

# Fastest CD Burners Benchmarked

# MAXIMUM PC

▶ EXTREME HOME COMPUTING

MAY 99

Latest soundcards & speakers reviewed:

OVER  
**30**  
NEW

**REVIEWS**

# BIG

# audio

# SHOWDOWN



Gateway's new P-III:  
A real heartbreaker!



Palm V: The next-  
generation PDA



Sony PictureBook:  
3-pound powerhouse



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will change  
the way you  
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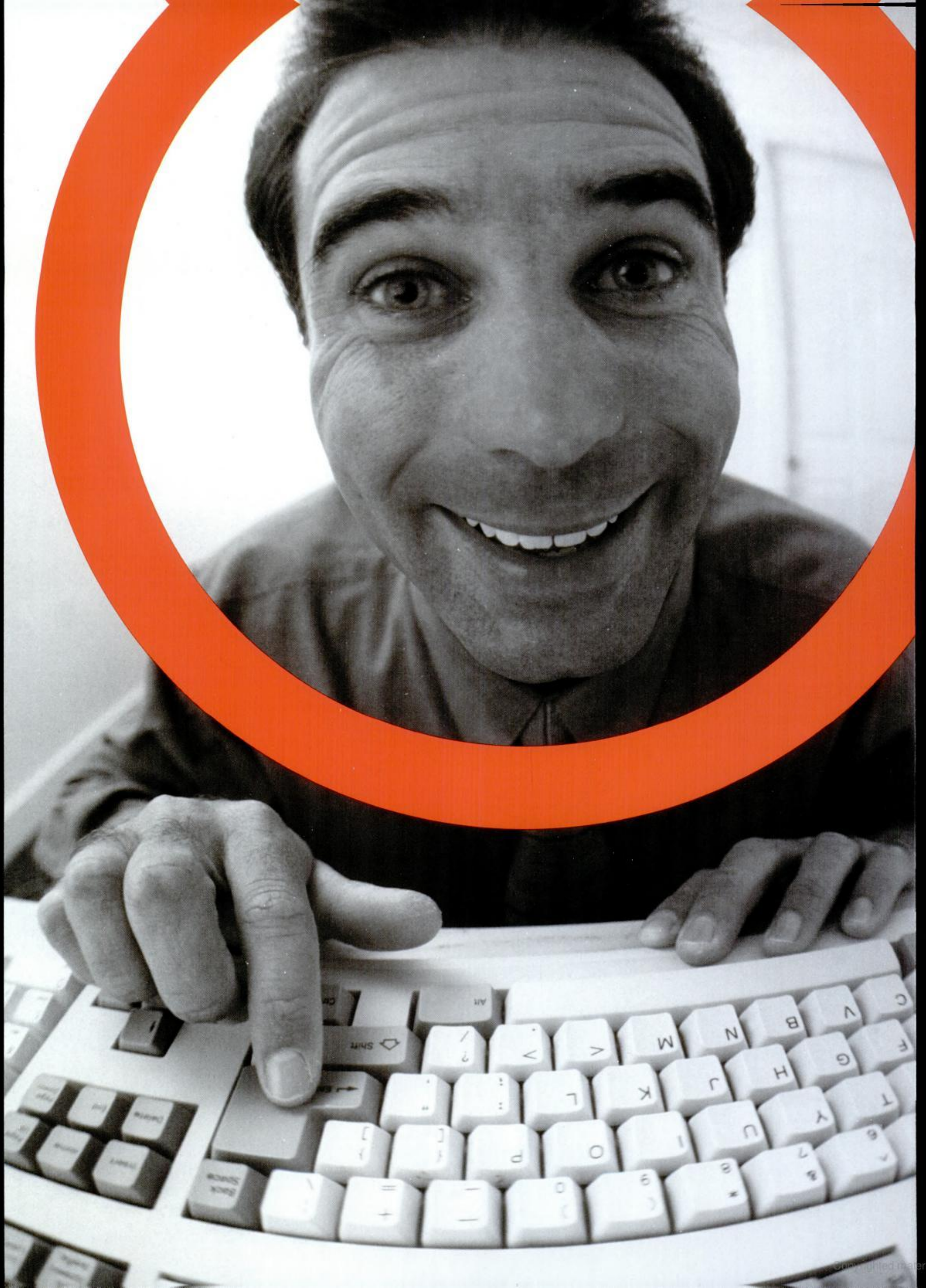
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- 40X CD-ROM drive<sup>◊</sup>
- 3Com USRobotics V.90 WinModem<sup>\*\*</sup>
- Diamond Viper 550 TnT 16MB graphics
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Hard Drive	8.4GB Ultra ATA hard drive*	13GB Ultra ATA hard drive*	13GB Ultra ATA hard drive*	20GB Ultra ATA hard drive*	25GB Ultra ATA hard drive*
Monitor	17" Micron 700Vx monitor (15.9" display)	17" Micron 700Vx monitor (15.9" display)	17" Micron 700Vx (15.9" display) monitor	17" Micron 700Vx (15.9" display) monitor	15" Micron LCD flat panel display
DVD/CD-ROM	40X CD-ROM drive*	40X CD-ROM drive*	40X CD-ROM drive*	6X max speed DVD-ROM drive	6X max speed DVD-ROM drive
Modem	3Com USRobotics V.90 WinModem**	3Com USRobotics V.90 WinModem**	3Com USRobotics V.90 WinModem**	3Com USRobotics V.90 WinModem**	3Com USRobotics V.90 WinModem**
Graphics	8MB AGP graphics nVidia Riva 128 ZX	8MB Real 3D Starfighter AGP graphics	16MB Diamond Viper 550 TnT 2X AGP graphics	16MB Diamond Viper 550 TnT 2X AGP graphics	16MB Diamond Viper 550 TnT AGP graphics
Sound System	PCI 64-voice Wavetable sound	PCI 128-voice Wavetable sound	PCI 128-voice Wavetable sound	PCI 128-voice Wavetable sound	Sound Blaster LIVE! Value audio card
Speakers	Advent AV009 speakers	Advent AV009 speakers	Advent AV009 speakers	Advent AV009 speakers	Monsoon 3-piece flat panel speaker system
Warranty	5-year/3-year Micron Power™ limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty
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Palm V: The next-  
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Sony PictureBook:  
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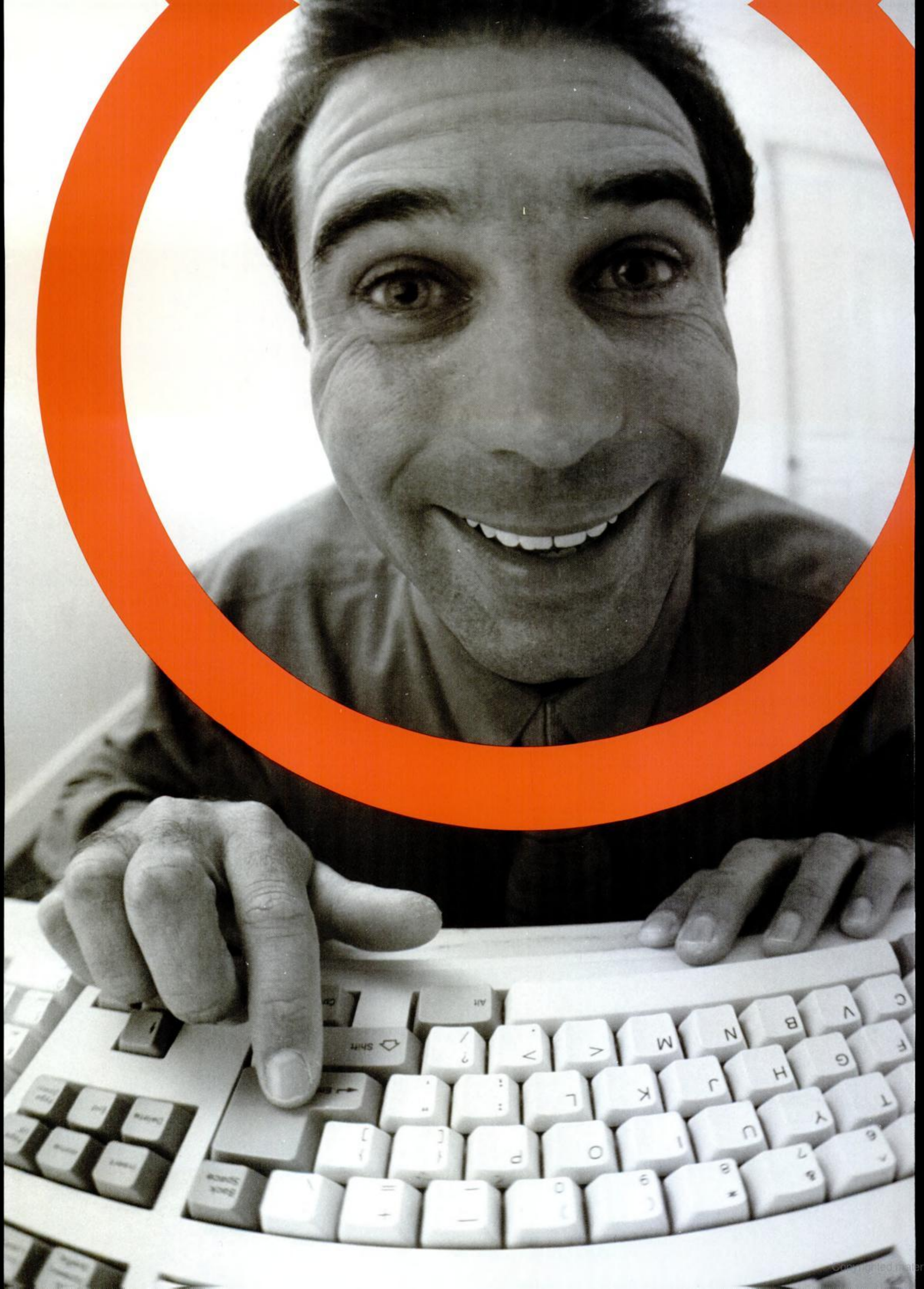
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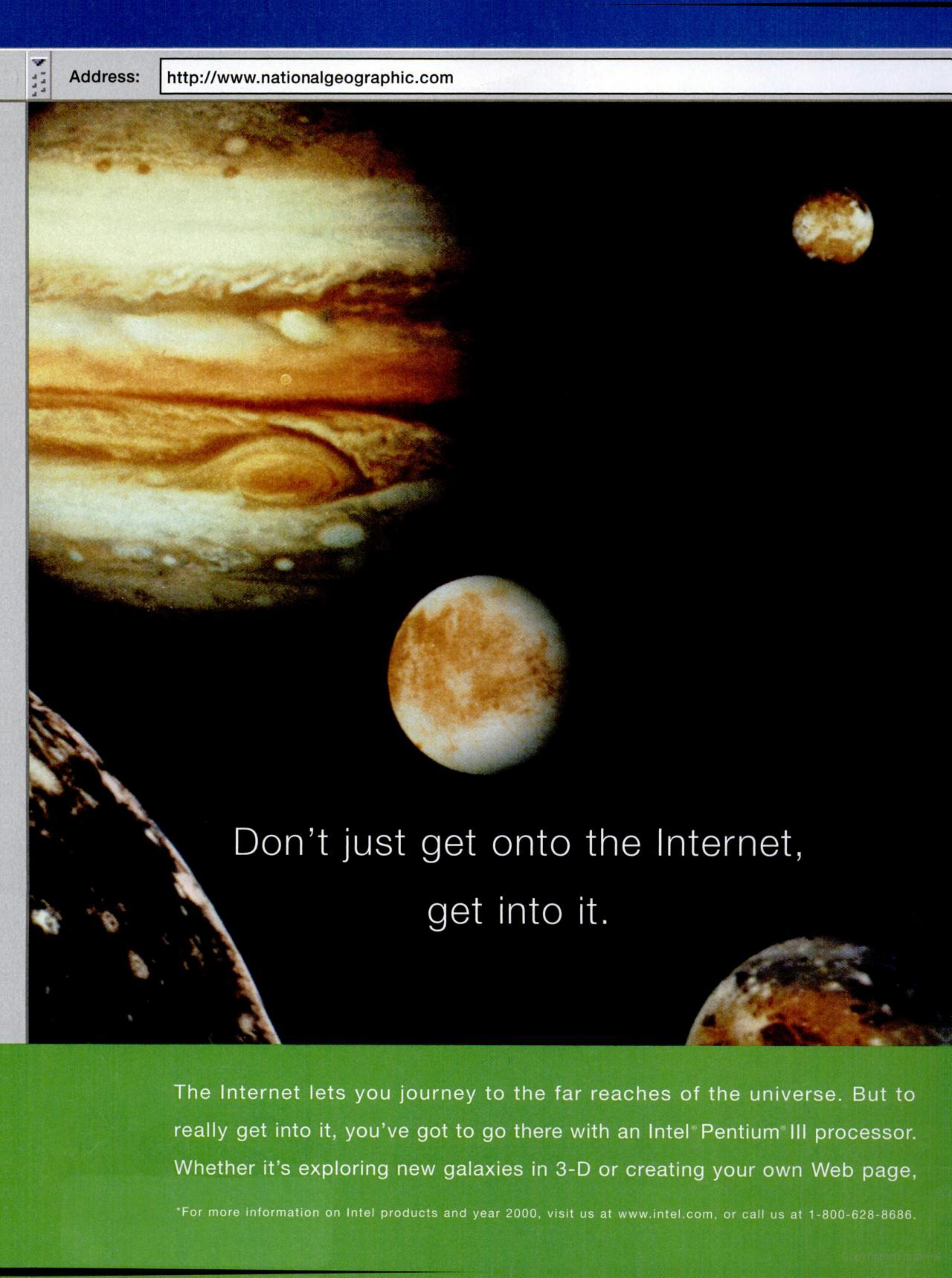


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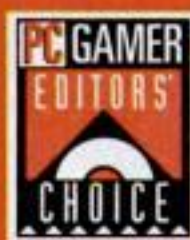
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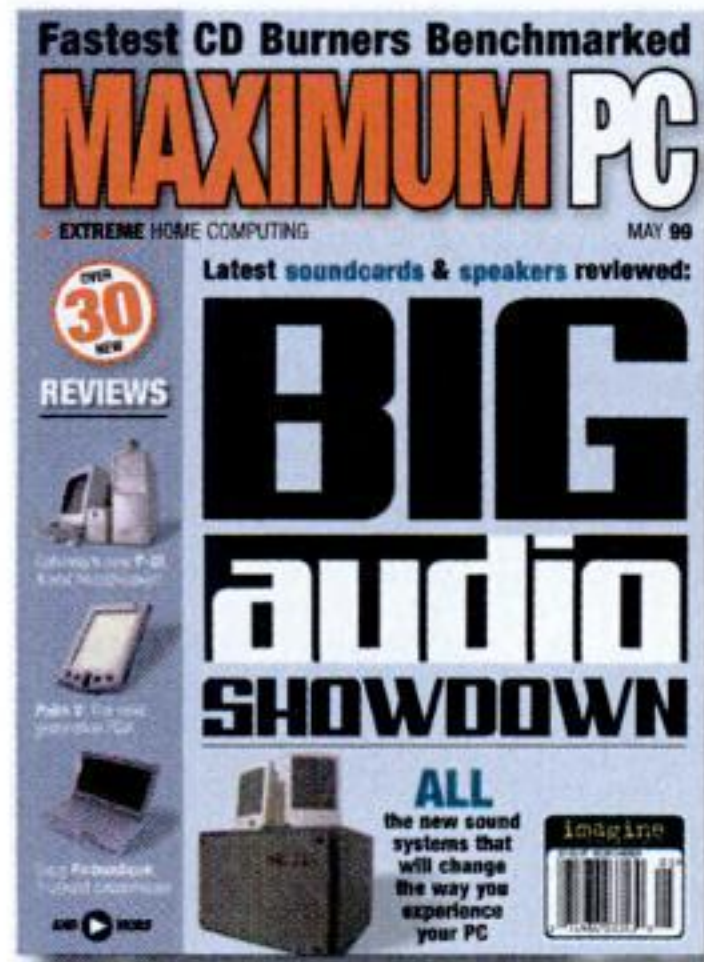
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# MAXIMUM PC

▶ MAY 1999



## 50 BIG AUDIO SHOWDOWN

Your CPU has more processing power than you know what to do with, and your video-card is powerful enough to run games that haven't even been released yet. But your soundcard and speakers may be dropping the ball with old technology. It's time to turn your PC into a multichanneled, 3D-positional-sound, home-theater and gaming system.

## 62 Burning New Ground

The latest generation of CD recorder and rewritable drives will knock you down with faster performance and easy-to-use, drag-and-drop software. We benchmark and review the six hottest burners, and give you the full 411 on how these suckers work.



## 44 Interrogation: Deer Hunter

Love it or despise it, *Deer Hunter* has spawned a host of imitators and redefined the state of PC gaming. **James Boer**, one of the game's original developers, shoots straight from the lip taking aim at the critics who say the game just isn't much fun to play, and the techno-freaks who wailed about missing polygons. Boer also targets game developers who desire nothing more than a quick buck. Ready... Aim... Fire!

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MAY 99 MAXIMUM PC



## ▶ VOICES

### 10 Ed Word

**Brad Dosland** warns about the dangers of building businesses on bubbles and misrepresentative advertising.

### 14 Comm Port

The Smartest Readers in the World have spoken. And as a special treat, we've decided to print their wise words... again.

### 37 Fast Forward

Crafty **Tom Halfhill** has fashioned a winning strategy that will help you come out on the winning side of the CPU wars being waged between Intel and AMD.

### 39 On the Line

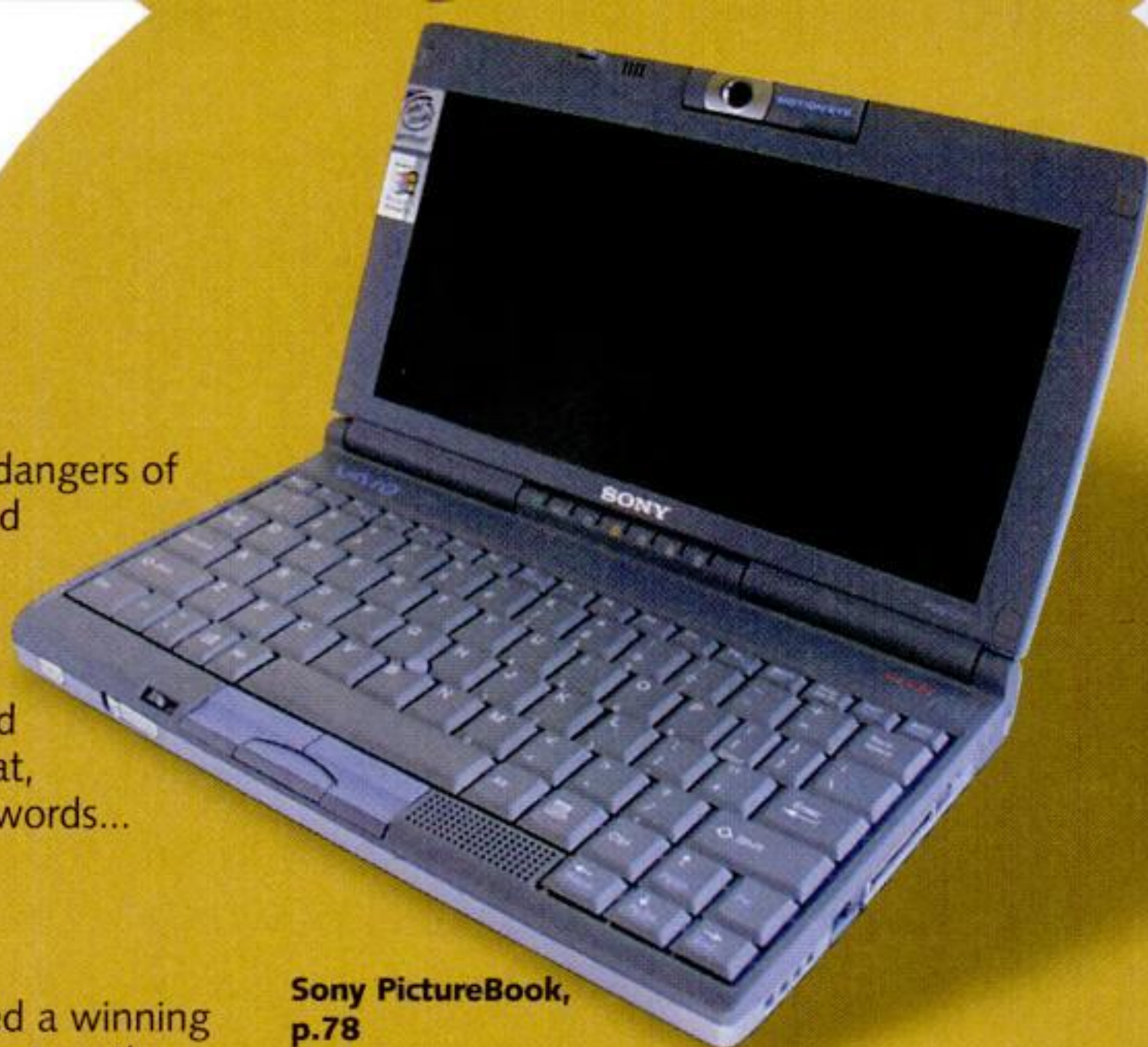
Girl-about-net **Shel Kimen** is hammering out a built-to-order vision for the WWW.

### 41 Game Theory

Armchair general **T. Liam McDonald** bemoans the death of a once-proud genre.

### 104 The Saint

Insidious Insider **Alex St. John** was witness to one of tech's most tense stand-offs: The Wintel Missile Crisis.



Sony PictureBook, p.78

## ▶ TECH FILES

### 30 Watchdog

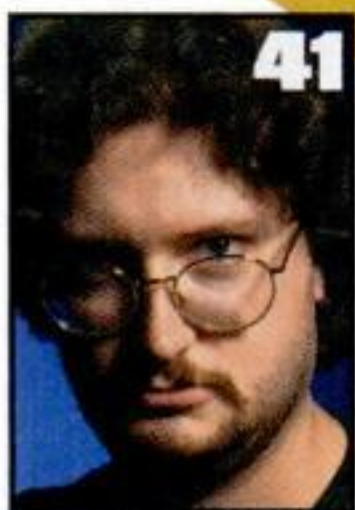
Has a company violated your rights as a consumer? The **Watchdog** investigates your complaints and then snaps the necks of those who've wronged you with a single bite.

### 62 Ask the Doctor

Does your hard drive have blemishes? Does your registry need a facelift? Come to the **Doctor** and let us bring out your PC's inner beauty.

### 99 Terminator

You know those underlined words strewn about the magazine? We explain them here.



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## ▶ NEWS

### 24 Inside Sources

**News for discriminating tech-heads**

▶ Yo, ho, ho, and a bottle of... mice? Modern day buccaneers aren't sailing the seven seas for buried treasure anymore. They've now graduated to counterfeiting software and hardware products and making a killing when their contraband swag is sold to the very unsuspecting public. Ahoy maties! Beware!



▶ **Also:** Aural sounds off about wavetracing and and A3D 2.0.

And in this month's **Spin Cycle:** Intel unveils Geyserville while Gateway cozies up to AMD's K6-2—but not the K6-III.

PC Pirates, p.24

## ▶ PRODUCTS

### 33 Peripheral Vision

High-tech toys on the PC periphery, including goofy goggles from Sony, a pocket e-mail thingy, and an eBook for reading great lit.

### 75 Previews

nVidia's **TNT2** is the much-anticipated successor to 3Dfx's crown. We have the silicon and we put it to the test.



Palm V, p.91

### 77 Reviews

Month in and month out, nobody punishes hardware and software harder. Come, revel in the gore.

**Highlights include:** Systems packing **P-III power** from Gateway and CompUSA are in the Terror Dome this month. **ATI's Rage Fury** has been a long time coming... is it worth the wait? Tilting the scale at under 3 pounds, Sony's petite **PictureBook** has everything you'd want from a portable PC, including a great built-in camera. And did we mention that we have another killer **DVD-ROM** drive roundup? Well, we do.



# DEMONSTRATION #2:

- 1 Tear out your old sound card.
- 2 Smash into pieces.
- 3 Toss over your shoulder.

▶ The sound those pieces make when they hit the ground all *around* you is the power of A3D from Aureal, the only audio that works the way your ears do.

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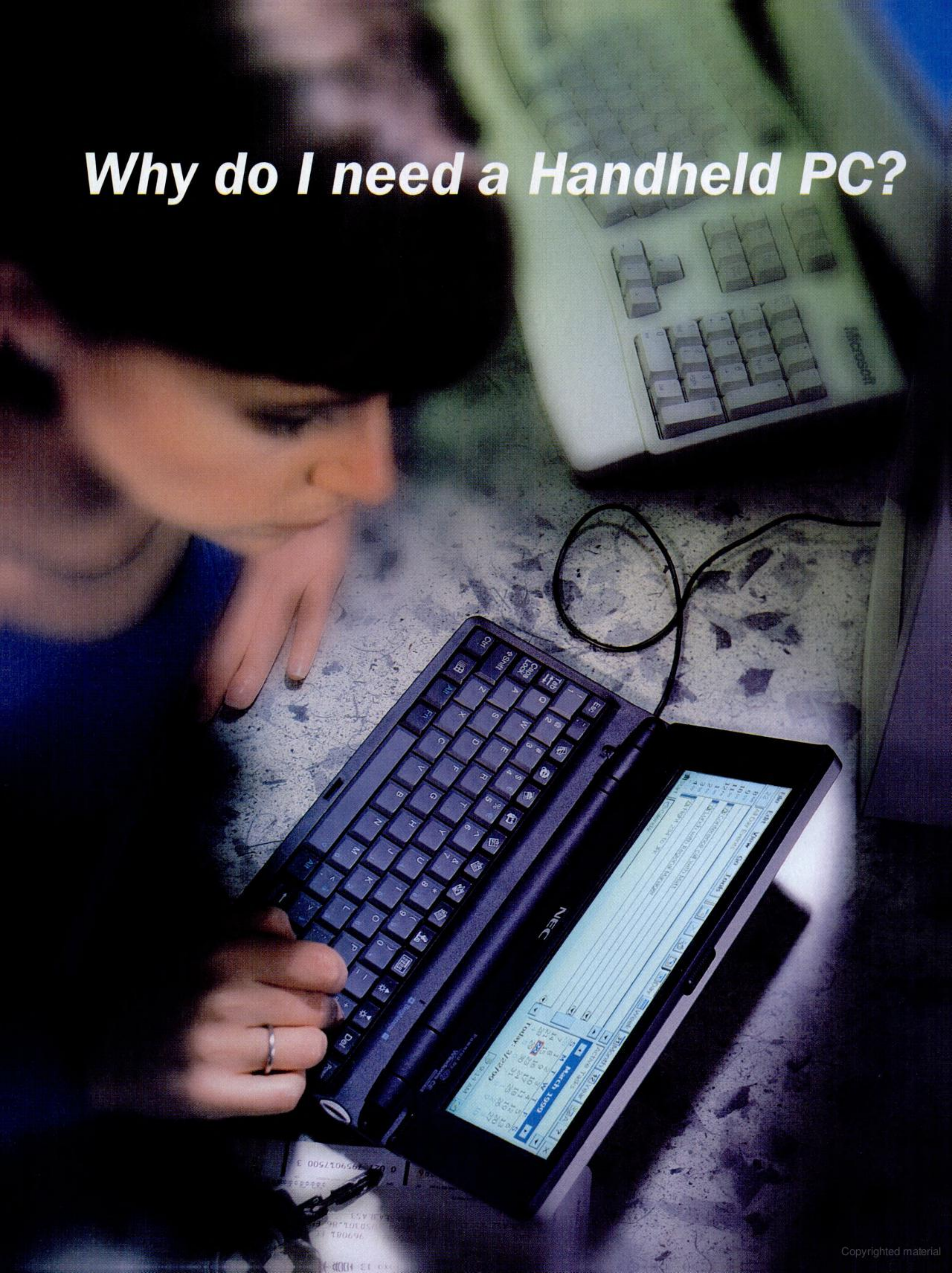


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## Playing a Bad Lie

**A**s expected, my March EdWord column regarding Apple's deceptive advertising has drawn voluminous mail. But intriguingly, many of the iMac defenders agreed with my position.

For example, self-proclaimed Mac aficionado Tyler Regas agrees that Apple has "used deception to raise its bottom line," but offers the following defense: "The point is that most companies use 'spin' to gain an edge. The few that don't do this typically pass from existence after a while. As you well know, this industry is rife with unhealthy competition, and that will always spawn tasteless tactics. Apple is merely playing the game with the others. Turncoat on its old values? Absolutely. Most likely healthy and profitable through the millennium? Most likely. A nonissue in the eyes of consumers? No longer."

While many readers had the clarity to see my point, others questioned whether my objectivity was up to the challenge. Would I be able to call bunk on the PC platform

as readily as I saw fit to protect potential iMac victims? Anyone who has read some of our more scathing reviews, columns, and reader letters knows that no product or technology, no matter how big the name, is immune to our most honest critique.

But reader Ladd Romans (who signed his letter "Apple owner since 1981") really put it on the line when he asked: "You are concerned about the message presented by Apple's commercials? Are we really supposed to believe the Intel factories are full of dancing clean-suited freaks or that our Internet experience will be transformed into something grand and wonderful if we buy a new computer with another new Pentium chip (III)?"

While I can't testify to the existence of dancing engineers (although my more practical side has doubts), I do have a take on Intel's claim that its new P-III will revolutionize the web.

It's full-on BS.

On its web site, Intel claims the Pentium III provides "performance for a faster Internet. Imagine downloading video clips and applications in the blink of an eye. Internet access will be 100 times faster..." We all know that none of this has the slightest relation to CPU horsepower, so the blurb buries credit at the bottom with "... thanks to new technologies like broadband, so you'll want a processor that can handle the media-rich future of the Internet." Anyone with access to a full-fledged T1 line will attest that even the most modest CPU is miles ahead of anything the Internet might spew, even with broadband.

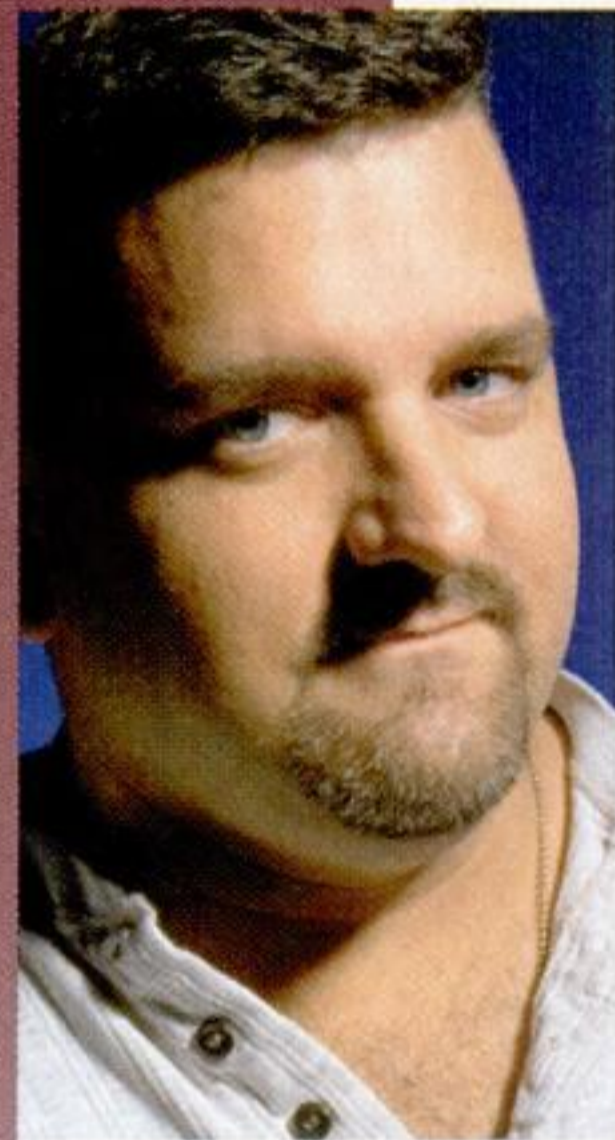
While Intel's latest is a fine product in its own right, it will not have a significant impact on anyone's web experience. This spurious claim is marketing hype that's fathoms below a company with the reputation of Intel. One can only assume the once-proud company has been driven to this desperate move by the fierce competition posed by its one-time token competitor, AMD.

According to market-research firm PC Data, Intel kicked off the year by having its ass kicked by the scrappy CPU comer. With 43.9% of the market, K-6-based machines bested Intel's dwindling 40.3% slice of the pie. This was the first time an Intel processor hasn't resided comfortably at the top of the sales list.

Intel hopes that hitching its antiquated wagon to a racehorse with the buzz of the Internet will give it the comfortable lead that it had enjoyed for so long, but as Apple may soon learn, businesses built on bubbles are bound to burst.



Brad "Big Daddy" Dosland  
Editor in Chief



**"Would I call bunk on the PC platform as readily as I saw fit to protect potential iMac victims?"**

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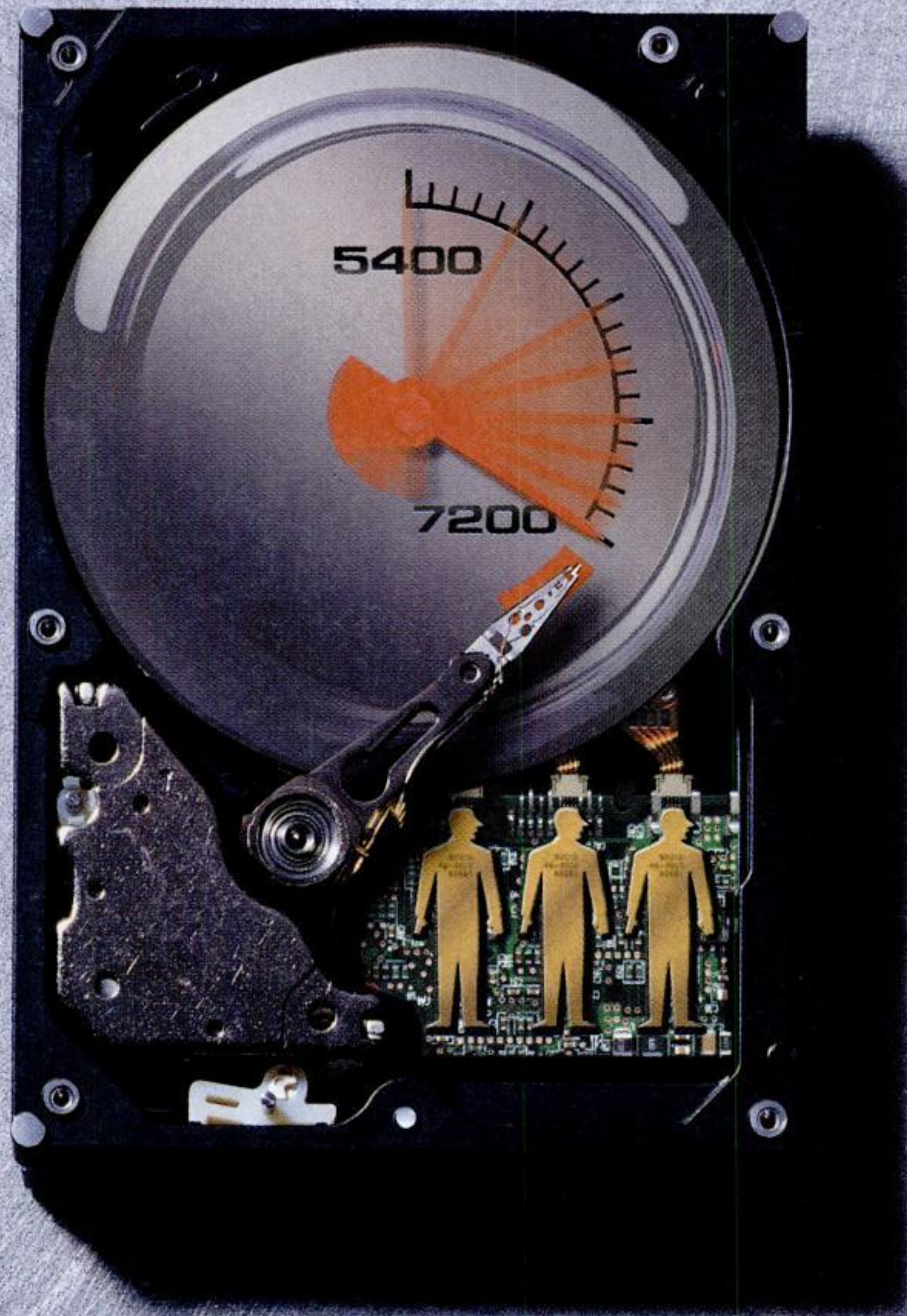
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## Letters from the Smartest Readers in the World

Here's the deal: You (being the smartest readers in the world) write letters about the magazine, the PC industry, the software you love or hate, and the hardware that runs it. We read it and share as much of it as space permits in the mag and online, and respond or comment when the letter calls for it. Get it? Now get busy and write us at [commport@maximumpc.com](mailto:commport@maximumpc.com)

### Reading George Bush's Mail

I just heard on the radio that the FBI took out the hard drives of many of the White House computers that were used during George Bush's term to look at certain deleted e-mail messages. It when on to say that all of the e-mails and documents that I delete on my computer are somehow still saved on my hard drive and that at a later date, someone could read these. Is this true? How can I delete them for good?

— Josh Lowe

**Online Editor Gordon Ung replies:** When you delete a file on your hard drive, it doesn't actually physically wipe out the data. It simply deletes the reference to it and makes the space available. The actual data isn't overwritten until new information uses that space. The fuzz or any snoop person can peer directly at the sectors on the drive and read what's there. Programs are available to wipe out unused portions of the hard drive and to encrypt the data, such as *PGP Disk* from McAfee. Performing a defrag after deleting sensitive data or loading a large file like *Quake II* should provide enough security. If you really need to protect your data from law enforcement, you really shouldn't be using a computer in the first place. Capiche?

### Upgrade Your Eyeballs

Michael Howse, vice president of marketing at 3Dfx, stated that "framerates are what really matter" in March 99 *Inside Sources*; presumably in response to John Carmack's belief that 16-bit rendering will be insufficient for third-generation 3D boards.

Howse is wrong.

I spent four years in film school, and I can promise you beyond a shadow of a doubt that framerates are nigh-meaningless these days. Ask your eye doctor how many frames per second the human eye is capable of registering. His answer, if he's a good doctor, should be around 70.

Then ask him how many the human eye can appreciate—that is, it can see 70, but at what point will the brain no longer be able to process an increase in image quality. His answer will be 35 or so.

Motion picture film runs at 24fps. Video runs at 30fps. Some films, particularly European artsy ones,

have been shot at 72fps, usually to justify a ridiculously large budget. But the fact is, the human eye perceives liquid motion at 24 frames per second, and anything beyond that is wasted. With pretty much every card on the market these days delivering 30fps+, framerates are no longer an issue. Furthermore, we are now limited by our monitors, which I'd say hover around 85Hz refresh rates—still far higher than the human eye can see.

I beg *Maximum PC* to stop telling its readers to shell out for dual-Voodoo<sup>2</sup> SLI. Stop gargling over 200fps *Forsaken* Marks and start drooling at 512x512 textures and 32-bit rendering. Stop telling your readers to waste their money. I get 60fps in *Quake II* on my Celeron 333A (overclocked to 509) with one Voodoo<sup>2</sup>. If that number were to be cut in half, my eyes would not be able to tell the difference.

If we were all eagles, maybe framerates would still matter. But the human eye is actually pretty pathetic. If 3Dfx doesn't realize that, and quick, they'll put themselves out of business before Diamond has a chance to say "I told you so."

— Matthew Sakey



"Stop gargling over 200fps *Forsaken* Marks and start drooling at 512x512 textures and 32-bit rendering"

**Executive Editor Jon Phillips replies:** We have to argue that framerates are indeed still relevant in this

age of superpowerful 3D accelerators. You say the human eye cannot discern improved liquidity beyond 35fps. We won't dispute that—except to say that this rate of 35fps must be sustained with nary a glitch or hiccup.

When a 3D accelerator turns in a *Quake II* score of 35fps, it means the game played at 35fps on average. And if you know 3D games, you know that complex, high-polygon-count scenes cause framerate dips. So that 35fps-capable accelerator is most likely hitting framerate chasms in the middle teens. Unacceptable. Hence our celebration of average framerates in the 60s and 70s. There's nothing worse than fits and starts. We'd take a locked-in 40fps over a wiggly 25fps-to-55fps variance any day, even if it meant giving up 15fps on the fast end of the scale. That's why arcade machines—which lock in at 60fps—are such a pleasure to play.

Regarding monitors: Almost any modern CRT will do above 100Hz at 800x600. Regarding 200fps in *Forsaken*: Such a score in this benchmark is unachievable; we've never drooled over it, so don't

### This month:

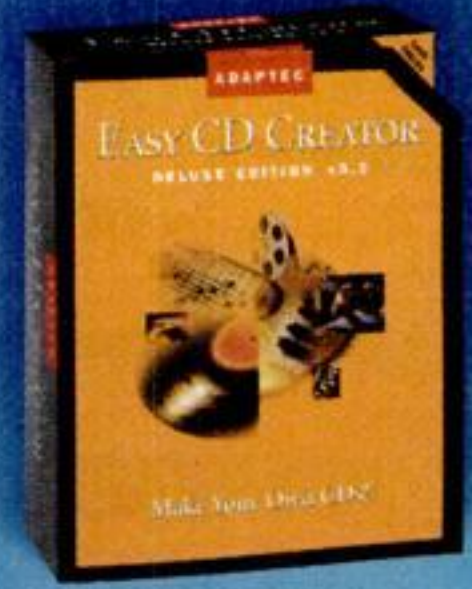
- ▶ **Doubting SCSI's speed**
- ▶ **Master Rebates**
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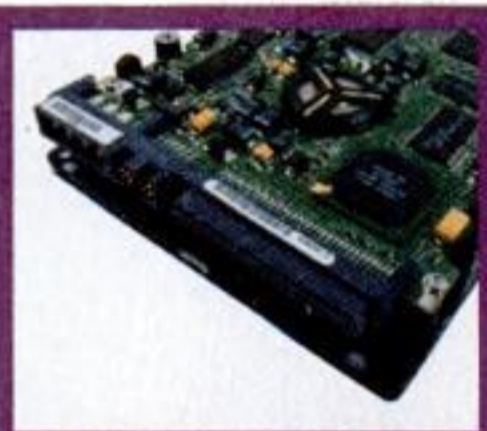
**Micro Center**



put drool in our mouths. Regarding your *Quake II* score: Of course you're getting a 60fps average! The big problem with 3D games is polygon and lighting setup; your overclocked Celeron is kicking ass by feeding that single Voodoo<sup>2</sup> more polygons than it can possibly handle. Add a second Voodoo<sup>2</sup> and you'll probably get even faster framerates. And we argue that your eye would be annoyed by swings from 60fps into the mid 30s.

