unlike with the pre-2007 criteria, which allowed 98 percent of systems to slide past its benchmarks. The new Energy Star specifications are expected to save consumers and businesses more than $1.8 billion in energy costs over the next five years, plus eliminate the greenhouse-gas equivalent of 2.7 million vehicles driving around for a year. To find out which computers make the grade, visit www.energystar.gov.
—Jasmin Malik Chua

GreenGear

HP Deskjet D2545

HP's slim $44.99 Deskjet D2545 inkjet printer is good for the environment in several ways, including being Energy Star compliant and made of 83 percent recycled plastic. Also, its Smart Web Printing feature helps save paper by letting you choose exactly which part of a Web page you want to print.
Hewlett-Packard, www.hp.com

Belkin Conserve Energy Surge Protector

Just because you've pressed the "off" button doesn't mean your equipment is fully powered down. Many electronics, particularly those that work on standby power, still draw small amounts of electricity; even a cellphone charger that isn't connected to a phone will waste electricity when it's plugged in. Over time, those small amounts lead to a lot of wasted energy and money. To help eliminate this problem, add an energy-saving surge protector such as Belkin's Conserve ($49.99), which has a remote switch that lets you completely cut power to six devices. The switch can be placed anywhere that's conveniently accessible.
Belkin, www.belkin.com

Western Digital Caviar Green

The WD Caviar Green hard drives ($119.99 for 500GB, $239.99 for 750GB, $229.99 for 1TB) employ several advanced technologies to reduce their power consumption, allowing them to use between 4 and 5 watts less per year than competing drives. It may not sound like much, but it's actually the equivalent of taking a car off the road for three days per year.
Western Digital, www.wdc.com

Netgear WNR2000 Wireless-N Router

Netgear's new $79.99 WNR2000 is the company's greenest router yet. Not only is it Energy Star compliant, but its packaging is comprised of 80 percent recyclable materials. Even better, the router includes an on/off switch, letting you power the unit down at night to save energy.
Netgear, www.netgear.com

Cooler Master 80 Plus Power Supplies

Cooler Master's UCP (Ultimate Circuit Protection) power supplies are some of the most efficient power supply units (PSUs) on the market, and they've earned the second-highest efficiency award available—the 80 Plus Silver certification. These PSUs are able to achieve an impressive 88 percent efficiency, so they'll save you energy as well as money on your utility bill.
Cooler Master, www.coolermaster.com

Asus Eee Box

If you need a secondary computer for Web browsing, word processing, or e-mail, why pay extra for power you don't need? Asus' Eee Box desktop starts at just $349.99, and it's smaller than an 8.5x11-inch piece of paper—which means it doesn't suck up much power. Even when performing relatively intensive tasks (like playing high-definition video), it can get by using 20 or fewer watts of electricity. That means you can keep your productivity up and your power bills down. (See page 14 for our full review of the Eee Box.)
AsusTek Computer, usa.asus.com

Green Doesn't Always Mean Go

If you're considering switching to green hardware for your PC to save money or help the environment, start by being diligent when shopping. There's still lots of confusion over what exactly amounts to a specific product being green; no green organization officially ratifies standards, so it's up to manufacturers to declare themselves and their products green. (The Environmental Protection Agency's Energy Star certification is a helpful resource, however—see "Star Power" on p. 71.)

As a shopper, you need to be able to identify which specific features have granted a product its green label, then decide for yourself whether they're genuine or not. Western Digital's Caviar Green drives, for example, use patented technology to constantly adjust their platter speed, thus reducing energy consumption. On the other hand, some printer manufacturers are now claiming that the ubiquitous "print cancel" button that's been on every printer since the earth cooled is a green feature, because it can save paper. Saving paper is a good thing, but that's like saying any product with an on/off switch is green because you can turn it off to save energy.

Our advice is simple: Do your homework. Don't be fooled by marketing hype or a green sticker, because to some manufacturers the word green refers more to the color of money than saving the environment. —*Josh Norem*

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COMPUTER CURES JOHN A. BUREK

AGP X-FACTORS

I purchased a high-end Gateway desktop PC back in 2000 that still provides acceptable performance. The video card supplied with my machine is failing, however. Gateway no longer supports it, nor can it provide a replacement card that fits the motherboard slot.

The original card was a 32MB Nvidia GeForce2 2x/4x AGP card. How to locate a replacement?