## The Evil That Rebates Do

Speaking of "Evil Rebates," have you seen some of the other tricks companies will pull to try to dissuade you from filling out their rebates? For instance, Diamond Multimedia had a \$30 rebate offer for its Monster Fusion graphics accelerator over the holiday season. The



"SCSI is supposed to be faster, but HD Tach shows that the 5,400 IDE is faster than the SCSI."

thing is, the rebate slips you got were on these super-tiny round disks that were glued to the front of the product package. After peeling them off, you find that the lines they gave you to write your information on are only about 2mm high! I dare you to write legibly in that space. It was the most ridiculous thing I've ever seen. On top of that, the blasted things were coated with some kind of gloss that regular ink wouldn't stick to, meaning you'd have to have some kind of special pen (like a

Sharpie) to write on it. If that weren't enough, even an Ultra Fine Point Sharpie still writes too damn big to fit in that 2mm space.

— Clint Hasting

## Just How Fast is SCSI?

SCSI is supposed to be faster, but I don't really notice any "real" speed difference between my 7,200RPM Ultra Wide SCSI-2, my IBM 5,400 IDE UDMA and my other IBM 7,200 IDE UDMA. In fact, HD Tach shows that the 5,400 IDE is

faster than the SCSI. Are these speed differences noticeable or is it only for charting purposes (and I'm wasting my money)?

— Gus Ko

## Technical Editor Sean Cleveland

**replies:** Your IBM 5,400RPM drive may very well be faster than your 7,200RPM Ultra Wide SCSI-2 drive—at least when reading data sequentially, which is all HD Tach tests. HD Tach is a great benchmark for testing a hard drive mechanically because it bypasses all onboard cache and tests straight throughput. But you can't rely on this benchmark alone, especially when looking for "real world" numbers.

ATA and Ultra ATA/DMA are single-threaded I/O interfaces that limit the ability to execute more than a single request at a time. SCSI is a multi-threaded I/O interface that can process multiple I/O requests at a time. This is called Command Queuing and it allows a single drive to process multiple requests in a single application automatically. The drive can also re-order requests to minimize the amount of time it takes to service them. For multiple drives, a feature called connect/disconnect, makes SCSI the king. It works by disconnecting a device from the SCSI bus when other devices have information to send, allowing those devices to share the bus bandwidth among connected drives. IDE does not support this. Also, Ultra DMA drives are currently limited to 7,200RPM spindle speeds, whereas Ultra Wide SCSI (40MB/sec maximum bus throughput) and Ultra 2 SCSI (80MB/sec maximum bus throughput) can spin at 10,000RPM. Ultra Wide SCSI-3 and Ultra 2 have wider data paths inherent to their 68-pin cabling and support higher burst speeds, although Ultra DMA/66 may take some of the steam out of this

## You Will Be Integrated

I have to disagree with Tom Halfhill's column regarding Microsoft's integration of *Internet Explorer* into the Windows OS. Your description of the Internet is correct, and it is wonderful being attached to so many systems worldwide, but a web browser is not the way to do it.



A web browser is a one-way device, and as such, should be a standalone app, with a standalone purpose. Making it part of the shell is pointless and only leads to more crashes, bigger, slower DLLs, and lousy performance.

I don't want to look at my local file system as a web page, and neither does anyone else, as it contradicts the design of HTML. The web is information one can look at, read, and hear. When one actually wants to take that content, one uses FTP.

Integrating FTP into the shell makes more sense than anything else, and I have to wonder why Microsoft hasn't even bothered to try adding it to IE. Web browsers should be web browsers, and they needn't be 12MB in size.

What's next? Integrating every MS Office app into the kernel, just because everybody might want to type a letter at any time?

Microsoft is wrong, and the only reason IE is part of the OS is market share.

There is no technical requirement for it.

— Ian Firth

**Columnist Tom**

**Halfhill replies:**

A modern OS should have the innate ability to connect to the world's largest network, the

Internet. We don't run special programs to use LANs, and we shouldn't need special programs to use the Internet, either. The OS needs to speak TCP/IP, HTTP, and—you're right—FTP as well.

The objections you raise about the size of the web browser and how often it crashes could just as easily be raised about Windows itself. The fault is code bloat, not network integration. It's possible to have one without the other.

Although I'm sure that one of Microsoft's motivations for integrating IE into Windows was to gain market share, the fact remains that Microsoft is merely following a well-established trend toward higher levels of software integration and networking. Microsoft isn't doing anything that wouldn't happen anyway.

**Sharing is Cheaper**

Is there a way to share Internet access via one modem over a peer-to-peer Win98 network? I have three computers in our office set up with separate Internet access, but we all share the same phone line. So as it is, it's one at a time. It would be nice,

albeit slower, not to have to ask my two coworkers if they are online every time I need the Internet. And, of course, I would like to do it on the cheap.

— Chris Thorpe

**Tech Editor Sean Cleveland replies:**

We recommend WinGate, published by Deerfield.com (www.wingate.com). Three versions are available—WinGate Home for home users, WinGate Standard for small businesses, and WinGate Pro for enterprise use—that offer modem/Internet-access sharing from peer-to-peer networks up to LANs with security, advanced user management, and firewall components. There are others, but WinGate is the one we use.

**From a Bunker in Nevada...**

Regarding Intel's new Pentium III chips: I've heard a rumor that the new chips will take a reading of everything on your system from



What's next? Integrating every MS Office app into the kernel, just because everybody might want to type a letter at any time?

software, hardware, and sites you visit on the Internet, keep a record of all this information, then later send it to Intel about once a month via e-mail.

I think many people would feel this to be a violation of their privacy.

— Jonathan Petryk

**Executive Editor Jon Phillips**

**replies:** The new Pentium III chips include a randomly generated serial number that can be used to identify your machine on a network, track where you go on the Internet, and even validate online purchases. But this Orwellian activity doesn't happen automatically; instructions aren't hard-coded into the chips to spontaneously run system surveys and then send the results to Intel.

We have to wonder what Intel would do with such information. Hire teams and teams of analysts to sift through everyone's Internet dossier, collate the information, and then use the data to take over the world? The problem with conspiracy theories is that they assume Big Brother is sufficiently inclined and competent to actually oppress the common man. Intel can't even get out

the 133MHz system bus on time—so do you really think it's going to sift through your hard drive once a month?

**It Has the Same Effect on Us**

Your Forsaken benchmark is a great tool to calm my eight-month-old daughter! (She likes it when I turn it up REAL LOUD!)

— Mat Ring

**Q's Latest Gadget**

I'm trying to connect my Qualcomm Q-phone (digital/analog) phone to my Toshiba Portégé 7000CT. What do I need and what brand modem do you recommend?

— John Howells

**Online Editor Gordon Ung replies:**

There's currently only one answer for you, John. Qualcomm's TXPCM0002 Data On The Go modem will hook your CDMA

Q800 phone up to your laptop. The PC card modem comes with drivers for Win9X, NT, and MacOS. It's generally available for \$299.

The modem kicks your digital phone over to analog mode and will also work as a landline modem at V.34 speeds as well. The modem will also work with CDMA digital data networks, but that'll depend on your service area. Qualcomm has a digital data cable planned to hook up to PC serial ports, but I'm told it's not available yet and will only work where there is CDMA digital data service. The Data On The Go is probably the best answer if you really need a dial tone for your machine anywhere in the United States.

**Search and Destroy**

I noticed that the windows\options\cab directory in Windows 98 contains quite a bit of information. To my knowledge, it is a means of creating install disks for your programs. But if I already have everything on CD-ROM, can I safely delete that directory and regain the 350MB of space it is taking up?

— David J. Conley

**Technical Editor Sean Cleveland**

**replies:** The Cab directory not only



contains the means of making install disks for your programs, but driver and install data used by everything on your computer. In fact, the Cab directory typically contains all the Windows files (which is why you are probably never prompted for a Windows disc when installing new hardware). Delete this directory only when you feel confident you have all the necessary drivers for all your hardware, including a copy of Win98.

### Long Live the Floppy!

It amazes me how silly an intelligent man like Ted Briscoe sounds when stating that the floppy drive is dead (Interrogation, March 1999). He has obviously missed the boat. He states all sorts of reasons for why he believes the floppy drive still exists and why Iomega

deliberately dismisses the need for backward compatibility with floppies, but he missed the most obvious reasons floppies are still here... cost and disposability. Floppy drives aren't in today's PCs just because PC manufacturers like to stay status quo. They are still here because a consumer can save small files on them and sell, give, or even toss them at a very low cost.

Think about it. Why should I save a 185K *Excel* file to give to anyone on a \$10 100MB Zip, when I can do the same thing for 30 cents with a 1.44MB floppy? Heck, I can hand out a floppy to each of my 50

reps for \$15 or less. I'd have to spend \$500 on 100MB Zip disks. Don't get me wrong, I'm not bashing the need for 100MB Zips. There is definitely a use for more storage on disks. It would be silly to send 40 floppies to anyone when it could be done with one Zip disk, but it is equally silly to believe sharing small files on Zip is practical.

Briscoe makes a good point for why he believes it doesn't make sense for Sony to choose to come out with its

external 200MB HiFD drive with backward compatibility with floppies. Why indeed, would anyone use Sony's new external drive for floppies when you can use the floppy drive already in your computer? If Sony plans to keep it only external, then I would have to agree, but it's expected that Sony will manufacture an internal version. If so, would you still think Sony made the wrong choice for HiFD to be backward compatible with floppies? Sounds to me like Sony plans to make HiFD drives a replacement for floppy drives, in the same way DVD drives are replacing CD-ROM drives. The reason is not just better technology, but rather backward compatibility.

With a HiFD, or even a SuperDisk drive, I'd have the best of both worlds. The small size and low cost (disposable if you will) storage of 1.44MB floppies, with the larger capacity storage in a 120MB or 200MB disk. Wake up, Mr. Briscoe, don't sleep on Sony. Just ask Sega about that.

Remember... Iomega's so-called competitors—Avatar, Nomai, and SyQuest—were also not backward compatible and had no small-storage or price advantages over general floppies. So they had absolutely no edge against Iomega's Zip or general floppy drives. Both HiFD and SuperDisk are backward compatible and make consumers consider upgrading/replacing their general floppy drive, since they can still use floppies on these newer, higher-capacity drives.

Sorry, Mr. Briscoe, but you are the one who is "dead"...dead wrong about floppies. 250MB Zip disks with backward compatibility to 100MB zips are an excellent advancement, but if Iomega really wanted to wipe out the floppy it should have made a 5MB Zip disk for 50 cents instead.

— Alex Vasquez



"Why should I save a 185K *Excel* file on a \$10 100MB Zip, when I can do the same thing for 30 cents with a 1.44MB floppy?"

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► In our review of the Dell Dimension XPS T500 in the March 99 issue, we listed the incorrect motherboard. The Dimension ships with the Seattle III motherboard.

► Our *Paint Shop Pro 5* review in the March 99 issue mistook the number of undos the program will make. By checking the "Limit Number of Step to Undo" box, you can set from 1 to 99 levels of undo.



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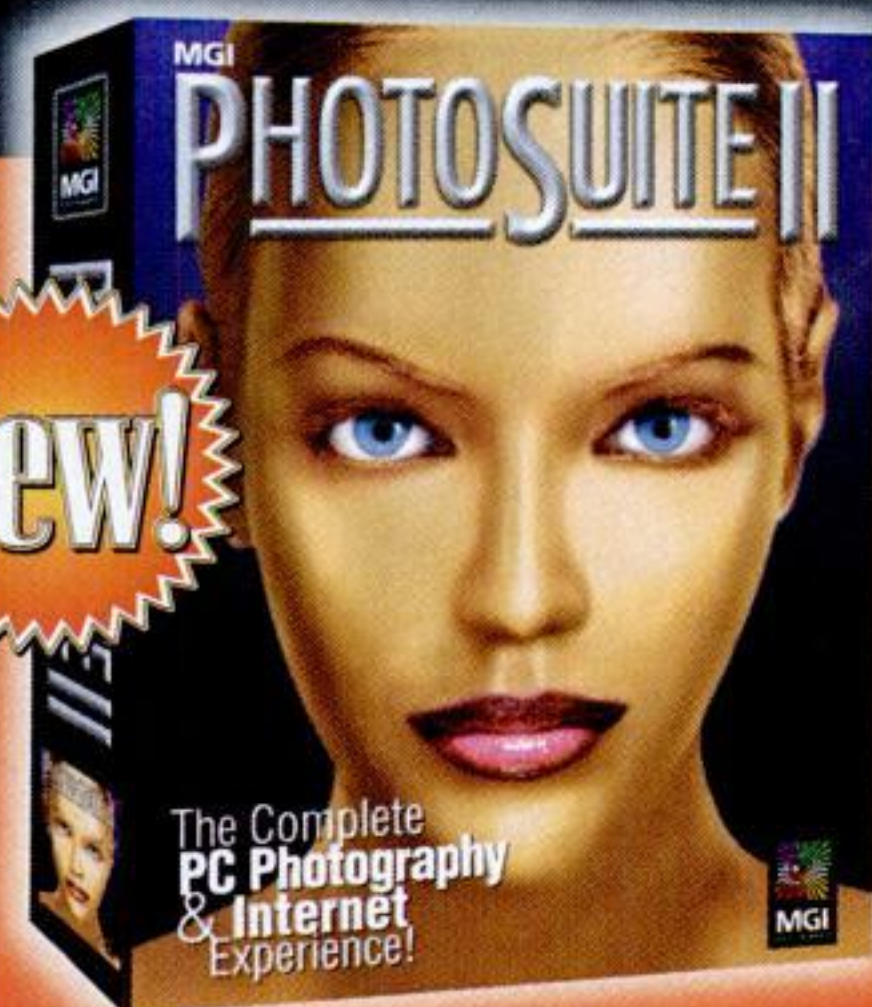


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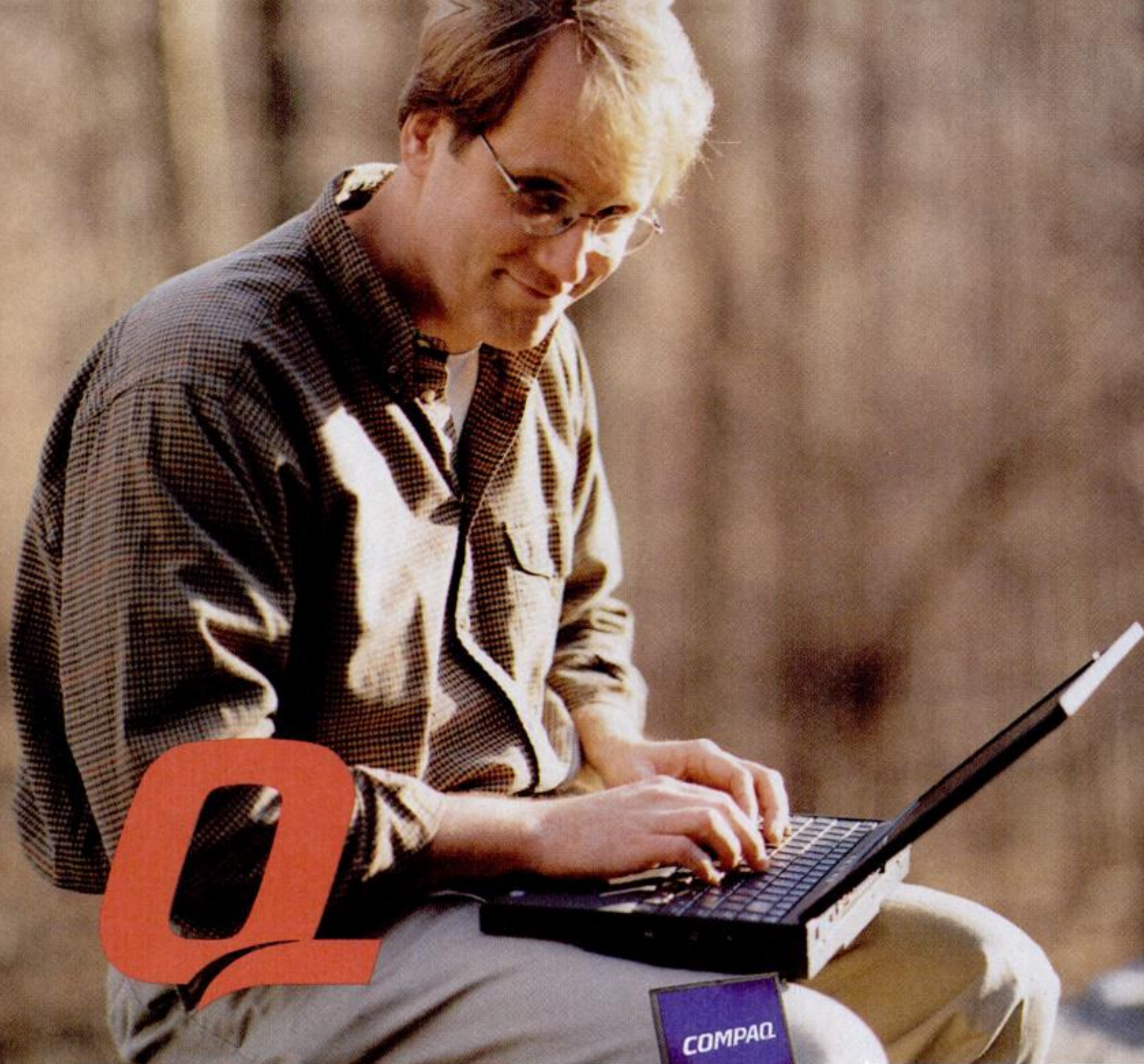
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Aureal 8820 PCI Audio Card	Aureal 8820 PCI Audio Card	Aureal 8820 PCI Audio Card	Aureal 8820 PCI Audio Card
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JBL Pro Speakers	JBL Pro Speakers	JBL Pro Speakers	JBL Pro Speakers
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INTERNET NOTEBOOK PC**

**PRESARIO 1600i-300  
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trends ► counterfeiting

# PC Product Counterfeiting on the Rise

## You should be on the lookout

If you've been experiencing mysterious blue screens of death, reaching for your manual may not solve the problem. You may be the victim of counterfeiters.

Sales of counterfeit versions of Microsoft Windows 98, other software packages, and PC hardware are on the rise worldwide, according to software companies and trade groups. Although no hard figures exist, fake software, movies, and music topped the list of swag confiscated by the U.S. Customs in 1997. And counterfeit computer parts were the fifth highest seizure.

Don't confuse counterfeiting with someone cutting a CD-R for a friend. That's child's play compared to what professional counterfeiters are doing.

For example, in February of this year, the FBI and police in Paramount, CA, seized hundreds of thousands of bogus

Microsoft Certificates of Authenticity and pallets of software. In the United Kingdom this year, police had to resort to using a steamroller to smash 55,000 copies of *Office 97* recovered in a bust.

Microsoft is by no means the only victim, but it's the top seller for counterfeiters. Authorities say they've also seen the sophistication of counterfeiting increase recently. Counterfeit copies of software are so good, even discriminating users are duped.

"I cannot tell you the number of times I've gone to a police department working a (counterfeit) case, and sure enough the software they're using is counterfeit," said one former police officer who now works as an investigator for Microsoft. The investigator asked not to be named because of death threats. Is this fear justified?

Yes, says George Abbott with the International



Modern day pirates aren't after doubloons—they're after companies brimming with hardware and software riches.

Anti-Counterfeiting Coalition. Counterfeiters today aren't just pimply-faced kids with a room full of CD burners.

"We're finding that brand-name counterfeiting is increasingly linked to organized crime. They use it to launder proceeds from other serious crimes," he says. The reason is simple: "It's

far safer than drug trafficking, and the profits are as great or greater."

In one operation taken down in Southern California, police recovered automatic weapons and explosives alongside counterfeit CDs awaiting shipment. Instead of the danger of trying to import drugs, CDs and

ILLUSTRATION BY SCOTT PECK

## SPIN CYCLE This month's top stories broken down ►

HEADLINE	NEWS	DETAILS	QUOTE	OUR TAKE
<b>Intel Jacks Notebook Processor Performance</b>	Intel's new mobile processor technology, Geyserville, should close the performance gap between mobile PCs and their higher-performance desktop counterparts.	Geyserville allows mobile PCs to operate at higher clock frequencies when plugged into a wall outlet and switch to a lower power and frequency when running on the battery.	"This year, we will have notebooks running at least 600MHz or higher in the maximum performance mode," said Intel Vice President Robert Jecmen.	Intel seems to think that all consumers care about is MHz. Although Geyserville is a breakthrough, we'd be happy with improvements in mobile 3D graphics and sound.
<b>Encryption Debate Heats Up Once Again</b>	Legislation that relaxes export restrictions on encryption technologies has been reintroduced to Congress—the Security and Freedom through Encryption (SAFE) Act	Law-enforcement agencies want the 56-bit limit to remain the standard, fearing more encryption will hinder their ability to eavesdrop on terrorists and terrorist states.	"Proposals to [restrict] domestic controls on encryption are entirely unacceptable, and likely unconstitutional," said Rep. Zoe Lofgren, one of the bill's co-sponsors.	The government should stay out of the encryption debate. Clinton's proposal for "Key Escrows" put the U.S. at a technological disadvantage



# Aureal Sounds Off

## Turns up volume about wavetracing, A3D 2.0

In January, we interrogated Creative Lab's Chief Scientist, Dave Rossum, who explained why he thought his company's Environmental Audio (EAX) reverb technology sounds better than Aureal's wavetracing-based A3D 2.0. We recently sat down with **Toni Schneider**, Aureal's vice president of advanced audio, to hear the other side of the 3D-audio story.

**Maximum PC** So, what makes you think your A3D

2.0 sounds better than Creative Labs' EAX 3D audio?

**Schneider** A3D 2.0 is at the beginning of its life cycle, while EAX—which is basically just reverb—is at the end. Our technologies tightly tie in with the way 3D graphics are done in games. It looks at the 3D geometry and derives the acoustics from it. This has never been done before, and as games get more 3D-centric, our technology makes more sense because it can scale up.

EAX isn't based on the 3D-geometry principle. It's not even really interactive because it's based on reverb, which is a static, pre-rendered form of acoustics. As you get more-complex environments, you're very much limited to just how static reverb is. Because their technology isn't scalable, it doesn't have a very bright future.

Creative also claims that our wavetracing, although physically correct, is too hard to implement. We did it, so it can't be that hard, can it? Second, they

argue wavetracing eats up too much of your CPU. It doesn't. We've gotten this technology to where it's not even noticeable

or detrimental to gameplay. They also claim they can "fake it" with reverb and it'll sound just as good, but you only have to turn to the news-groups to know it's not. Most

people, when asked to compare, will hands down say wavetracing sounds better. It's more interactive, interesting, and exciting.



**Aureal's A3D 2.0 is the exclusive audio engine for Flatland Rover.**

**Aureal Interview | 26** ▶

documentation are actually cooked up in the United States for export to the rest of the world.

Software manufacturers say there's no quality assurance on the production. While software companies try to make sure every CD works, counterfeiters have been known to distribute software with viruses and use CD stampers beyond their rated cycles.

Of course, counterfeiting isn't limited to software. Counterfeiters create copies of mice, motherboards, add-in cards, and everything else PC-related.

**"Brand-name counterfeiting is increasingly linked to organized crime."**

—George Abbott, International Anti-Counterfeiting Coalition

In November, the U.S. Attorney's Office indicted two men for allegedly selling counterfeits of Adaptec's popular AHA-2940 SCSI card. More recently, a popular motherboard company caused alarm among its customers when it put out a news release that said its top-line BX board had been counterfeited. The company, which

asked not to be named, said it has since had to retract the alarm because it hasn't been able to provide a way for people to determine the copies from the real deal.

Just as popular as its software,

Microsoft's mice are often imitated. While it's hard to believe the counterfeits are that good, even editors on the *Maximum PC* staff had trouble finding the authentic mouse when looking at both side by side.

"The mice have been a serious counterfeiting problem," says Anne Murphy, an attorney with Microsoft's anti-piracy department. More recently, as Microsoft has taken steps to make it harder to copy the mice, the counterfeiting has been decreasing. Still, copies of its latest IntelliMouse wheel mouse exist.

Counterfeit hardware is more prone to problems because the crooks aren't using the original code like they do with software

counterfeiting. They're actually trying to re-create the hardware from scratch. The result is often bad and prone to an early death.

While much of the counterfeit software and hardware can be found at computer swaps and fleamarkets, counterfeits have been known to make it into the retail channels through small- or medium-sized chains duped by crooked wholesalers.

So what can you do to protect yourself? Buy from reputable vendors and avoid deals that seem too good to be true. When you do buy "OEM" software or hardware, be very discriminating about its quality. If you're suspicious, it may be prudent to pass up the deal. ☀

to the pertinent details.

HEADLINE	NEWS	DETAILS	QUOTE	OUR TAKE
<b>Metabyte Creates Pseudo SLI Mode for TNT2 Boards</b>	Metabyte has confirmed it is working on a solution that will allow users to hook two Wicked3D TNT2 boards together, similar to 3Dfx's popular Voodoo <sup>2</sup> /SLI mode.	The technology will initially be incorporated onto Wicked3D/TNT2 boards, but the hardware/software solution can be applied to other graphics chipsets as well.	"This setup will practically double the fill rate of a single TNT2 board," said a Metabyte spokesperson.	Needless to say, we're anxious to check this out. And if Metabyte can actually pull this off, consider it another nail in 3Dfx's coffin.
<b>Internet Fridge Unveiled</b>	The next time you head to the kitchen for a midnight snack, you may soon find yourself browsing the web... on your Frigidaire fridge.	Frigidaire's concept fridge is equipped with a 233MHz PC, touch screen, 32MB of RAM, and a bar-code reader for scanning in product UPC codes.	"You can upload a grocery list to the supermarket, whose workers can pack your goods in advance or deliver them to your home," said co-designer Adrian King.	Last November we reported on the Microwave Bank. Now we have the Internet Fridge. What's next? Digital Dishwasher? Web Waffle Maker? E-mail Egg Beater?



◀ **Aureal Interview | 25**

EAX has failed to inspire the same level of enthusiasm.

**Maximum PC** Both Aureal and Creative rely on developer support to bring 3D audio to the masses. What happens if they don't?

**Schneider** If all developers want to do is put an EAX logo on the box, all they have to do is turn on reverb someplace in their game. That's it. We can't condone that level of support. With our API, you have to support the whole thing, but if you do, you get full-on interactive acoustics in the entire title.

We were the first company to truly make positional audio happen in games, when all of our competitors said "it's too hard, and nobody will use it." That's a typical response by companies that don't have technology. But once it proves itself and gets adopted, everybody else jumps on the bandwagon. That's how the PC platform evolves. If somebody innovates and the feature is good, everybody adopts it, turning it into an open standard and a baseline feature on the platform. Already, Creative is taking one of our features, occlusion of sound behind objects, and trying to add it to their standard!

**Maximum PC** But Microsoft already has DirectSound3D. Why

should they support A3D 2.0?

**Schneider** They're neutral about our API. It's not theirs of course, and they don't necessarily endorse it, but they're OK with it because it's a layer on top of DirectSound3D that's completely compatible and extends the functionality of the platform. And since we're not doing anything to break DirectSound3D or make it run poorly on other platforms, it's a win-win for developers.

We're talking to Microsoft to have our features supported in future versions of DirectX. The way we see this happening is to come out with a new feature, and popularize and prove it in

the marketplace. Once it's proven, it's a safe feature to bake into DirectX and the Windows platform permanently. You can

use our API to push the envelope and see what works for the mainstream.

**Maximum PC** Will consumers who buy your Vortex 2 have to make any sacrifices?

**Schneider** We support both EAX and A3D, so to the consumer it's a no-brainer when it comes to both hardware and software. Anyone who gets a Vortex 2 will get a driver update with EAX support. If the game supports A3D 2.0, it'll use that. And if it doesn't, but supports EAX, it'll use that. Games can also support vanilla DirectSound3D as a fallback.

It'll also support an emerging open reverb API called I3D2 that's being published by the Interactive Audio Special Interest Group (IASIG). Our goal is to make sure Vortex 2 supports everything.

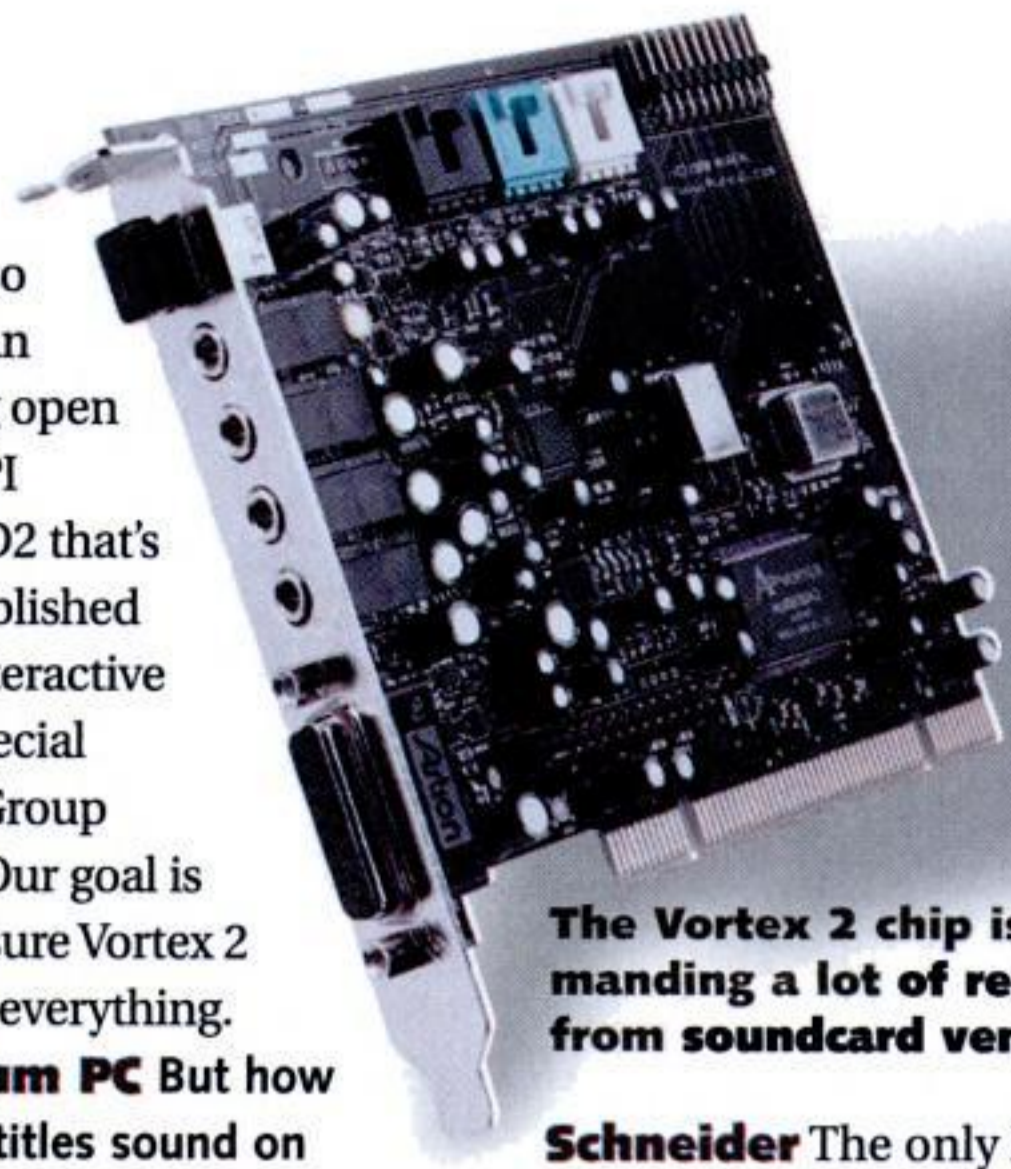
**Maximum PC** But how will EAX titles sound on Vortex 2 compared to the Sound Blaster Live!?

**Schneider** Although anyone can implement EAX, reverb has been around for a long time and everybody's reverb sounds a little bit different. My guess is that you're not going to be able to hear a lot of difference.

A lot of people think we already support EAX because certain games—such as *Half-Life* and *Unreal*—have their own reverb engines built in. People think it's EAX reverb, but it's not. **Maximum PC** Why haven't we seen a game that definitively demonstrates the importance of 3D audio?

**Schneider** Some games have come close. *Thief* is a good example of where the audio is so crucial to gameplay, you really need 3D audio to play the game well. Many people are upgrading their audio subsystems to play games that do it well, such as *Half-Life*.

**Maximum PC** But how do you convince non-gamers that 3D audio is important?



The Vortex 2 chip is commanding a lot of respect from soundcard vendors.

**Schneider** The only killer app for 3D audio is gaming. However, our chip does a lot of other things: wavetable, 2D support, and DVD audio support. It's not just about 3D audio—it's a complete audio subsystem.

Besides, we're taking our A3D gaming engine and turning it into an Internet engine. You want that functionality tightly integrated, especially with multiplayer games. We're also working with a company called Flatland on a new standard called 3DML that we think will open up a new set of 3D content and 3D environments on the web. Plus, traditional 2D content and Internet radio will also start to drive up the demand for better sound, because once you compare the way your PC sounds to your home stereo system, you'll realize that those songs you just downloaded don't sound nearly as good. And we can fix that with better soundcards and speakers. ●

**"The only killer app for 3D audio is gaming."**

—Toni Schneider, Aureal

SPIN CYCLE



◀ 25

HEADLINE	NEWS	DETAILS	QUOTE	OUR TAKE
<b>Gateway to Ship AMD-Based Consumer PCs</b>	Gateway has decided to adopt AMD processors across its product lines. Surprisingly, however, Gateway is starting out with the K6-2, and not the recently released K6-III.	Gateway's top-of-the-line AMD offering will be the company's Select 450, containing a 450MHz K6-2, 96MB SDRAM, 13GB hard drive, and 17-inch monitor.	"Intel and AMD offer a broad range of high-quality and competitively priced product lines," said Gateway Vice President, Jim Booth.	A win-win for consumers. Many of AMD chips were dumped into sub-standard PCs, but Gateway's configurations look pretty solid. But where's the K6-III?
<b>Matrox Unveils G400 Graphics Chip</b>	Matrox has announced the latest 3D chip to its graphics family, the G400. But boards based on the new chip won't appear for a couple more months at least.	Specs include 32MB of SRAM, 300MHz RAMDAC, 256-bit dual bus, parallel architecture, and support for DirectX 6 "Environment Mapped" bump mapping	"The Matrox G400 is the new standard by which all other graphics solutions will be measured," said Ed Dwyer, Matrox's executive vice president.	The G400 looks great on paper, but until we get our hot, little hands on some serious silicon, we'll have to reserve final judgement.

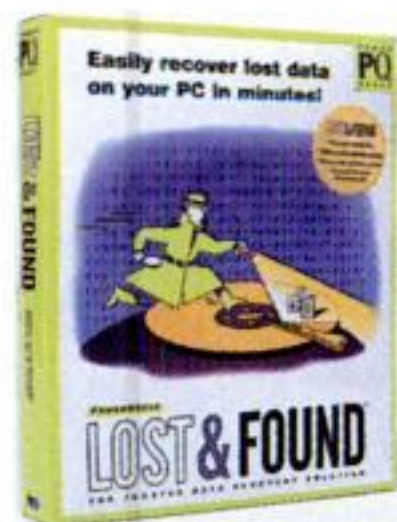




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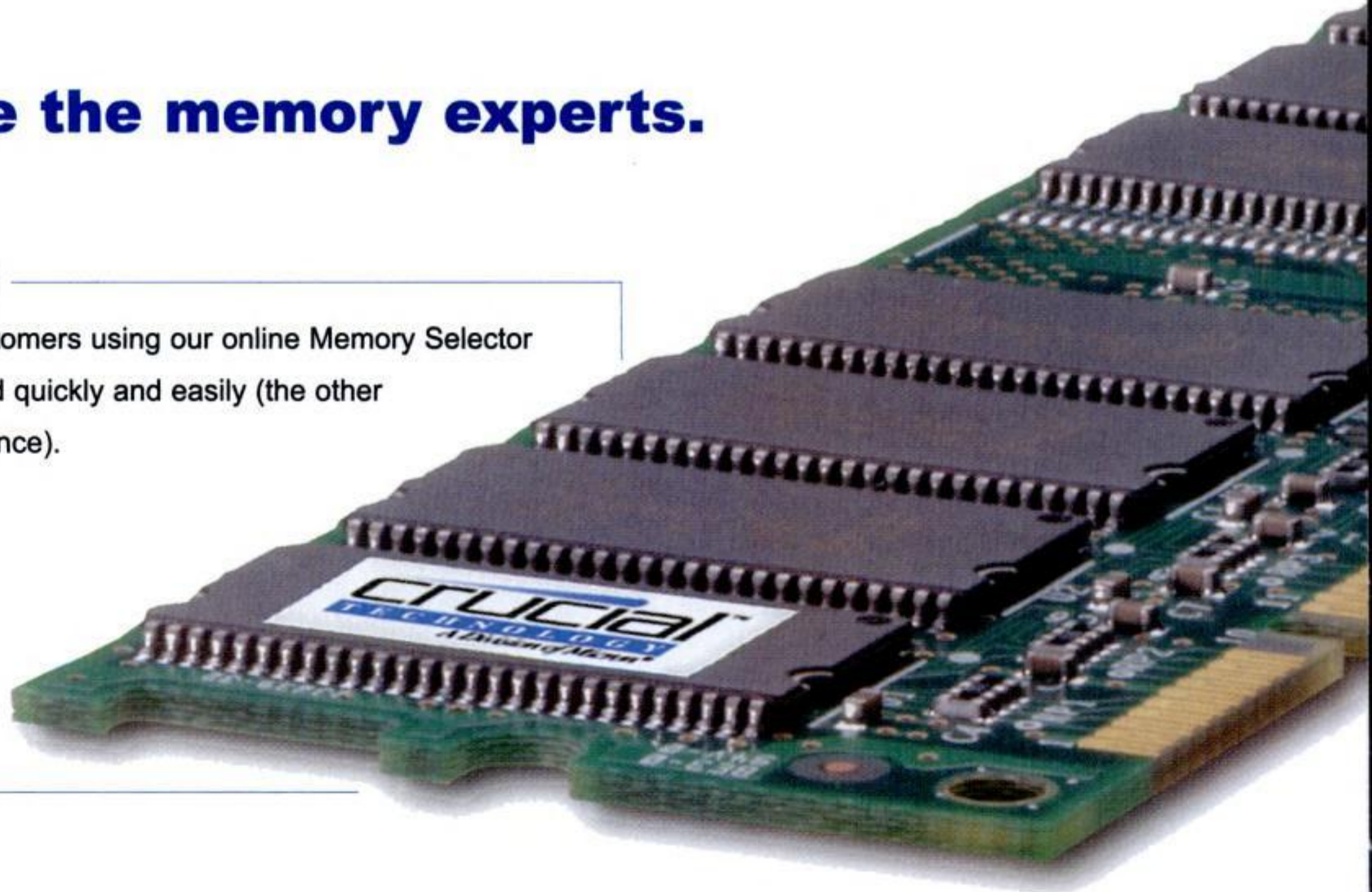
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**Jeff Tansey**, IS Consultant

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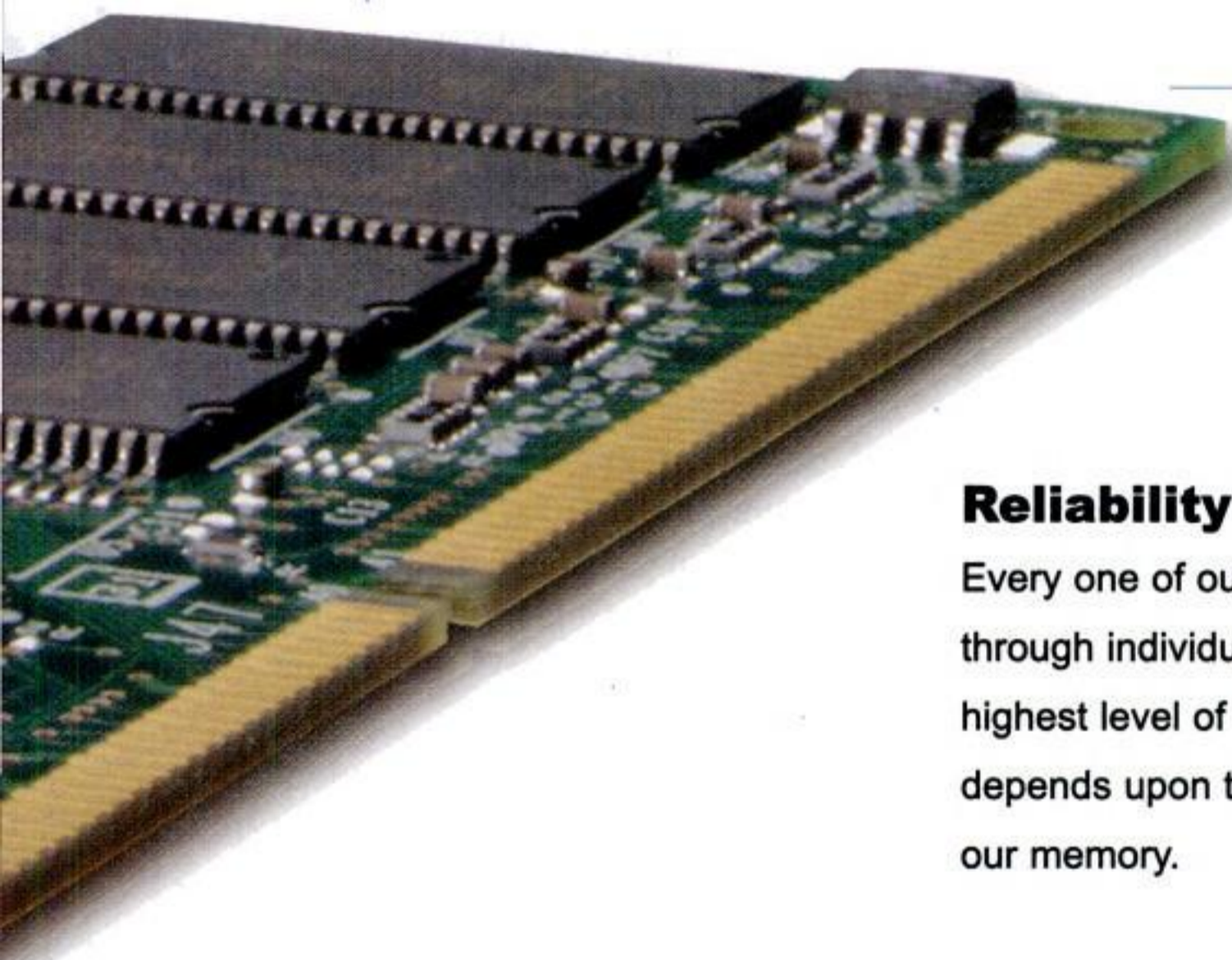
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# WATCH DOG



### THIS MONTH

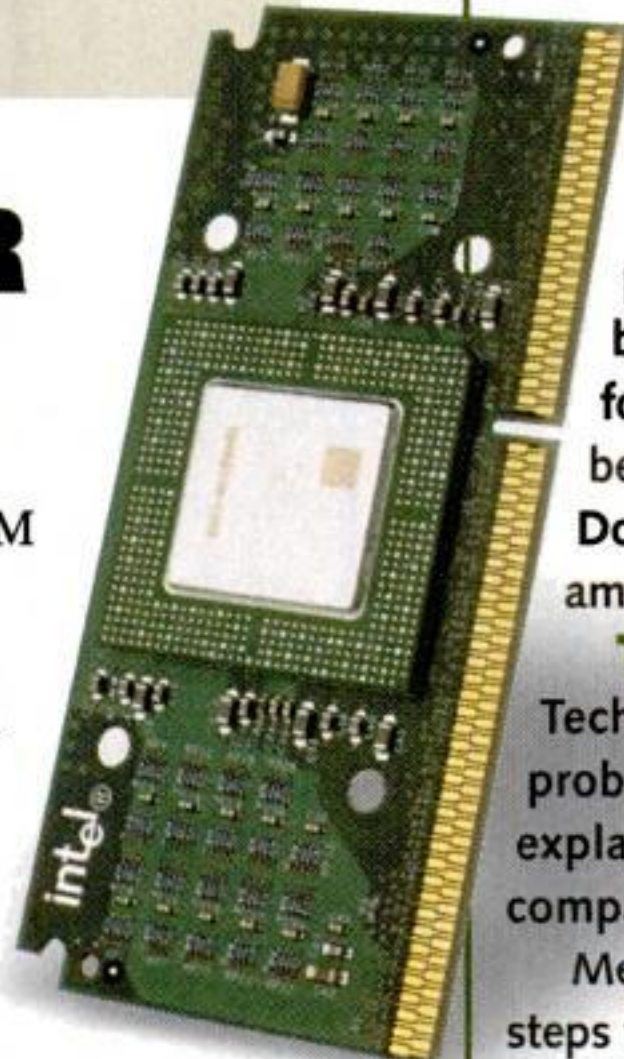
- Readers Find Celeron Wanting
- Missing-in-Action RAM
- JTS Utters Death Gasp

## SEARCHING FOR THE BLACK BOX

**DEAR DOG** A few weeks ago, I bought an OEM version of the Intel Celeron 333A for \$78. Here's the problem: I was under the impression (from previous OEM purchases) that I would receive a CPU without a fan/heatsink. Unfortunately, I received only a chip, without a black casing or anything—merely the single-edged chip. Is this becoming a common practice for vendors? I can't imagine that Intel authorizes the sale of chips as such to consumers (or anyone else, for that matter). I cannot buy the casing separately. How do I mount a fan to it?