DAN GORBY, VIA E-MAIL

Accelerated Graphics Port (AGP) is the graphics-card interface that preceded today's standard, PCI Express (PCIe). Unless you change motherboards (a far bigger undertaking), you'll need to upgrade the card with another AGP model. Pinpointing a compatible one can be a little tricky, though. That's because unlike today's PCIe video cards, which are backward-compatible to the very first iterations of the PCIe interface, not all AGP graphics cards are compatible with a given motherboard's AGP slot.

AGP cards have a fractured compatibility history due to overlapping variations in data rates, electrical compatibility, and physical fit that appeared as succeeding generations of AGP cards debuted. All AGP cards support one or more data rates, indicated by the specs 1x, 2x, 4x, or 8x. Each rate is backward-compatible with the lesser ones. Where complications arise is with slot voltage; roughly around the era that AGP 2x cards debuted, new AGP cards began requiring a 1.5-volt current from their motherboard slots, instead of the 3.3 volts that was standard before. At the same time, new AGP specs mandated changes to the cards' physical connector to prevent cards from being plugged into voltage-incompatible AGP slots.

How to tell what you have? Remove the card from your PC and check the row of electrical contacts along the bottom edge. It will be split into either two or three clusters of contacts by one or two deep notches. If the card has just one notch, and the *smaller* of the two clusters is closer to the I/O bracket (the part of the card with the monitor port or ports on it), then you have an older 3.3-volt card. If there's one notch and the *larger* cluster is closer to the bracket, it's a 1.5-volt card. If there are two notches, the card is a "Universal AGP" card, which supports either voltage. (Given your PC's age, you probably don't have one of these.)

Now, check the motherboard's AGP slot. If there's a bar in the slot that matches the notch in the card, your new card must match the old card's voltage to fit and work. If the slot lacks a bar, it's a Universal AGP slot that should accept either type.

My advice: If you have a 3.3-volt-only slot, triple-check that any new card you buy actually supports 3.3-volt operation. Some Universal AGP cards, confusingly, support a newer spec called "Universal AGP 3.0"; some of these have only the 1.5-volt-connector notching and won't work in a 3.3-volt slot. Also, take heed: The last iteration of consumer AGP cards, "AGP 3.0" cards, technically run at 0.8 volt and are theoretically compatible with older 1.5-volt slots, but in practice, some act unstable or don't work at all in older systems. If you buy one of these, make sure you can return it easily if you run into trouble.

DVD-BURNER LOWDOWN

I'd like to install a DVD burner inside my Dell Dimension 4550. It's about six years old. How would I go about doing this, and what type of burner would I buy?

RICHARD BORGOGNONE, VIA E-MAIL

Any 2002-era PC almost certainly has only IDE drive interfaces. The first drives supporting the current drive-interface standard, Serial ATA (SATA), only began trickling out in late 2002 (and they were hard drives, not optical drives). A SATA interface on the motherboard would have been uncommon at the time in a mainstream PC like yours.

IDE optical drives are still being made, though, and they're very inexpensive. So-called "multiformat" DVD burners, which write to CD-Rs as well as the "plus" and "minus" variants of recordable DVDs, start around $25. Any of these will do; the main difference among them nowadays is not speed but the software bundle. The cheapest drives are "OEM" models—just a bare drive in a box. If you need basic burning software (and install instructions), look for a "retail" drive that comes with a suite such as Nero Express.

One other differentiator: Some current DVD burners support LightScribe, a technology that works with compatible media to allow laser-etching of text and images on the top of the disc. Because LightScribe support costs only a little extra these days (even though the discs are still premium-priced), it's worth getting.

As for the install, to replace your current optical drive with the DVD burner, simply plug the new drive into the same IDE ribbon-cable connector and power-supply connector as the old drive when you make the swap. Just make sure the new DVD drive's "Master/Slave" jumper—that tiny nugget of plastic that bridges a pair of pins on the back of the drive—matches the setting on the old drive. The three possible positions for the jumper are Master, Slave, and Cable Select. If you need to change it, use needle-nose pliers.

Installing the DVD drive alongside another optical drive requires a little more deduction. A PC of your vintage will have two IDE ports, each supporting up to two IDE drives, with each drive pair chained off a single cable. The IDE cable or cables will have three connectors: one at the motherboard end, one in the middle for a secondary

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drive, and one at the end for a primary or "Master" drive. It's best to attach the DVD burner to the same cable as the other optical drive, not along with a hard drive, for the best performance. If the new drive will be attached to the middle of the cable, set the drive to Cable Select (if the other drive is set to Cable Select) or Slave (if the other drive is set to Master). You may need to remove the other drive to determine its jumper setting.

Finally, considering the age of your system (circa 2002), check its hardware specs against the requirements of any DVD burner you're considering, as well as against those of its bundled software. You may need to upgrade the RAM, hard drive, or other components to use your new burner fully.

RAM JAM

My computer can take two pieces of DDR2 667 RAM, but many places are selling faster RAM cheaper. Can I use the faster RAM, and will it slow down my computer?
MARTIN DIXON, VIA E-MAIL

Two short answers: Yes, and no. Yes, you can use the faster RAM, as long as it's DDR2. Original DDR won't work. (DDR has 184 edge contacts as opposed to DDR2's 240, and is notched differently, so it won't fit, either.) Newer DDR3 memory has the same 240-contact count as DDR2, but it's incompatible, as well.

No, the faster speed rating on the new RAM shouldn't be a problem, but the new modules will run only as fast as the motherboard's front-side bus allows. That said, occasionally hardware that should get along doesn't, so buy your RAM from a seller with a no-hassle, no-restocking-fee return policy.

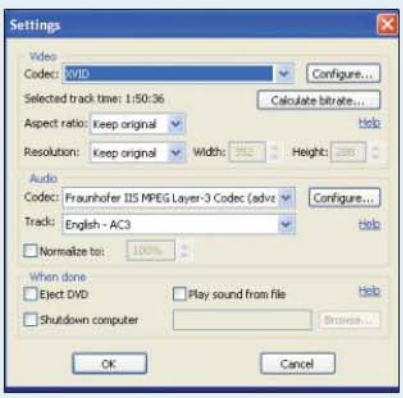
DOUBLE VISIONARY

I'm trying to find a software program that allows me to operate two monitors separately from the same computer. Could you give me an idea of where to look?
"FIDAD4" VIA E-MAIL

You may not have to look far—most modern graphics cards employ drivers that incorporate dual-monitor functionality (such as ATI/AMD's Hydravision and Nvidia's nView), and multi-monitor support has been a Windows staple since Windows 98. No additional software is needed, but your system must have a "dual head" graphics card with outputs for two monitors, or a second graphics card. Even the cheapest new PCI Express and AGP cards these days are dual-head, though. They come with two monitor connectors—two DVI, or one DVI and one VGA—that will support any combination of LCD and CRT monitors you might have (though you might need to use some simple adapters).

The functionality of Windows or your graphics driver will suffice for a basic two-monitor setup, whether you want to perform simple spanning (stretching the desktop across two or more monitors) or extending (allowing for multiple displays with independent resolutions, color depths, and other settings). But if your needs are more advanced, a few apps provide further functionality. The best known is Ultramon from Realtime Soft ($39.95, **www.realtimesoft.com**), which provides much-enhanced control over program appearance/resizing, screensaver configuration, and wallpaper display across two or more displays.

TIP OF THE MONTH: EASY DVD, NO PC



In a recent Computer Shopper, *reader Gary Cassidy asked for the "best" way to convert VHS tapes to DVD. I've tried the hardware/software route, with mixed results. A much easier (and thus "better") way would be for him to go to his local big-box electronics store and buy a DVD recorder. One can be had for about $100 these days. Connect the output of the VCR to the "line-in" of the recorder, hook the DVD recorder to a television (to monitor the action), pop a blank DVD into the recorder, cue up a VHS tape, and hit "Record" on the DVD recorder and "Play" on the VCR. Stop both machines when the end of the clip (or DVD) is reached.*
HARVEY DUHON, VIA E-MAIL

In that letter, I focused on PC-centric solutions, but you have a point: The stand-alone (or "set-top") DVD recorder is an underrated device that, ironically, is also handy for getting video into your PC without fumbling with video-capture paraphernalia. (The fact that prices have plummeted on these units helps, too.) Of course, you can use one of these set-top devices to make a quick-and-dirty DVD from VHS clips, and though you won't be able to edit the video or make overly creative menus, for many purposes that will suffice. But bear in mind that you can write a compilation of clips to a DVD using a set-top recorder, rip the contents of that DVD to a PC AVI file using freeware such as BitRipper **(www.bitripper.com)**, and trim the clips as desired with video-editing software, such as the freeware Free Video Dub (available at **www.computershopper.com/downloads**). A basic DVD-creation app such as NeroVision can then recompile and burn the clips back to DVD with custom menus and clip sequencing.