I will probably call Intel and ask if this is a real to-market Celeron or some overstocked, out-of-warranty, rejected chip. I spoke to the vendor, but they said that this is OEM, and it comes with a 30-day warranty. For me, it's not enough. Can you help?

The naked Celeron 333A



—LeRoi Isaacs

**THE DOG** Hey LeRoi... guess what? What you received is what you were supposed to get. The Celeron processor comes in a different package than the Pentium II, without that black cartridge you expected.

Also, one of Intel's top dogs told us to warn you about purchasing OEM processors. If you had bought a "boxed" version, you would've gotten the heatsink for free. Regardless, you can still buy the fan and mount it directly.

## TO SIR, NO LOVE

**DEAR DOG** I'm getting the major runaround from **Sir Technologies**. I ordered a Viewsonic PS790 19-inch monitor from them in December that I still haven't received. When I ordered the monitor, I was told I would receive it in about 10 days. I called them at that mark and was told to contact the customer service line. This turned into a nightmare. The number is always busy or rings off the hook.

I've gotten through to their "answering service" a few times, but all I could get from them was that Sir Technologies is upgrading its computer systems. Bah!

So I called back to the order line and canceled. I was told that customer service would take care of the cancellation. I also put in a payment dispute on the Visa I used. I may have to wait three months for a resolution, though. Major bummer!

—John Maupin

You did the right thing by contacting your credit card company and canceling the order. Online buying tip: If you can't get service or communication with a company on a product you ordered, don't wait an excessive amount of time before trying to cancel. What's excessive? Readers have asked for the Dog's help in clearing up purchases made a year before—obviously past the safety on the reader's credit card. Don't be afraid to cancel the order after waiting a reasonable amount of time.

**THE DOG** phoned Michael Meyer, president of Sir Technologies in the Philadelphia area, to talk about Maupin's problem, which was the second reported to the Dog. Meyer's explanations for the delays were common for e-commerce companies these days—too much business.

Meyer apologized for the delay and said they were taking several steps to address the problems, including upgrading the phone system and firing the answering service, which was giving out misinformation. Meyer said they also offered to ship products to customers and let them pay for it after the products arrived to make amends.

"We're a mid-sized company and we got hit like a large-sized company. Not only were we not ready for it, but our distributors weren't. We're a very honest company and doing things to address the problems."

Meyer offered to address the problems of the two readers who barked. The Dog checked with both readers and found they had received satisfaction and received a follow up letter from Maupin:

I just got off the phone with Meyer, who was apologetic and very cordial. What came out of the situation was that he was going to personally send out the monitor at a substantial cut in cost to me.

My figures show about a 48% cut in price. I have already purchased another monitor,

but I have a friend who is in desperate need of more viewable real-estate, so I will be passing the savings on to him. In the end, I'm pleased with the outcome of this situation.

—John Maupin

### SIR TECHNOLOGIES

## RAM TOUGH

**DEAR DOG** I purchased eight sticks of 32MB EDO RAM to upgrade computers at Madisonville Technical College in Kentucky.



I bought it over the net on December 17 from **Lenoir Computer Shop** in Metuchen, NJ. The credit card was charged the next day. On January 5, I sent an e-mail to them because the merchandise had not been received yet. No response. On January 7, I sent a fax. No response. On January 5 and January 7, I left messages by phone. No response. January 25: phone message left. No response.

It is my belief that any order placed with any business should never be charged to the credit card until the order is ready to be shipped. I would appreciate any help that you can offer.

—Harold Morris

You're right. Gary Almond of the Los Angeles Better Business Bureau advised **THE DOG** that web companies should follow the Federal Trade Commission's Mail Order Rule and not bill customers until the order is shipped. Some companies may not actually be charging you—they could be putting the charges through to check if you have the balance available.

## LENOIR COMPUTER SHOP

After a confusing round of calls and e-mails, **THE DOG** was able to reach a woman who identified herself as Dina Gordon, one of the owners of the company. Gordon said she doesn't understand how Morris' problem could have slipped because she answers customer e-mail within 48 hours. "If we made a mistake, I apologize and we'll make amends. This is a small business. We can't answer the phone all the time. In fact, we try not to answer the phones or we would end up on the phone all day." Gordon said she would check into Morris's problem and get back to the Dog or Morris. Did she? Nope. More than two weeks after Gordon promised to "make amends," neither Morris nor the Watchdog heard a peep. Since then Morris has turned to his credit-card company for a credit. This is poor customer service. Consider Lenoir.com a.k.a. ComputerShop.Com in the Dog House. Woof.

## ULTIMA OFFLINE

**DEAR DOG** I ordered an *Ultima Online* Game Time coupon by sending a check to **Electronic Arts** for the exact amount on January 5, 1999. I received a confirmation e-mail on the 19th saying they placed my order and it would ship soon. I still have not received it, even after e-mailing them more than 10 times without getting a reply. I called the EA customer service line. It was busy. I called the next day. It was busy. I called the next week. It was busy. Finally I got through and was on hold for 30 minutes before talking to someone. The lady I spoke to said the Game Time Coupons were on backorder until January 21. I called her February 2. She said it had not been shipped yet. She said she had no idea when it would be shipped. She said I could use the order number to check the status on the Internet. When I tried that, it didn't even show up as an order! She said to call back in a week if nothing changed.

I've sent 12 e-mails now, and have not received a single reply. In the morning, afternoon, and night, the support number is busy. But when I called the order hotline, they answered in less than two minutes, and when I asked whether they had stock they said "yes, it's in stock" and could be shipped as soon as I placed an order. I just said

thanks and hung up. I checked with my bank, and my check cleared in January! Please help!

—Robert Schmitt

**THE DOG** We e-mailed Origin on Schmitt's behalf, and a mere four days after intervening, Rob's order arrived in the mail. Despite the service call delay time that most tech companies have now, Origin's been more than fair and open to responding to the Dog's calls about other reader complaints, such as this letter from Rudy:



**DEAR DOG** What can I tell you? The EA boys and girls outdid themselves. I actually feel embarrassed because of the service. I appreciate your assistance and I appreciate EA correcting the mix-up. Now for even more embarrassing news: I finally managed to smoke my PC's partitions while reformatting the DR-DOS partition. So I am humbly asking you to reach the folks at EA, the gentleman whose name I don't have any longer, and thank him for what he did. \*

—Rudy

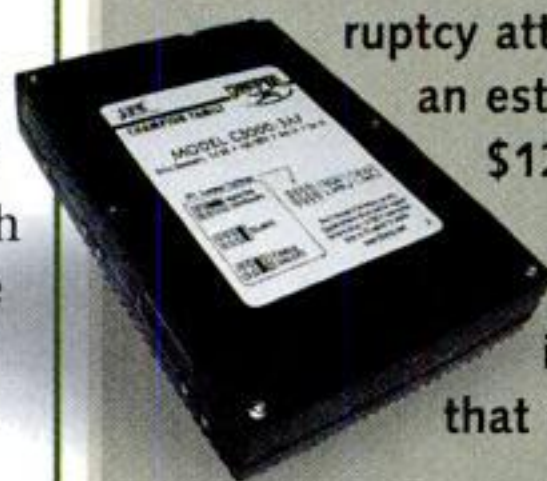
**"In fact, we try not to answer the phones or we would end up on the phone all day."**

Got a bone to pick with a vendor? Get spiked by a fly-by-night operation? Sic the dog on them by writing [watchdog@maximumpc.com](mailto:watchdog@maximumpc.com). The dog promises to get to as many as possible, but only has four paws to work with.

## DOG UPDATES ▶ WHATEVER HAPPENED TO...

### JTS PLATTERS SPUN DOWN

Loyal readers hoping for some relief from JTS's bankruptcy may want to lower those expectations. In February, the company converted its Chapter 11 filing to Chapter 7 liquidation. It's the final head crash for the company. According to **JTS's** bankruptcy attorney, Tom Gaa, the company had an estimated \$4 million in assets and \$121 million in debts. Filing a claim may still prove worth the effort though. Refer to the Dog's column in the March issue for where to file that claim form and what file.



### STB'S VELOCITY 4400 MINUS 200

Take 4400 and subtract 200. What do you get? An OEM version of **STB's** Velocity 4400 based on the TNT chipset. Although readers suspected that they had been scammed and sold "beta" boards never intended for sale, STB officials told the Dog the card is real. The main difference? No TV out and a slightly slower core. The cards should be compatible with 4400 drivers, but not with the 4400 BIOS updates. BIOS updates will be made if they're needed, officials said.



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**Microsoft To Plug Privacy Leak** | 03.09.09  
Microsoft said it plans to plug a potential privacy service pack release. [COMPLETE STORY](#)

**Top PC Makers Turn To VIA** | 03.09.09 10:35  
Compaq and Dell may turn to VIA Technologies' chipsets features on some of its PCs, according to news reports.

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### Gateway GX-

Goodies galore—Xeon's a bore

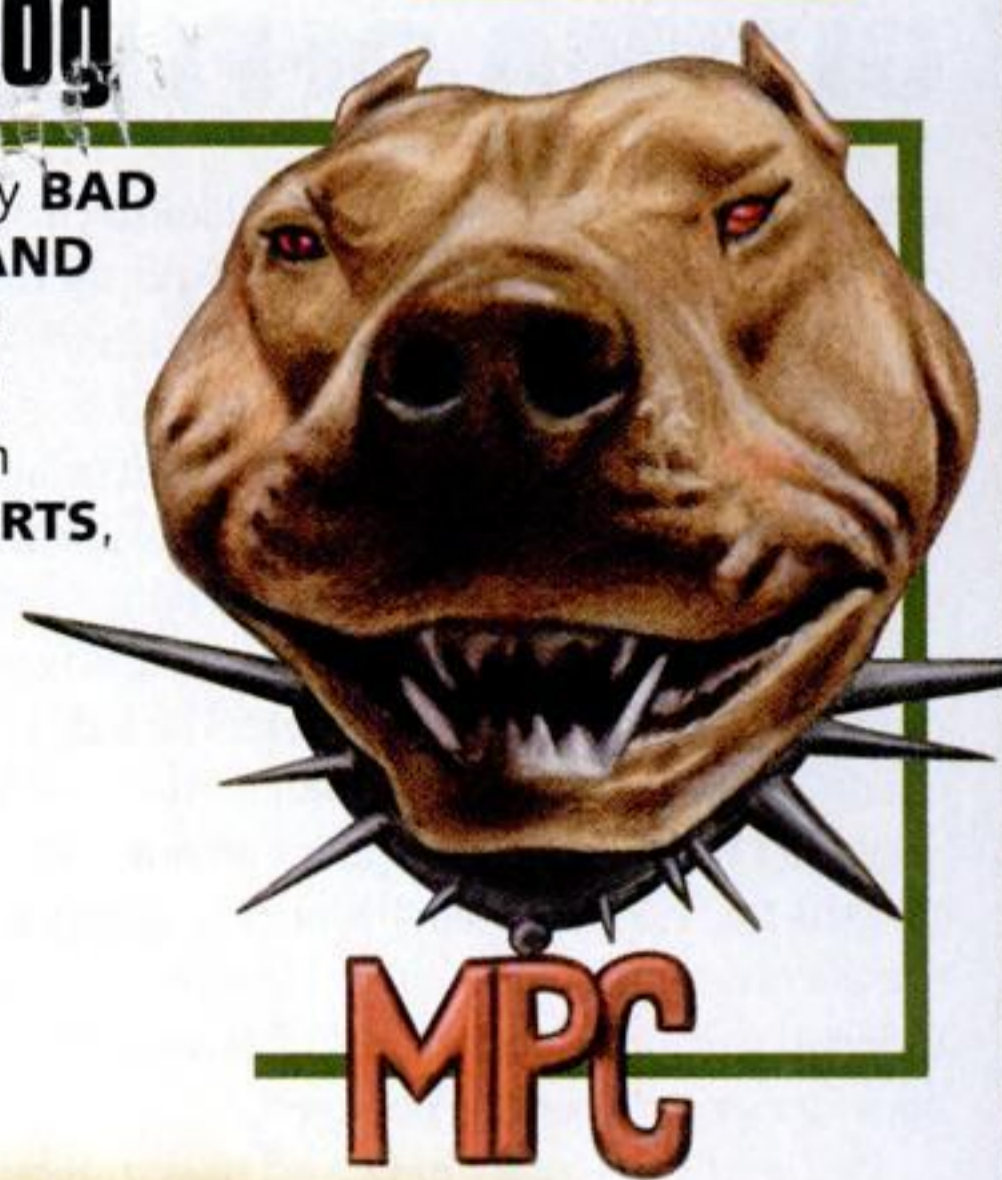


Xeon power in an amazing consumer package enjoy.

MaximumPC Verdict: **9**

## Watchdog

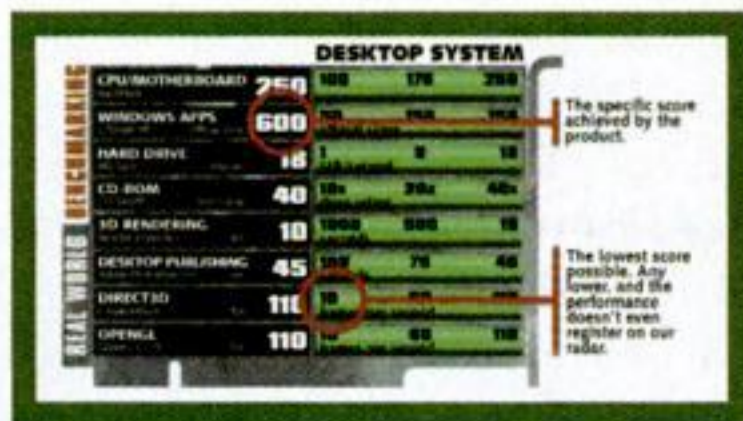
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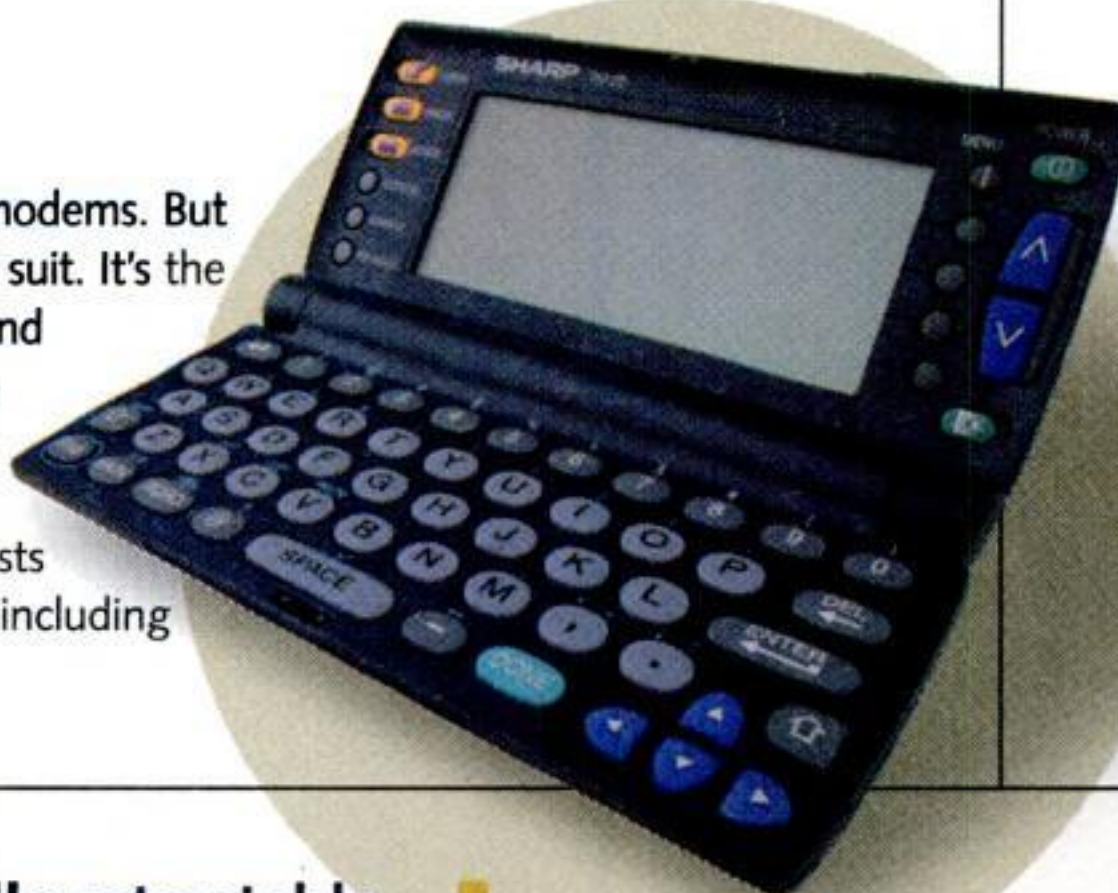
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## Sharp TelMail TM-20

If disco, bell bottom jeans, and lava lamps are back in, so must be acoustic modems. But Sharp's TelMail TM-20 is no average handheld device dressed up in a leisure suit. It's the second unit to feature Pocket Science's cool technology that let's you send and check mail from almost any phone on the planet. Just cup the TelMail to the receiver, dial an 800 number, and away you go. Featuring 384K of RAM for messages and a serial interface to your PC, the TelMail doubles as a basic PDA with the ability to save your data to your PC. Service for the TelMail costs \$10 and has the ability to grab POP3 mail from your other e-mail accounts, including America Online. **Sharp; www.sharp-usa.com; 800.237.4277**



## Sony Glasstron

"Warning, this product should not be used by children age 15 or younger. Individuals diagnosed with eye or heart disease or injury or high blood pressure should consult your doctor prior to use. Misuse or overuse of the product may result in eye fatigue or eye damage."

Why is it that all the fun things in life are bad for you? A case in point is Sony's Glasstron PLM-A55: 12oz head-mounted video display glasses, which actually come with the aforementioned warnings on the packaging. Unlike older headmounted displays, such as Virtual I/O's i-glasses, which had terrible 320x240 resolution, today's Glasstrons are incredibly sharp and clear, supporting 180K pixels at 800x225 resolution. The glasses have composite video and RCA stereo ins (sorry no S-Video), so you can hook up just about any video source, giving you the feeling you're sitting in a movie theater with the screen about 15 to 20 feet away. However, while the picture quality is truly outstanding for such a compact gadget, we don't recommend you wear them for more than 45 minutes at a time without taking a break. **Sony; www.sony.com; 800.571.7669**

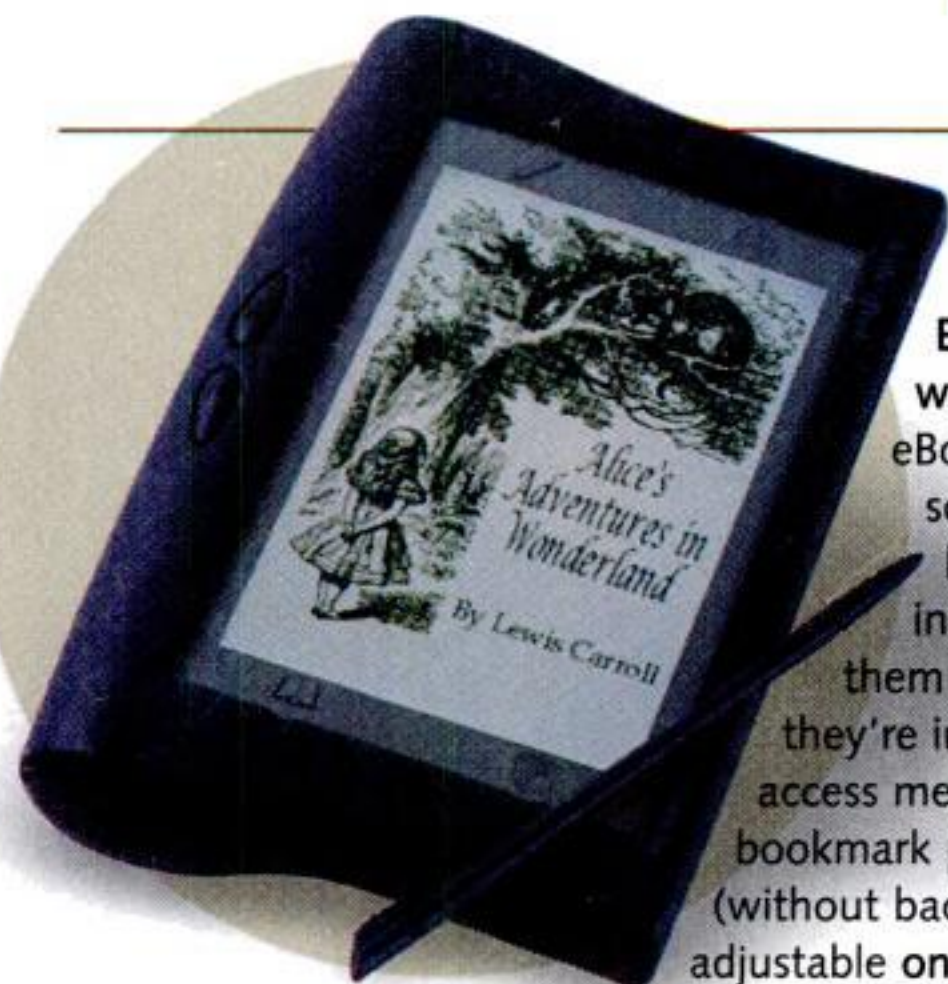
The ear phones are fully retractable so they don't get tangled up with the rest of the wires that come with the glasses.



The Glasstrons actually have a front panel shutter that opens so you can both watch a movie and see where you're going at the same time!

## NuvoMedia Rocket eBook

Electronic publishing is here, and the Rocket eBook heralds the revolution of the digitized word. Completely portable, weighing in at 22oz., and measuring 5x7<sup>1</sup>/<sub>2</sub>x1<sup>1</sup>/<sub>2</sub> inches, the eBook holds up to 4,000 pages of text and graphics, or roughly 10 titles. The *RocketLibrarian* software turns your PC into a library where you store any publication or document, such as books, newspapers, journals, and trade magazines. By syncing with your PC via the included cradle, you can download titles to the eBook's 4MB of flash memory, then delete them when you're done. Currently, you can purchase titles only from barnesandnoble.com, but they're inexpensive. The 3<sup>1</sup>/<sub>2</sub>x5<sup>1</sup>/<sub>2</sub>-inch backlit, monochrome touchscreen has icons you can click to access menus through which you can browse, search, annotate, highlight, link, and reference text, bookmark pages, or look up words. The internal nickel-metal hydride battery lasts up to 33 hours (without backlight) and recharges via an AC adapter in 90 minutes. Page orientation and text size are adjustable on the 106dpi screen. **NuvoMedia; www.rocket-ebook.com; 650.327.5110**





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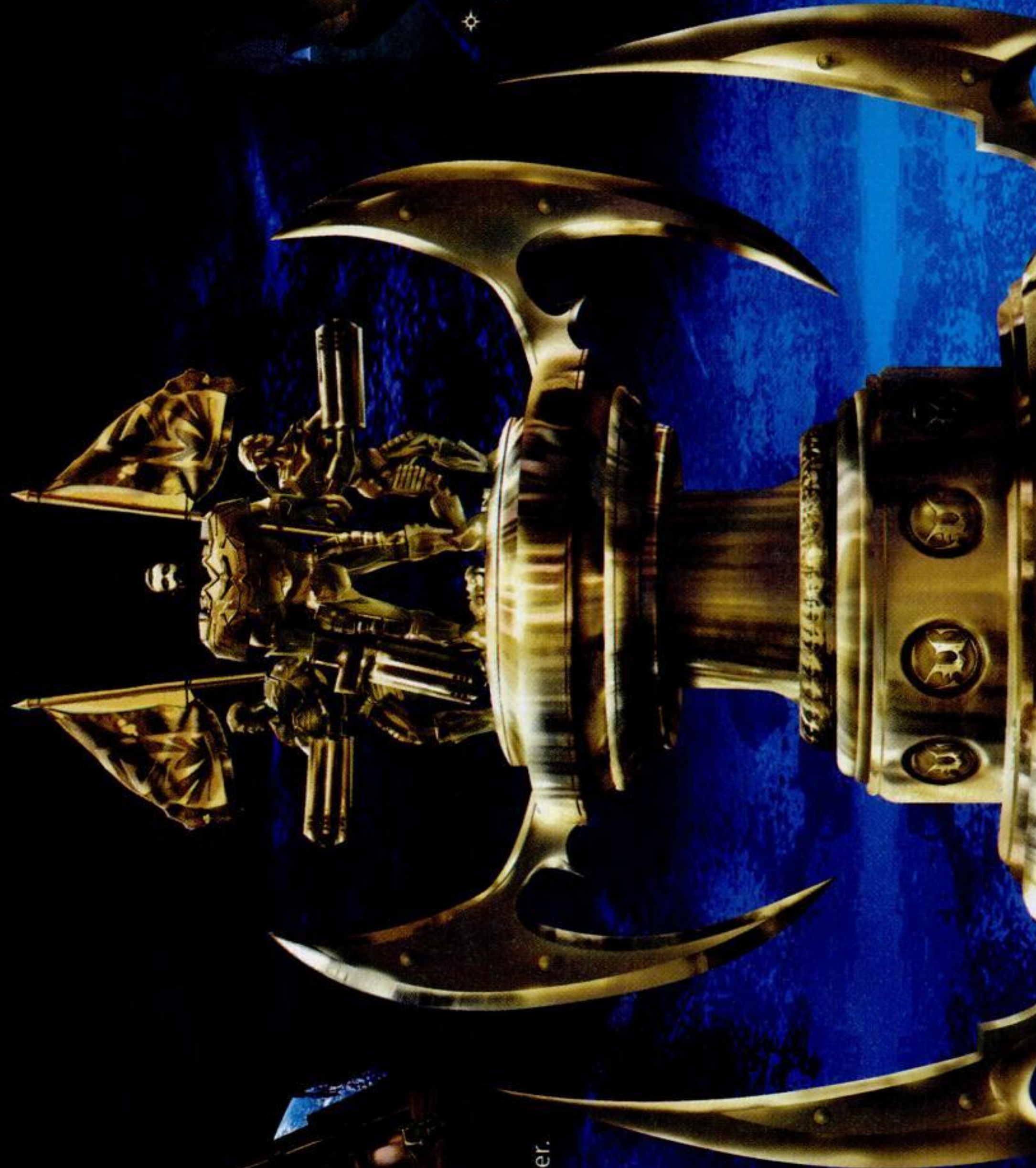
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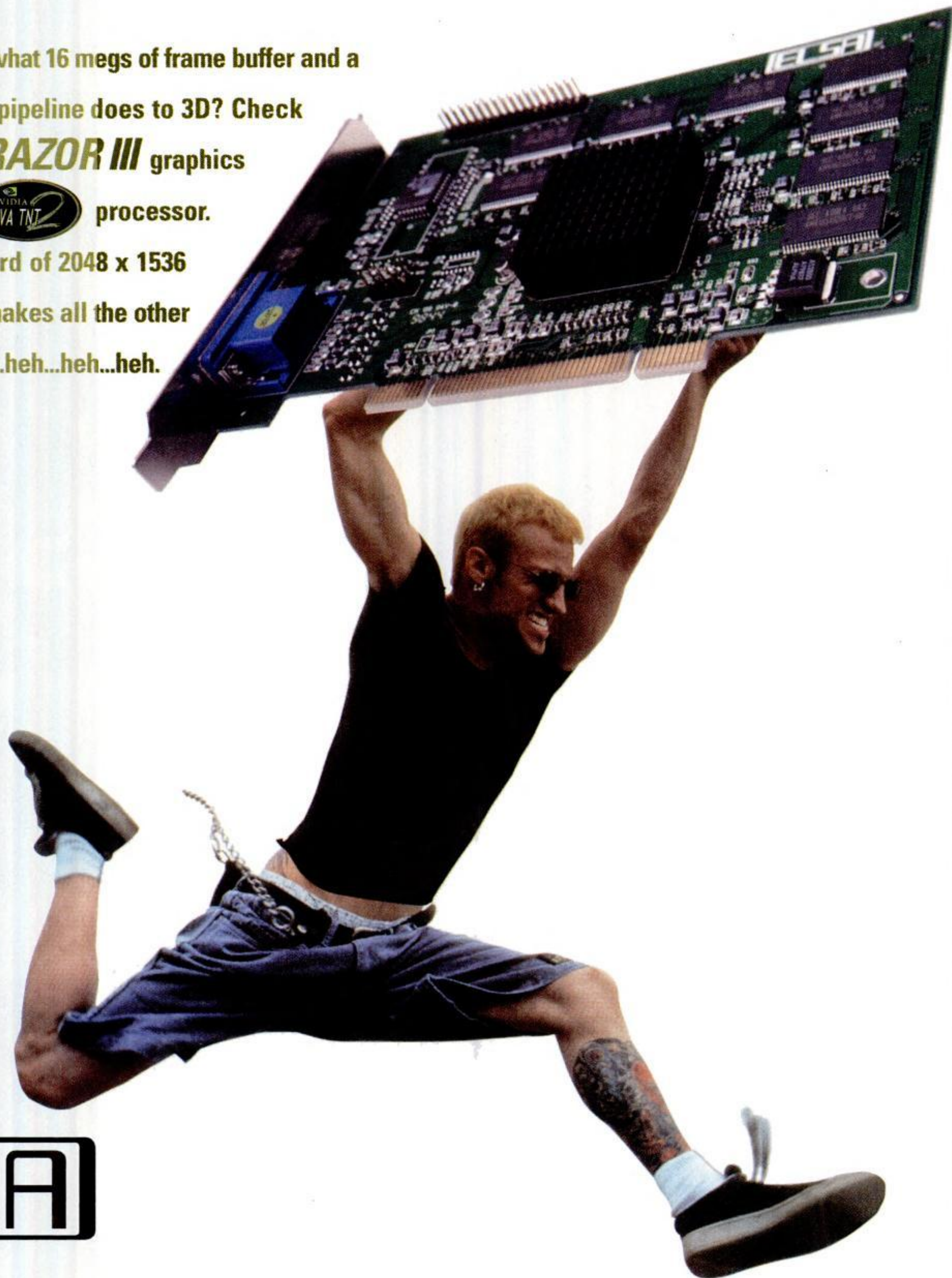
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**T**he long-running feud between Intel and AMD is approaching the boiling point, and there will be only one sure-fire winner: consumers. In the short term, a price war that drives down the cost of CPUs could save you hundreds of dollars if you're shopping for a new PC. But in the long term, you might lose if the war weakens AMD's ability to compete.

Something else is happening, too: Intel is gradually moving its CPUs out of their bulky cartridges and back into the socket-type interfaces from whence they came. If you're wondering how these events are related, you've come to the right place.

Historically, AMD sells processors for about 25% less than comparable Intel CPUs. If Intel has a processor that costs \$400 for a certain level of performance, AMD generally has a comparable CPU that costs \$300. AMD would love to sell its chips for the same prices as Intel's, but AMD usually can't get away with it. Intel has always been the "name brand," while AMD was "Brand X."

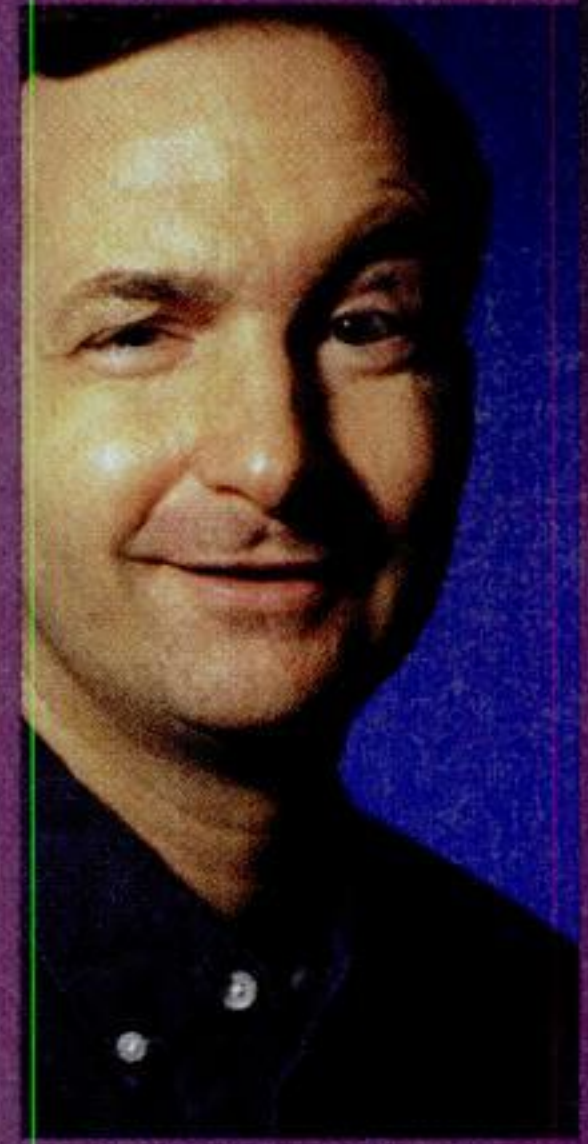
effect of price cuts at the high-end forces the price of the older CPU below \$100. Of course, AMD doesn't like to sell CPUs for less than \$100, either. But as PC prices kept falling toward the \$500 point, the demand for cheap CPUs kept increasing. AMD has been rapidly gaining market share and surprised everybody this year by drubbing Intel in the U.S. retail market.

Intel has responded in several ways. Last year, Intel introduced the first Celeron, which was really a Pentium II in a cheaper cartridge without a Level 2 (L2) cache. Amputating the L2 cache crippled the Celeron's performance, but it was a stopgap measure until Intel could come up with a better solution.

One solution was the "Mendocino" Celeron, which has an integrated 128K L2 cache. The on-chip cache significantly improves performance because the L2 bus runs at the full core speed of the CPU. (If the CPU runs at 400MHz, the cache bus also runs at 400MHz.) In contrast, the external L2 cache inside a Pentium II cartridge runs at only half the speed of the CPU.

To win back market share from AMD, Intel is dramatically slashing prices. PC makers can buy a 300MHz Mendocino Celeron for as low as \$63—an unheard-of price for Intel. Even a 400MHz Celeron was selling for only \$138 early this year. That forced AMD to slash prices, too, except AMD can't afford it as well as Intel can. If AMD compensates by investing less money in R&D and new chip foundries, the long-term effect could be less competition and higher prices.

The price war is also dangerous for Intel, which is trying to manage it like a controlled forest fire.



**TOM HALFHILL** was senior editor at Byte magazine and is regarded as one of the most knowledgeable experts on processor technology in the industry. Contact him at [thalfhill@maximumpc.com](mailto:thalfhill@maximumpc.com).

While the 400MHz Celeron was selling for \$138, the 400MHz Pentium II was holding steady at \$353, and the Pentium III was soaring over \$400.

Yet internally, all three CPUs have virtually identical cores. The Pentium II and Pentium III have faster system buses (100MHz vs. 66MHz) and larger L2 caches (512K vs. 128K), but the Celeron's L2 cache is much faster.

## How to Win the CPU Price War

INTEL AND AMD HAVE GONE TO WAR, BUT YOU MIGHT STAND TO LOSE

Despite the 25% discount, AMD can still make money because Intel's prices have always been relatively high. Intel's profit margins can exceed 60%, which is remarkable for a company that manufactures a capital-intensive product such as microprocessors. (Software manufacturing is practically free compared to chip manufacturing.) Companies that make disk drives, motherboards, expansion cards, memory chips, and other hardware components are forced to survive on razor-thin margins while Intel makes money almost as fast as Bill Gates does. Wisely, Intel invests a large portion of those profits in R&D to maintain its technological lead.

Two years ago, the ground suddenly shifted. PC prices started dropping below \$1,000, and AMD was in a better position than Intel to ride the tidal wave. Cheap PCs need cheap CPUs, and Intel didn't have any cheap CPUs. Typically, Intel discontinues an older CPU when the trickle-down

Mendocino's integrated L2 cache makes Intel's cartridges superfluous. The cartridge contains little more than a CPU chip on a naked daughtercard. That's why Intel is eliminating the cartridge altogether. In its place, Intel has introduced a

**If AMD compensates by investing less money in R&D and new chip foundries, the long-term effect could be less competition and higher prices.**

cheaper 370-pin socket that closely resembles the 238-pin sockets of pre-Pentium II days. As Intel gradually releases new CPUs with integrated L2 caches, the Slot 1 interface will slowly disappear from motherboards. Slot 2 will probably live longer because servers need larger caches than desktop PCs, and it's not practical with today's technology to integrate several meg of cache on a CPU chip.

If you gotta have a Dream Machine, you won't settle for anything less than a Pentium III. But if you don't need the Streaming SIMD Extensions and the faster system bus, do what Intel hopes you won't do: buy a Celeron or a K6-III. You could save \$300 on the CPU alone. If you invest the savings in a better graphics card and more memory, you'll have a Lean Machine that really cooks. ●



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I have a day job as an information designer for a large digital (web and more) design firm. As an information designer, I spend my days categorizing blocks of content, diagramming process flows, and developing navigation systems, and interfacing to support these findings. You can blame people like me when you don't know what button to click or where to find the help features. Navigation is a tricky business.

Because of our mass acceptance of the Internet, technologies such as Vignette's Story Server (dynamic web publishing and serving technology), ad-driven web sites looking for links to user demographics, and consulting agencies such as Forrester Research, there's a big mad trend called customization/personalization of content and navigation. And now everyone, especially eager executives looking for killer web apps, wants a piece of the action.

Notice that I wrote "customization/personalization" as if the words were indistinguishable. That's because people treat the words and their meanings as the same

Yahoo! also lets you "Customize your My Yahoo! Headlines to see only the news of interest to you." So which is it? Personalize or customize?

Excite and Firefly also allow you to "personalize" the experience for "personalized" content, while TheGlobe.com's MyGlobe urges you to "customize" your page, as does cnet, also originally titled MyNews.com. (Can we kill MyMicrosoft yet for the über-annoying MyTrend on MyComputer?) Here's the punch line: When an associate of mine asked the difference between personalization and customization, Forrester replied that it used the words interchangeably. Hmmmm...

What's a girl to do? Especially a girl whose 9-9 workday involves the tedious definition of the most minute of details in order to deliver clear and precise documents for positive and consistent user-to-web site experiences. If I'm a user and one site tells me to customize what another site tells me to personalize, that's a bad thing.

A very bad thing.

suggests that a system of databases and servers will personalize, or tailor, content specific to what it knows about that user (sometimes based on options selected in customization worksheets). This could mean offering a username in a welcome message or recommending services or features based on that user's specific traffic patterns or buying habits."

Users may specify how or to what degree they would like a system to personalize content, but that is not personalization, that is customization of personalization features. (Egads, I know it's tedious, but it's also important!)

Customization is an active process for the user, while personalization is something that happens automatically on the back-end. And as Yahoo, Excite, Forrester Research, and

everyone else has figured out, both are important to integrating the user into the overall site experience. When a user clicks "customize," there should be choices for them to select. A user should never click on anything that

## The Built-To-Order Web Site

CUSTOMIZATION AND PERSONALIZATION... WHAT'S THE BIG DIFF?

thing. A significant drawback of blitzkrieg mass acceptance (and the desperate search for killer apps) is the lack of education necessary to understand exactly what it is we're accepting or seeking.

Of course, pioneers such as Yahoo! don't help matters. If

you register for an account on My Yahoo (I actually use mine), your own "personal" Yahoo!, you'll see instructions on the

page to both personalize and customize the content and layout. To Yahoo!, personalizing content means picking news headlines and weather, album listings, or technology tips to be displayed on your My Yahoo! homepage. You can "personalize" layout by selecting which items you want to appear at the top of each column as well as select the personal "options" (that's a new one) to select a color palette.