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Install a Liquid-Cooling System

BY MATTHEW MURRAY

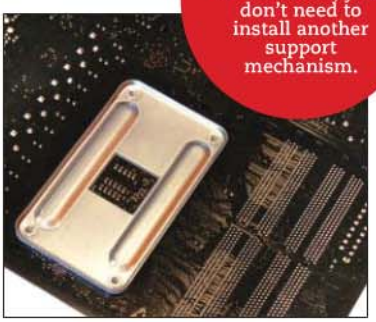
WHETHER IT'S BECAUSE your mammoth CPU cooler is too noisy, or because you don't want to go the usual fan/heat-sink route as you build (or upgrade), installing a liquid-cooling system in your desktop can be a good idea. And it's not hard—if you can perform basic upgrade duties, you can complete the task in just a couple of hours.

If you're feeling industrious, you can handpick components yourself, but it's much easier and more convenient to use a kit. We used Thermaltake's PW 850i, which costs just $149.99 and contains all the components and hardware you need (well, except for a Phillips screwdriver). Different kits may vary a bit, but all will help you dump your CPU fan and go for quieter, cooler cooling.

For more: computershopper.com/howto

1 Supporting and installing the waterblock

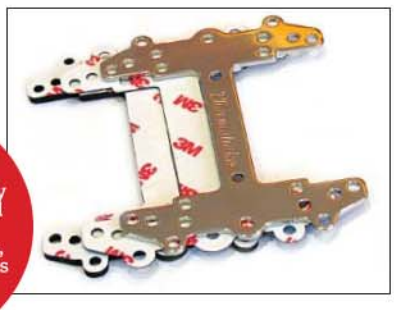
The most involved (and time-consuming) step is the first: setting up the waterblock, the mechanism that uses flowing liquid to chill down the CPU. The good news is that the process is simple. The bad news is that you probably won't be able to do it while the motherboard is in the case. (For more information about removing or reinstalling your motherboard, check out our Weekend Project "How to Replace Your Motherboard" at **computershopper.com/127**.)



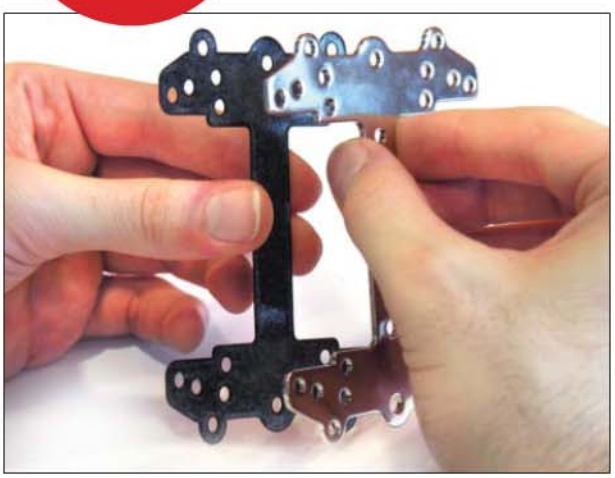
If your AMD CPU has threaded holes or standoffs, you don't need to install another support mechanism.

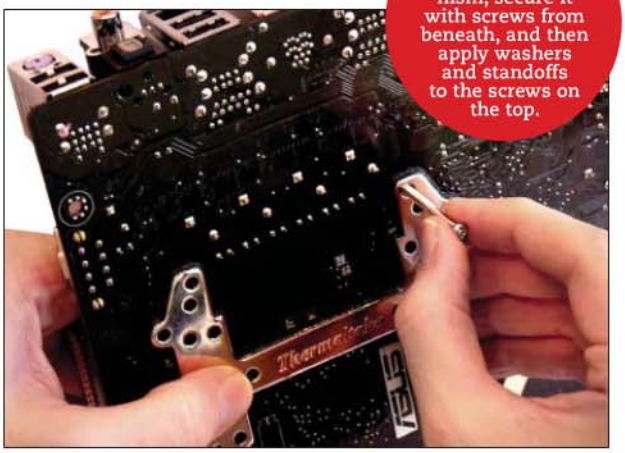
The one exception might be if your system uses an AMD CPU. Remove the fan and heat-sink retention frame from around the CPU cradle. Be sure to notice how it was connected: with threaded standoffs that stick up on this side of the motherboard, through threaded holes, or through smooth holes. If either of the first two scenarios applies, skip the next paragraph.

If your frame was threaded, you'll need to put together the waterblock's support mechanism, which will attach below the motherboard. It consists of three pieces, all vaguely shaped like a capital "H" and containing screw holes, a



The support mechanism is easy to set up: Just peel off the backing from the adhesive, and stick the pieces together.



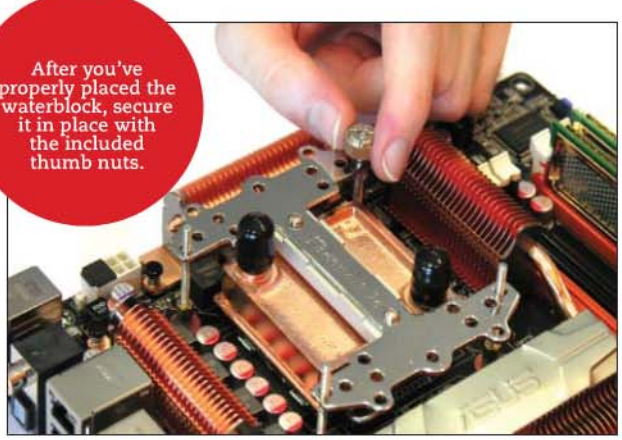


Once you've assembled your support mechanism, secure it with screws from beneath, and then apply washers and standoffs to the screws on the top.

metal clip, a cushion to protect the motherboard, and an insulator to go between them. Peel the plastic backing from the metal strip to expose the adhesive, and stick the clip to the insulator; then do the same to one side of the cushion, and stick that to the insulator, too. (There's also adhesive on the other side of the cushion, should you want to affix the support to the motherboard permanently, but that makes it much harder to remove later.)

If you need to use the cooler's support, align it with the holes surrounding the processor cradle, usually in the four corners. Then, slide long screws through the holes so they pop up above the front side of the motherboard. Turn the board over, slide washers down for insulation, and then screw brass standoffs all the way down all four screws to secure them. If your AMD motherboard has its own support, just put the screws through the holes that already exist.

Place a tiny amount of thermal grease on the processor's top (just as if you were installing a fan) to properly conduct the heat the CPU will generate. If your AMD processor has the standoffs on the top side of the motherboard, gently place the waterblock on the processor side of the motherboard and screw it down into the standoffs. Otherwise, lower the waterblock onto the screws until it rests on the CPU. Then secure it by adding and tightening the thumb nuts.

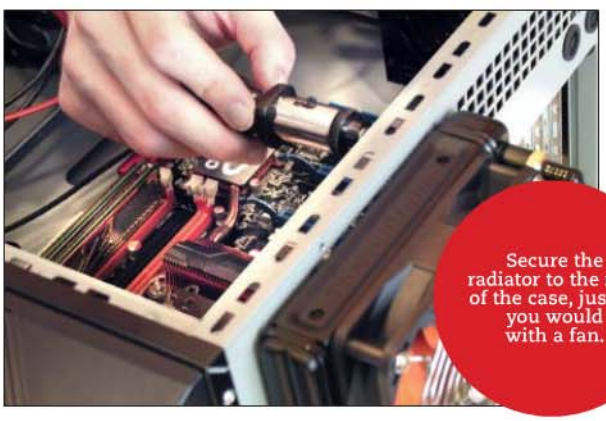


After you've properly placed the waterblock, secure it in place with the included thumb nuts.

2 Install the radiator

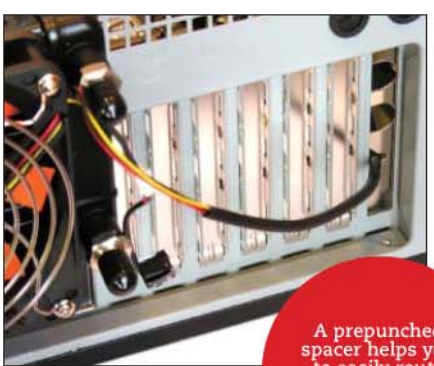
Once the coolant that's passed through the waterblock has cooled off the CPU, it needs to lose the heat it's acquired before reentering the system. The radiator will take care of this before expelling that heat back outside your computer where it belongs.