Here's the definition that the collective sum of myself and the brainiacs I work with have developed and that I use to explain the difference to our clients (large and small): "Customizable means that a user can select which types of features,

content, and in some cases layout of that content he or she would like to see on a web site or page. My Yahoo! allows users to 'customize' which types of news they would like and where on the page they would like it to be displayed. Choosing a username is also a form of customization, as is determining personal priority of informational displays. Personalization, on the other hand, is transparent to a user and

says "personalize." But a web site should say "Customize your personal Yahoo! experience," etc., etc., etc...

And once sites get around to getting a handle on the naming conventions, maybe they'll start offering customizable content that is actually *useful*, beyond the same lame, dippy news and generic entertainment sources that everyone and their competitor uses. ❁



**SHEL KIMEN** has worked in the industry, traveled the world, and covered the Internet for both The Net and boot magazine. She can be contacted at [skimen@maximumpc.com](mailto:skimen@maximumpc.com).

**A significant drawback of blitzkrieg mass acceptance (and the desperate search for killer apps) is the lack of understanding as to exactly what it is we're accepting.**



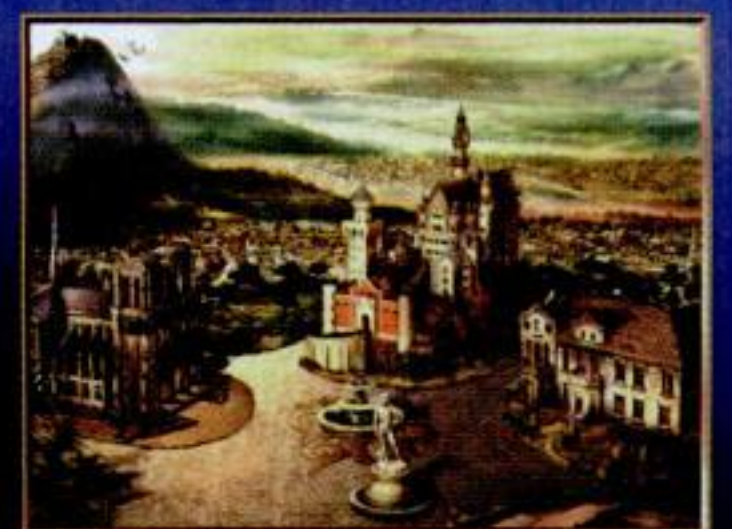
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Look closely and you can see gaming's first endangered species since the death of the text parser, and aside from dedicated grognards, few seem to lament the soon-to-be departed.

Gamers who took up the hobby P.D. (post-*Doom*) might find it hard to believe, but there was a time when wargames such as *Kampfgruppe* and *Shiloh* were among the hottest titles available. Today, the historical wargame is outflanked by the superior numbers of mega-publishers, and only a handful of niche companies are keeping it from raising the white flag.

I can count on one hand the number of "true" wargames due out in 1999. *Operational Art of War II*, the revived *Battleground* series, and a new Civil War game from Talonsoft are all that come to mind. *Panzer General III* and *Steel Panthers 2000* won't make 1999, and Microsoft has no plans for more *Close Combat* games.

How could a dominant genre drop so far? The decline began around 1991, when

Strangely, however, it didn't have the expected ripple effect.

There were no *Panzer General* clones. No one aside from TalonSoft even bothered turning out wargames. Talon's *Battleground* series were lavish, detailed games that found an audience with hardcore gamers. Talon continued the series for eight games, with minimal development cost for the new entries, and has even revived the series for *Battleground 9: Chickamagua*.

This was precisely the tactic that wargaming desperately needed, yet only Talon exploited it. Because wargames are generally built on systems, and those systems are easily adaptable, the best idea would be to invest your money in an engine and then use it for several games, as with the first *Panzer General*, *Battleground*, and *East Front/West Front* series. Wargames will never sell huge numbers (unless they are greatly simplified like *Panzer General*), but they will sell consistently. This is the defining characteristic of niche publishing, and one that few publishers seem to grasp.

consistently reach the right gamers.

Yet aside from micro-developers such as HPS and Incredible, no one is bothering with this market. That's a mystery, because the market is there, it's constant, it's stable, and it's relatively inexpensive to tap. But it's not such a mystery since the mentality of game publishers follows the "bigger/louder/faster/more is better" model. This is symptomatic of a much bigger problem with the gaming industry. Publishers feel they must spend millions to have a big hit, but the risk is greater (less than 1% of the games published will hit



**T. LIAM MCDONALD**

is a veteran of PC Gamer magazine and is much bigger than he looks in this picture, so keep that in mind before writing him any hate mail at [tmcdonald@maximumpc.com](mailto:tmcdonald@maximumpc.com).

## Where Have All the Wargames Gone?

DON'T BLINK OR YOU'LL MISS THE DEATH OF ONE OF GAMING'S VENERABLE GENRES

games such as *Wolfenstein* and *Doom* stole center stage from titles such as *Pacific War* and *Eastern Front*. Developers and publishers chased the new and exciting possibilities offered by expanded processing power and graphics capabilities, and they were paid off with huge sales that crossed all demographic groups. Wargames had no place in the mid-90s graphics-driven gaming explosion, since wargames never really *needed* sexy graphics. There was a new market to exploit, and wargames didn't have a place at the table.

But did wargamers just go away? The astounding sales of the highly playable (albeit softcore) *Panzer General* games prove otherwise. SSI obliged by using this engine to turn out several more games and produce a big-budget sequel.

Let's say 10,000 guys buy *every* wargame published. That's considered a flop by *Myst* standards, the same way an art-house film would be seen as a flop by *Armageddon* standards.

But given that wargames traditionally

the top ten) and the bar is much higher. Sure, you may sell more copies of an action game that cost \$4 million to develop than you would a \$500K wargame, but it better be a *lot* more.

Wargames don't need to die. There

**Let's say 10,000 guys buy every wargame published. That's considered a flop by *Myst* standards, the same way an art-house film would be seen as a flop by *Armageddon* standards.**

cost less to produce, you can sell a mere 10,000 copies and still turn a profit, especially if you can get four or five different games out of the engine. When publisher Take 2 emerged from the disastrous *Battlecruiser* fiasco with a sock full of money, they instantly put it to buying TalonSoft. Clearly, they saw the strength of Talon's wargame development and publishing technique and its ability to

are enough of us here to support good historical simulations. We don't need a lot of chrome or big budgets. All it takes is a publisher willing to take a modest profit for a modest outlay and cater to a select but loyal market. With the trend towards flash-in-the-pan developers who go supernova without even producing a product, that may be too much to hope for. ●



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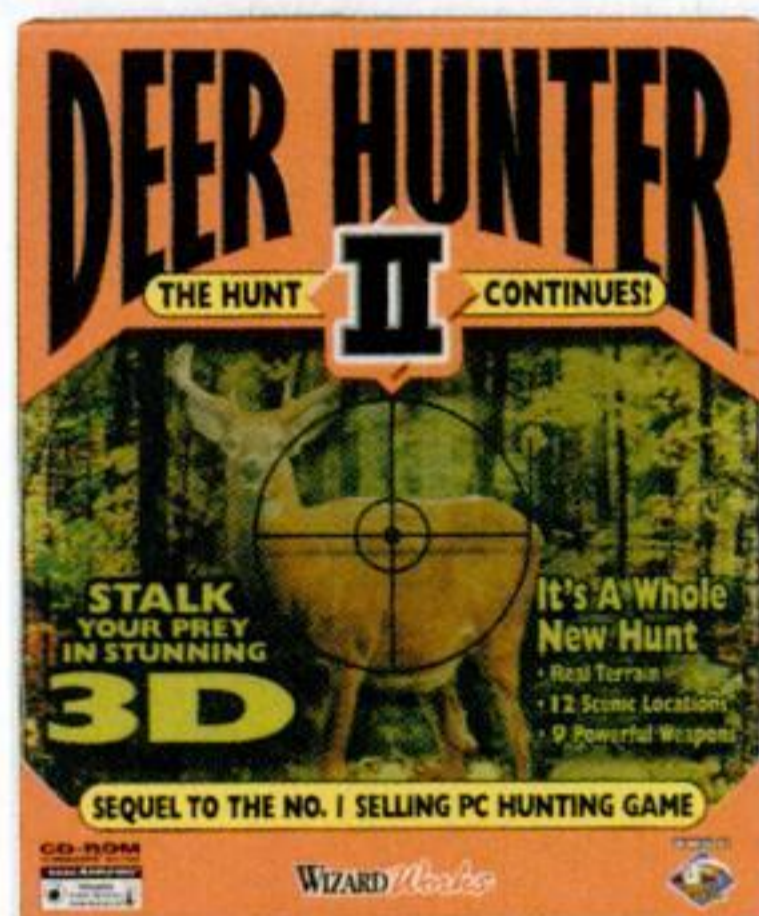
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# Dodging



**Maximum PC** Deer Hunter was the biggest selling game for much of last year, but critics lambasted its gameplay and technology. How did that make you feel?

**Boer** To be honest, we pretty much laughed at that because the people who were buying the game didn't care. They didn't read those reviews. The people that were reviewing the game missed the mark every single time. They'd say, "I've been out here for 15 minutes and I haven't even seen a damn deer! How much fun is this?" And we would read those reviews and laugh at how few rating points the game got. But we were laughing all the way to the bank! Even when it was in the number-one spot, they still couldn't understand how in the world anyone could find a deer-hunting simulation fun.

**Maximum PC** So what were they missing?

**Boer** If you don't enjoy hunting, you're not going to enjoy this game. If you don't enjoy just relaxing, sitting out in the woods, enjoying the scenery and the sounds, and tracking a deer, it's not going to be fun for you. Most reviewers expected blood splattered all over at every turn and had a hard time with the concept of a slow-paced, simple simulation.

**Maximum PC** Would critics have respected the game more if it had used high-end 3D technology, complete with high polygon counts and trilinear filtering?

**To a typical gamer, Deer Hunter absolutely stinks. But that's not who we were making the game for...**

—James Boer, Deer Hunter Developer

**Boer** They still would have missed the point that the game wasn't targeted for them at all. We never cared what they thought. We listened to the people that actually bought the game; but we pretty much ignored the reviewers.

**Maximum PC** So what was the reaction from hunters when the game came out?

**Boer** They thought it was the greatest thing out there. I'm sure everyone thought a true sportsman made it, and I kind of hated to break it to them that it was made by a bunch of guys that never hunted at all!

**Maximum PC** You weren't a hunter?

**Boer** No. The funny thing is, it turns out that no one in the company knew a damn thing about hunting! I ended up being the on-the-spot hunting expert by buying all kinds of books and videos. I just immersed myself in hunting literature for a couple of weeks straight and learned all I could about the sport.

**Maximum PC** Did you actually go out on a hunt?

**Boer** No, but I did watch a lot of videos and learned some of the strategy. I looked at what strategies hunters use to actually stalk and kill deer, and then captured those elements and put them into a game.

Even though I enjoy target shooting, I don't think I could bring myself to shoot a live animal.

**Maximum PC** Did you ever involve real hunters in the development or beta test?

**Boer** We got advice from some real hunters, but mostly we tried to stick to the advice given in the books and the videos.

**Maximum PC** Much has been said about the minuscule budget Deer

**Hunter was produced on. Just how small was it?**

**Boer** The budget was basically the salary of two programmers, an intern who came even cheaper than I did, and a part-time artist. That's it.

**Maximum PC** Deer Hunter was your first official programming gig. How did you land it?

**Boer** It was my junior year in college—I was majoring in computer science—and since I was fairly burnt-out with school, I decided to

## PROFILE

### And he would be?

James Boer is one of only two game developers who worked on the original Deer Hunter game. In short, you can blame him for the PC hunting craze.

### And I would know him from?

Although he may not be a household name (yet), Boer has certainly made a name for himself as the "Deer Hunter Guy." But after the game's phenomenal financial success, Boer white-tailed it back to the Pacific Northwest to work on WizBang Software's Baseball 2000, the sequel to last year's Baseball 3D.

### And I would care because?

Even if you absolutely despise Deer Hunter, you can't deny the fact that it's opened PC gaming to a whole new mainstream audience. Boer says its low-budget success should force game developers to rethink their philosophy on making a quick buck in lieu of making a good game.



# Bullets





try something a little bit different. I looked on the web, saw who was advertising for programmers and applied to a number of companies. I sent out some demo programs that I had worked on, and since I came fairly cheap, SunStorm hired me sight unseen.

**Maximum PC** Deer Hunter—and its offspring—outsold some high profile games last year. Do you go to bed at night thinking, “Damn! I’m good!”?

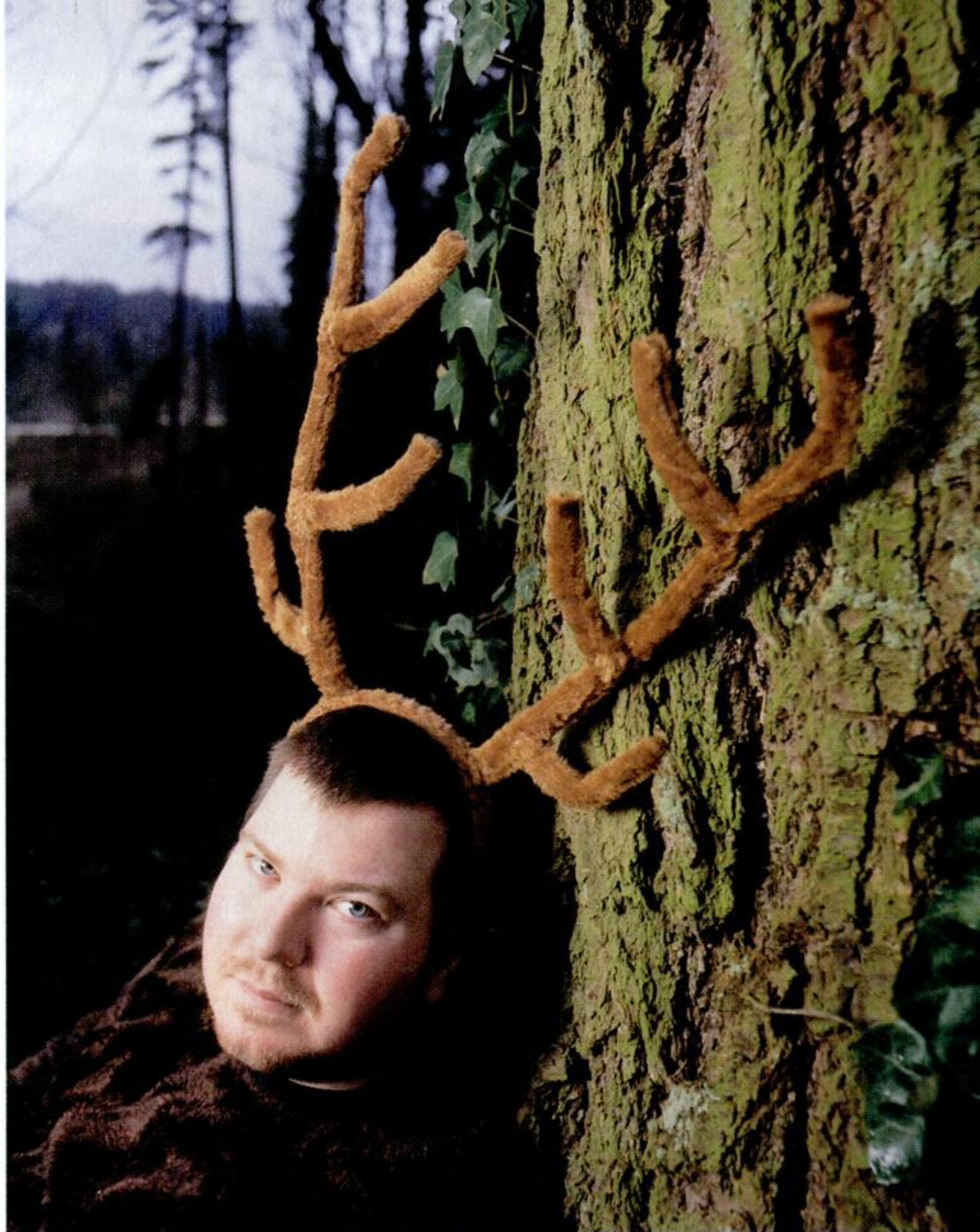
**Boer** No, it’s more like “Damn, we were lucky!” We happened to catch an untapped market—that’s all there is to it. There was never an ego problem, because the game itself wasn’t that amazing. There’s really nothing much to brag about.

**Maximum PC** Do you think of yourself as the “John Carmack” of hunting sims?

**Boer** Oh, no! That’s definitely not how I’d characterize it at all. To a typical gamer, *Deer Hunter* absolutely stinks. But that’s not who we were making the game for. It was for people that were completely outside the gaming community—the type of people that would never pick up a gaming magazine. If they read a review, it would be in a magazine like *Field and Stream*. Those reviews tended to be a lot kinder, simply because they saw the game for what it was—an honest attempt to simulate the sport.

**Maximum PC** Do you think *Deer Hunter* may have been the catalyst that opened up the gaming market to a mainstream audience?

**Boer** Oh, absolutely! The market is opening



**“Magazine reviewers would rather spew about bitmaps, trilinear filtering, and how many polygons are being rendered than ask, ‘Was it fun to play?’ ”**

up. Out of the top 20 best-selling games from last year, probably half are by Mattel. The Barbie franchise has been extremely successful. Another mainstream success is Hasbro, which has produced versions of board games and games based on TV shows such as “Jeopardy” and “Wheel of Fortune.”

This broadening of the market is not something that’s going to detract from the quality or the quantity of games. It’s simply opening up more of an audience. There are always going to be niche markets here and there, and hardcore gaming is still going to be a solid area, but it’s changing.

**Maximum PC** Do you view hardcore game developers as an elitist group who are only making games that they themselves would play?

**Boer** It’s not elitism at all. It happens to be true of me, too. Obviously, you would like to be associated with something you enjoy doing more, and I would have preferred to have been making the type of games that I like to play—such as *Quake II* or *Half-Life*—but the hunting/outdoor sport franchise was simply too valuable for SunStorm to give up.

**Maximum PC** What game last year were you most impressed with?

**Boer** *Half-Life*. That was an amazingly fun game to play, I think mostly because of its immersive quality. The game was designed so that you were made to feel like you’re the starring role of this action-adventure movie. The guys at Sierra did a great job on it.

**Maximum PC** What was the worst game you’ve played recently?

**Boer** *Trespasser* was the most horribly clumsy game I’ve ever played in my life. It was a beautiful example of marvelous technology, but it was completely brain dead in the gameplay factor. I hate to mock them too heavily, but what the hell were they thinking?! The game had a lot of real physics, which was cool in theory, but hideously annoying and hard to control in the game.

**Maximum PC** You didn’t spend a lot of money, and you didn’t spend a lot of time developing games that became instant hits, spawning clones. Does it piss you off to learn of companies, such as Ion Storm, that have had lots of operating capital, but have squandered it away on fluff, and still can’t finish a game?



**Boer** Yeah. I look at those types of situations and wonder how in the world they could not get a lot done with that kind of money because I've just been in situations where so much more is done for so much less.

I think it's simply that some people are concerned a little bit more about which Ferrari they're going to buy next instead of focusing on producing a game as quickly and efficiently as they can. It comes down to personal discipline. There are a lot of people who aren't mature in this business.

**Maximum PC** We heard *Deer Hunter* was completed in three months.

**Boer** Actually, a little less than three months.

**Maximum PC** And what about *Deer Hunter II*?

**Boer** Some of the engine development work started five or six months before the

release date, but everyone geared up and really started cranking on the game in about three months. Considering that normal game cycles are anywhere from a year to two years or more, *Deer Hunter II* was still done in an extremely short amount of time.

For the sequel, we really wanted to make an impressive game, and we worked harder at developing better technology. We tried to address all the issues that people complained about. When I said that we laughed and didn't listen to the reviewers, that's half-true. The one good point they did make was that you couldn't walk around in the woods. This was a major failing in *Deer Hunter*, but for the sequel, we wanted to add that in, but still keep it accessible to people with lower-end systems.

**Maximum PC** Is there a risk that developers will try to capitalize on technology, forgetting about gameplay or storylines?

**Boer** Oh, absolutely! Many people focus way too much on technology. Magazine reviewers are bad about this. They would rather spew about bitmaps, trilinear filtering, and how many polygons are being rendered than ask, "Was it fun to play?"

Game developers are susceptible to that, as well. When I saw *Unreal* for the first time, it was a very impressive-looking game, and it was one of the first games to make use of colored lighting. In other words, they had a new toy to play with. Unfortunately, you saw these horrible combinations of colored light drawn everywhere in the game and it was just horribly overused. They used it because they had the technology, and it was

**"Even though I enjoy target shooting, I don't think I could bring myself to shoot a live animal."**



something they wanted to show off, but it ended up looking a little gaudy in places.

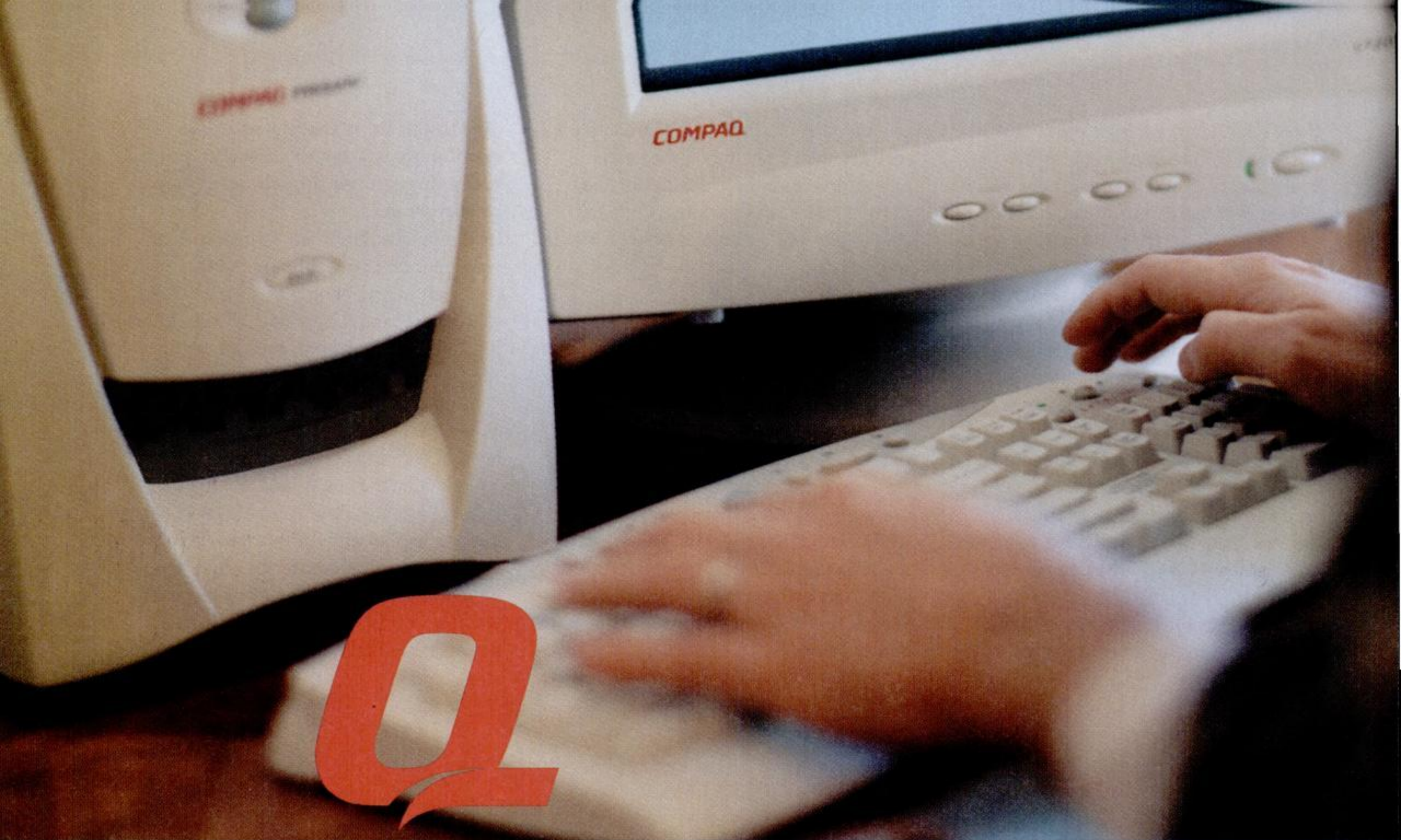
In *Deer Hunter*, gameplay basically drove everything. We knew that we had less of a technical-oriented crowd that would be purchasing the game, and so the game controls were kept very simplistic, very easy to use. It was not just a matter of expedience to simplifying the game like that; it was actually a requirement based on our expected audience.

So, yeah, gameplay is everything and I think people are starting to trivialize that. *Quake* and *Doom* were really good examples of a game based on pure game technology and no gameplay. And that was pretty neat at the time. Everyone was really impressed with how they looked. But I think people are realizing that you need to go beyond that now. People are not as nearly as impressed with pure technology anymore—you need to have something behind it too.

**Maximum PC** You said you laughed at the reviews. Does it bother you at all that the game is the brunt of many industry jokes?

**Boer** No. It would probably hurt me a lot more if hunters had disliked the game because that's who we wrote the game for. But if I work on another game, a game specifically targeted at hardcore gamers, and it gets the same kind of reviews, then that would sting. But since hardcore gamers weren't our target audience, it doesn't bother me. It's hard to be bothered when your game is still number one! ●





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# BIG AUDIO

In the scope of computer history, the Sound Blaster (SB) soundcard standard is the equivalent of communist Berlin in the 60s—deeply entrenched and technologically backward.

For years, SB compatibility was a necessity. But the basic FM synthesis technology is dead and decaying. SB's shortcomings have never been so blatant: while CPU performance has improved exponentially and videocards now pump millions of polygons per second, the ISA-based SB-compatible soundcard is basically the same device originally minted in the 1980s.

Well, it's 1999, baby, and the revolution is here. Viva La Revolution! Proud warriors of the rebellion have propelled today's soundcards to new heights. These upstart technologies include 3D positional sound and immersive effects.

## Speaker of the House

On the output tip, computer speakers pump up to six discrete channels of surround-sound audio. In other words, with the right DVD setup and speakers, you can turn your computer into a home theater—or home stereo—system. Chances are that playing an MP3 through your computer speakers sounds at least as good as playing a CD, tape, or vinyl record through your “Purple Rain”-era hi-fi, and MP3 free-ware offers even better programmability.

**Pumping soundcards and thumping speakers will revolutionize the way you use your computer, watch movies, and listen to music**

## The Audio Junta

While burning 650MB of MP3s to a CD is a rebellious experience indeed, it's not the full-

frontal attack in the computer sound revolution. As always, gaming leads the technological coup.

Yesterday, immersive gaming meant a laser blast lifted straight from a bad Italian sci-fi movie. Today, immersive gaming is the sound of bullets ricocheting around you, spent shell casings bouncing off a stone floor, the roar of a beast behind you, and a thumping techno soundtrack shaking your game room.

Yesterday, developers simulated distance in a game by lowering a particular sound's volume. Today, developers can add the right amount of reverb to simulate that distance. What are the cadres of this sound revolution? The most exciting new technologies are 3D positional sounds and environmental effects.

3D positional sound uses algorithms to fool you into believing a sound is in front of you, behind you, or to the right or left. The technique works best over four discrete sound channels, but can be virtualized over two speakers. Companies that espouse this virtualized “3D” sound say it can be done the same way humans do it with just two ears. By filtering sounds just right and supplying visual clues, the virtualization can supposedly fool a person into believing that something is overhead or to the rear.

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**BY GORDON LUNG**



# SOUNDCARDS

## AOpen AW300

If you're dead-set on moving your audio to the PCI bus, but don't want to spend a lot of money, the AW300 is passable, but not much more. For about \$30, you get ESS's Maestro-2 chipset, DirectSound and DirectSound3D acceleration, and a fair serving of features, including A3D 1.0 emulation and a powerful 64-voice hardware wavetable. The feature buffet line stops here, though. We were still hungry for quad-speaker support and extra connectors for things such as a TV tuners.

During testing, the 64-voice wavetable kept CPU utilization low, but the stock general MIDI set had us tasting plastic at times. Bleh.

### Pluses

Low price  
DOS support  
64-voice hardware wavetable

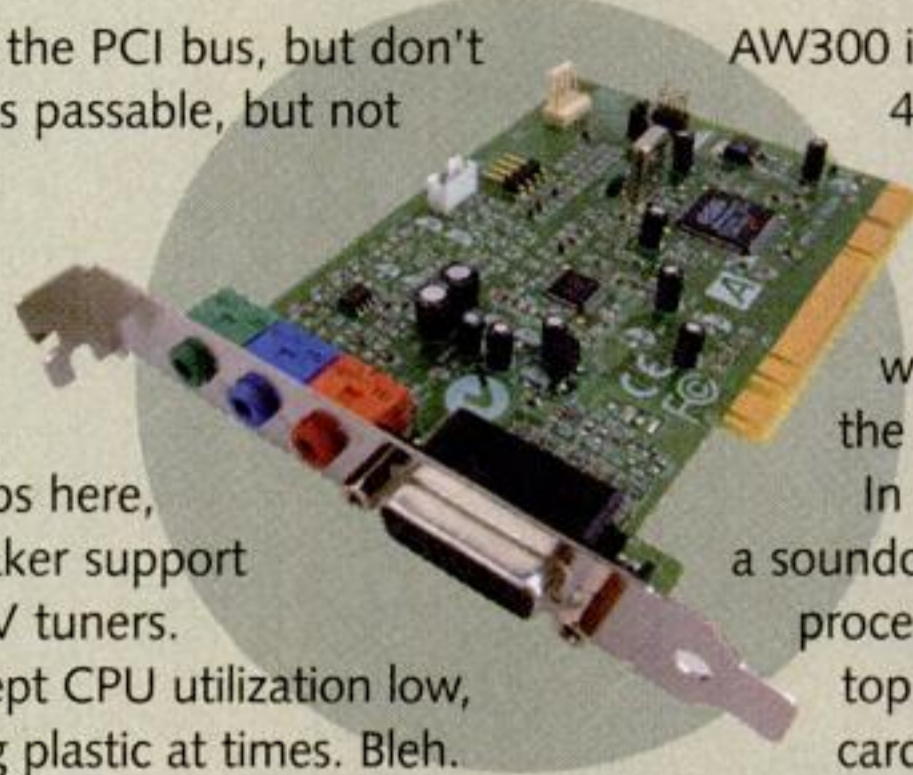
### Minuses

Bad drivers  
No quad-support  
Minimalist documentation  
Not enough connectors

Joystick compatibility is always an adventure with soundcards, so we set up a little joystick slalom test to determine just where this month's soundcards would bail. Out of three sticks, the AW300 gagged only on the Thrustmaster Rage.

Full real-mode DOS support comes correct through a [TSR](#). The card also features a connection for the "PC/PCI" motherboard port, which helps PCI soundcards achieve 100% Sound Blaster legacy support: Simply run a ribbon cable from your soundcard to the connector on your motherboard (if present).

But we found problems with how the



AW300 interprets sound. While running *Turok 2* with a 44kHz setting, bird-chirping sounds were almost inaudible. The same chirps sounded properly loud on a Montego II, which features the Vortex 2 chipset. Chalk it up to bad drivers (and note we were running the absolutely latest drivers because the AW300's installation CD kept bombing).

In the overall gaming benchmark—in which we test a soundcard's ability to free up CPU cycles for graphics processing—the AW300 did well, pushing through the top framerates in the two games we tested. But the card did fall in our DirectSound3D test, in which we cram an ungodly amount of 3D streams through the card. In this test, the AW300 dragged our 400MHz Pentium II performance to the level of a 166MHz Pentium.

Central Research Laboratories provides the AW300 with filtering algorithms to approximate 3D surround sound via simple stereo speakers. This "Sensaura" system provides good separation and helps distinguish where laser blasts are coming from. But what the AW300 really needs is basic polished drivers, because that's all we ask of a \$39 product. An applet to switch easily between speakers and headphones wouldn't hurt either.

### MAXIMUM PC VERDICT

Price \$39  
Company AOpen  
Phone 800.369.6736  
URL [www.aopenusa.com](http://www.aopenusa.com)

5

## Yamaha WaveForce 192XG

The WaveForce 192XG gets its name from the 192 MIDI voices it can play simultaneously. Only 64 voices are played through the onboard hardware wavetable; the other 128 are played via CPU-assisted software synthesis. The card uses XG technology, a superset of general MIDI, for better sound quality. Yamaha says the difference between regular MIDI and XG is like the difference between 256 and 16.7 million colors. While we don't find XG to be *that* stunning, it is pretty decent if you're willing to give up CPU cycles for it.

### Pluses

Good MIDI  
Eats joysticks for lunch

### Minuses

Bombed DOS tests  
No wavetable connector  
No additional expansion

Like the AW300, the 192XG uses CRL's Sensaura 3D algorithms and does a great job with *Jedi Knight* sound effects. In fact, over headphones, the 192XG makes *Jedi Knight* sounds as good as it does when playing over an A3D card. Blaster shots rain down on you with precision, but be advised that your ears may hear things differently, so road test this virtualized 3D sound before you buy into it.

Unlike the AW300, the 192XG features an applet to swap between speaker and



headphone rendering, and doesn't spare connectors. You get inputs for modem, aux, and PC/PCI, as well as two CD inputs. Yamaha also includes two 1/8-inch outputs, but they're a tease; you're not getting quad sound. One output is a stereo line out, while the other is the same output amplified. A3D 1.0 is "emulated" by redirecting the calls to DirectSound3D. There was no EAX support in the drivers we received, and it's unknown if EAX will be added in the future. The card did skate past all our joysticks unscathed, however.

Our brutal 3D sound test bogged down the 192XG. As we added more and more DirectSound3D streams, the Yamaha slowly drained all life from the system. Our test inflicts more chaos than anything that currently happens in real-world gaming, but you have to wonder what will happen when developers begin adding more sounds to games. With this Yamaha card, you may not hear some of them.

### MAXIMUM PC VERDICT

Price \$70  
Company Yamaha  
Phone 800.468.3775  
URL [www.waveforce.com](http://www.waveforce.com)

6



# Turtle Beach Montego II

Based on Aureal's Vortex 2 chipset, the Montego II offers almost all the must-haves in today's soundcards: DirectSound and DirectSound3D acceleration in hardware, 18-bit DACs, a hardware wavetable connector, and loads of other connectors. Of all the cards in this roundup, the Montego II is the only card to offer support for Aureal's A3D 2.0 wavetracing technology. The Montego II supports

## Pluses

A3D 2.0 support  
Good performance

## Minuses

No quad support  
No digital outputs

DirectSound3D acceleration, as well.

Turtle Beach has promised driver updates to add support for Creative Labs' EAX API.

Like its Vortex 2 sibling, Diamond's fabu MX300, the Montego II produces first-rate sound, crisp explosions, and MIDI that's a little too neutral at times, but satisfying nonetheless. The Montego II tested well in most of our benchmarks, turning in the lowest CPU utilization scores of any of the shipping products



reviewed here. While it lagged by 3fps in *Turok 2*, the Montego II rendered the best in-game sounds.

Be aware, the board submitted to us for review was the "white box" edition shipped in pre-fab systems and sold through Turtle Beach's web site. The only glaring missing features were full quad-sound support and digital outputs. A header on the Montego II lets you add a S/PDIF, but Turtle Beach has opted not to let Montego II owners buy breakout boards for quad-sound. The missing features appear in the full retail version, called the Montego II Quadzilla, which wasn't available for review at press

time. While we like the performance and feature set on the Montego II, we have to advise you to wait for the Quadzilla.

## MAXIMUM PC VERDICT

Price \$99  
Company Turtle Beach  
Phone 800.233.9377  
URL www.tbeach.com

# 8

## SOUNDCARDS: COMPARISON AND BENCHMARKS

For comparison purposes, we've included VLSI's latest sound chip, which promises incredibly low CPU utilization. The VLSI chip will be reviewed in a future issue. To test CPU utilization, we concurrently ran a fixed set of WAV files and Win98's System Monitor, which reports a utilization percentage (the first number

in utilization scores; lower is better). We then concurrently ran the same WAV file set and Shiny's PerfTest benchmark (the second number in utilization scores). This benchmark, which measures system performance in DirectX gaming, should top out at 161; lower scores indicate the sound processing is sucking CPU cycles.

SOUNDCARD	AOpen AW300	Yamaha WaveForce	Guillemot ISIS	Turtle Beach Montego II	VLSI Thunderbird 128	Edirol UA-100
Chipset	ESS Maestro-2	Yamaha YMF724	ESS Maestro-2EM/ Dream 9707	Aureal Vortex 8830	VLSI VT21702	Proprietary Roland
<b>HARDWARE SUPPORT</b>						
DirectSound3D streams	5	8	5	16	64	0
DirectSound streams	69	22	69	96	128 <sup>1</sup>	0
S/N Ratio	>85db	>90db	>85db	>97db	N/A	N/A
DAC/ADC	16-bit / 16-bit	16-bit / 16-bit	20-bit / 20-bit	18-bit / 18-bit	N/A	20-bit / 20-bit
<b>% CPU UTILIZATION</b>						
8 mixed signals <sup>2</sup>	3% / 152	4% / 149	5% / 152	1% / 148	2% / 154	1% / 136
16 mixed signals <sup>2</sup>	33% / 144	22% / 147	12% / 147	6% / 143	6% / 151	2% / 133
24 mixed signals <sup>2</sup>	36% / 134	26% / 141	16% / 141	13% / 138	23% / 145	5% / 130
<b>% CPU UTILIZATION WITH 3D SOUNDS</b>						
8 mixed signals <sup>3</sup>	8% / 140	1% / 146	1% / 101	6% / 146	1% / 156	1% / 115
16 mixed signals <sup>3</sup>	30% / 106	22% / 111	34% / 77	9% / 136	3% / 152	20% / 94
24 mixed signals <sup>3</sup>	58% / 76	49% / 77	69% / 58	23% / 119	5% / 149	39% / 72
<b>REAL-MODE DOS SUPPORT</b>						
Dark Forces	Passed	Failed	Failed	Passed	N/A	Failed
Redneck Rampage	Passed	Failed	Failed	Passed	N/A	Failed
<b>GAMING PERFORMANCE</b>						
Turok 2 (800x600)	40.9fps	40.8fps	38.7fps	38.4fps	37.1fps	37.6fps
Quake II (800x600)	46.7fps	45.1fps	45.6fps	45.5fps	45.1fps	45.1fps
<b>WIN9X FEATURE SET</b>						
DirectSound accelerator	Yes	Yes	Yes	Yes	Yes	No
DirectSound 3D accelerator	Yes	Yes	Yes	Yes	Yes	No
A3D 1.0 support	Yes <sup>4</sup>	Yes <sup>4</sup>	Yes <sup>4</sup>	Yes	Yes <sup>4</sup>	No
A3D 2.0 support	No	No	No	Yes	No	No
EAX support	No	No	Yes	No <sup>5</sup>	Yes	No
DLS	Yes	Yes	Yes	Yes	Yes	No
Adjustable sample RAM	Yes	Yes	Yes	Yes	Yes	No
Resources	1 IRQ / 1 DMA	2 IRQ / 1 DMA	1 IRQ / 1 DMA	2 IRQ / 1 DMA	1 IRQ / 1 DMA	0 IRQ / 0 DMA
<b>STATS</b>						
Price	\$30	\$70	\$390	\$99	N/A	\$499
Maximum PC Verdict	5	6	8	8	N/A	8

Test system: Micron 400MHz Pentium II, Intel Seattle motherboard, Windows 98, DirectX 6.1, Diamond Viper 330 and Monster II 8MB <sup>1</sup> Thunderbird 128 can process 64 DirectSound streams on hardware with another 64 streams using MMX processing on the host CPU. <sup>2</sup> Using the DirectSound 3D mixer in the DirectX 6.1 SDK, we played various wav files of different lengths and frequencies and monitored CPU utilization with system monitor and Shiny 1.4 DirectX Perf Test 1.4 <sup>3</sup> Using the DirectSound 3D mixer in the DirectX 6.1 SDK, we played various wav files of different lengths while moving the sounds with the DS3D mixer. The Mixer was minimized and CPU and PerfTest measurements were taken separately. <sup>4</sup> A3D 1.0 is achieved through emulation. <sup>5</sup> Aureal and Turtle Beach will add EAX in forthcoming driver updates.



## Guillemot Maxi Studio ISIS

Agent Cooper from *Twin Peaks* would know what to say if he heard the Roland MIDI samples that power Guillemot's Maxi Studio ISIS: "Damned good MIDI. And hot."

Of all the soundcards reviewed here, including the specialized Edirol box, the Maxi Studio turned in the most pleasing MIDI. But the Maxi Studio ISIS isn't really made for the everyday fragger. It is Guillemot's latest push to bring pro-level features a step closer to the masses.

The Maxi Studio is really two soundcards in one. The first component is the impressive "Console 8/4" breakout box. Equipped with eight 1/4-inch mono inputs and four 1/4-inch outputs, the Maxi

Studio is a miniature recording studio for your PC. Using the bundled *Logic Audio Pro ISIS* application, you can perform simultaneous multitrack recording straight to your hard disk for re-mixing, pitch shifting, and editing. ISIS supports DirectX audio plug-in effects, as well. The Console 8/4 includes RCA connectors, optical ports for digital I/O, and a full complement of MIDI ports. Guillemot also wisely moved the **DACs** and **ADCs** that handle digital-to-analog sound conversion out of the noisy confines of the PC and over to the Console 8/4.

### Pluses

MIDI breakout box  
20-bit external DACs  
EAX support  
Damned good MIDI

### Minuses

3D performance lags  
Immature drivers



The Console is connected to the PCI soundcard in your PC via a hefty cable. The PCI card is powered by two **DSPs**: a Dream RISC chip and ESS's Maestro-2EM. Unlike other new wave PCI cards that store MIDI samples in system RAM, Guillemot chose to add a SIMM slot to the PCI card and pack 4MB of RAM onboard. Up to 32MB can be sandwiched onboard. You switch between the external box and a "multimedia" mode via an applet, and then reboot.

Although the breakout box and so-sweet-it-hurts MIDI impressed us, we were less jazzed by the performance of the card in multimedia mode. Loading the card up with DirectSound3D samples drained a lot of CPU cycles, sending the ISIS to the bottom of the 3D streaming heap. Still, *Turok 2* and *Quake II* didn't suffer framerate drops in real-life testing. We couldn't get real-mode DOS support to work, even though Guillemot technical support assured us that it's available. But EAX support is available (with a long list of presets for games), as well as quad-support that'll make the ricocheting Razorjack projectiles in *Unreal* sing around walls. A3D 1.0 emulation is present, but unfortunately is supported only in stereo mode.