If your case is roomy enough, you can install the radiator inside it. If it isn't, the radiator can go on the outside of the case. Regardless, the process is basically the same: Remove your currently installed exhaust fan and replace it with the radiator module. If the module will go outside the case, you'll need to reverse the fan so that it's sending the air in the right direction—just unscrew the grille, flip over the fan, and replace the grille.



Secure the radiator to the rear of the case, just as you would with a fan.

One extra wrinkle: If the radiator is outside the case, the power and control connectors and tubing will have to get into the case somehow. Some cases have holes predrilled for this purpose. If yours doesn't, or the holes are too small (which happened to us), just pop out the spacer in a free expansion slot, send the cables through, and replace the spacer with the special one included with the cooler. It's prepunched with proper-size openings for routing everything into and out of the case.



A prepunched spacer helps you to easily route wires and tubing into and out of the case.

Next, connect the small wire to the fan connector on the motherboard, and the larger (four-pin Molex) power connector to your power supply.

3 Place the pump and tank

Something's got to hold and move liquid throughout the system. Enter the pump and tank. But they have to be placed somewhere.

Installing them can range in difficulty from easy to ridiculously easy. If you have mounting holes in the bottom of your case, you can secure them that way—just align the pump and tank with the holes, then screw the screws up through the bottom. If you don't have these holes, the process is even simpler: The Thermaltake kit includes adhesive-backed Velcro strips. Just peel away their plastic backing, press them to the bottom of the pump and tank, then stick the units to the bottom of the case.

Then, just connect the pump and tank to the power supply, do likewise the four-pin Molex connector, and you're done.

The pump and coolant reservoir may be secured with either screws or Velcro.

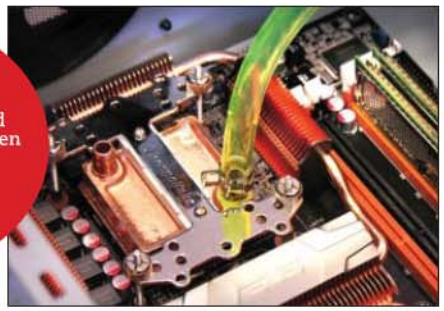
4 Connect the tubes

All of the individual components are ready to go, but you have to make sure the coolant can move between them. The cooler comes with a coil of plastic tubing for just that purpose. Start by removing all the black rubber caps from the nozzles on the various components—the liquid won't be able to get inside with them present.

The process is the same for each component: Slide a hose clip around one end of the tubing, connect the tube to a nozzle so that the clip is directly over it, and tighten the clip with a pair of pliers. (This step is very important—fire-hydrant fountains might be fun in the summer, but you don't want one inside your PC.)

Of course, you'll need to make sure your tubing layout makes sense as a way to cool the processor. Think of it this way: Cold liquid is pumped from the tank to the waterblock, where it sucks up the CPU's heat; then it moves to the radiator, where it's cooled back down; it then passes through a flow indicator, so you can monitor the efficiency of the pump; and finally it goes back into the storage tank, where the process can begin again. It's essential that the tubes lead from the pump to the waterblock, from the waterblock to the radiator, from the radiator to the flow indicator, and from the flow gauge to the tank. Don't set the tubes up in any other order.

A hose clip is vital for securing tubing to nozzles.



Once you've slid on the tube, tighten the hose clip with pliers.

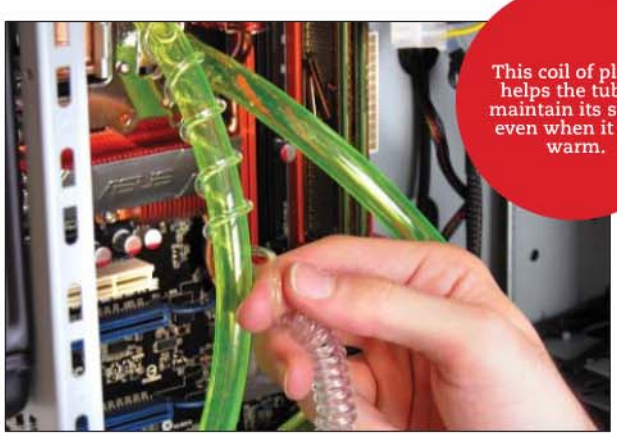
Connect the tubing to the radiator with a spacer or—if you have them—predrilled case holes.

5 Finishing up

The last major element missing is an important one—the liquid. The PW 850i comes with a bottle of coolant, though you can (and probably will have to, at some point) buy more.

Start by unscrewing the tank's lid and filling the reservoir with coolant. It first needs to pass throughout the whole system, however, so make sure your computer is plugged in and turned on. The coolant will start passing through the tubing, which will decrease the amount of coolant in the reservoir; top it off. Once the reservoir is consistently full and liquid is flowing freely through the tubing, shut off the PC and replace the tank lid.

Finally, heat can cause the plastic tubing to soften and lose its shape. To guard against this, Thermaltake includes what it calls an "iStripe," a small coil of plastic you cut to fit, then wrap around the tubing to help it maintain its shape. This easy process also has another benefit: It helps the tubing look as cool as your processor will now run with its liquid-cooling system.



This coil of plastic helps the tubing maintain its shape even when it gets warm.

Build Your Own

NEW PRODUCTS FOR BUILDING A CUSTOM PC

BY JOSH NOREM

Control freak

Once you've built your system, you'll want to make sure your case's airflow is sufficient to keep things cool—without being so noisy that you'd need ear plugs just to surf the Web. NZXT's **Sentry LX** lets you keep all your fans in check by tying them to temperature probes you can place anywhere inside the chassis; you can then program the LX to adjust fan speeds based on preset temperatures, thus making sure that hotspots get the airflow they need. The aluminum controller, which slots into two 5.25-inch drive bays, includes five fan controllers and five temperature probes. Fan speeds can be adjusted automatically or manually. The Sentry LX sells for $59.99. *NZXT, www.nzxt.com*

Compound interest

Your new multicore processor tears through video-editing tasks, but it runs hotter than Hades. The solution is **Chillaramic**, Coolink's new thermal compound, which is made with ceramic nanoparticles to increase thermal conductivity. Available in giant 10-gram tubes, Chillaramic's unique ceramic properties make it nonconductive, so you don't have to worry about it shorting something out if it spills onto your motherboard. Coolink also touts a short burn-in time, which is handy because some pastes require several weeks of operation before they achieve optimal temperatures. One tube, good for up to 30 applications, will set you back $8.90. *Coolink, www.coolink-europe.com*

We're big fans

The cooling units on today's graphics cards are sufficient for standard operation, but they can be noisy and hot, and they don't usually allow for overclocking. That's where Arctic Cooling's quiet **Accelero Twin Turbo** comes in. The $38.95, double-wide cooler can drop your card's temperature by an incredible 78 degrees Fahrenheit, sucking heat with four copper heat pipes, spreading it out through 30 aluminum fins, and allowing its twin rubber-mounted fans to radiate heat out of the system. It's also compatible with CrossFireX and Scalable Link Interface (SLI) setups, and it fits most current high-end cards such as the Nvidia GeForce 9800 GTX and the ATI Radeon HD 4870. *Arctic Cooling, www.arctic-cooling.com*

For more: computershopper.com/build-your-own

In your sights

If you're hunkered down and carefully scanning the horizon for midtower PC chassis deals, settle your crosshairs on the affordable Apevia **X-Sniper**. This $79.99 case is available in black, blue, green, red, or silver, and it includes high-end features such as tool-less construction, a brushed aluminum faceplate, and three 120mm cooling fans with blue LEDs. It also features 10 drive bays and two fan controllers, along with room for extra-long video cards. *Apevia, www.apevia.com*

A new view

MSI's **P45** motherboard line looks just like any other on the surface, but once you install it and boot up, you'll notice that it features something you haven't seen from any other motherboard—a BIOS with a 3D interface. Instead of the traditional black-and-white BIOS on nearly every other PC, the P45's BIOS is rendered in full, three-dimensional color and can be navigated with just a mouse. P45 boards are based on Intel's latest P45 chipset and offer support for ATI's CrossFireX. The P45 Diamond (pictured) is $274.99. *MSI Computing, www.msicomputer.com*