### MAXIMUM PC VERDICT

Price \$390  
Company Guillemot  
Phone 877.484.5536  
URL www.guillemot.com

8

## Edirol AudioCanvas UA-100

It's a software synthesizer, it's an effects box, it's a MIDI controller, and more. But most of all, it's fun. The UA-100 is a great gadget for any musician's toolbox. Professional electronic musicians will love the opportunity to plug in RCA jacks and two 1/4-inch electronic instruments, and record up to 44.1kHz directly to their hard drives. And because the UA-100 goes through USB and not a soundcard, you won't pick up the interference normally associated with soundcard recording. Even better, the box has a 20-bit digital output for recording to DAT.

Because it's USB-dependent, the UA-100 will work only with Windows 98. On the other hand, despite the fact that the UA-100 isn't a soundcard, it still includes the full Roland GS soundset (with 546 sounds) and is capable of handling up to 128 voices. While the box doesn't include a joystick port, you shouldn't have any problem playing MIDI-enabled mouse/keyboard games.

We did encounter a conflict with our MPEG-2 decoder board during installation. Disabling the drivers cleared it right up, though, and once we were running, we were spacing out like *Meddle*-era Pink Floyd.

The first thing we did was hook up our Kurzweil 2000 keyboard to one of the UA-100's two MIDI-in jacks and play with Edirol's

killer audio adjustments, which include reverb, chorus, bass, and countless other parameters. Each adjustment module is the equivalent of a standard guitar effects pedal. The only drawback is that with a few of the effects, depending on which instrument sound is sent through the box, you may not hear a change at all. We found this to be the case especially with instruments that have longer sustain, such as violins and cellos. And sometimes the effects can sound downright awful. But that's where your job as a supreme tweaker comes in.

The UA-100 includes so many tweakable settings, you'll find yourself playing with sounds for hours trying to find the right one. The good news is that once you've found the sound, you can save it as a preset.

After tooling around on the keyboard, we plugged in our microphone and entered the VT Mixer. Here you can alter your voice with effects that'll have you sounding like anything from a high-pitched chipmunk to a slo-mo robot. While this mixer was a load of laughs, the novelty wore off quickly. And we were disappointed that once we perfected an effect, we couldn't carry it over to the other mixer.

When you add up everything that comes with this box, you'll quickly see the UA-100 is an outstanding value.

### MAXIMUM PC VERDICT

Price \$499  
Company Edirol  
Phone 800.380.2580  
URL www.edirol.com

8





# SPEAKERS

Reviewed by  
**RICK POPKO**

## Gallant AudioStorm MT7F/X

These cool-looking speakers use the new **electro-planar** flat-panel technology, but deliver some of the worst sound we've ever heard. We'd take a pair of bundled no names before we'd bring this set home. The biggest problem lies in the speakers' plastic faceplates: Deep notes cause tinny reverberations that are totally unacceptable, cutting-edge technology notwithstanding.

In fact, the MT7F/X system needs to be tossed out the window and redesigned from the ground up. The setup consists of four satellites,

a small subwoofer, and a Dolby Pro Logic decoder box. The satellites weigh only a few ounces apiece, and the metal lump in the base of each of these featherweights isn't heavy enough to support the speakers at different angles. If you don't adjust a satellite's angle just right, the speaker will tip over.

The satellites are also just 3 watts each. Such low power translates into increased distortion at high volumes.

While its design is certainly futuristic, the breakout box supports a watered-down

version of last year's Dolby Surround Pro Logic technology: The setup lacks a true middle-channel speaker (part of the Pro Logic spec), and instead blows the middle channel stream through the subwoofer. Of course, real Pro Logic or this year's Dolby Digital would be preferred. Also, the cable that goes from the decoder to the sub is only about 12 inches long, so you'll need to arrange your components in proximity to each other. The subwoofer itself is a dismal-sounding coffee can of a speaker that drops off the spectrum at 100Hz.

The decoder box has an LCD display that denotes switches among Dolby Pro Logic, lesser surround sound, and stereo modes, and has adjustments for volume and balance. But forget about bass and treble controls. The speaker system's most annoying feature is you can't turn the volume up without suffering horrible consequences. Gallant needs to completely reconsider these speakers, and take some electro-planar cues from Monsoon (see the November 98 issue).

### MAXIMUM PC VERDICT

**Price** \$149  
**Company** Gallant Computer  
**Phone** 510.656.5887  
**URL** www.gallantcom.com

2

### Pluses

Ships with plenty of satellite cable  
Electro-planar coolness

### Minuses

Terrible audio quality  
Ersatz Pro Logic  
Flimsy design  
Not worth the price



## Parasound Media Lab ML-1

At first glance, this nondescript three-piece set looks like it belongs bundled with an OEM system—but looks can be deceiving. Each of the small, 10-watt satellites are weighty (about three pounds a piece) and encased in a thick, nonresonant plastic shell that gives your audio a stable, earthy quality. The satellites' cabling is heavily shielded, and Parasound provides plenty of cable length for those who like a lot of distance between speakers.

The satellites are powered through the sub, while dual audio inputs grace the main satellite. We like being able to plug two audio sources—say, your computer input and maybe a home stereo input—into the main satellite and toggle between the two with the flick of a switch. But Parasound is much less generous with tweakable controls. All you get are a sub adjustment and main volume control—no

bass and treble controls for you! You don't get mike or headphone jacks either.

The 15lb discrete servo subwoofer pumps a solid, thumping bass that handles between 40Hz and 50Hz with only slight bleeding into the satellites' range. The package includes a couple of satellite stands, but they're about as functional and attractive as a Bonded Pinto without tires.

At 10 watts per satellite, Parasound's small, 5.5-inch speakers put out surprisingly rich sound. However, the Microsoft Digital 80s—a competing three-piece set—are easily just as powerful and about \$40 cheaper. Also, unlike the Media Labs, the Digital 80s support USB digital sound and come with a software equalizer. In the

performance/value war, it's clear that Microsoft has it over Media Labs every way to Sunday.

### MAXIMUM PC VERDICT

**Price** \$200  
**Company** Parasound  
**Phone** 877.636.3342  
**URL** www.medialab-hifi.com

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### Pluses

Solid satellite casing  
Generous cable lengths  
Two inputs

### Minuses

No frills except volume knobs





# Cambridge SoundWorks Desktop Theatre 5.1

We couldn't wait to get our hands on these speakers. Out of all the speaker sets reviewed in this roundup, the Desktop Theater 5.1 is the only rig to support Dolby Digital (a.k.a. AC-3). The 5.1 is a seven-piece set that includes a front right, front left, center-channel, sub, back right, back left, and decoder box—this is just what you'd want if you have a DVD player and hardware MPEG-2 decoder with S/PDIF-out. The S/PDIF-out goes to the S/PDIF-in on the Cambridge breakout box, which looks and feels kind of cheap, but delivers true 5.1 sound.

We tested the speakers using the James Bond flick *Tomorrow Never Dies*, and they worked as advertised, delivering six discrete channels of multiplex sound. The breakout box has two inputs— analog and S/PDIF—and independent controls for master, center, subwoofer, and surround sound volume. You also get buttons for a special speaker test (to make sure you have all six speakers hooked up right), mute, and audio mode, which lets you select from preset audio options such as music, movie, and 4.1 stereo.

That's the good news. The bad news is that the five satellites and subwoofer sound horrible when you turn up the volume. This can be attributed to the incredibly weak wattage that the little 3-inch units put out (5 watts for each satellite and 15 watts for the sub). Compare these numbers to the Microsoft speakers that jam with 16 watts per satellite and 44 watts for the sub. The plastic subwoofer, which is barely bigger than a regulation-sized football, could only handle between 63Hz and 80Hz before falling off the charts.

The 5.1's cabling is flimsy, as are the rinky-dink plastic speaker-stand legs. The setup doesn't come with bass and treble controls or mike and headphone jacks. If Cambridge wanted to do the right thing, it'd sell the set we



looked at for \$150; as it stands now, these speakers just don't have the power that hardcore audiophiles crave. This is disappointing because Cambridge makes some great stuff—the PSW-1 subwoofer won our Gear of the Year award last year.

Our suggestion to Cambridge is, if you're going to skimp on components for a lower-end product line, do it under a pseudonym so you don't tarnish your pristine image and reputation among hardcore audiophiles.

## Pluses

True 5.1 sound  
Multiple volume settings

## Minuses

Poor subwoofer  
Feels cheap  
Expensive

## MAXIMUM PC VERDICT

**Price** \$300  
**Company** Cambridge SoundWorks  
**Phone** 800.367.4434  
**URL** www.hifi.com

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## SPEAKERS: DARE TO COMPARE

58

FEATURE	Gallant Computer AudioStorm MT7F/X	Microsoft Digital Sound System 80	Labtec ATX-5820	Parasound Media Lab ML-1	Cambridge SoundWorks Desktop Theater 5.1
Number of Pieces	6	3	3	3	7
Supported audio formats	Stereo, Dolby Pro Logic	Stereo	Stereo, surround sound	Stereo	Stereo, surround sound Pro Logic, Dolby Digital
Watts per satellite	3	16	13	10	5
Watts per subwoofer	12	44	44	25	15
Satellite dimensions (HxWxD)	7x5x.5	6.5x5x4.5	10x4x4.5	5.5x4.5x4	3x3x3
Subwoofer dimensions (HxWxD)	8x5x5	13x7x7.5	15x11x11	11.5x8x10.5	9.5x6x6
Analog or Digital support	Analog only	Analog and digital	Analog	Analog	Analog and Digital S/PDIF
Power Adapter input	AC 110V	AC 120V	AC 120V	AC 120V	DC 15V
Equalizer	No	Yes (in software)	No	No	No
Headphone jack	No	No	Yes	No	No
Number of inputs/outputs	1	2 (including digital)	1	2	2 (one analog/one S/PDIF)
Bass/treble controls	No	Yes	Yes	No	No
<b>STATS</b>					
Price	\$149	\$160	\$200	\$200	\$300
Maximum PC Verdict	2	7	5	6	7



# Surround Sound

## ► A tale of three standards

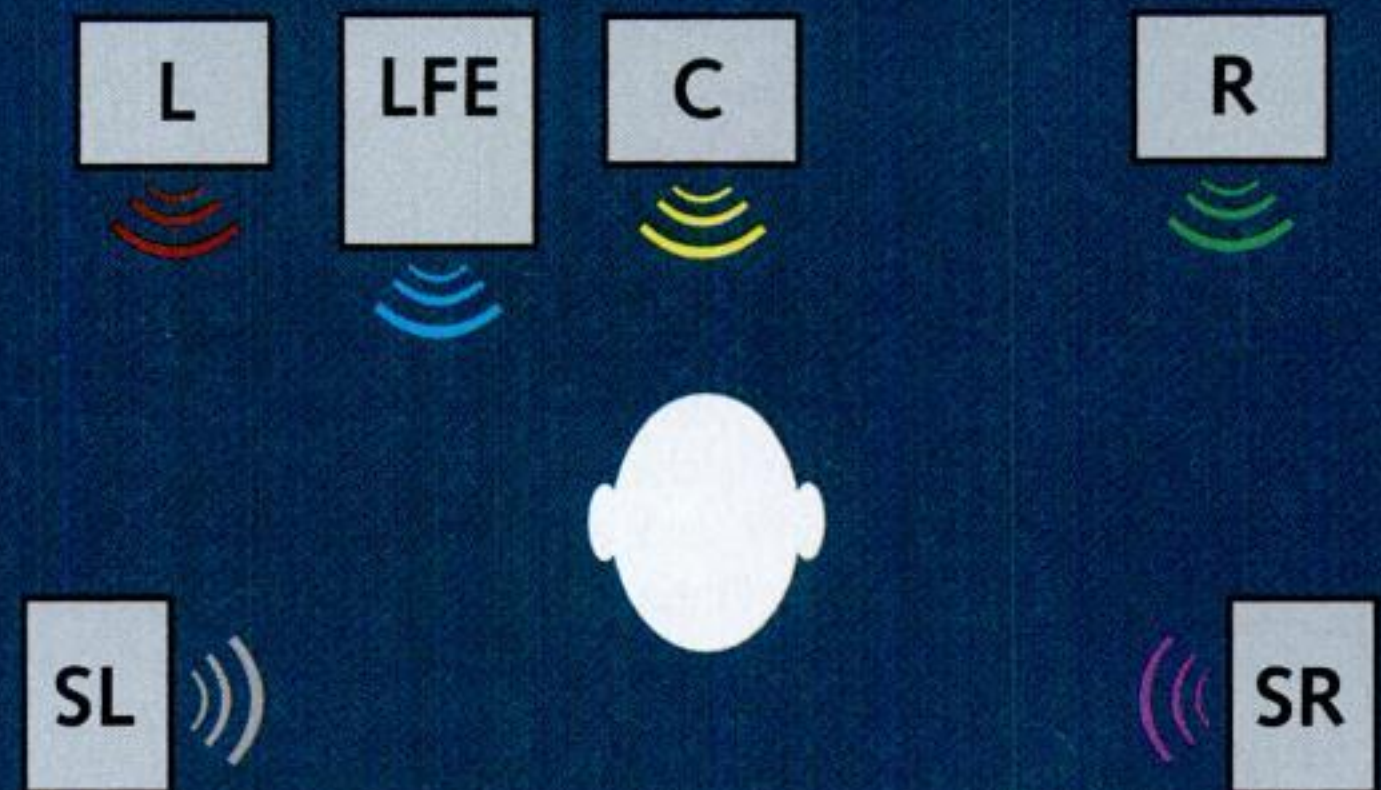
Even horrible speaker systems such as the Gallant Audio-Storm below offer support for surround-sound audio. But just like speakers systems, all surround-sound standards are not created equal. The most germane differences lie in the number of discrete—or independent—channels that each standard offers. Here are the speaker layouts for the three most popular surround-sound standards; each distinct speaker output color represents a discrete audio channel. All surround-sound standards can “mix down” to simple stereo, so don’t be shy about buying a pumping, multi-channeled speaker system even though you only have a few 3D-audio games and haven’t bought a DVD-ROM drive yet. Surround-sound computing is the wave of the future and will only become more prevalent during the course of the year.



### ► Dolby Digital 5.1 (AC-3)

Applications: DVD movies, laserdiscs, HDTV

Necessary Outputs: 6 analog outs; S/PDIF to decoder

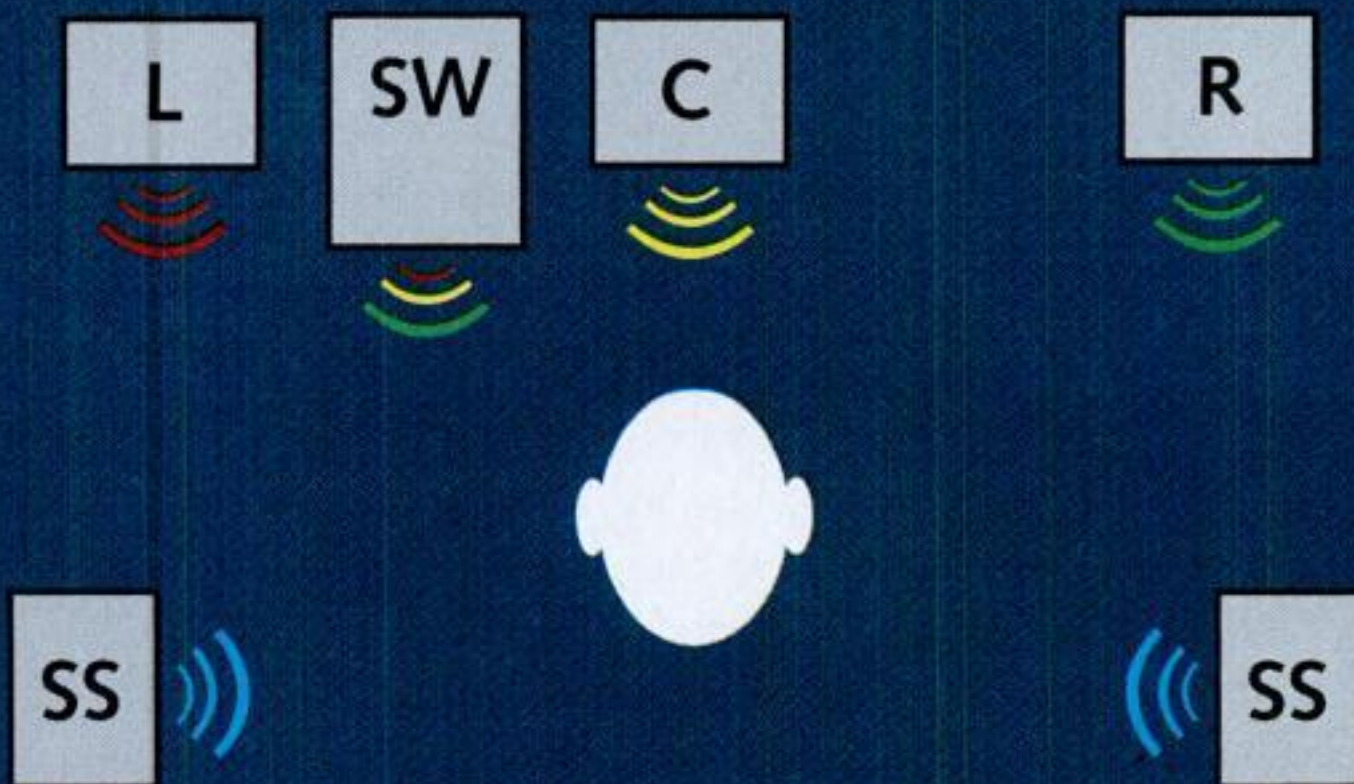


Dolby Digital 5.1 offers six discrete channels: front-left, front-center, front-right, surround-left, surround-right, and a special low-frequency effects channel that adds extra oomph to explosions, shotgun blasts, and the like. The low-frequency channel operates at a limited 3Hz to 120Hz—thus it’s denoted as the fractional “.1” in “5.1” (the other channels offer a full frequency response of 3Hz to 20,000Hz and can be augmented with individual subs if you really wanna get nasty).

### ► Dolby Pro Logic Surround Sound

Applications: DVD movies, laserdiscs, VHS, radio

Necessary Outputs: 1 analog out to Pro Logic decoder



Dolby Pro Logic offers four discrete channels: front left, front-center, front-right, and a single limited-bandwidth (100Hz to 7000Hz) surround-sound effects channel that’s piped through both the left-rear and the right-rear speakers. A subwoofer that handles low-frequency crossover from the front three speakers is optional.

### ► EAX & A3D Quad Support

Applications: Games that use four-channel APIs

Necessary Outputs: Dual-stereo outs on the soundcard



The DirectSound3D, EAX, and A3D gaming APIs offers four discrete channels: left-front, right-front, left-rear, and right-rear. An optional sub carries bass crossover from the front channels. The rear channels can be used by game developers to create ambient 3D effects. For example, when you fire the Razorjack in *Unreal*, you can hear sounds ricochet off every wall and behind your head.



## Labtec ATX-5820

We really wanted to like these speakers. Labtec is best known for making the throwaway speakers bundled with OEM systems (of course if PC manufacturers shipped good speakers with their systems, there wouldn't be a need for a story like this). And because Labtec has been the joke of the speaker industry for years, we really wanted them to stage a comeback and show us what a bunch of wankers we've been for making fun of them. So when they called and said they wanted to send us their "top of the line" speakers, we hoped they were going to floor us.

At first glance, it looked like Labtec had righted its wrongs. The 5820's satellites are hefty, and the air-purifier-sized subwoofer had us anticipating an intense ear-bleeding sound session. But, alas, this would not be the case.

### Pluses

Huge subwoofer  
Treble/bass controls

### Minuses

Not good at high volumes  
Hokey surround sound

In practice, the 5820 barely differentiated itself from other three-piece speaker systems. We didn't have a chance to drive the sub to its upper limits because its volume is controlled from the right satellite, and when we turned this volume control to the max, the sub only put out a light bump instead of the thump-pumping we were expecting (notwithstanding volume, the sub did sound good, hanging in between 50Hz and 63Hz).



But we still wanted to hear major cranking, so we turned up the main volume—and the satellites started rattling. The truth is, the 5820s are not made for cranking. If you push them to the limit, expect major distortion from the underprepared 13-watt satellites.

If there's one thing that'll get a *Maximum PC* editor excited, it's adjustable controls. We love tweaking things, and the 5820 doesn't disappoint. It has knobs for bass, treble, volume, and surround sound, but the surround sound, like any kind of pseudo-spatializing effect, sounds hokey. Give us generic stereo, give us Pro Logic, give us Dolby Digital 5.1, but whatever you do, please don't give us anything that has the word "virtual" in it, because all virtual 3D audio sucks.

Included plastic brackets let you easily and snugly mount these speakers to your monitor. And unlike all the other speaker makers in this roundup, Labtec was the only company to include headphone and microphone jacks.

We have no doubt that Labtec can make great speakers, but next time out, we want to see something that demonstrates that they can deliver the goods.

### MAXIMUM PC VERDICT

Price \$200  
Company Labtec  
Phone 360.896.2000  
URL [www.labtec.com](http://www.labtec.com)

5

## Microsoft Digital Sound System 80

The Microsoft 80 offers the cleanest digital sound you'll never hear. You have to jump through a prohibitive number of hoops to use this three-piece setup in its digital mode, a USB-based scheme that ditches your soundcard and its intrinsic line noise.

Before you even try to access the 80's digital sweet spot, you should read the lengthy read-me file, which explains who will and will not be able to take advantage of pristine digital audio. Aside from needing USB jacks and adequate USB operating-system support, you'll need a CD-ROM drive that supports digital audio extraction. Not all ATAPI CD-ROM drives are equipped with this support, and SCSI CD-ROM drives are entirely hapless (though Plextor says it's working out a fix for its own SCSI drives). And because of USB support restrictions, these speakers won't work under NT until Microsoft builds a USB patch. We should also note that DVD-ROM users can't play DVD soundtracks through USB.

But the problem that bugged us the most was intermittent audio dropouts. Audio CDs played fine as long as we didn't touch the mouse or attempt to actually work in an application. As soon as we did, the music would sputter, stop, and start again after we stopped

what we were doing. It should be noted that this problem occurred only when using the digital connection (and remember that when using the digital connection, you only get basic Sound Blaster support in games).

These speakers actually work quite well in the "noisier" analog mode, which entails hooking the speakers directly to the soundcard in the traditional fashion. However, if you go analog, you can forget about using the software-based 10-band equalizer, which only works when you're running digital. This is a shame, because the equalizer is one of the 80's coolest features, letting you tweak your soundscape to perfection and save your presets.

In both digital and analog mode, the speaker output was surprisingly crisp and clear. In fact, for sheer intrinsic sound quality, the Microsoft Digital 80s are the best speakers in this roundup. The satellites are made of reinforced plastic for minimal vibration. The subwoofer's frequency response was phenomenal, managing to handle between 63Hz and 50Hz before dropping off the radar. But we do have a problem with the subwoofer design: the bottom has two big unprotected diaphragms. When we picked the sub out of the box, we almost poked our fingers through the diaphragm paper.



### Pluses

Incredibly crisp audio  
Sturdy satellite casing  
10-band equalizer

### Minuses

Digital mode not for everyone  
Digital audio drop outs  
Poorly protected subwoofer diaphragms

### MAXIMUM PC VERDICT

Price \$160  
Company Microsoft  
Phone 800.426.9400  
URL [www.microsoft.com/hardware](http://www.microsoft.com/hardware)

7



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Environmental effects use reverb and echo to simulate the natural acoustics of a particular environment.

Whether your gaming action takes place in a large metal arena or small padded room, the reverberation and echo can be adjusted to match what you would hear in real life.

## Competing APIs

Different APIs, or programming interfaces, let game developers access these new soundcard features. The API that captured the most mindshare early on was Aureal's A3D 1.0. Improving on, but still very similar to, Microsoft's original DirectSound3D, A3D 1.0 has arguably been the most successful 3D positional sound API to date.

Creative Labs, the creator of the Sound Blaster standard that helped unify PC sound in the first place, has responded to A3D with its own Environmental Audio eXtensions (EAX) API, a direct subset of DirectSound3D. These extensions are simple commands that link to a general reverberation engine on the soundcard. The extensions—an easy way for programmers to induce effects such as "large cave" or "small metallic corridor"—have helped push developer support for a standardized API on DirectSound3D. Creative's competitors QSound and ESS have since joined Creative's side in supporting EAX.

In response to EAX, Aureal has just launched its A3D 2.0 API, an engine that uses geometry models to render how sounds are actually manifest in the real world. A3D 2.0 also provides for occlusion effects, which

simulate how things sound when they move behind environmental barriers.

So how do you pick the right soundcard? It's clear that support for DirectSound3D and EAX is a must-have going forward because of its Microsoft backing and ease-of-use for developers. But since Aureal supports DirectSound3D as well, and plans to support EAX in the future, your choice may depend on the game titles that float your boat. You should also consider the hardware acceleration abilities and feature set of each card under consideration.

Currently, only the Vortex 2 chipset—which appears in the Turtle Beach Montego II and Diamond Monster Sound MX300—supports A3D 2.0. EAX support is found in Creative Labs' 10K1 chipset (which appears across Creative's entire Sound Blaster Live! line-up), as well as in chipsets from Guillemot, ESS, and VLSI.

Don't confuse APIs with 3D audio rendering engines—Chipset A may interpret a particular API quite differently than Chipset B. For example, Aureal, Creative Labs, QSound, and Central Research Labs all have their own takes on how to filter DirectSound3D calls to create the best 3D positional effects. What sounds best and most realistic is subjective, but everyone agrees that quad-speaker support and using headphones when in two-channel mode is imperative for 3D positioning. Quad speakers help widen the sweet spot in which a person can tell where positional sounds are coming from. Nearly all the

top soundcards support quad speakers or more. Even more effective for some people are headphones, which place positional effects right against your ears. Companies such as QSound have designed 3D positioning filters that completely rely on the special acoustic properties of headphones.

## Get on the Bus

Today's intense sound effects need major processing power. Sure, you could assign your CPU to process the din of distant gunfire, but then you wouldn't have enough CPU cycles left to set up polygons and lighting effects. Nope, what you really need is a dedicated sound processor. Enter the new breed of soundcards that feature DSPs devoted to audio excitement. By necessity these soundcards must ride the PCI bus. Why? It's the bandwidth, stupid. With ISA's 6Mbps bandwidth ceiling, sounds from the card must be limited to just a few channels. But the PCI bus provides 132Mbps of bandwidth, allowing card designers to stream multiple channels without worrying about a bus bottleneck. ISA's bandwidth limit also precludes the opportunity to use system RAM for MIDI sample storage, a scheme used to great effect by PCI cards. So expensive memory must be physically added to ISA cards, driving up prices.

Whether you go for USB speakers or Dolby Digital, A3D or EAX, it's clear the revolution is upon us. Join up, Citizen, or lose your head. ☀

## ISA vs USB vs PCI... FIGHT!

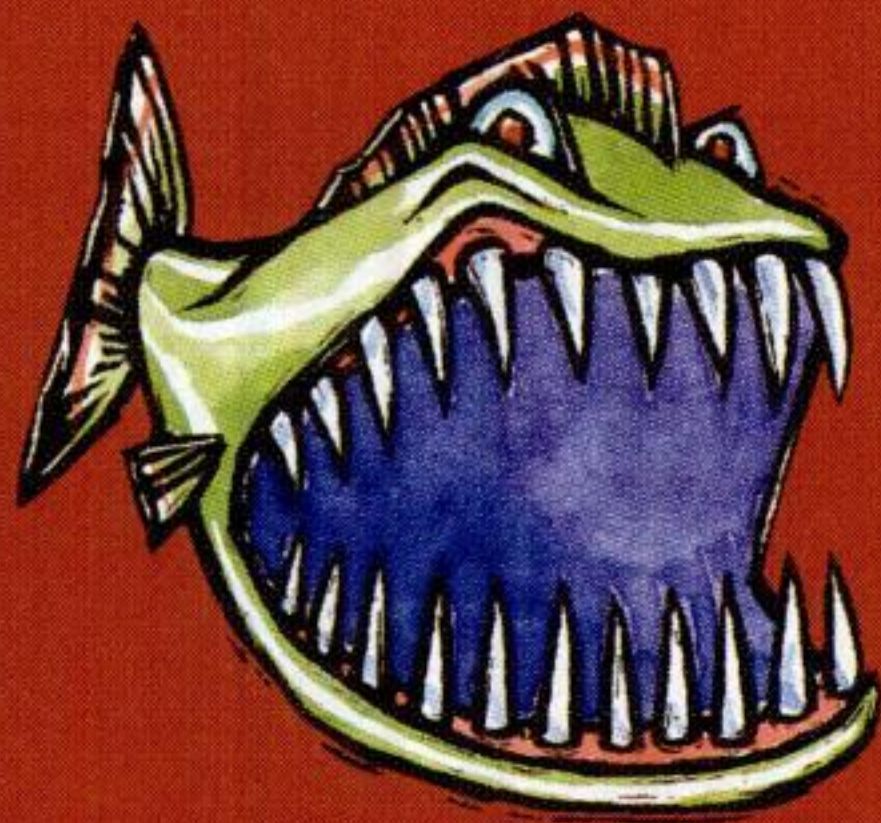
USB audio is the splinter faction in the audio revolution. USB speakers completely bypass your soundcard and instead plug directly into your USB port. Raw digital audio signals flow from your system straight down the USB pipe and are ultimately

decoded by a DSP inside the speaker itself. This scheme promises clean, noise-free sound because it removes audio processing from the noisy electrical environment of the motherboard. Here's how ISA-, USB-, and PCI-based sound solutions stack up.

ISA	USB	PCI
<b>BANDWIDTH:</b> 2Mbps–6Mbps	<b>BANDWIDTH:</b> 12Mbps	<b>BANDWIDTH:</b> 132Mbps
<b>IRQ REQUIRED?</b> Yes	<b>IRQ REQUIRED?</b> None, besides root USB controller	<b>IRQ REQUIRED?</b> Yes
<b>PROS:</b> 100% Sound Blaster DOS Support; economical; doesn't eat precious PCI slot.	<b>PROS:</b> Plug-n-play, hot-swappable; easy to install, no need to crack open case; processes sound outside the electrically noisy PC box; pure digital signals	<b>PROS:</b> Bandwidth, bandwidth, bandwidth; speed of bus allows MIDI samples to be loaded into system RAM, negating need for onboard RAM and lowering cost of soundcard
<b>CONS:</b> Low bandwidth to the CPU; not enough bandwidth to handle multiple audio streams; soon-to-be extinct, trailing-edge technology	<b>CONS:</b> Occasional buggy sound drop-outs; requires CD-ROM drive that can extract digital audio for music CDs; bandwidth suffers when other devices—such as scanners, printers and mice—ride the USB bus; external-only solution may not fit everyone's needs	<b>CONS:</b> Requires a precious PCI slot; never truly 100% compatibility without odd workarounds such as "PC/PCI" port or TSR; clumsy TSRs consume precious IRQs; still an inside-the-electrically-noisy-PC box-only solution
<b>FUTURE:</b> ISA soundcards are doomed, but remaining stock will continue to sell in the millions because of low pricing.	<b>FUTURE:</b> Cloudy. Next-generation products such as IEEE 1394 and even USB 2.0 may relegate USB to low-bandwidth peripherals such as mice and keyboards.	<b>FUTURE:</b> The future is with PCI for now and the foreseeable future. The only threat to it will be external plug-n-play schemes such as IEEE 1394 and USB 2.0, but both will be of no threat for good long while.



SO WHAT IF  
WE'RE THE  
SMALL FISH  
IN THE  
BIG POND.



Piranha, pi-ran'ya, n. A small, voracious freshwater fish that will attack any sized opponent, no matter how large.

We're not  
the biggest,  
so we have to  
be the best.

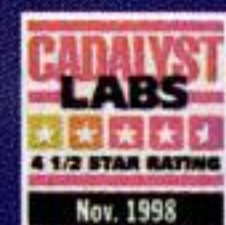
So, we're not the biggest – that means we try harder...we have to be the best. By offering the perfect **combination of** service, quality and price, you get the best hardware solution possible. **Personalized Service:** You will be assigned a SAG Integration Specialist who will be your single point of contact from pre- to post-sale. It's their job to know your system inside and out.

**100% True Customization:** Everybody claims to offer customized solutions, but our systems are truly built to order; you specify it, we build it. **Warranty & Support:** Our 3-year extensive warranty rivals the industry giants – plus you'll speak directly to our own on-staff tech advisors.

**Leading Edge Technology:** We are known for being first-to-market with the latest technology.

**Best Price:** Our prices continually beat our competition, see for yourself at [sagelectronics.com](http://sagelectronics.com).

**Top Quality:** We only use top-of-the-line components. That's why we've won so many awards. Here are just a few:



BX Workstation



Xeon Rackmount



Xeon Workstation



Xeon LVD Raid





SAMPLE WORKSTATIONS

XEON EDITING & CADSTATION

- (1) Intel Xeon 450Mhz Processor
- 512KB Cache, Expandable To 2 CPUs
- 256MB SDRAM Expandable to 2GB
- Slots: (6) PCI, (1) ISA, (1) AGP
- (2) 9GB 10,000RPM LVD (5.0ms) Removeable HDs
- AMI LVD Ultra2 Raid 0-5 Controller
- #9 Revolution IV 32MB AGP 2X Video
- Sony 32X CD-ROM/Max
- Keyboard, Floppy, Mouse
- Full Tower 300 Watt

**\$4290**  
ES Galaxy 52MB Dual Port Solution \$5370

STA DUAL XEON 450MHZ

- (1) Intel Xeon 450Mhz Processor
- 512KB Cache, Expandable To 2 CPUs
- 128MB SDRAM Expandable to 2GB
- Slots: (6) PCI, (1) ISA, (1) AGP
- Sound & Ethernet 10/100 by Intel
- (1) Matrox G200 16MB AGP Video
- IBM 22GB 7200RPM IDE
- Sony 32X CD-ROM/Max
- Keyboard, Floppy, Mouse
- Full Tower 300 Watt

**\$2581**

**NEW!** STA DUAL PII 500/BX

- (1) Intel Pentium II 500Mhz Processor
- 512KB Cache, Upgr. To 2 CPUs
- 128MB SDRAM
- Slots: (5) PCI, (2) ISA, (1) AGP, BX chipset
- IBM 10GB 7200RPM Ultra-33 Drive
- Sony DVD CD-ROM
- Soundblaster Live
- Subwoofer Speakers
- 16MB Diamond Viper 550 TNT Video
- Keyboard, Floppy, Mouse
- Mid Tower Chassis

**\$2159**  
SCSI Drive Solutions Available

STA DUAL 450/BX

- Pentium II 450Mhz with 512K Cache
- 64MB SDRAM
- Slots: (5) PCI, (2)ISA, (1)AGP, BX Chipset
- 10GB 5400 RPM Drive (ST38641A)
- #9 Revolution IV 32MB AGP 2X Video
- Sony CD Recorder/Rewritable
- Keyboard, Floppy, Mouse
- Mid Tower Chassis

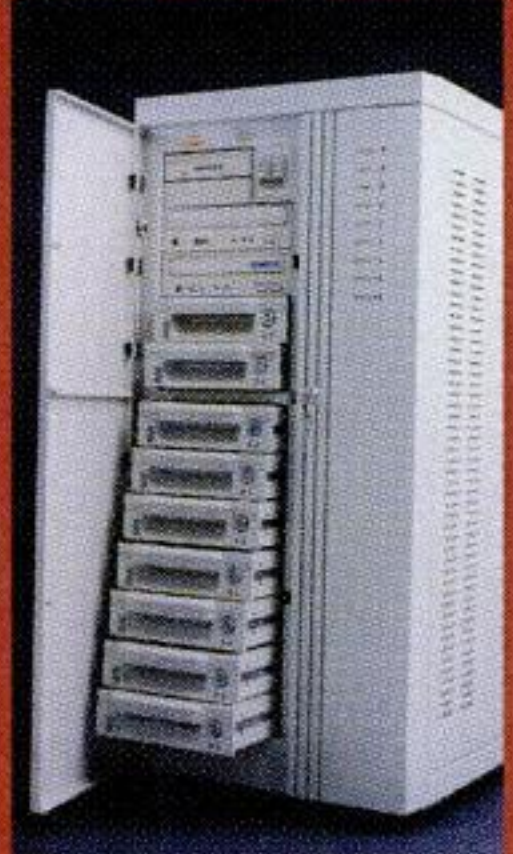
**\$1,718**

STB CELERON 333

- Celeron 333Mhz w/128K Cache
- 32MB SDRAM
- Slots: (3)PCI, (3)ISA (1 shared), (1) AGP, BX Chipset
- Integrated: PCI Soundblaster 8MB nvidia Video
- 4GB IDE Hard Drive (ST34321A)
- Sony 32X CD-ROM/Max
- Keyboard, Floppy, Mouse
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# Burni

## A new breed of CD recorders has arrived.

Fast and easy to use, these recorders can pack a disc with 650MB of data, images, and digital video that can be read on any CD-ROM drive. A CD recorder (CD-R) can archive all your important files onto one polycarbonate platter that will survive into the next millennium. With the right software, you can even create a backup of your healthy hard drive on an unalterable CD-R disc for that ill-fated moment when your hard drive fails. There's also the added convenience of storing all your installation software on one CD-R disc instead of all those random CD-ROMs stored in places long forgotten.

CD recorders can fill a disc with 74 minutes of the same high-quality digital-audio tracks found on commercial audio CDs, and CD-R discs can be read by the majority of CD players. While this is a great tool for musicians eager to immortalize their latest masterpieces, it can also be used for music piracy. With a CD-R, you can easily duplicate a hot new album without degrading audio quality one bit.

Before we go any further, you'll need to stop rubbing your greedy

little hands together long enough to meet Mr. Copyright Violation. You see, CD-Rs may be able to accurately duplicate non-copy-protected discs, but if you don't actually own the disc you're duplicating, you're breaking the law. Creating a backup copy of an often-used disc is one thing, but mass-producing it to trade or sell is a federal offense.

The current controversy over MP3s and Internet music distribution has broken the copyright controversy wide open, and CD-Rs lie at the heart of the row. While the MP3 format itself isn't illegal, its use to compress copyrighted music into near-CD-quality files that can be transferred across the Internet—and

**by Sean Downey**

later burnt to CD-R—has alarmed the music industry. Motions are afoot to regulate the distribution of music in digital formats. New encrypted file formats and copy-protection schemes are being developed to stymie wily CD-R owners.

The intense public interest in CD-Rs couldn't come at a better time. The new generation of drives is quickly erasing the CD-R's rep as a slow-moving beast that requires special care and feeding. Ultra fast

8x CD-R drives can burn a full disc in a previously unimaginable nine minutes. These new drives arrive hand-in-hand with easy-to-use, GUI-driven recording software that simplifies the intricacies of CD mastering. Want to create a mixed CD of all your favorite music? Just select the tracks and hit the burn button. The latest software even lets you use your CD-R to digitally capture, clean, and burn your old record collection to CD-R discs.

CD rewritable (CD-RW) drives, which combine all the advantages of traditional CD recorders with the forgiving nature of rewritable media, add even more versatility to the mix. Worried about permanently etching your failures onto a CD-R disc? Try burning it to a CD-RW disc, and if all goes well, you can use the same drive to make a permanent commitment to CD-R.

When they first appeared two years ago, CD-RW drives burned rewritable discs more slowly than recordable ones, but faster engines take the latest generation of drives into the 4x write/4x rewrite realms. This makes CD-RW drives ideal for the conveniences of packet-writing software. Packet writing provides drive-letter access to your CD recorder, allowing you to drag and



# ing New Ground

drop files directly to a CD-R or CD-RW disc, much like you would with a floppy or Zip. While 4x may not sound very fast, it's only slightly slower than an ATAPI Zip drive, and

CD-RW has the advantage of being readable on any multiread-capable CD-ROM drive.

CD recorders aren't just competing for space in your PC as storage

devices. All the CD recorders reviewed here have notched up read speeds to CD-ROM drive levels—so toss your old read-only CD-ROM drive for a member of the new guard. ▶

## Spinning Gold

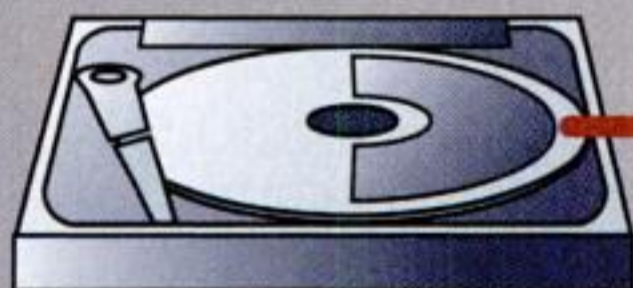
### Silver

The disc to be duped is read from the source CD-ROM drive.



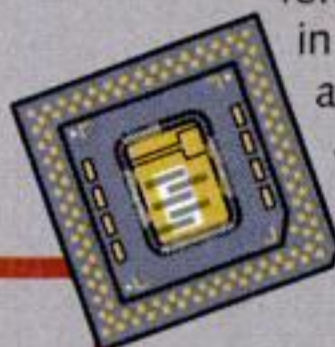
### Hard Drive

The data to be mastered is read from the hard drive.



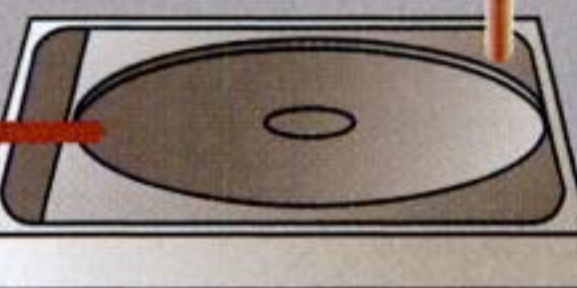
### Data Organize

The mastering software formats the data in the appropriate CD format and feeds it to the buffer.



### Buffer

Holds the data to be burned and streams it out to the recording laser at a steady rate.



### CD-R

The recording laser burns the data as pits and landings on CD-R and CD-RW discs.

The faster your CD recorder, the faster your PC will need to supply it with data. If a drive is interrupted during a recording session, the disc will be rendered useless. Although recorders come equipped with a data buffer to ensure the flow of data doesn't stop, the mastering software needs to

keep the buffer full. If it doesn't, you get a buffer underrun—and your disc is ruined. To keep everything primed and ready for the CD recorder, the mastering software arranges all the files contained in source data on your CD-ROM or hard drive into a virtual image that it spoon-feeds to the recorder.