Supply line

A high-quality power supply is the foundation of a healthy and stable PC, and Antec's new line of **Signature Power Supplies** is built to last, while also being highly energy-efficient. The Signature series includes a cooling fan that uses Pulse Width Modulation (PWM) to modulate fan speed according to system demands, ensuring quiet and effective operation at all times. The company hard-wires mandatory cables to the unit for reduced resistance; you can plug peripheral cables in to keep your PC's wiring nice and tidy. The Signature series is available in both 650- and 850-watt configurations for $249 and $299, respectively. *Antec, www.antec.com*

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The Right Thin-and-Light Laptop

BY SERGUEI SERVIANOV

Apple MacBook Pro

Powerful enough for most computing tasks you throw its way, yet portable enough not to weigh you down on the road, a thin-and-light notebook provides you with the best of both worlds. Here's how to select the right one for your needs.

For more: computershopper.com/buying-guides

SHOPPING SPECS

CASE

Road warriors should shop for a laptop that weighs between 4 and 6 pounds; durable, metal alloy cases around 1.5 inches thick are best. Many thin-and-lights feature black or gray exteriors, although more companies now offer stylish finishes and case color options.

PROCESSOR

Look for a model powered by Intel's Core 2 Duo processor (preferably based around Intel's new Centrino 2 platform), which provides long battery life, strong performance, and cool running temperatures. If you're interested in purchasing an AMD-based laptop, go with a Vista-friendly Turion 64 dual-core processor.

OPTICAL DRIVES

Go for a multiformat DVD burner (DVD±RW), which also writes CDs. Some thin-and-light notebooks can be configured with drives that play high-definition Blu-ray discs. This upgrade is pricey, however, especially if you select a drive that can also burn Blu-ray discs.

DISPLAY

Thin-and-light wide-screen displays range in size from 12.1 to 15.4 inches. You may have a few options for screen resolution—for the best viewing experience, pick the maximum resolution you can afford. Displays that use LED backlighting instead of the traditional fluorescent tubes offer improved color performance and increased power savings.

3 GREAT BUYS

GOOD

Dell Inspiron 1420
(www.dell.com, starting at $649)
The 5.4-pound Inspiron 1420's glossy 14.1-inch screen and solid set of components allow it to keep up with more expensive machines. Plus, it comes with a great array of special services, such as a subscription to Dell's DataSafe Online Backup.

BETTER

Fujitsu LifeBook S6510 ✓
(www.toshiba.com, $1,429)
The 4-pound LifeBook S6510 business portable is on the light side, but it packs a 14.1-inch screen, a beefy Core 2 Duo processor with solid performance and battery life, and a modular bay that lets you swap in either an optical drive or a second battery.

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Apple MacBook Pro ✓
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✓ = Editors' Choice

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by MATTHEW MURRAY

Tech Tools

Our 75 must-know PC-building tips (see p. 53) can take you a long way on your journey to assembling your own computer. But what equipment do you need for the trip? Here's a look inside our essential PC tool kit—the five things no PC builder should be without.

Screwdriver: A Phillips is a must, because most of the screws you'll find inside (and outside) computers are of the Phillips-head variety, but you'll occasionally run across hex-head and flathead screws, too. Our recommendation: Get a ratcheting screwdriver with an easily adjustable screw-and-unscrew thumb switch and removable bit heads to keep everything you need right at your fingertips.

Cable ties: To keep your airflow levels up and your frustration levels down, properly organized cables are a must. A handful of these in your tool kit will ensure you'll always be able to keep cables where you want them—and away from where you don't.

Parts picker: We came late to these, but now we can't imagine computer work without them. Just push the plunger to extend a claw that lets you pick up and place tiny pieces. They're especially useful for screws, which have a habit of falling into the most inconvenient crevices on motherboards.

Needle-nose pliers: These are a must for securing standoffs in a case, moving and placing those tiny jumpers on drives or motherboards, and tightening connections on a liquid-cooling system (see this month's Weekend Project, p. 94).

Antistatic wrist strap: Sure, you can discharge yourself by touching bare metal inside your case, but why take the risk? Just put on the strap, clip it to your computer's chassis, and you and your equipment are protected from the dangers of electronics-frying static electricity.

Chatter Capture

August Poll Results

What do you do most with your computer?

Heavy productivity (graphics/video editing, etc.)
30%

Light productivity (word processing, spreadsheets, etc.)
23.3%

Media (playing music, watching videos, watching and recording television)
19%

Games
16.6%

Not as much as I should
11.1%

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