Philips CDRW400 .....	64	Yamaha CRW4416 .....	66
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# Philips CDRW400

## All that glitters isn't gold

The bold lines and bitchin'-Camaro paint job on the Philips CDRW400 belie the less-than-dazzling engine under the hood. Slick packaging aside, this drive is a sub-par performer, bringing up the rear with Yamaha's CRW 4416SXZ in the majority of our benchmarks. The CDRW400 hit

3.7x speeds only when burning audio, conserving its strength at lower speeds through the majority of our recording tests. And the CDRW400's 12.5x read speeds are laughable for a 20x drive. Compared to the all-around versatility of Ricoh's MediaMaster, the only other

4x4x20 CD recorder in our roundup, the CDRW400 just doesn't cut it.

But don't think that the CDRW400 doesn't deserve any kudos. It's the easiest-to-use CD burner of the bunch. We found the bundled Philips *Write2CD* software (a repackaged version of CeQuadrat's *just!burn*) to be an innovative graphic approach to CD recording. With *Write2CD* you just choose what type of

disc you want to burn, drag the files to the window, hit burn, and you're on your way. No fuss, no muss.

Power tweakers may wonder where to go to adjust recording method options. You don't—*Write2CD* handles all the messy details so you don't have to. For instance, we couldn't make the software burn a disc-at-once audio disc—it automatically switched to track-at-once and went to work. While Philips' *Write2CD* makes the CDRW400 a good drive for CD-RW neophytes, it suffers from too much style at the expense of important substance.



With a database of more than 300,000 titles, *Write2CD* is a mixed CD creator's dream. The software automatically creates a cover and label with all the song titles, and provides rudimentary audio manipulation tools to clean up your tracks and test playback.

### MAXIMUM PC VERDICT

**Price** \$399  
**Company** Philips  
**Phone** 800.531.0039  
**URL** www.pc.be.philips.com

The Philips CDRW400 gets a great big brownie button for ease of use, but falls short in recording and CD-ROM read performance. Funny how ease-of-use and powerful performance never quite go together.



# Ricoh MediaMaster MP7040A

## Masterful performance

Ricoh's MediaMaster MP7040A turned in the best overall scores of the 4x rewritable drives tested. It set the pace in the data CD duplication and mastering benchmarks at a consistent 3.7x rate, and scorched through the CD-RW packet-writing test at damn near 3x speeds. It also

chirps like a chipmunk when overly excited.

The MediaMaster has a lot to chirp about. Besides laying down CD tracks lickety-split, it performs well as a CD-ROM drive and extracts both data and audio at 10x. In fact the only problems we experienced with the

MediaMaster occurred when we duplicated a mixed-mode disc from a CD-ROM drive on the same IDE bus—wham, bam, buffer underrun. This is more of a problem with the bundled software, CeQuadrat's *WinOnCD* 3.5, than it is the MediaMaster. Version 3.6 of *WinOnCD* is currently available from CeQuadrat, and it addresses this problem

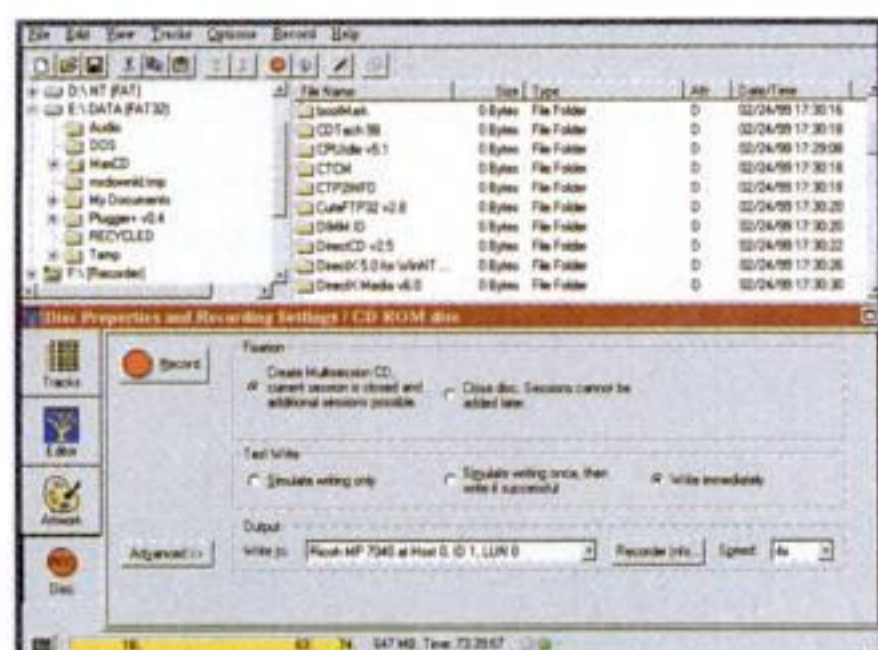
and adds support for CD Text and direct MP3-to-CD audio conversion.

MediaMaster uses CeQuadrat's *PacketCD* 3.0 as its packet-writing solution, a choice we heartily agree with. *PacketCD* is a graceful UDF 1.5 writer that cooks up a platter full of packet-written data as fast as fast can be. Each *PacketCD* written disc contains a UDF reader (written on an ISO portion of the disc) that you need to install on a PC before it can read the rest of the disc.

### MAXIMUM PC VERDICT

**Price** \$399  
**Company** Ricoh  
**Phone** 800.225.1899  
**URL** www.ricohcpg.com

Ricoh's MediaMaster lives up to its name with solid recording speeds, excellent packet-writing support, and superior data and audio-extraction abilities.



While the *WinOnCD* interface is still clunky, it supports powerful features such as hybrid disc creation and manually adjustable audio extraction settings that aren't found in other mastering packages.



# Smart and Friendly CD Rocket 8020

## Reaching escape velocity

Built around Sangyo's 8x20 drive mechanism, the CD Rocket CD-R managed to touch down in the high ground of our recording benchmarks. Averaging 6x speeds, the CD Rocket fell just short of the CD-mastering scores posted by the PlexWriter 8/20. Where the Rocket runs out of fuel, however, is in CD-ROM performance, lagging behind

most of the other drives as a reader, particularly when it comes to audio. It may hold the distinction of being the Sputnik of CD recorders, but the Rocket misfires when it comes to audio extraction.

Blame it on the post-Cold War Russian economic crisis if you like, or maybe on the bundled NTI *CD Maker Pro* software, which just doesn't deliver the speed of more robust mastering packages such as *Easy CD Creator* or *WinOnCD*. Any way you look at it, the Rocket doesn't have what it takes to reach the stars, especially when you factor in the drive's complete lack of packet-writing support.



CD Architect is a chock-full of all the features professional audiophiles crave, including auto-crossfades and full control over index marks and pauses.

This is really a shame because the CD Rocket is a great deal, and the sheer number of bundled apps is almost worth the price of the drive. We particularly liked the inclusion of Sonic Foundry's *Sound Forge XP* and *CD Architect*. If you're serious about burning CD audio, these are the tools to use. Unfortunately the same can't be said for the CD Rocket.



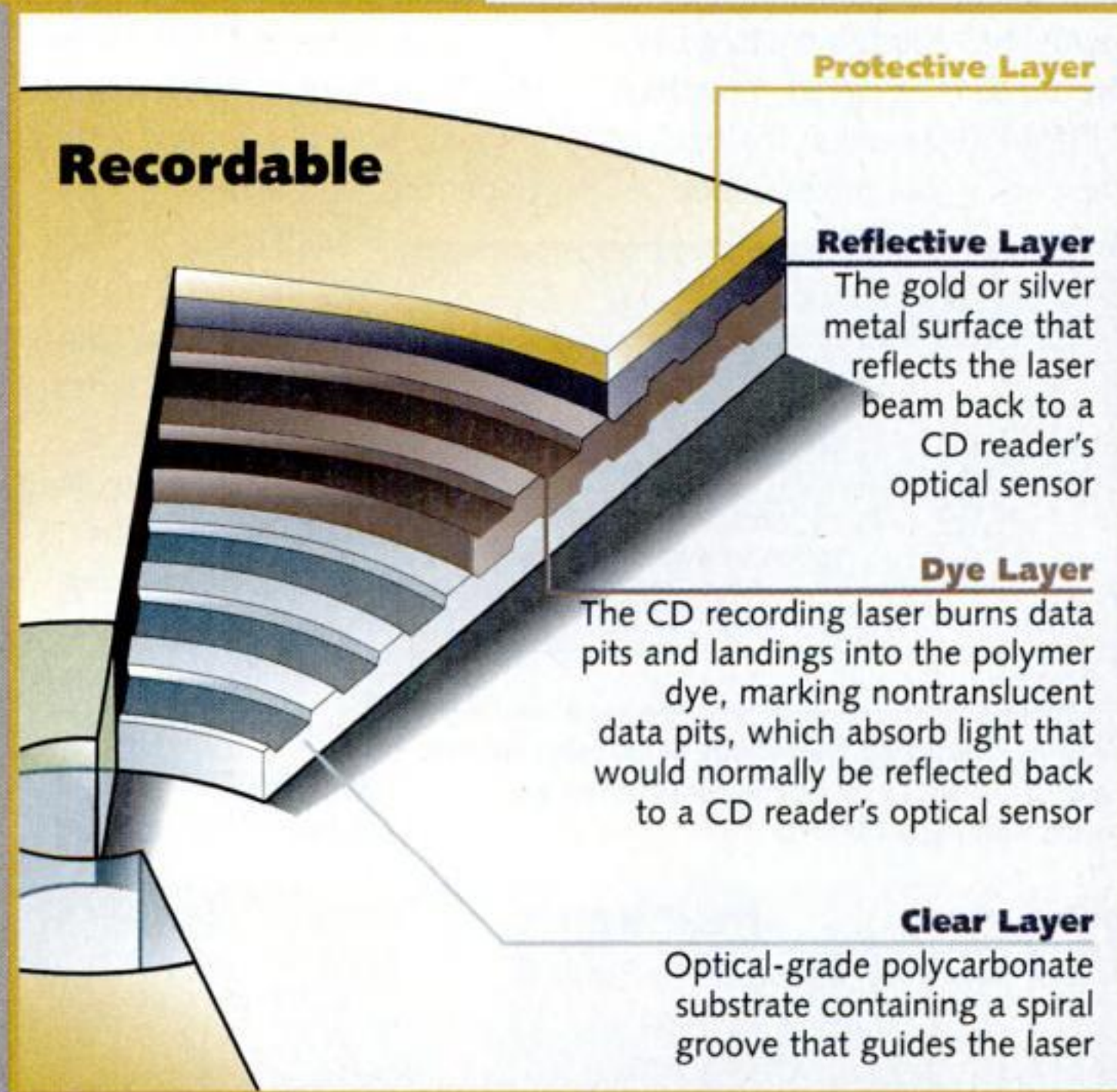
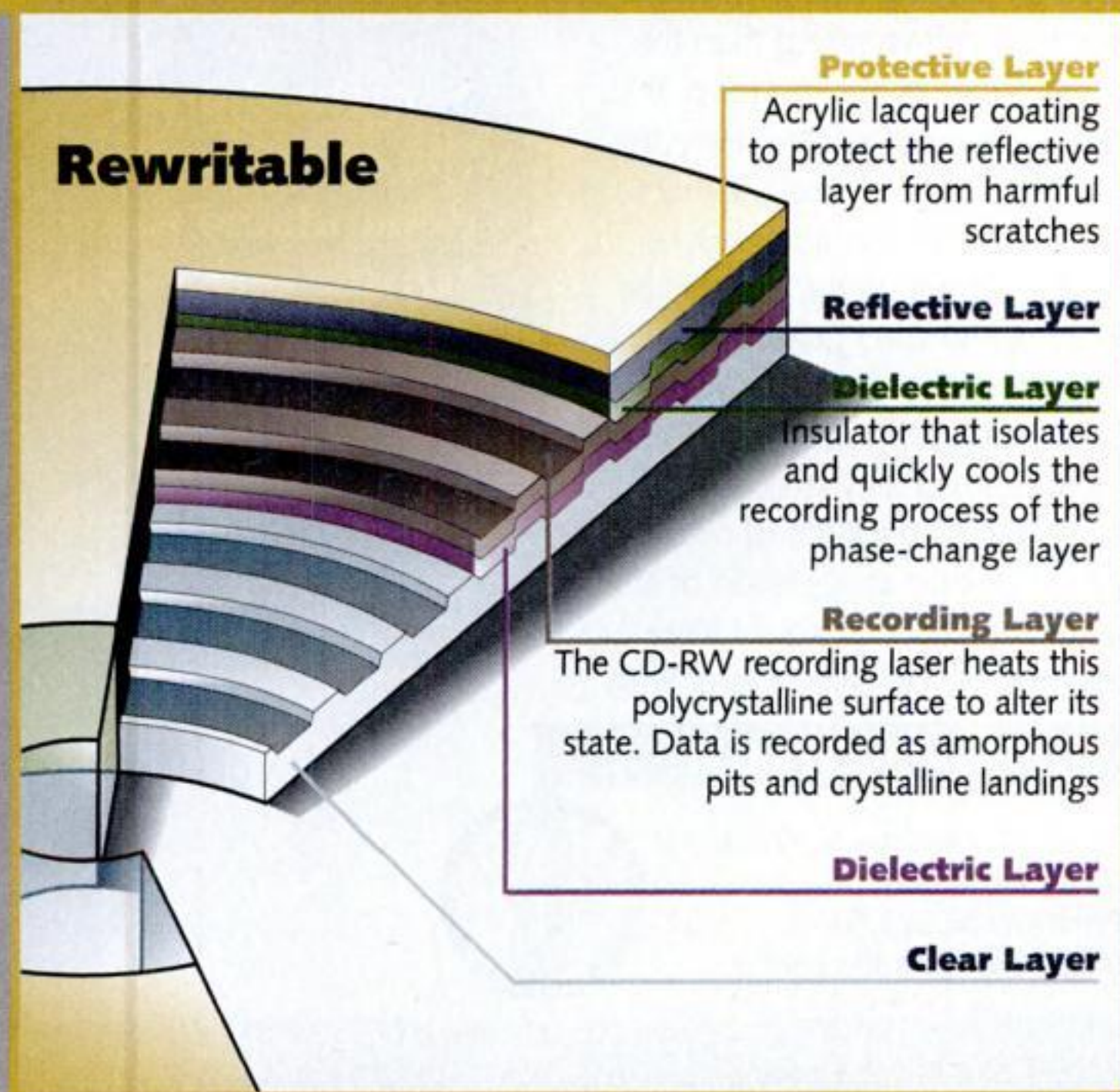
**In the race for faster recording speeds, the CD Rocket is the Sputnik of CD recorders—the first drive in 8x space. But don't confuse first with best. CD Rocket just couldn't top the performance of the PlexWriter 8020, the only other 8x20 CD-R in our roundup.**

### MAXIMUM PC VERDICT

**Price** \$599 internal; \$699 external  
**Company** Smart and Friendly  
**Phone** 818.772.8001  
**URL** www.smartandfriendly.com



## How it Works



Two types of discs are used with CD burners: recordable discs and rewritable discs. Recordable discs are layered with organic dye, gold or silver alloy, and polycarbonate plastic, and are used by both CD-R drives and CD-RW drives. Data is recorded on these discs when a CD recorder's write laser reacts with the dye in the recording layer to create pits and grooves out of reflective and nonreflective surfaces. Rewritable discs can only be written to by CD-RW drives but bring with them the added bonus of reusability (1,000-plus rewrites is standard). Instead of an irreversible burning process, a CD-RW drive's write laser uses phase-change technology

to create pits and grooves by changing portions of the recording layer from reflective to light absorbing. When you erase and reuse a CD-RW disc, the table of contents is wiped, and the new data is written directly over the old.

Although CD-RW discs have the advantage of reusability, older CD-ROM drives aren't able to read them. The latest generation of CD-ROM drives are designed to be multiread-capable, meaning they have an automatic gain control in their optical pickup that allows them to read the less-reflective CD-RW discs.



# Teac CD-R56S

## Heavyweight contender in a middleweight class

While not a groundbreaking drive, the CD-R56S manages to deliver rock-steady speeds. It handled the more intensive data portions of our benchmarks with aplomb, both creating and duping a data disc at 5.6x rates. It slowed down to more subdued 3x speeds, however, when notching audio tracks. What really knocked our socks off about the CD-R56S is its CD-ROM performance. It supports max sequential reads of 3.1MB/sec

and rips a 6:19 minute audio track in a stunning 24 seconds. Add in low CPU utilization and you have a CD recorder with a 15.2x CD Tach drive rating that's good enough to give your CD-ROM drive the boot.

Teac chose to bundle *Easy CD Creator 3.5*, and considering how straightforward and stable Adaptec's mastering software is, we're glad they did. *Easy CD Creator's* intuitive interface and powerful features, such as the

session selector and disc-recovery tool, keep *Creator* the CD-mastering software of choice for more CD recorders than any other software.

Blow-by-blow, Teac's 56S is an excellent drive. While it doesn't hit with the same force as the 8x drives in our roundup, it still delivers a powerful punch.

### MAXIMUM PC VERDICT

**Price** \$399 internal, \$499 external  
**Company** Teac  
**Phone** 213.726.0303  
**URL** www.teac.com

Teac's CD-R56S neither dipped into the slower territory of the 4x rewritable drives nor hit the big-time velocities of the dedicated 8x burners.



# Yamaha CRW4416

## I've got a bad feeling about this

A long time ago in a magazine far, far away, we called Yamaha's CDR400tx the best drive we'd ever used. Unfortunately, the sequel has a long way to go to live up to the original. Yamaha's CRW4416 lagged at the back of the pack in our mixed-mode

duplication and data CD-mastering benchmarks and only hit 3.6x write speeds on our data CD-duplication test.

What happened? All the elements are here: Yamaha's sturdy 4x write engine still defies buffer underruns, and excellent

RapidLinked technology handles high-speed packet writing with ease. Adaptec's *Easy CD Creator* is even included, making the CRW4416 the most stable burning environment on the planet. Yet we still feel the need for speed, and Yamaha doesn't deliver the goods.

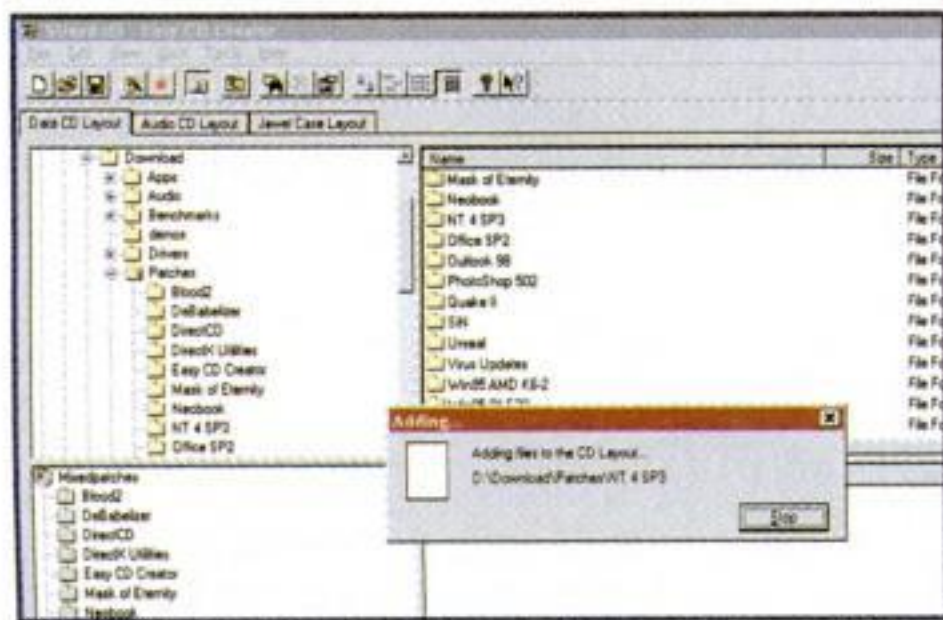
On the CD-ROM side, the CRW4416 only redeems itself by sticking closer to its advertised drive rating than the other drives in this roundup. It's not the slowest reader here (that honor goes to Philips' CDRW 400), but the Yamaha's 13.1x CD Tach drive rating, combined with its low CPU utilization, delivers consistent reads without affecting system performance.

It's admirable that Yamaha continues its tradition of reliability, but a little acceleration of the read/write speeds would have taken the CRW4416 a long way.

### MAXIMUM PC VERDICT

**Price** \$419 internal; \$499 external  
**Company** Yamaha  
**Phone** 800.823.6414  
**URL** www.yamaha.com

Yamaha delivers the goods with a dependable CD burner that's chock-full of features. Unfortunately high-speed recording doesn't make it on the list.



With no distracting animations or intrusive wizards, *Easy CD Creator's* four-pane construction window makes burning a CD easy.

## IDE vs SCSI

SCSI has traditionally been the interface of choice for recording CDs, but with IDE CD-Rs steadily gaining speed and reliability, the choice isn't as clear anymore. Since Hi-Val's H43316A-00R ATAPI CD-RW drive is a repackaged Yamaha CRW4416 (reviewed here), we used it to test how the two



Hi-Val brings Yamaha's sturdy 4x SCSI beast to the IDE bus

interfaces stack up.

The results are surprising, since the Hi-Val bested the

Yamaha in almost every recording benchmark (the mixed-mode CD dupe being the exception) and turned in the best overall packet-writing time of any of the CD-RW drives in this roundup. The Yamaha recomposed itself on the CD-ROM read performance side, where Hi-Val's CD-RW stum-

bled and mustered a measly 12.1x CD-Tach drive rating.

In the SCSI vs. IDE debate, it really comes down to a question of price. IDE drives are cheap and fast, but not as stable as SCSI drives. With SCSI, you pay a premium for the robust multi-tasking environment that a bus-mastering SCSI adapter provides.



# Plextor to the Rescue

Plextor ups the coolness quotient of the PlexWriter with its *PlexManager* software, which allows you to make fine adjustments to the drive's audio extraction abilities and spindown time. With *PlexManager*, you can view digital audio tracks as WAV files that can be dragged-and-dropped directly from a CD into any audio editor. You can also use *PlexManager* to scrutinize the format, tracks, and sessions contained on any disc you pop into the drive.

Windows 98 USB support is currently hobbled by the inability to play music or game sound effects from a SCSI CD-ROM drive on a USB speaker system. Normally CD audio is carried from the audio-out on the CD-ROM drive to the soundcard as an analog signal, but since USB speakers bypass the soundcard, the analog connection is worthless. *PlexManager* remedies this problem with support for transmitting digital audio directly across the SCSI bus straight to your USB speakers, giving you

full access to all the audio features of your Plextor CD-ROM drive.

But that's not all. *PlexManager* also contains a killer *DiscDupe* app that performs bit-by-bit-accurate disc copying from any Plextor CD-ROM drive. With *DiscDupe*, you can conceivably copy anything that exists on a polycarbonate platter. This means PlayStation discs, Mac discs, and even those lasciv-



PlexManager's simplified interface holds a host of powerful features.

ious discs they sell in the back of skin mags.

How much would you pay for a CD-ROM/CD-R combo like this? 729 bucks gets you in the door to the hottest CD recording action in town.

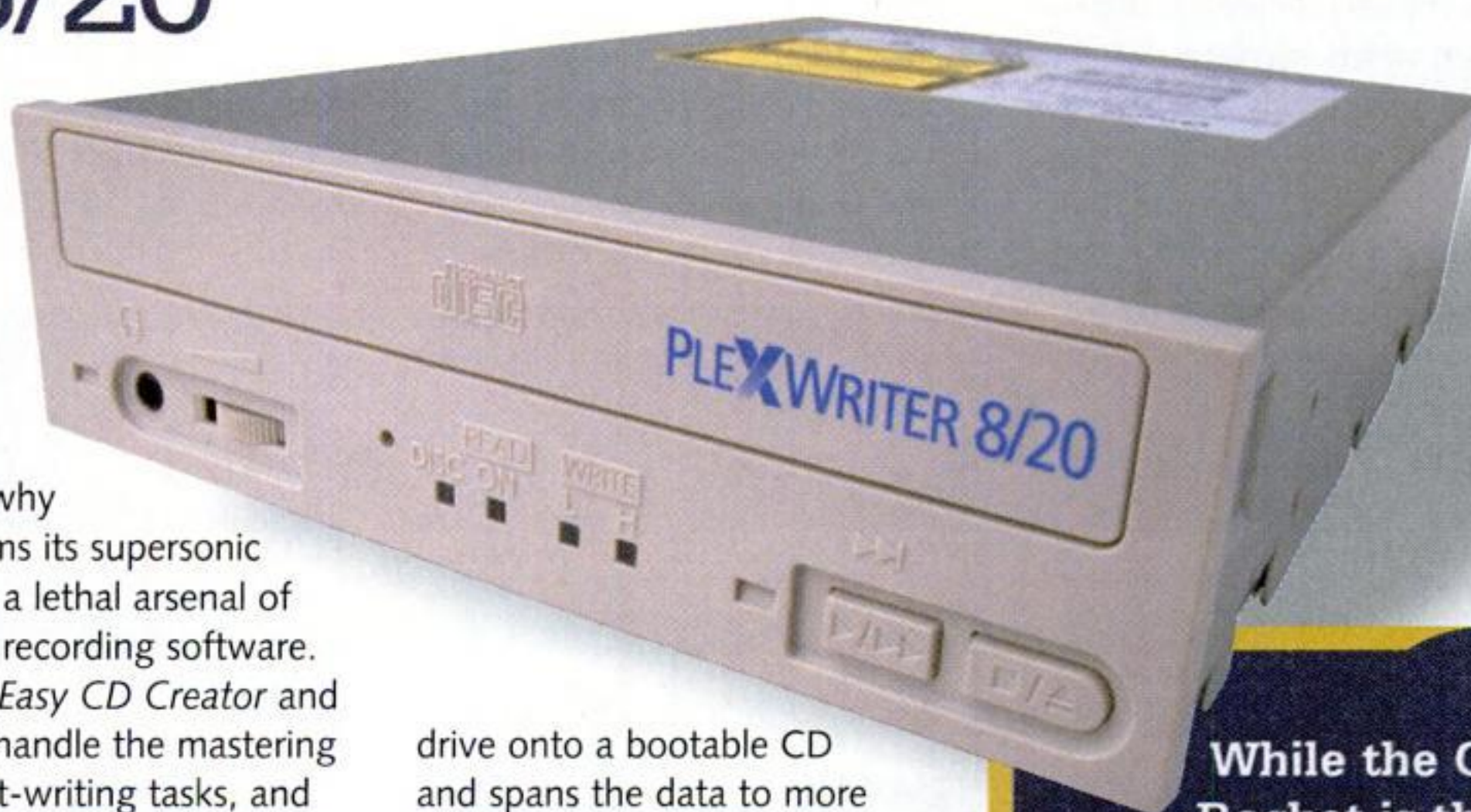
## PlexWriter 8/20

### One giant leap for recording-kind



The PlexWriter is the flat-out best CD recorder that's ever passed through our labs. While most of the 4x rewritable recorders took about 20 minutes to burn a 73 minute audio disc, the PlexWriter took half as much time to record the same tracks. It ripped through our disc duplication test at steady 7.2x speeds and created a 646MB data disc in an astonishing 11:14 minutes. The PlexWriter bested the CD Rocket, the only other 8x recorder in our roundup, in every conceivable way. Power like this shouldn't fall into enemy hands.

That's why Plextor arms its supersonic drive with a lethal arsenal of top-notch recording software. Adaptec's *Easy CD Creator* and *DirectCD* handle the mastering and packet-writing tasks, and Plextor's ultracool *PlexManager* (see sidebar) gives you access to more CD-ROM and recording features than you can shake a stick at. An added bonus is Plextor's *CDResQ* disaster recovery software, which makes system restores a painless process by backing up your hard

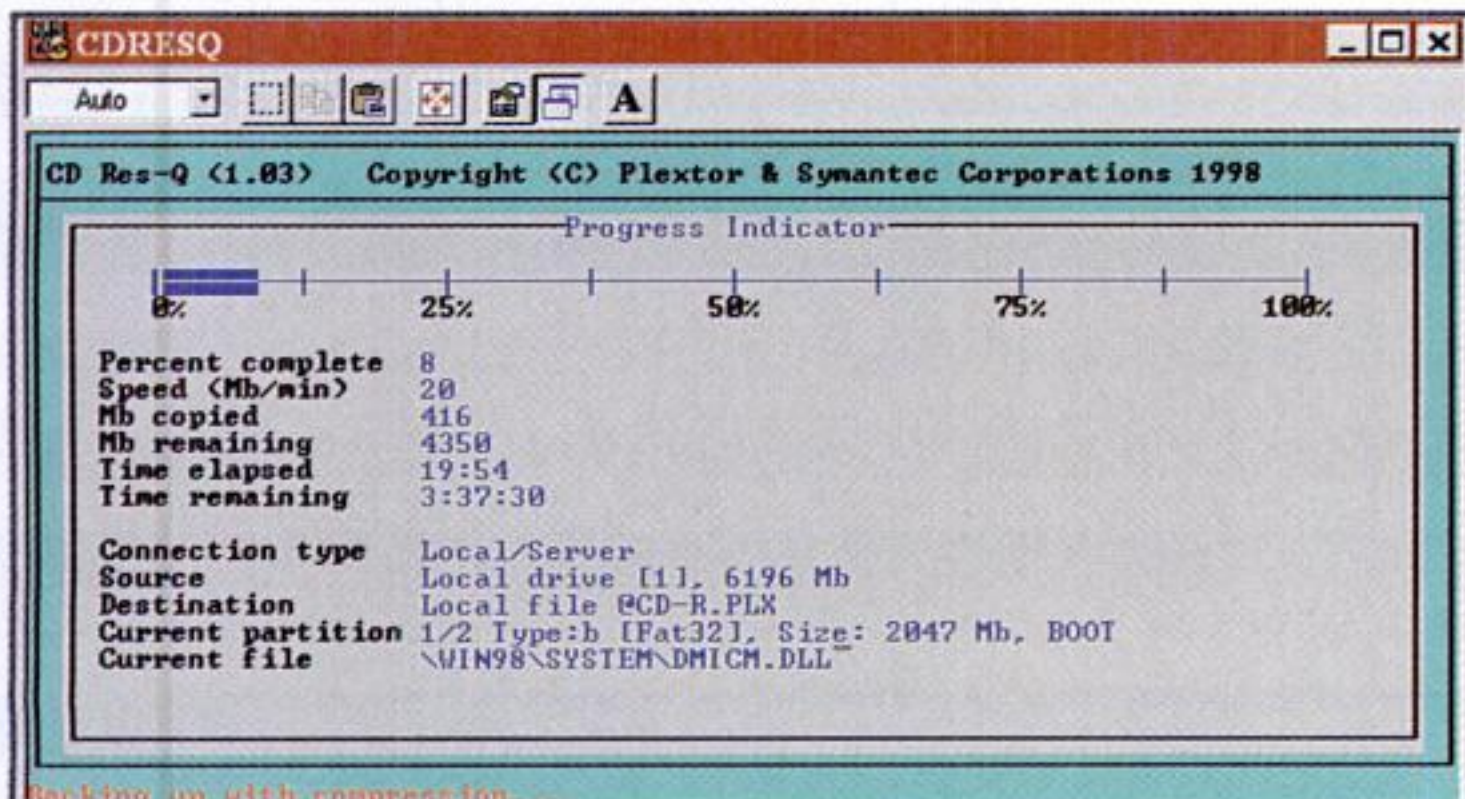


drive onto a bootable CD and spans the data to more discs as needed.

It's hard to burn a tosser with the PlexWriter. It's the only recorder in this roundup that comes stock with a 4MB buffer to smooth out data-access irregularities. Combine this with a new spindle-motor suspension system and you have a recorder that defies buffer underruns.

Plextor has truly taken CD recording to the next level with the multiread-capable PlexWriter 8/20. It has eliminated every variable that could possibly disrupt the writing process, except for human error.

**While the CD Rocket is the first drive to achieve escape velocity, the PlexWriter 8/20 will take you to the moon. It was the first to touch down in every recording benchmark and posted the best extraction rates of any CD-R drive we've ever tested.**



Once your hard drive is backed up by CDResQ, you can boot off the backup disc and restore your system in the event of a crash.

#### MAXIMUM PC VERDICT

**Price** \$529 internal;

\$594 external

**Company** Plextor

**Phone** 800.475.3986

**URL** www.plextor.com





# Benchmarking<sup>1</sup>

## CD Duplication (min:sec)

Smart and Friendly	19:55
Plextor	19:50
Teac	20:12
Philips	20:07
Ricoh	20:02
Hi-Val	20:31
Yamaha	13:25
Hewlett-Packard	10:15
Sony	10:21

Time to copy 646MB data disc

## Mixed-Mode CD Duplication (min:sec)

Smart and Friendly	11:07
Plextor	12:42
Teac	12:53
Philips	12:57
Ricoh	11:03
Hi-Val	12:21
Yamaha	09:34
Hewlett-Packard	07:52
Sony	07:53

Time to copy 286MB data/audio to disc

CD burners may share the same specs, capabilities, drive mechanisms, and platters, but still perform very differently depending on which interface—SCSI or ATAPI—the drives use, and what software feeds the burner data. **Recording Tests.** We used the software that ships with each CD

recorder to illustrate the strengths and weaknesses of the hardware/software combo. The benchmarks test disc duplication, disc creation, and packet writing, as well as data and audio extraction rates and CD-ROM read performance. **Disc Duplication.** Benchmarks were done on-the-fly, meaning

they copied the source disc without temporarily storing data on the hard drive. The first duplication test copied the single 650MB data track on Maximum CD 01. The second test duplicated *Half-Life: Day One*, a mixed-mode disc with one 160MB data track and 10 audio tracks totaling 15:87 minutes. On-the-fly disc duplication shows

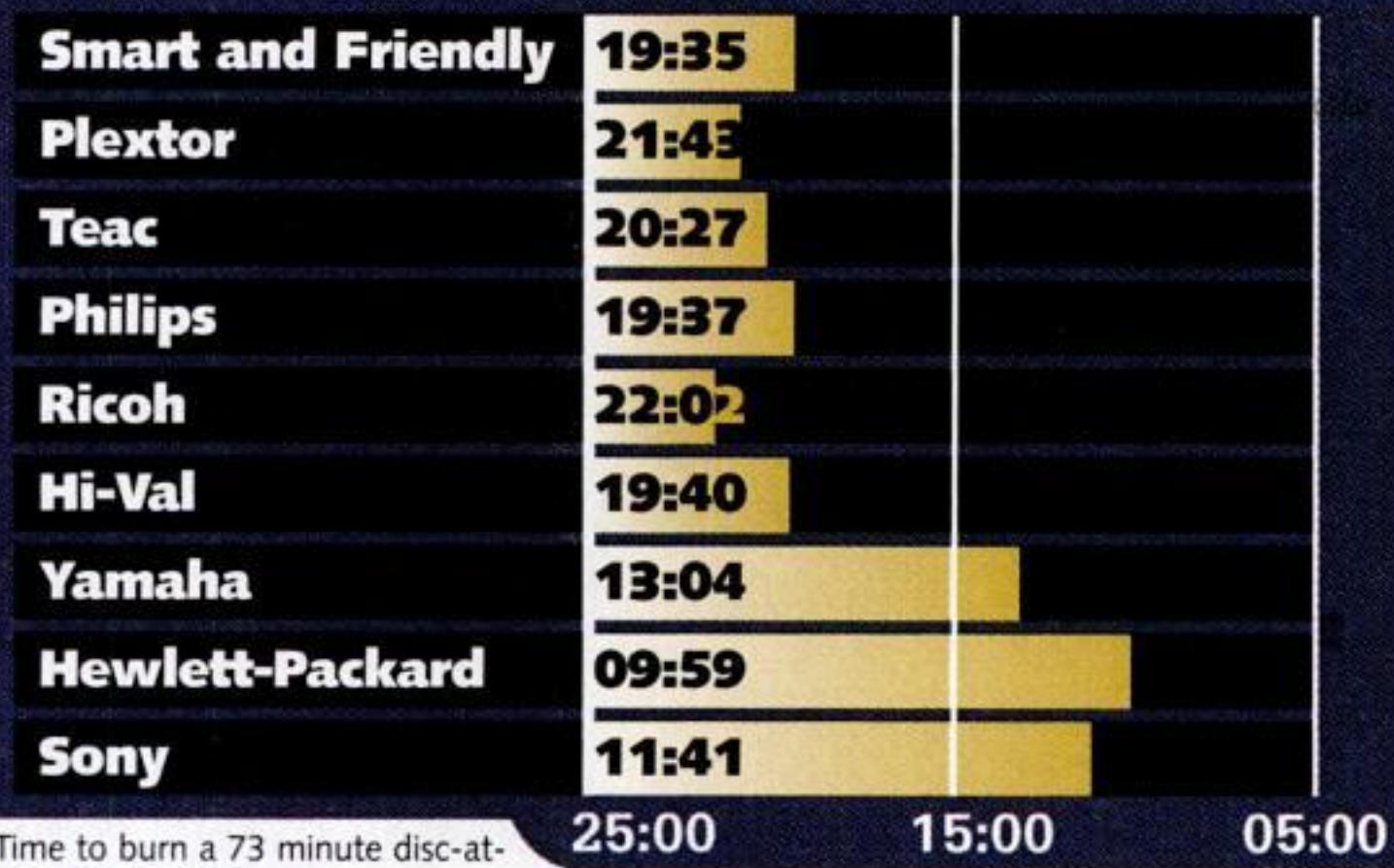
how well the software manages the data bus, which is especially important for ATAPI recorders transferring data on the same IDE channel as the source drive. **Disc Creation.** Benchmarks tested how well a CD recorder masters a disc from hard-drive source data. The first test burned a 73-minute, 11-track audio disc as a disc-at-once disc, which

MANUFACTURER	SONY <sup>2</sup>	HEWLETT-PACKARD	YAMAHA	HI-VAL	RICOH
Drive Model	Spressa CRX100E/CH	CD-Writer Plus 8100i	CRW4416	H43316Z-00R	MediaMaster MP7040 A
Drive Type	CD-R	CD-RW	CD-RW	CD-RW	CD-RW
THE SPECS					
Record/Rewrite/Read speed	4x/2x/24x	4x/2x/24x	4x/4x/16x	4x/4x/16x	4x/4x/20x
Interface	ATAPI	ATAPI	SCSI	ATAPI	ATAPI
Buffer size	1MB	1MB	2MB	2MB	2MB
Recording Methods Supported	Disc-at-Once Track-at-Once Multisession Incremental Packet Writing	Disc-at-Once Track-at-Once Multisession Incremental Packet Writing	Disc-at-Once Track-at-Once Multisession Incremental Packet Writing	Disc-at-Once Track-at-Once Multisession Incremental Packet Writing	Disc-at-Once Track-at-Once Multisession Incremental Packet Writing
Bundle	Sony (Prassi) CD-Right! 1.5   Sony (Prassi) abCD   Sony (Seagate) Spressa Backup	Adaptec Direct CD 2.5   Adaptec Easy CD Creator 3.5   Seagate Disaster Recovery   HP Simple Trax	Adaptec Easy CD Creator 3.5   Adaptec DirectCD 2.5   Adobe Photo Deluxe BE   Adobe Page Mill 3.0	Adaptec Easy CD Creator 3.5   Adaptec DirectCD 2.5   IBM ViaVoice 98   The Learning Company Internet Cyber Patrol 4.0   Mindscape PrintMaster Gold 4.0	CeQuadrat Win On CD 3.5   CeQuadrat just! Audio   CeQuadrat PacketCD 3.0   Seagate Backup Exec
CD-RW PACKET WRITING <sup>3</sup>					
Time to fill disc (min:sec)	NA <sup>4</sup>	26:13 (2.31x)	23:12 (2.61x)	<b>21:01 (2.89x)</b>	21:49 (2.78x)
Amount of disc used (MB)	NA <sup>4</sup>	531	533	<b>533</b>	533
CD-ROM PERFORMANCE					
Drive rating	<b>15.4x</b>	<b>15.4x</b>	13.1x	12.1x	13.6x
Min sequential read (MB/sec)	<b>1.5 (10.4x)</b>	<b>1.5 (10.4x)</b>	1.4 (9.5x)	1.4 (9.5x)	1.3 (9x)
Max sequential read (MB/sec)	2.8 (19.4x)	2.8 (19.4x)	2.3 (16.7x)	2.0 (13.7x)	2.7 (18.3x)
Full stroke/Random access times (ms)	206 / 131	207 / 129	231 / 146	147 / 248	<b>204 / 110</b>
Min/Max CPU Utilization	20% / 66%	20% / 66%	17% / 59%	25% / 64%	22% / 86%
CD MASTERING SOURCE DISC RATING					
Data read speed	10x	10x	10x	8x	10x
Audio extraction speed	8x	8x	7x	7x	<b>10x</b>
AUDIO EXTRACTION TESTS <sup>5</sup>					
Extract audio from inside of disc	0:48	0:47	1:00	0:58	0:41
Extract audio from outside of disc	0:44	0:46	0:37	0:37	0:27
STATS					
Price (internal / external)	\$400 / NA	\$350 / NA	\$419 / \$499	\$399 / NA	\$399 / NA
Maximum PC verdict	9	9 / KICK ASS	6	6	8

—red text denotes highest or best score

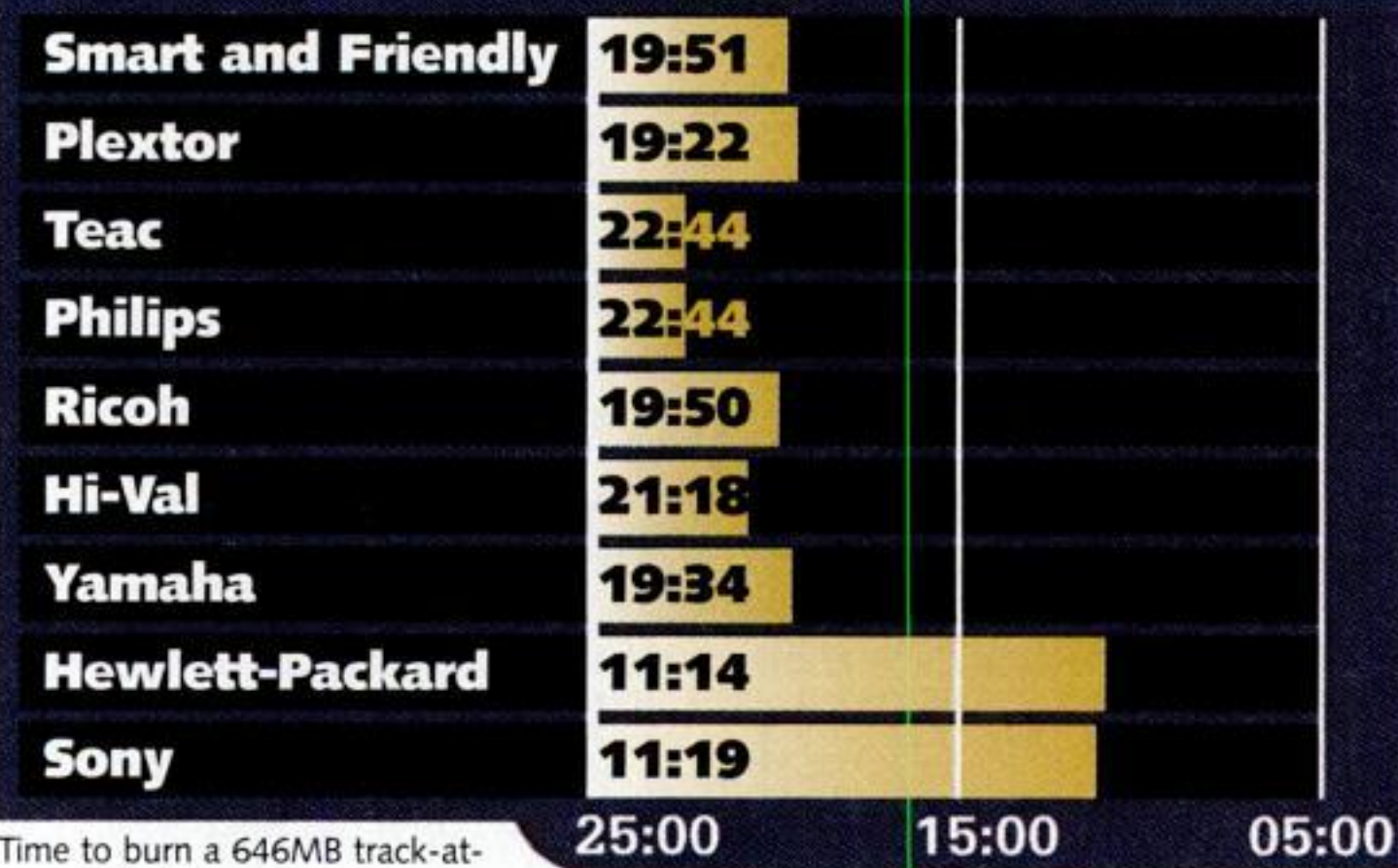


## Audio CD Creation (min:sec)



Time to burn a 73 minute disc-at-once audio disc

## Data CD Creation (min:sec)



Time to burn a 646MB track-at-once data disc

records in one shot without turning off the laser. Disc-at-once is especially important in digital audio recording because it creates a disc without two-second pauses between each track. The second test was a straight 646MB fast-as-you-can-burn, track-at-once data disc meant to illustrate a drive's peak write speed.

**Rewritable.** We used each CD-RW drive's bundled packet-writing software to pack as much data as it could on a CD-RW disc. We measured both the time it took to fill a disc and the maximum amount of data that could fit, since packet-writing requires a little more headroom than traditional CD mastering.

**CD-ROM Performance.** Testing was done with CD Labs' CD Tach 98, which reports an overall drive rating based on a weighted average of full-speed reads from nine different locations on the disc. The overall drive rating was compared to the drive's spec'd read speed to reveal false advertising claims. CD-Tach also measures

CD-ROM details such as access times and CPU utilization. **CD-Mastering.** Source disc rating and audio extraction tests measure how fast the software can safely pull data off the CD recorder, and how fast a 6:19 minute audio track can be ripped from the inside (track 1) and the outside (track 11) of the same disc. ●

PHILIPS	TEAC	PLEXTOR	SMART & FRIENDLY
CDRW400 CD-RW	CD-R56S CD-R	PlexWriter 8/20 CD-R	CD Rocket 8020 CD-R
4x/4x/20x ATAPI	6x/24x SCSI	8x/20x SCSI	8x/20x SCSI
2MB	2MB	4MB	2MB
Disc-at-Once Track-at-Once Multisession Incremental Packet Writing	Disc-at-Once Track-at-Once Multisession Incremental Packet Writing	Disc-at-Once Track-at-Once Multisession Incremental Packet Writing	Disc-at-Once Track-at-Once Multisession
Philips (CeQuadrat) Write2CD I CeQuadrat PacketCD I Adaptec 2904 SCSI Adapter I Adaptec Easy CD Creator 3.5 I Adaptec DirectCD 2.5	Adaptec 2930C SCSI Adapter I Adaptec Easy CD Creator 3.5 I Adaptec DirectCD 2.5	Adaptec 2930C SCSI Adapter I Adaptec Easy CD Creator 3.5 I Adaptec DirectCD 2.5 I CD Res-Q I Plextor Manager	Adaptec 2902A SCSI Adapter I NTI CD-Maker Pro I Sonic Foundry CD Architect I Sonic Foundry Sound Forge XP I Tracer Technologies Diamond Cut Audio Restoration Tools 32 I Macromedia Backstage Designer Plus I ECI Disc Inspector Pro
22:00 (2.76x) 532	NA NA	NA NA	NA NA
12.5x 1.4 (9.5x) 2.2 (14.8x) 241 / 151 23% / 81%	15.2x 1.5 (10x) <b>3.1 (21.4x)</b> 235 / 154 <b>12% / 59%</b>	14x 1.3 (9.2x) 3.0 (20.2x) 321 / 168 6% / 100%	13x 1.3 (8.9x) 2.9 (20.5x) 368 / 158 12% / 48%
9x 7x	12x 10x	<b>12x</b> <b>11x</b>	9x 4.5x
0:58 0:38	<b>0:40</b> <b>0:24</b>	0:43 0:35	1:38 1:373
\$399 / NA 5	\$399 / \$499 7	\$529 / \$594 10 / KICK ASS	\$599 / \$699 7

**NOTES:** <sup>1</sup>All drives were tested on a Micron Millennia 400MHz Pentium II system with 64MB and an Adaptec 2920C SCSI Adapter.

<sup>2</sup>The Spressa CRX100E/CH and the CD-Writer Plus 8100i were reviewed in the January issue of Maximum PC. They are listed in this chart for reference.

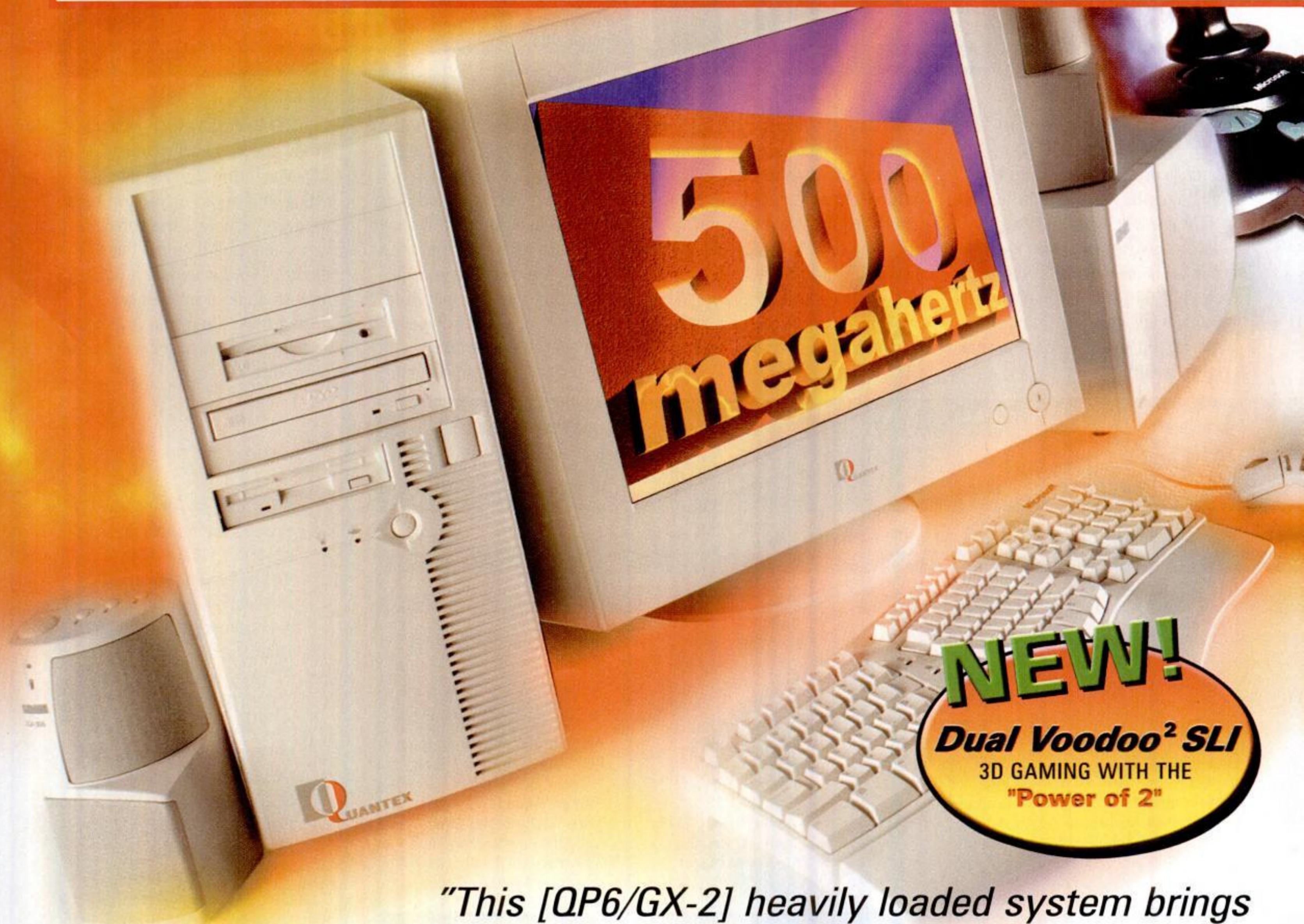
<sup>3</sup>For the recording and the packet-writing benchmarks we used the software that ships with the CD recorder.

<sup>4</sup>Sony's abCD software was too unstable for us to reliably benchmark packet writing on the Spressa.

<sup>5</sup>Time to convert CD Audio to a WAV file.



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- MS SideWinder Precision Pro Joystick
- Activision Game Titles: Battlezone, Heavy Gear, Interstate 76
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- Quantex highly-expandable ATX Mid Tower Case
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# Ask the DOCTOR

This month **THE DOCTOR** looks at:

- ▶ **Socket 7 vs. AGP... Fight!**
- ▶ **The little 56K lie**
- ▶ **Multiple monitor difficulties**
- ▶ **The asynchronous advantage and more...**

Even the burliest of PCs comes down with a bug every now and then. That's when you need to call The Doctor and get a diagnosis that'll have you up and running in no time. Send your symptoms to [doctor@maximumpc.com](mailto:doctor@maximumpc.com).

## Too Much TNT

What's the problem with Socket 7 AGP and the TNT chipset? I'm running an 8MB Diamond Viper V550 on a Gigabyte motherboard built around the SIS 5591 chipset, and I can't get any 3D to work. Period. I know Socket 7 AGPsets had trouble with Intel's 740 a while back, and that problem was fixed with BIOS flashes and driver updates. Will this be the case for the TNT?

—Jonathan Bogack

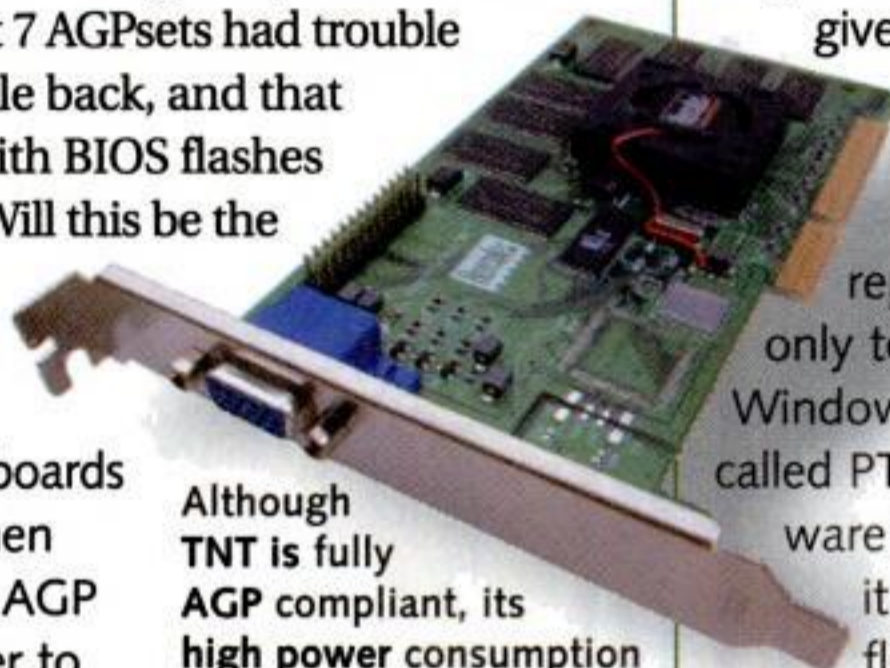
Many early Super 7 boards were persnickety when coupled with full 2x AGP cards, but the answer to your problem may lie in many areas. There seems to be a rash of problems with certain Super 7 implementations and nVidia's stellar TNT. Some of these problems may indeed be fixed through BIOS and/or driver updates and some may never be fixed. TNT-based boards are known to be high-wattage and some AGP implementations simply can't handle the power requirements and may never support it properly. While these problems seem more prevalent on the non-Intel chipsets, they do affect LX boards as well.

## Burning Crashes

I recently purchased a Hewlett-Packard CD-Writer 8100i and installed the bundled Adaptec *Easy CD Creator* software. When creating audio or data CDs, the program is great, but it doesn't back up PlayStation discs very well. I got my hands on a copy of Prassi *CD Right!*, and it backed up my old PlayStation discs perfectly. But with both programs installed, my system won't boot. It always gets stuck at the Win98 screen. The only way my computer boots up again is if I remove one of the programs. I was wondering if there was any way these two programs could get along on my computer, since both have features that I really want to use.

—Eugene Kim

Some programs just don't get along. In the case of *Easy CD Creator* and *CD Right!*, the two apps are



Although TNT is fully AGP compliant, its high power consumption brings Super 7 motherboards to their knees.

downright hostile to each other. Since both programs access your CD-R drive through the ASPI layer (even though it's an ATAPI device), you'd think they'd do so in a manner amenable to their mutual survival. But they don't. Install both apps on your PC and Windows will lock up, crash, and give you the blue screen of death more often than usual. Even reinstalling the OS won't clear up the problem.

I've spent days sorting through and replacing all the different WinASPI files only to find that it's one little file that gives Windows apoplectic fits. The offending file is called PTASPI.VXD, and it's part of Prassi's software toolkit. *CD Right!* doesn't work without it, but with it installed, *Easy CD Creator* flips out and takes your system down with it. There isn't any way to get the two programs to work together in one stable environment. You should just figure out which software works best for you and delete the other app.

**TNT-based boards are known to be high-wattage and some AGP implementations simply can't handle the power requirements and may never support it properly.**

## DMA Downfalls

I've checked DMA on both my hard drive and CD-ROM, and the performance went down for me. Games stutter and installs from the CD-ROM take forever, plus I get install errors. Your magazine has suggested that DMA should be checked, but it works better for me without it. Both my CD-ROM (I/O Magic 36x) and hard drive (Western Digital 6.4GB) are Ultra DMA drives. My motherboard supports Ultra DMA (Otek Rhino 12). And bus mastering is enabled. Am I doing something wrong, or should I just leave DMA unchecked?

—Earle D. Zulueta

Enabling the DMA option in Windows doesn't automatically give you Ultra DMA. The DMA bus-mastering support that enables IDE devices to bypass the CPU and access data directly from memory (hence the name Direct Memory Access) was introduced before Ultra DMA came around. Most EIDE hard drives and ATAPI devices (such as CD-ROM drives) should be able to take advantage of Windows DMA support, but if your hardware doesn't work with it you shouldn't panic.

As far as Ultra DMA support goes, your problems could just stem from your cheap CD-ROM



drive. Since most CD-ROM drives are sent with Ultra DMA mode support disabled (for compatibility with older motherboards), you'll need to figure out how to turn it on if you want the higher throughput rates. Enabling Ultra DMA usually involves either adding or removing a jumper from the back of the drive, but unfortunately not all documentation explains this. Also, this jumper is usually unmarked for your convenience. I checked I/O Magic's web site ([www.iomagic.com](http://www.iomagic.com)), and their support section stinks. I also shot them an e-mail, but heard no reply by print time. Perhaps we should sic the Watchdog on them...

## Slow Traffic Keep Right

Why are my 56K modem's upload speeds considerably slower than its download speeds? I know uploading something is only a small percentage of the data transmitted during a connection. But why can't the upload speed match the download? If two modems handshake at a specific speed, wouldn't transfer rates be the same either way?

—Randall

The entire "56K" modem thing is a bit of a white lie. It's really 56Kb download and 33.6Kb upload. Your modem converts the digital signal in your PC to analog, which is passed through an analog switch to your telephone office. The telco converts it from analog to digital and passes it the few miles to your ISP's location. There, the signal is converted from digital to analog and sent through another analog switch to your ISP's modem rack where it is converted from analog to digital. So it goes from digital to analog to digital to analog to digital. Got that? This odd back and forth usually limits the maximum speed to 33.6Kb. To hit higher speeds, your ISP has to have a straight digital shot to your telco. If it does, you cut out the last digital to analog to digital hop and pick up the extra speed. It sounds like you don't have a digital connection to your telco, so the speeds won't ever be equivalent.

## Primary Colors

I have a Gateway Destination D6400 XL running Windows 98. I use this machine as the centerpiece to both my home entertainment system and my graphic design business. My problem lies in my video sub-system. The



To use your AGP card as the primary display in a multiple-monitor setup, change the default setting in your BIOS.

Destination came with a 2MB PCI videocard that only goes up to 800x600 on the 32-inch monitor. It does however have a 12MB Voodoo<sup>2</sup> accelerator on it, so *Quake II* looks gorgeous. I recently purchased an 8MB StarFighter AGP card to run my second monitor, but I don't know how to change the priority of my video adapters under Win98's multiple monitor support. I'd like to use my

17-inch monitor with the StarFighter set as my primary adapter and keep the big monitor on the PCI and set it as my secondary card.

—Dan Teisan

Win98's multiple-monitor support will normally default to the PCI card as the primary adapter, since the PCI bus is enumerated before the AGP bus. Win98 has no control over which card is chosen as primary/secondary. The Microsoft solution is to plug in the monitor that you want to use as the primary into the primary video adapter and the other monitor into the secondary adapter.

Since you want the StarFighter as your primary card, you'll need to change the order in which Windows receives the primary/secondary information from your hardware. Check your BIOS to see if it supports enumerating the AGP bus before the PCI bus. It should be listed as an option to specify the default primary video-display device.

## overclocker's CORNER

### Asynching Feeling

I have an Mtech R534F motherboard that is capable of 66MHz, 75MHz, and 83MHz bus speeds. I want to get an Intel 233 MMX and overclock it to 291MHz if possible. My motherboard has the option of running the PCI bus either asynchronous (constant 33MHz) or synchronous (half bus speed). I plan on running the PCI bus in asynch mode if I overclock to 291MHz (83 x 3.5), in order to minimize problems with peripherals unable to handle higher PCI bus speeds.

Is my understanding of this correct? Why don't other motherboard manufacturers that tout the overclocking potential of their boards use this option? Overclocking the CPU by increasing the bus speed while keeping the PCI and AGP bus within tolerable limits seems like a pretty damn good idea, especially since adjusting the clock multiplier is hardly an option anymore. Will enabling the asynchronous setting on my motherboard mean that any overclocking problems due to higher bus speeds be limited to the CPU only?

I'm trying to put off a full system upgrade as long as possible, or at least until K7 is released and the prices have dropped.

—Kevin Harmon

You are correct in your understanding of asynchronous vs. synchronous PCI mode. This is a safety feature built into some motherboards to keep the PCI bus running at a constant speed so the bus doesn't go beyond what the PCI 2.1 spec recommends. By enabling asynchronous PCI speed, you will be limiting any overclocking problems to your CPU or memory, so it is a great way to keep PCI slots in line.

But there is a performance penalty to be paid when running in asynchronous mode. There is always some loss of performance when running any bus out of sync with the rest of the system. In this case, bus traffic to and from PCI devices will sometimes have to wait for the next PCI clock cycle to "catch up" with the CPU bus. This doesn't happen when the PCI bus is running synchronously, that is, at a frequency that's an even fraction of the CPU bus frequency.

I'm afraid I can't tell you why some motherboards don't have this option. I suppose the designers don't approve of overclocking and therefore don't make any special provisions for it. ☀


The entire "56K" modem thing is a bit of a white lie. It's really 56Kb download and 33.6Kb upload.




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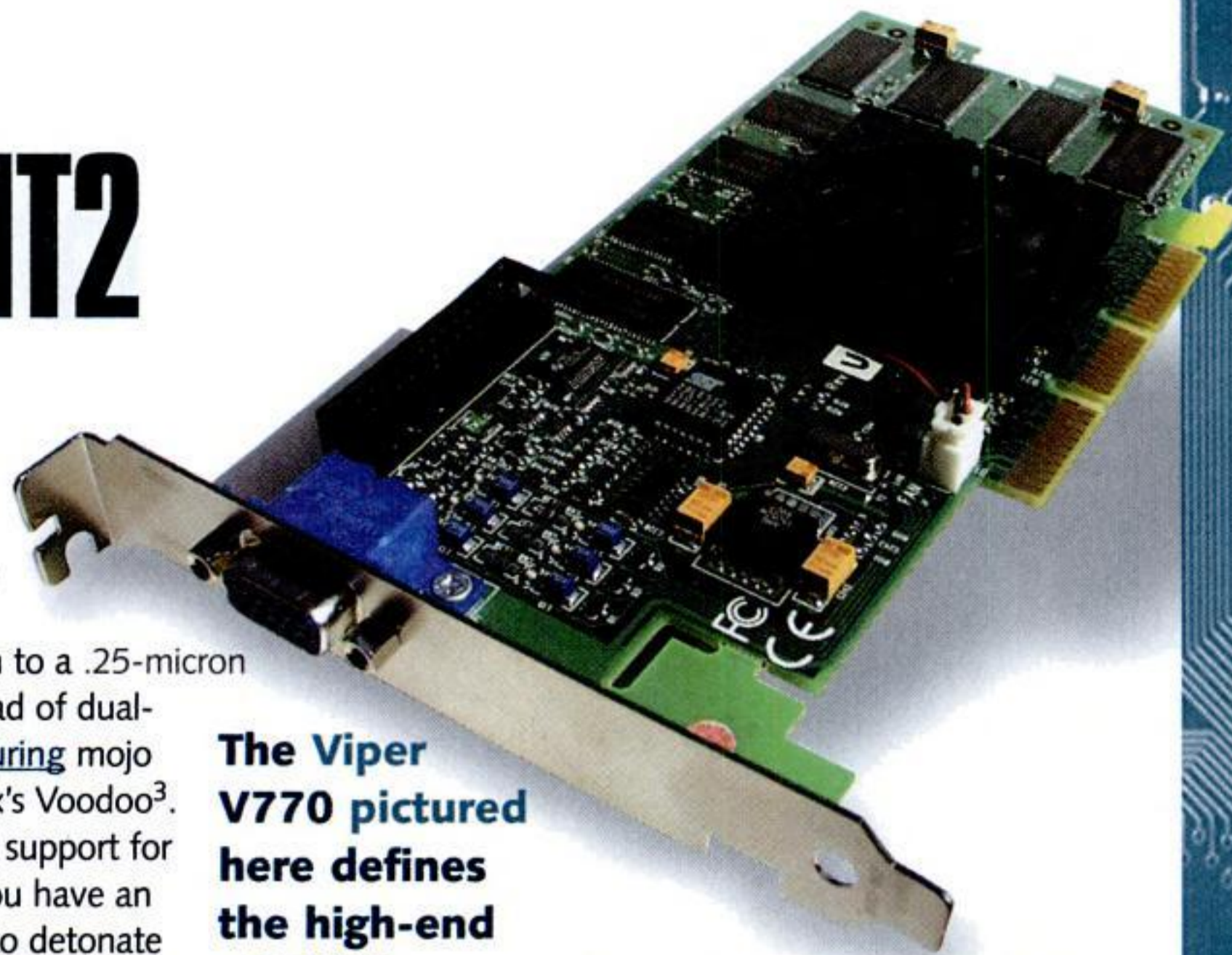


# nVidia TNT2

## The fuse is lit

nVidia continues its bombing run on the videocard industry with the sequel to its explosive Twin Texel graphics processor. Taking advantage of the switch to a .25-micron process, TNT2 delivers a payload of dual-pipeline, single-cycle multitexturing mojo at frequencies on par with 3dfx's Voodoo<sup>3</sup>. Add a 300MHz RAMDAC and support for up to 32MB of SDRAM and you have an AGP 2x/4x part that's primed to detonate in Camino motherboards, as soon as Intel makes the chipset available this fall.

All the features you've come to know and love in previous TNT offerings have made their way into the TNT2 chipset: bump-mapping, environment and procedural mapping, single-cycle trilinear and anisotropic filtering, order-independent full-scene anti-aliasing, and per-pixel perspective-correct fogging, lighting, and mip-mapping. TNT2 comes fully armed with an 8-bit stencil buffer and a 24-bit z-buffer that's ready to run *Quake III: Arena*'s 24-bit-color, 512x512 textures faster than anything else out there. Where Voodoo<sup>3</sup> will stumble while running the upcoming generation of true-color



**The Viper V770 pictured here defines the high-end of TNT2.**

games with textures larger than 256x256, TNT2's full AGP support

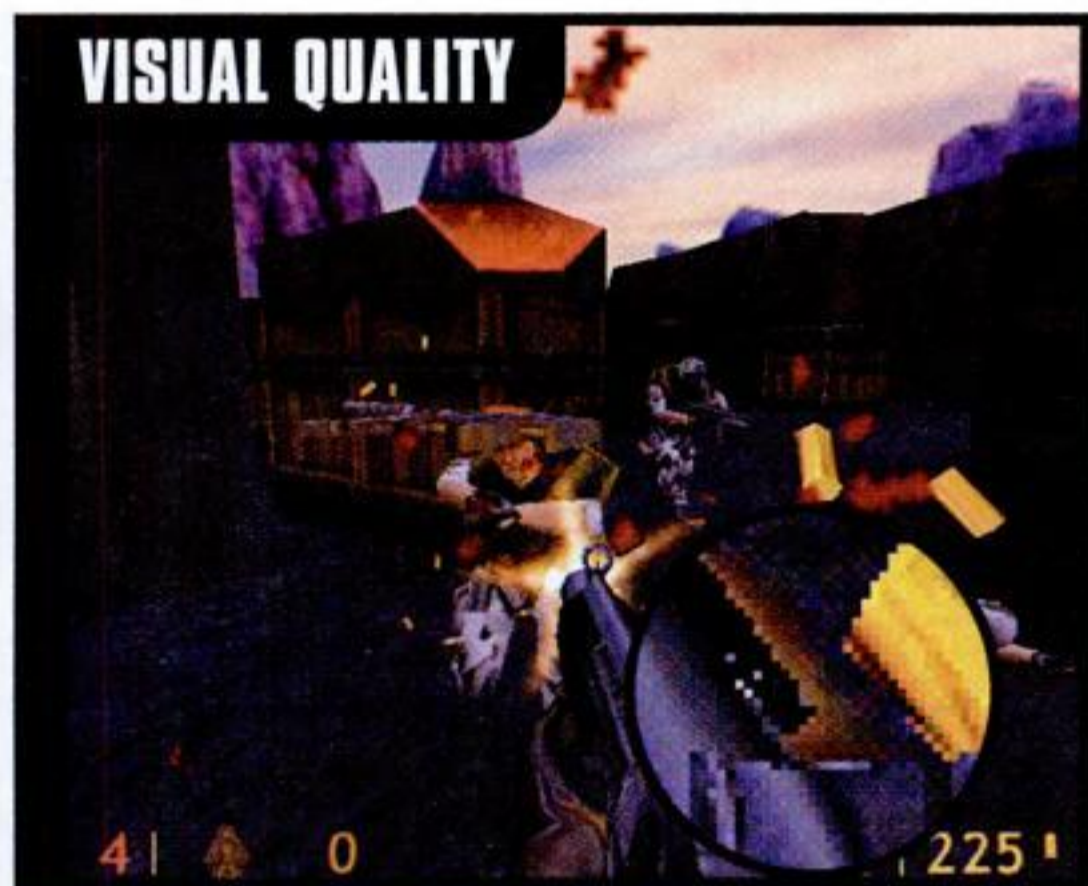
(which includes Direct Memory Execution for texture sizes up to 2048x2048) will make it the chipset of choice for high-power gaming.

The big difference between TNT and TNT2 is how fast nVidia's next-generation processor makes it all happen. Besides just upping the clock speed, nVidia has optimized the pipeline to handle the faster rendering speeds. Officially, TNT2 will come in two flavors: an entry-level part with a 125MHz bus and a 150MHz memory clock, and a speedier part sporting a 150MHz core clock and memory clocked at 183MHz. Unofficially, OEMs will enhance these specs with their own configurations. Expect a smorgasbord of clock speeds and features, such as S-Video and digital-flat-panel output from Elsa, Asus, Diamond, Guillemot, Creative Labs, and Hercules.

The Diamond Viper V770 card we benchmarked is a good representation of the current high end of TNT2. Stacked with 32MB of 5ns SDRAM clocked at 200MHz and running at a 175MHz core clock speed, the Viper V770 ripped through our benchmarks at speeds we haven't seen since our Voodoo<sup>3</sup> preview. The latest beta of nVidia's reference drivers was surprisingly stable, producing jaw-dropping visuals without any noticeable visual defects in Direct3D. We did initially experience OpenGL difficulties, but these were cleared up with a new set of detonator drivers from nVidia.

Keep in mind that the benchmarks at left were run on alpha hardware with beta drivers. Results may vary in the final shipping versions and could even be faster depending upon what the board manufacturer has done to make its card special.

—Sean Downey



■ nVidia TNT  
■ nVidia TNT2 (32MB)

<sup>1</sup>With a refresh rate of 144Hz.  
<sup>2</sup>In 32-bit color nVidia TNT2 scored 62.7fps for *Quake II* at 800x600 and 44.9fps for *Quake II* at 1024x768. As always, V-sync is enabled.

### PRODUCT AVAILABLE

**Price** \$ 230 (estimated retail price of Diamond's Viper V770)

**Company** nVidia

**Phone** 800.468.5846

**URL** www.nvidia.com

05.99

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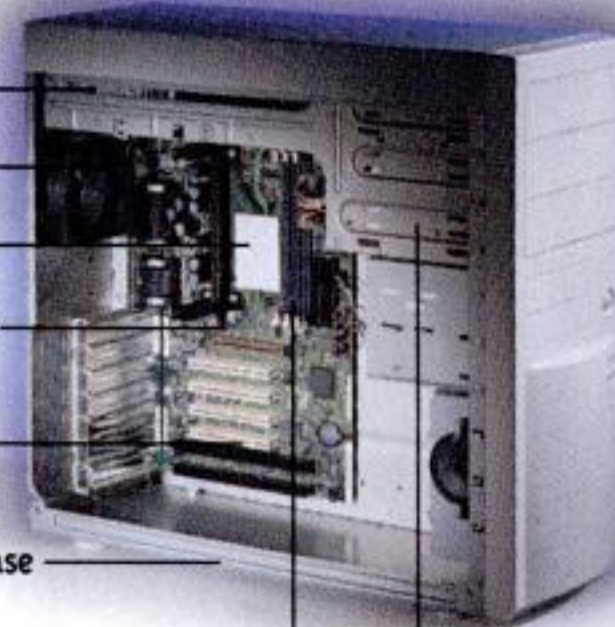
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CPU-COOL 1.9W (150-200 Pentium) ..... \$17  
CPU-COOL Z1 (233-300 Pentium, AMD K6) ..... \$19  
CPU-COOL Z1-C (Celeron, PGA 370 socket) ..... **NEW** \$19  
CPU-COOL Z1-H (AMD K6-2, K6-3) ..... **NEW** \$25

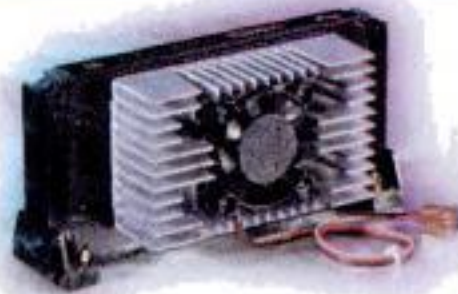
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Thermal Resistance:	1.5°C/W	1°C/W	0.8°C/W	0.6°C/W
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## Testing Policy

Our product evaluation process is built on down-and-dirty, hands-on testing. All hardware benchmarking is conducted in the Maximum PC lab by Maximum PC editors, and, whenever possible, we use real-world applications to gauge performance. Our final verdicts are based on benchmark results and a subjective appraisal of product features.

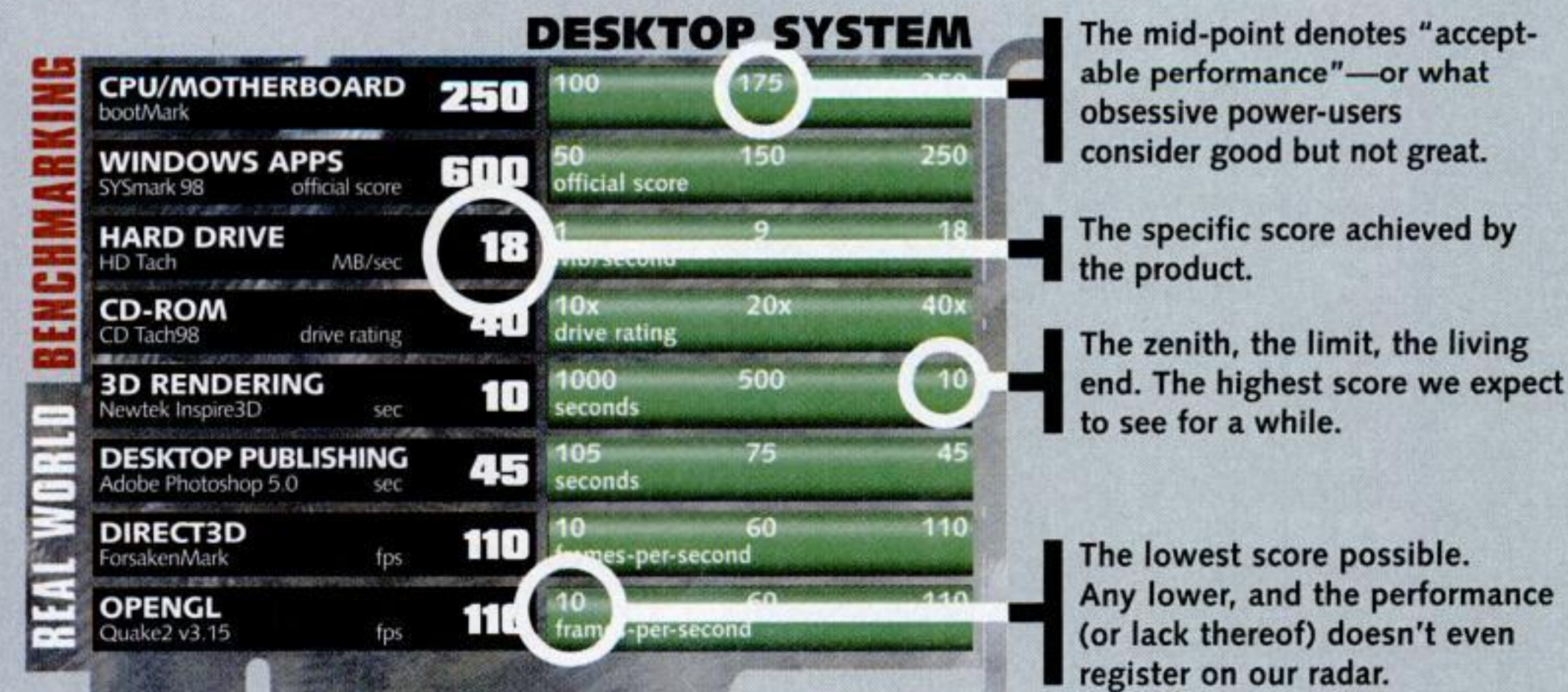
### EDITOR'S CHOICE AWARD:

Only 9 and 10 verdicts are even eligible for the coveted Kick Ass award, the mark of PC excellence.



## Online Guide to Benchmarking

Go to [www.maximumpc.com/benchmarking/benchmarking.html](http://www.maximumpc.com/benchmarking/benchmarking.html) for the complete explanation of Maximum PC's benchmarking policies.



KICKIN' THE TIRES  
ON THE LATEST  
HARDWARE AND  
TAKIN' THE LATEST  
SOFTWARE OUT  
FOR A SPIN

Hardware Photography by  
AARON LAUER



# Gateway Performance 500

Man does not live by burst speed alone



**Not a bad machine—unless you plan on gaming or want the most extra features for your money**

**PLUSES**

- ATA-66, screaming hard drive
- CD-RW drive
- Open PCI slots
- Respectable app benchmarks

**MINUSES**

- State-of-the-bunk 3D framerates
- Lame onboard sound chip
- No quad-sound support
- Poor-boy speakers
- No TV-out or S/PDIF
- Buggy DVD

The Performance 500 suggests that a PC is the sum total of all its parts. This machine is stuffed with a few bum components, and skimps on features that are quickly becoming de rigueur. The result is unacceptable performance in our two gaming benchmarks. And don't count on using this box as a home entertainment center because it'll break your heart. The Performance 500 is a decent Win98-consumer-workstationette-kind-of-machine, however, so let's first look at what the system does right.

The Performance's most interesting component is its 22GB IBM Deskstar hard drive, the first we've seen that takes advantage of the new ATA-66 EIDE bus protocol, which supports 66Mbps transfer rates. While the drive posted an average read rate of 16.8Mbps—right in line with ATA-33 Deskstars—it did hit 52.9Mbps during read bursts, a full 25Mbps better than the ATA-33 version.

Any ATA-66 device needs protocol support on the motherboard level. Because Intel is delaying Camino, its first ATA-66-ready core-logic chipset, Gateway put a Promise ATA-66 controller card in a PCI slot. ATA-66 support should make a big difference in applications that continuously hit the hard drive for data requests (e.g., video streaming). Including a Philips CD-RW drive for removable storage

duties is also a nice touch, even though the drive is last year's technology (see page 62 for reviews of next-gen CD burners).

The Performance hit strong numbers in six of our eight benchmarks. These now-familiar scores are consistent with what we've seen in other Pentium III-based systems, but in Direct3D and OpenGL gaming, the Performance plummeted to pitiful levels. The machine's 16MB Voodoo Banshee card boasts so little engine power, it hobbled along at 92.7fps in *Forsaken* and 36.3fps in *Quake II*. Respectively, that's 20.3fps and 26.4fps slower than scores achieved by nVidia TNT-based cards in Pentium III systems. If you do decide to buy the Performance 500, we recommend you forgo the Banshee card for Gateway's more expensive STB Velocity 4400 TNT option.

Gateway's contender in the P-III power-desktop arena also lacks amenities found in similarly priced machines: no home networking support, no DSL or cable modem, no IEEE 1394 support, no TV-out for

**UNDER THE HOOD**

**THE BRAINS**

CPU	Intel Pentium III 500MHz
L2 Cache	512K closely coupled, half core CPU speed
RAM	128MB 100MHz SDRAM
Motherboard	Intel Warm Springs, 440BX chipset, ATX formfactor
Drive Bays	One open 5.25-inch, three open 3.5-inch
I/O Ports	Two USB, two serial, one parallel, one MIDI/gameport

**DISPLAY**

Video	Ensoniq Voodoo Banshee 16MB
Monitor	Gateway VX900 (18-inch viewable, 0.26mm dot pitch)
Res/Refresh	1600x1200/75Hz

**STORAGE**

Hard Drive	22GB IBM Deskstar 22GXP, 7,200RPM, ATA-66
CD/DVD	4.8x Toshiba SDM1202 DVD-ROM (multisourced; models vary)
Removable	Philips CDD 3610 CD-RW drive (2x2x6x)
Fax/Modem	3Com U.S. Robotics V.90 Voice WinModem

**SOUND**

Sound	Ensoniq Sound Blaster Audio PCI (onboard ES1373 chipset)
Speakers	Boston Acoustics BA635 (three-piece)

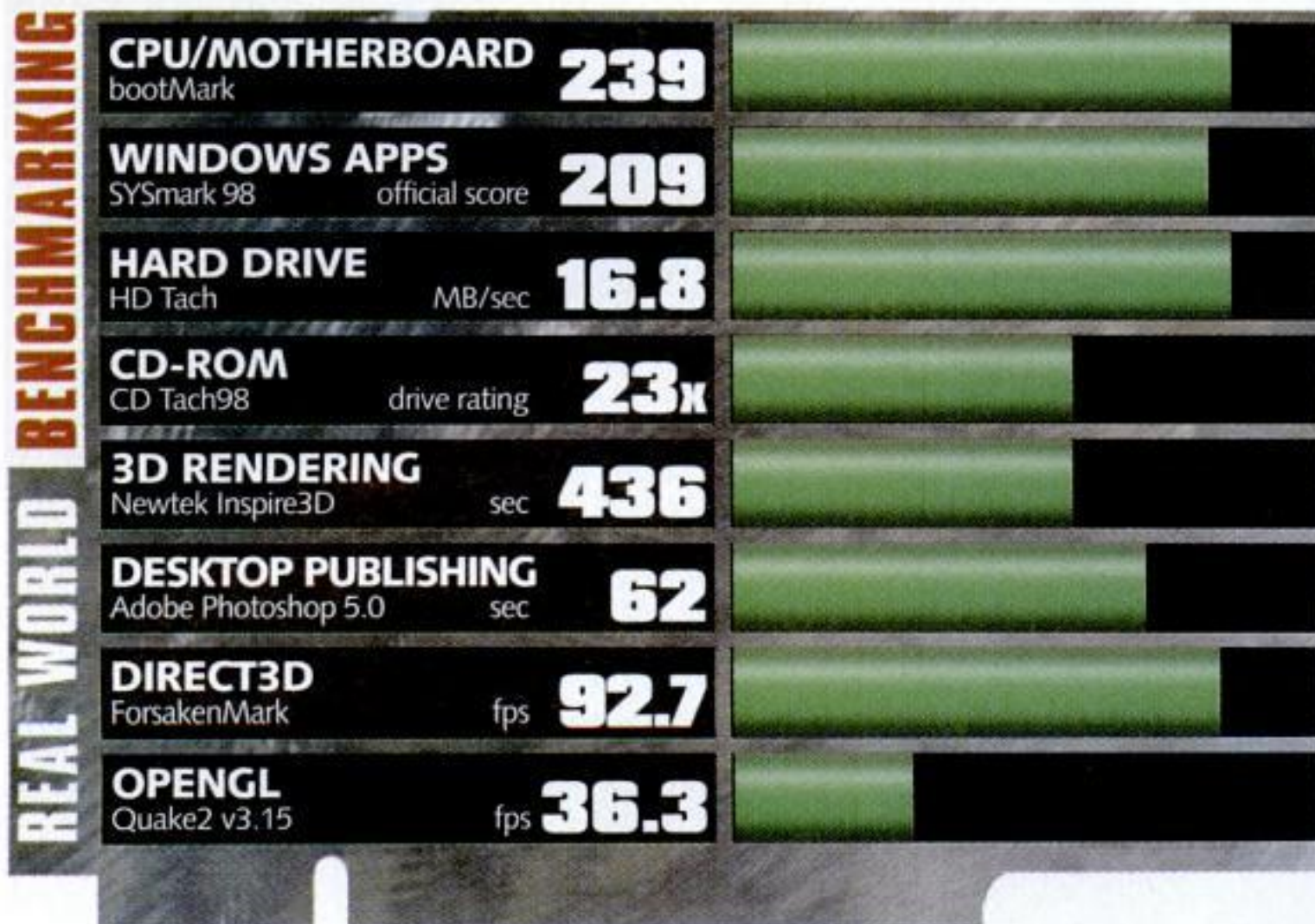
**OTHERS**

Promise Ultra66 ATA-66 controller card, free net access for one year

**THE BUNDLE**

Microsoft Home Essentials (Word 97, Works 4.5, Money 98, Encarta 98 Encyclopedia, Greetings Workshop, The Puzzle Collection)

BOOT 0:53 DOWN 0:05



DVD movies, no four-channel soundcard, no S/PDIF for Dolby Digital 5.1 sound, and no surround-sound speakers. The software-based Cinemaster decoding exhibited negligible artifacting, but we couldn't get the Toshiba DVD-ROM drive to play dual-layered movie discs. Not that you'd want to use the Performance 500 as a home theater system anyhow: the bundled Boston Acoustic speakers boast only enough oomph for neighborly volumes.

Besides the Performance's hard drive and CD-RW, the only compelling reason to buy it is the free year-long net access from gateway.net. Other machines offer better performance and features for the same price.

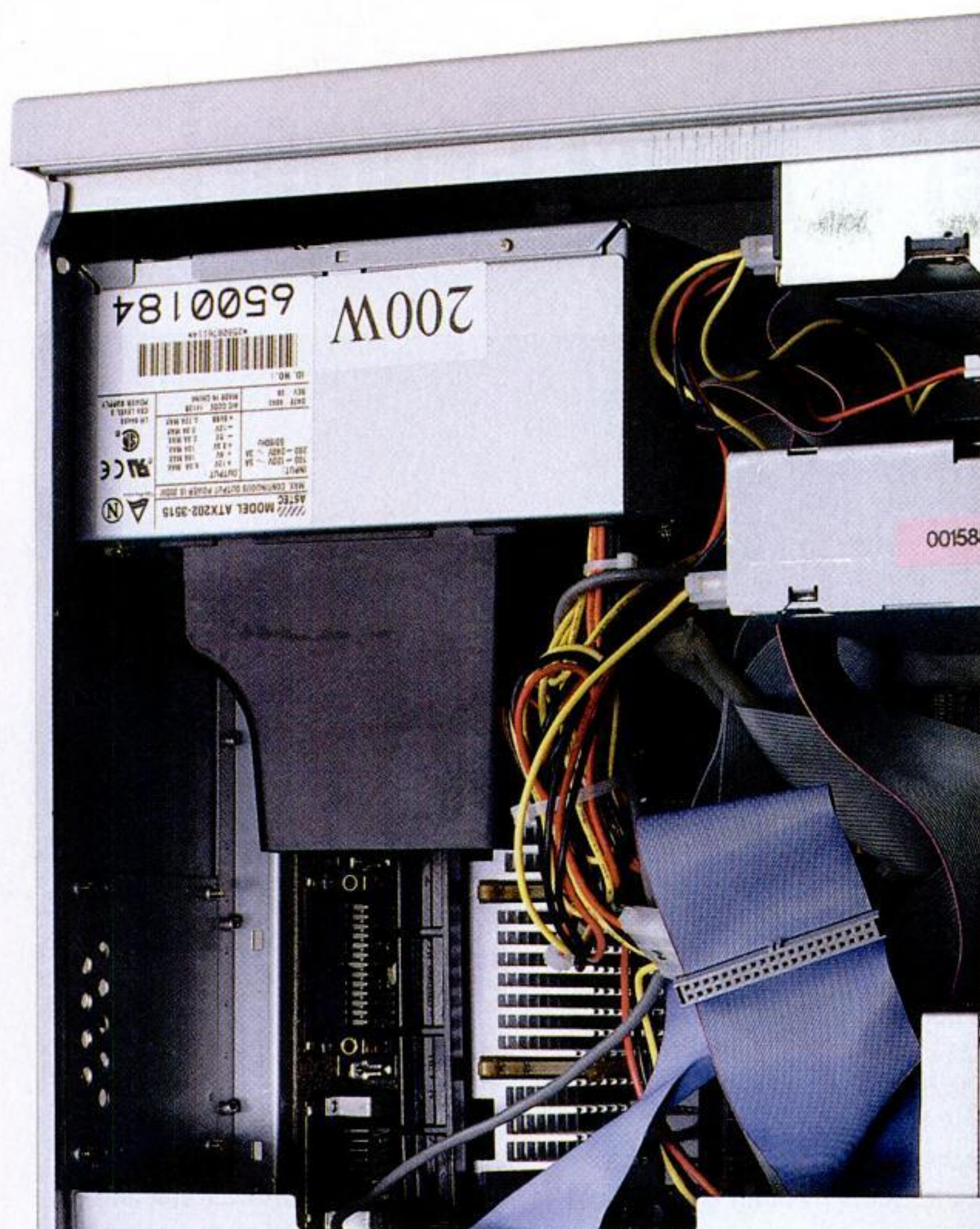
—Jon Phillips

**MAXIMUM PC VERDICT**

**Price** \$2,974 (\$2,569 without monitor)  
**Company** Gateway  
**Phone** 800.846.2000  
**URL** www.gateway.com







**EXPANSION NOTES**

With a bunch of open PCI slots, an open 3.5-inch front bay, an open 5.25-inch front bay, and two open 3.5-inch internal bays (in the same gondola that holds the IBM hard drive), the Performance has plenty of rooms in the inn for summer vacationers. And the wimpy 200W power supply may not have the strength to handle a lot of add-in components.

**EXPANSION MAP**

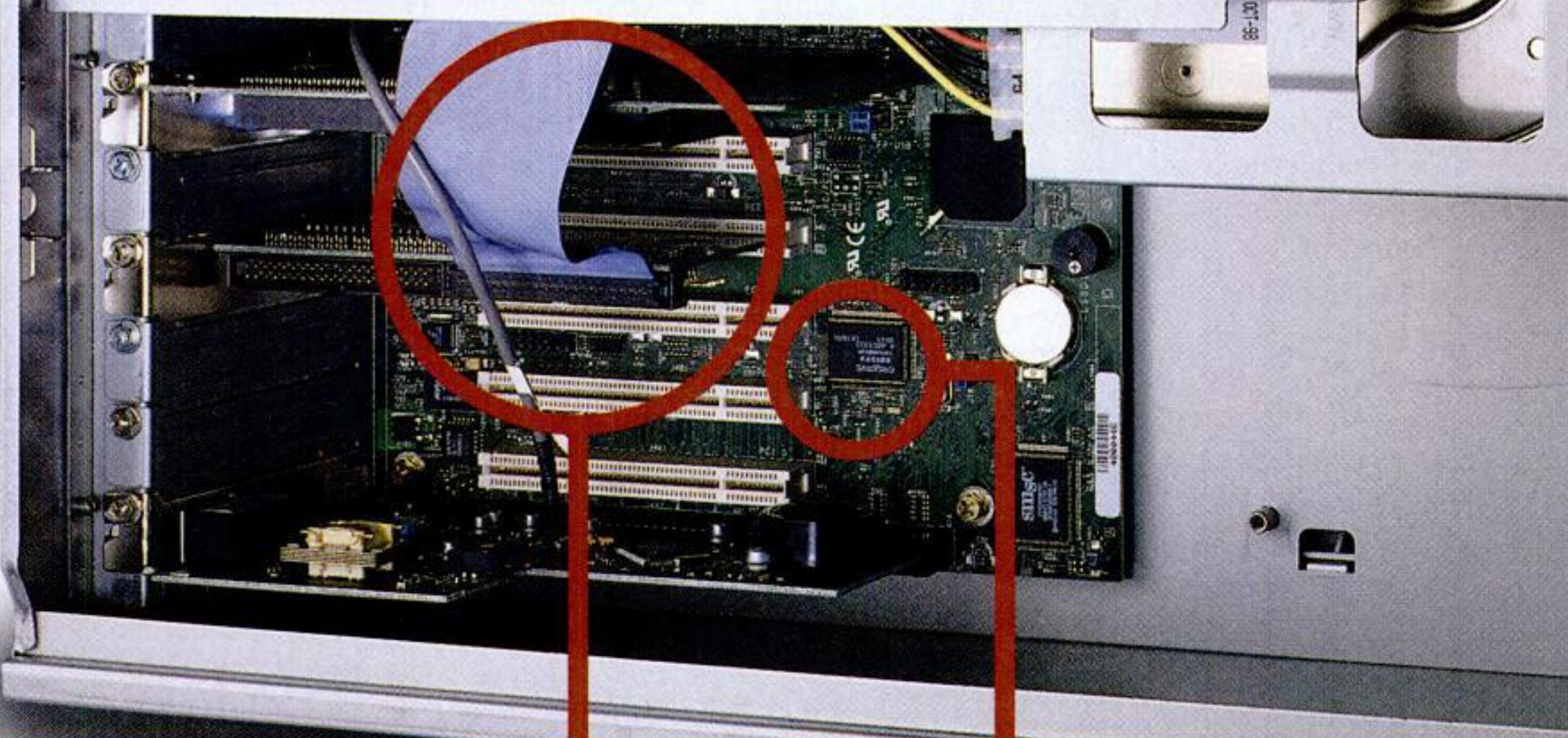
AGP	Banshee videocard
PCI	Free
PCI	Promise ATA-66 controller
PCI	Free
PCI	Free
PCI	Free (shared)
ISA	3Com modem (shared)

**IROS**

00	System timer	10	Free
01	Keyboard	11	Promise Ultra66 controller
02	Interrupt controller	11	SB AudioPCI
03	Modem	11	3Dfx Banshee
04	Com 1	12	Mouse
05	Free	13	Data processor
06	Floppy	14	Free
07	Printer	15	IDE controller
08	CMOS/Clock	15	2nd IDE controller
09	PCI-USB controller		
09	IRQ holder		

**DMAS**

01	SB Audio PCI legacy	03	Open
02	Floppy	04	DMA controller



**Ho-hum, another 19er** This 18-inch viewable, 0.26mm dot pitch, shadow-mask monitor does 1600x1200@75Hz, and can hit 120Hz at 800x600. At \$400, it's right on target for the quality of the display.

**Who's in control here?** That there blue ribbon cable connects Promise's ATA-66 controller to the Deskstar hard drive. Someday, ATA-66 support will be directly integrated into the mobo.

**3D-capable, 2D-only** Ensoniq's little sound chipset offers support for DirectSound3D and EAX, but because the system doesn't include dual stereo outs, the only 3D sound you'll hear will be virtualized across stereo channels.

**Not enough junk in the trunk** At 5W per satellite and 15W for the subwoofer, these little Boston Acoustics don't have much oomph. And we'd much prefer a four-, five-, or six-speaker set for surround sound.



**WE ARE MERELY PLAYERS**

*Sid Meier's Alpha Centauri* is a god game, and you play the god. It's only fair that you have omnipotent control over every aspect of it.

```

: RULES
3,  : Movement rate along roads
2,  : Nutrient intake requirement for
3,2 : Numerator & Denominator for art
2,  : Max artillery range (larger will
0,  : Max airdrop range w/o orbital i
10, : Nutrient cost multiplier
10, : Minerals cost multiplier
100, : Technology discovery rate as a
1,  : Limits mineral increase for min
-1, : Nutrient effect in mine square
5,  : Minimum base size to support sp
1,  : Drones induced by GeneJack Fact
7,  : Population limit w/o hab comple
10, : Population limit w/o hab dome
50, : Extra percentage cost of protot
    
```

In the mood for a short game? Bump up the units' movement speed and the strength of early weapons.

By caching variables in easy-to-edit text files, the Firaxis folks made it simple to hack the game and adjust the effectiveness of units, weapons, and such. The file ALPHA.TXT, which resides in the game's root directory, contains easily deciphered data defining everything from unit abilities and weapon strengths to the branches of the technology tree itself. Other text files define specific traits for each faction.

**THE SPECS**

**MULTIPLAYER**

- IPX (up to seven players)
- TCP/IP (up to four players)
- Serial
- Modem

**PLUSES**

- Crisp visuals make following the action easy
- Scales to run on low-end machines
- Modular design for easy customization
- Options to automate processes or control everything
- Possibly the most addictive gameplay ever

**MINUSES**

- Occasionally silly AI
- Steep learning curve
- Very similar to *Civ I & II*

# Sid Meier's Alpha Centauri

## Intelligent life in space



It's turn-based. It runs nicely on a Pentium 166. And it doesn't care whether you have a 3D accelerator—the polygonal landscape is pre-rendered and your units are sprites. *Sid Meier's Alpha Centauri* isn't a technological wonder in any way—and that proves for all time that hardware support isn't what makes a game worth playing.

If you've played *Civilization* or *Civ II*, then you already know designer Sid Meier's latest work; consider this the next game in that line. You're now in charge of one of seven factions simultaneously colonizing a distant planet. As the immortal ruler of your faction, you oversee everything your minions do from the moment they land on Chiron. Where *Civ II* had cities, you build bases; the Great Library is now known as the Datalinks; everything from the classic has evolved. The goal is the same: explore the world; build up your faction in population, technology, and military might; and become ruler of the planet through violence, diplomacy, or a combination of both. Seven difficulty levels make your climb to the top everything from a walk through the park to almost impossible.

SMAC packs some outstanding new features. Firaxis got serious with the game's AI. In the single player game, opposing factions behave logically according to their ideals. You can develop treaties, pacts, and vendettas, and if you stab somebody in the back, you'd better watch your own. You can automate unit and base behavior; though the decisions aren't always ideal, they can take a lot of the micro-management off your hands.

But micro-management is where the fun comes in. SMAC is customizable inside and out. In game, you can



**Boom! Turn-based combat may not be pulse pounding, but at 1024x768 it looks pretty.**

create units by mixing and matching whatever chassis, armor, weapons, and other goodies your technology allows. Outside the game, if you feel comfortable playing any of the factions,

you can make your own. The factions' looks and sounds are built from easily customizable BMP and WAV files. Nearly every numeric variable in the game can also be customized, from unit movement to weapon power, by tweaking various TXT files. You can even customize the game for running it on slow Pentiums or laptops: the CD contains a folder full of low-res art that you can drag and drop over the defaults.

When you're ready for some real action, you can hook up with friends for multiplayer SMAC, which—surprise!—is customizable. Turns can be successive, forcing each player to wait as the others make their moves, or simultaneous, and in the latter case you can adjust the length of time to make the pace as plodding or frenetic as you wish. An upcoming patch promises hot-seat play.

There's this little, intangible element games have—playability—and SMAC is swimming in it. Even if you've never played a strategy game, *Sid Meier's Alpha Centauri* will have you hooked within minutes. The interface is complex, but once you get started, it teaches itself to you through context-sensitive help and optional tours. You'll find half-hour sessions stretching into the wee hours of the morning, until your bladder finally forces you to take a break.

—Joel Durham Jr.



BEFORE: Enemy faction crimping your style?



Once you've developed the technology, Planetbuster nukes will make short work of enemy bases—and everything else nearby.



AFTER: Watch out, though—the use of such atrocities will both incite the other factions and result in ecological consequences such as global warming.

**MAXIMUM PC VERDICT**

**Price** \$50  
**Developer** Firaxis  
**Publisher** Electronic Arts  
**Phone** 800.245.4525  
**URL** www.ea.com





# Rage Fury

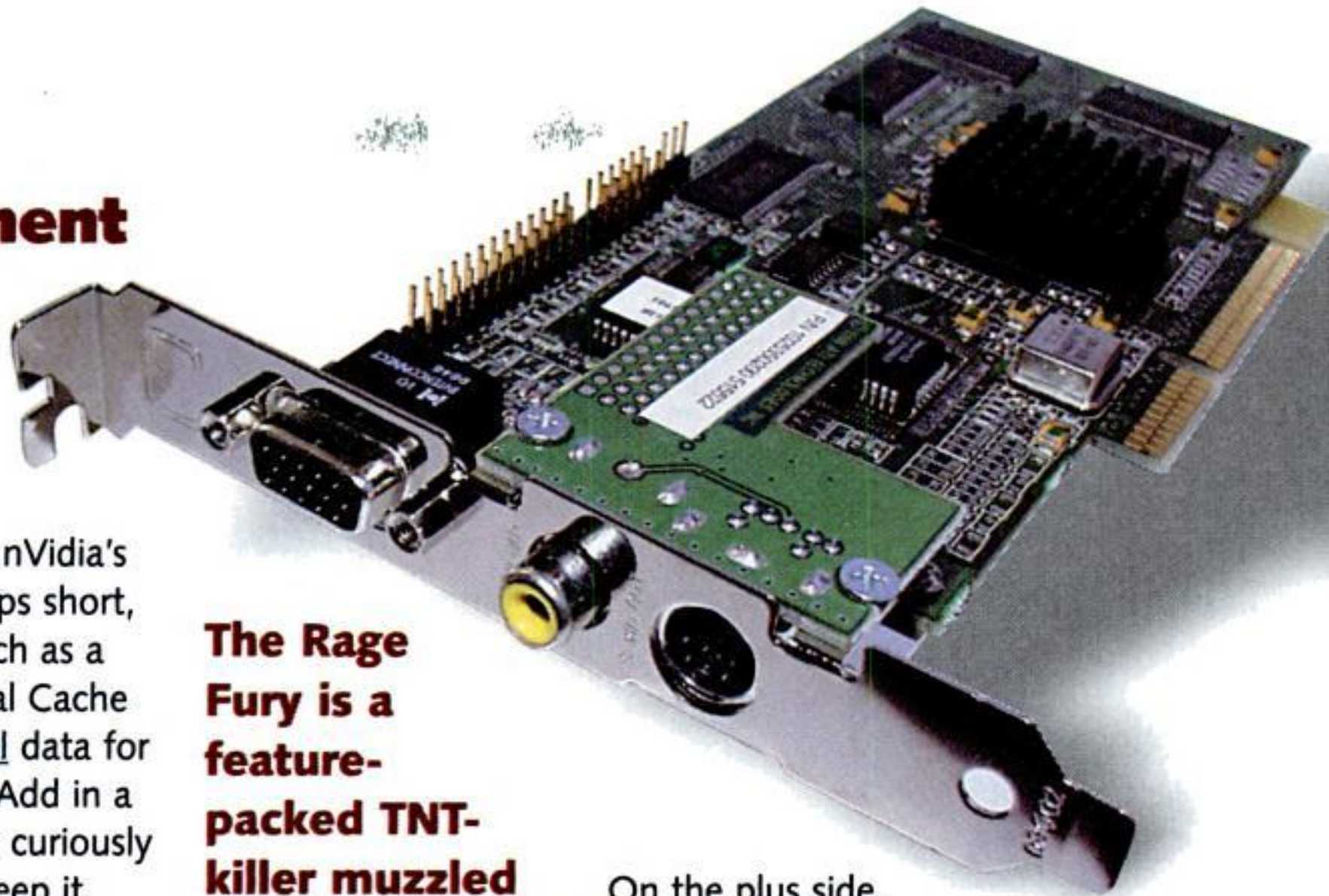
## Room for improvement

Rage Fury marks the debut of ATI's dazzling new 0.25-micron Rage 128 chipset, and it's been a long time coming.

Sporting a dual graphics pipeline, an 8-bit stencil buffer, and 32MB of SDRAM, ATI's Fury is clearly directed at nVidia's current TNT chipset. But where TNT stops short, the Rage 128 ladles on new features such as a full 32-bit z-buffer and a spiffy new Dual Cache Architecture that stores texture and pixel data for faster access by the graphics processor. Add in a 250MHz RAMDAC, and even the card's curiously unambitious 102.7MHz bus shouldn't keep it from leaving the TNT choking in the Rage 128's gorgeously rendered dust.

Unfortunately it's the Rage Fury that's doing the choking with immature drivers stuck in its craw.

Originally slated for release in February, the card was held up while driver issues were resolved. In our February preview, we noted the problems we had with refresh-rate bottlenecks and 32-bit rendering issues resulting in dithered 16-bit textures. While these issues are addressed in the shipping drivers, it's apparent that there's still work to be done. For instance, we were completely unable to set the Rage Fury to its maximum 1920x1200 resolution because the driver doesn't support it at all.



### The Rage Fury is a feature-packed TNT-killer muzzled by mediocre drivers.

On the plus side, ATI's OpenGL ICD has come a long way from the texture-dropping mess that existed on the Rage Pro. *Quake II* and its ilk will benefit from all the multitexturing magic and rich colors the Rage Fury offers. On the performance side, ATI's new AGP beast outpaced the TNT OpenGL benchmarks, but fell short in Direct3D framerates. And the only glitch we noticed in the Rage Fury's rendering quality was the dithering that marred alpha-blended effects, such as *Forsaken's* explosions and energy weapons, with a visible line. This should be addressed in the next driver release.

ATI's new chipset is optimized for 32-bit color depths, so next-generation games utilizing true-color textures and effects will look stunning on the Rage Fury and run at decent framerates due to the card's burly 32MB of local memory. We benchmarked *Quake II* at 32-bit color, and the Fury showed off how small a performance hit it takes running at that color depth. It popped out framerates that put it solidly in first place in the 32-bit-color race.

Rounding out the features of the Rage Fury are hardware assistance for MPEG-2 decoding, excellent video playback, and the strong TV out support that we've come to expect from ATI. Although the card currently doesn't ship with ATI's *SoftDVD* software, we tested a beta of the software and found playback and CPU utilization on par with dedicated MPEG-2 decoders.

The Rage Fury has set the bar high in terms of features and image quality. As the drivers evolve, the card should be able to deliver its visual delights without the performance penalties.

—Sean Downey

### THE SPECS

**MAX 24-BIT RES/REFRESH RATE**

1600x1200/85Hz\*

**MAX 16-BIT RES/REFRESH RATE**

1600x1200/85Hz\*

**AGP?/LEVEL**

Yes/2x

**BUNDLE**

Win9x | NT drivers | Expendable Lite | MotoRacer 2 | Half-Life: Day One | SoftDVD player

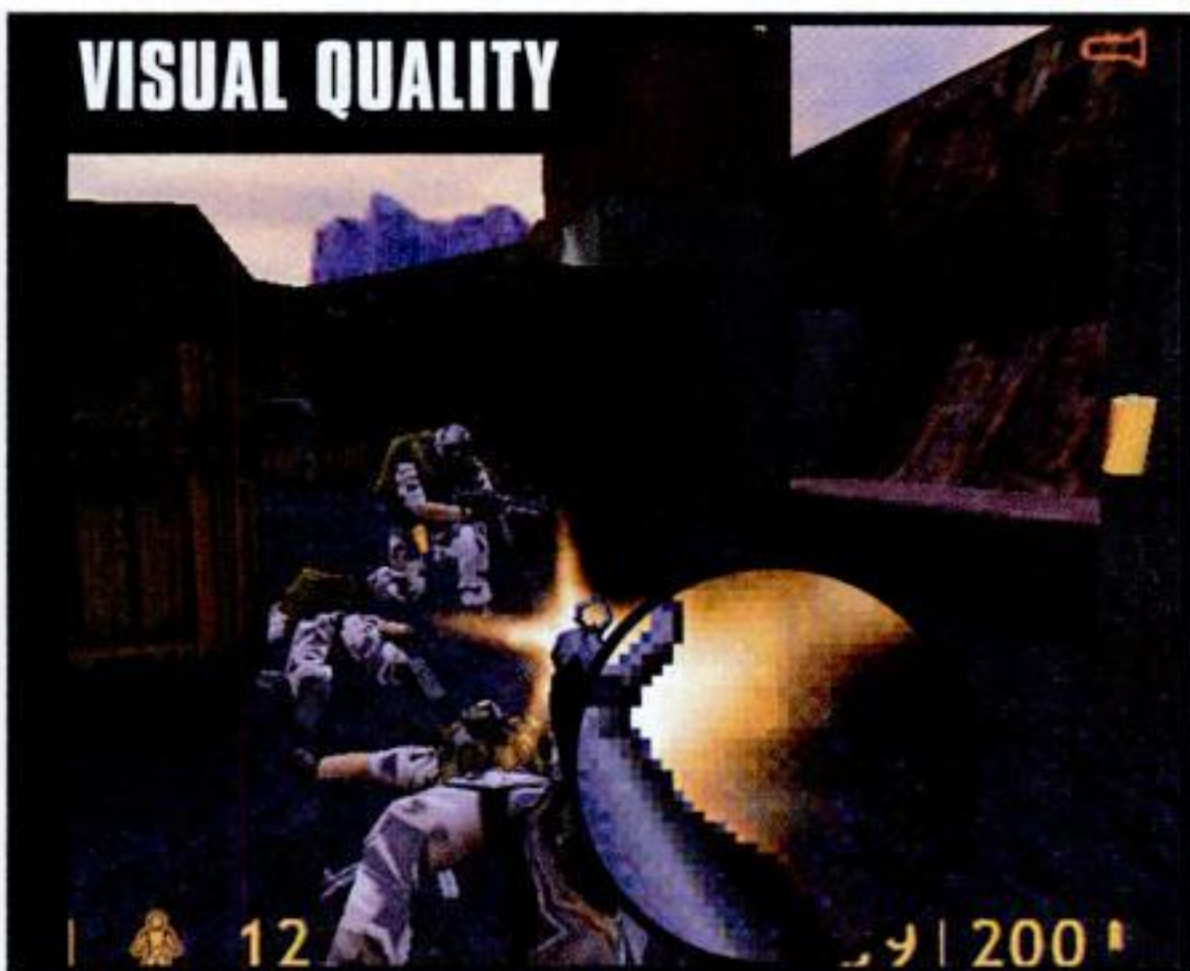
\*Although the card supports 1920x1200 the current drivers wouldn't let us set the refresh rate that high.

### PLUSES

- Strong video-out support
- Hardware DVD MPEG-2 decoding
- 32-bit rendering and z-buffer accuracy
- Full AGP 2x support

### MINUSES

- Immature drivers
- Slower 3D performance than TNT or Voodoo<sup>2</sup>
- Alpha-blend dithering



REAL WORLD BENCHMARKING	
FORSAKEN 800x600 fps	74.0
FORSAKEN 1024x768 fps	54.3
BATTLEZONE 800x600 fps	48.6
BATTLEZONE 1024x768 fps	43.3
QUAKE II 800x600 fps	58.9
QUAKE II 800x600 fps	53.3
QUAKE II 1024x768 fps	41.0
QUAKE II 1024x768 fps	32.4

Indicates tests done at 32-bit color.

### MAXIMUM PC VERDICT

**Price** \$199  
**Company** ATI Technologies  
**Phone** 905.882.2600  
**URL** www.atitech.com





# Sony VAIO C1 PictureBook

## Smile... you're on Candid Camera

With its integrated camera, the PictureBook is one of the most ingenious mobile products we've seen to date. Add in Sony's imaginative ergonomics and "violet" design, and you have the makings of a sure-fire Kick Ass product.

If only the PictureBook included a different processor—and not a lowly Intel 266MHz Pentium MMX. But let's face facts: the 266MHz Pentium is outgunned and outclassed these days, and its old age is noticeable when you look at the performance benchmarks. Numbers don't lie, and when it came to application crunching, the PictureBook didn't fare well. In fact, it was only a smidgen faster than the MetroBook sub-note we in the February issue, running an even slower 200MHz Pentium chip.

Of course, in achieving true portability, you'll have to make some sacrifices in the speed and battery-life categories. Luckily, Sony has deadened the performance pain by designing the PictureBook as a super-thin, super-lightweight wonder. The base unit—minus all the extra accoutrements such as the external CD-ROM and floppy drives—weighs a pinkie-lifting 2 1/2 pounds. That's it! And even if you decide to tote all the extras, including a supercharged battery or USB mouse, the overall weight balloons to only 6 1/2 pounds. It's amazing that Sony was able to pack what it did into this tiny footprint—including

the hard drive, which posted the fastest read speed we've seen in any notebook at 7.04MB/sec, and a built-in V.90 modem. If nothing else, the PictureBook's engineering team should be awarded a special kick-ass award for the compelling design.

Of course, the built-in 270,000 pixel, 1/6-inch camera—dubbed the Motion Eye—is the major attraction here, and to Sony's credit, it went with a more-costly CCD model instead of a lower-cost CMOS version. Although CCD cameras generally require more power, their image quality is vastly superior, and less susceptible to deviated lighting conditions. In short, the camera rocks. It swivels a full 180 degrees, allowing you to shoot upward and backward, and incorporates a small focus adjustment on the top as well. But Sony didn't stop there. A "capture" button, located at the top right of the keyboard, provides one-touch access to the camera software utilities, which includes realtime 23 special effects that can be applied to the camera images. Our personal favorites include "sphere," which turns a human face into a grotesquely

rotund beach ball. You can capture still images (ranging in size from 40x30 to 640x480) or a 60sec (max) movie clip. You can even capture panoramic stills or set a 10-second self-timer to include a self-pimping portrait in a family e-mail. Way cool! One caveat: although the PictureBook retails for \$2,300, be prepared to shell out an additional \$850 for all the accessories. Mobile bliss doesn't come cheap these days. —Bryan Del Rizzo

### UNDER THE HOOD

THE BRAINS	
CPU	266MHz Pentium MMX
RAM	64MB SDRAM (expandable to 128MB)
I/O Ports	i-Link, USB, single Type II PC card, VGA-out, mic-in, headphone-out
Modem	Built-in 56K V.90 modem
DISPLAY	
Video	NeoMagic MagicMedia 256AV with 2.5MB SGRAM
Display	8.9-inch XGA TFT LCD
Res/Depth	1024x480/24-bit
STORAGE	
Hard Drive	Various 4.3GB hard drive
CD/DVD	External 14x CD-ROM with PC card interface
SOUND	
Sound	ESS1879 wavetable/FM synthesis
Speakers	Mono speaker
TIPPING THE SCALES	
Dimensions	11 1/2 x 9 1/4 x 5 1/4
Lap Weight	2 pounds, 8 ounces
Carry Weight	6 pounds, 8 ounces

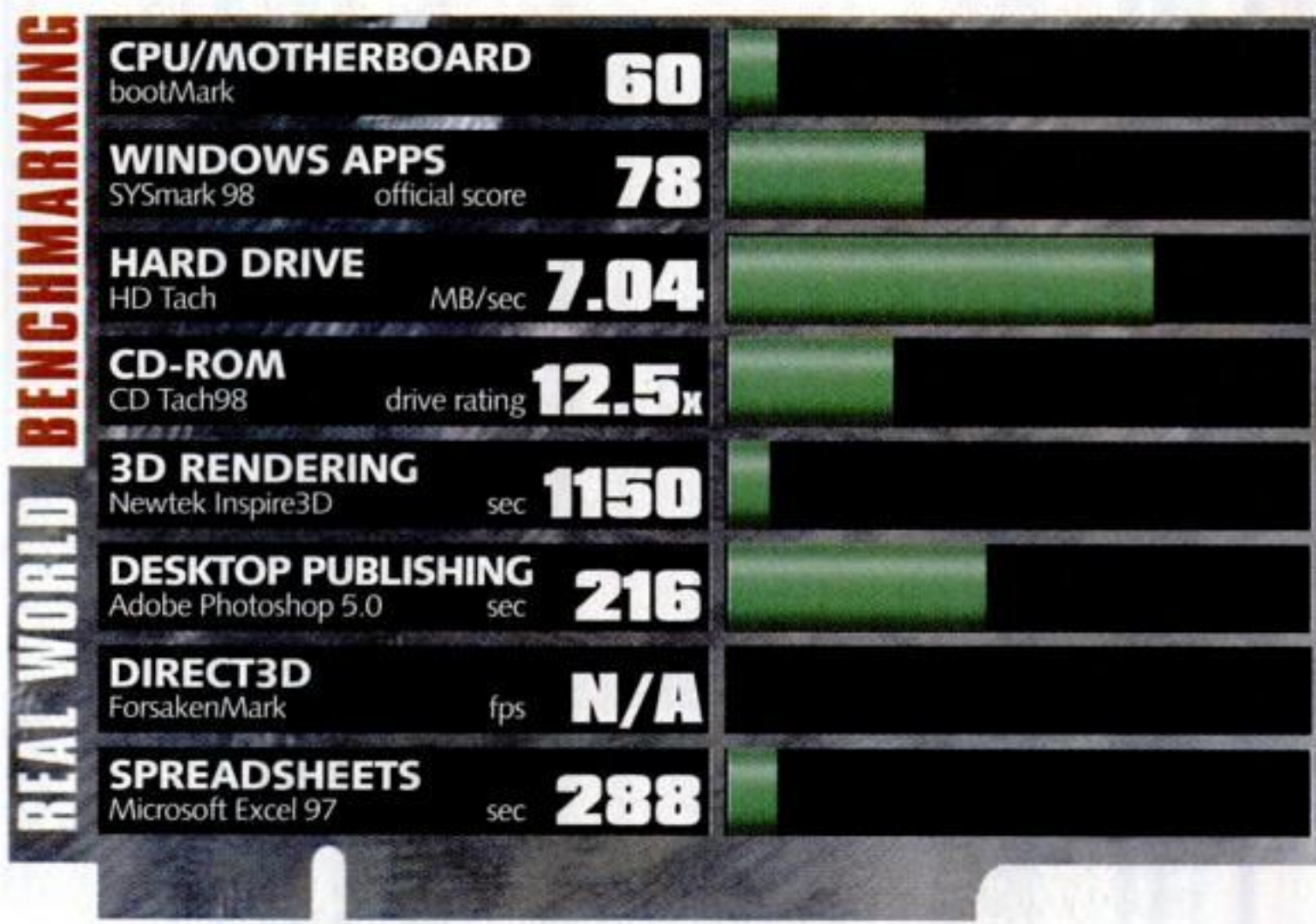
BOOT 1:07 DOWN 0:05

### PLUSES

- Integrated CCD camera
- Small footprint
- Cool aesthetics

### MINUSES

- Lowly 266MHz Pentium MMX
- Lots of external stuff to carry
- Small keyboard
- CD drive not included



### MAXIMUM PC VERDICT

**Price** \$2,300 (base unit only)  
**Company** Sony  
**Phone** 888.315.7669  
**URL** www.sony.com/pc



**Juice Maker** The super-duper \$200 battery charger can rev up two batteries simultaneously. A long-life battery—5 to 6 hours—can also be had for an additional \$300.



**REAL LIFE**

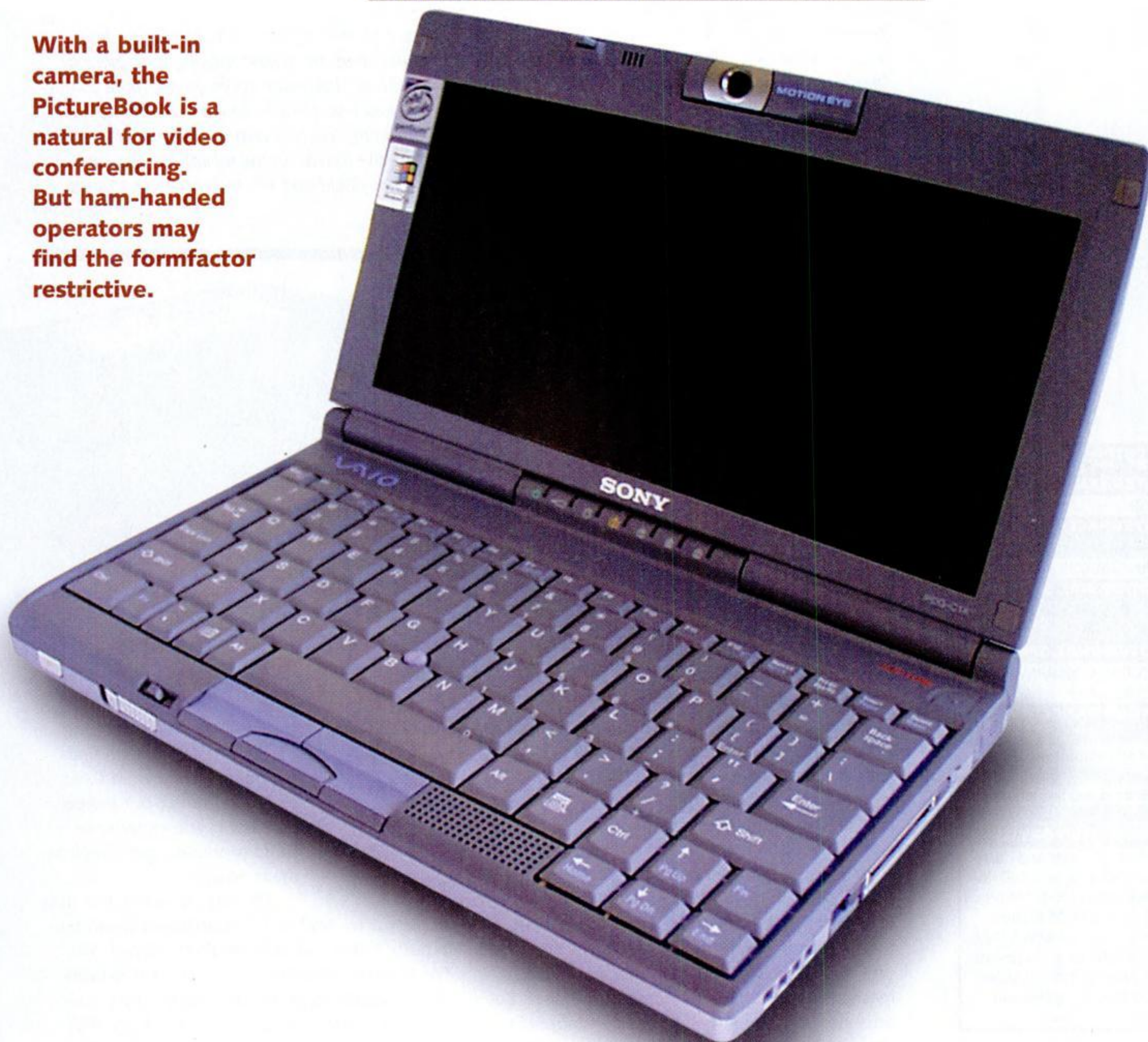
The PictureBook also includes a bevy of power consumption customizing options.

Battery Type	Lithium-Ion
Power Supply	External 16 volt

**REAL WORLD BATTERY LIFE\***

\*With standard battery; long-life battery not tested. **01:36:00**

**With a built-in camera, the PictureBook is a natural for video conferencing. But ham-handed operators may find the formfactor restrictive.**



**Spin to Win** The external CD-ROM isn't included with the base unit like the USB floppy drive is. To spin discs, you'll have to cough up another \$300.



**Plug it in** Sony's cool ergonomics even extend to the AC adapter. The metal prongs can be recessed, making portability even easier.



**Diet-sized** We shot the PictureBook with a Maximum CD for scaling purposes to prove it's smaller than a Jupiter-class CE device, and only a third the size of a regular notebook.



**I am Not a Crook** The "zigzag" special effect inexplicably turns the camera's subjects into cruel Richard Nixon caricatures.



# Third-Generation DVD Part 2

## The charge of the DVD brigade!

Be prepared for the imminent onslaught of DVD-ROM drives. Expect to see new drives from Samsung, AOpen, Kenwood, and a new 6x drive from Toshiba. We've even heard that Philips may be delivering by the end of the year. This flood can be chalked up to demand. People are asking for DVD drives, and OEMs such as Micron, Dell, Compaq, and Gateway are listening and building

drives into their systems. And of course, drive manufacturers are always looking for a piece of that action. This means more drives, more competition, and lower prices, so we're definitely not complaining. We just want more software supporting the format. In the meantime, here are a few more drives and kits to keep you occupied.

—Sean Cleveland

## Pioneer DVD-103S DVD-ROM Drive



We're seeing this drive everywhere, which is a good thing, because it truly kicks ass. By far the fastest drive available, the Pioneer makes the rest of the DVD crew look like punks. Pioneer incorporated its low-vibration mechanism and vast knowledge of DVD technology (it makes the only DVD-R/RW drive available) into what is now the industry's fastest DVD-ROM drive. The only thing it doesn't do is read **PD** or DVD-RAM media. This doesn't really matter much because DVD-RAM is so niche, we don't expect to see that media becoming mainstream anytime soon.

Under the gun, the DVD-103S sizzles, spewing forth DVD data at 8.1MB/sec (6.2x) and CD data at 4.9MB/sec (34x). Keep in mind that all these drives are based on **CAV** technology, meaning top speeds are reached only on the outer edges of full discs. But since no drive currently supports constant data streams (using **CLV** technology), we can't knock Pioneer for this. Audio extraction and real-world sequential benchmarks also reveal the Pioneer drive's dominance.

Currently, two companies are packaging the Pioneer drive in kits: Hi-Val and Utopia, both of whose kits come with the new Revision A Sigma Hollywood+ MPEG decoder card. Newer than the Kick Ass A4 version reviewed our January 1999 issue, the Revision A card, like the A4, has an orange S/PDIF connector—not yellow (which the A3 revision has). And has the words "Rev. A" printed on the RealMagic EM8300 chip.

Either way, the new board plays video out to TV better than the A4 version. And although we experienced problems with white/blue



**The Pioneer DVD-103S is by far the best DVD-ROM drive we've seen. It's a force to be reckoned with when paired with Sigma's Hollywood+.**

"snow-like" flakes popping up during playback on first-rev boards, they were fixed by Sigma during our review process. If you experience these problems, get a replacement board.

The Pioneer alone is a truly kick ass drive that can be purchased separately in both ATAPI and SCSI versions from Hi-Val. The Pioneer paired with the new Hollywood+ is a combo fit to grace the likes of any power user's rig—watching movies doesn't get any better than this. Either way, the Pioneer drive is currently the DVD fave of the bootLab. Too bad there still aren't any decent game titles to stretch its legs.

### THE SPECS

#### INTERNAL BUFFER SIZE

512K

#### INTERFACE

Bus-mastering ATAPI (EIDE)

Ultra DMA/33 Mode 2

#### ROTATIONAL SPEED DVD

4,000 to 1,500RPM  
(Partial CAV)

#### ROTATIONAL SPEED CD

6,000 to 4,000RPM  
(Partial CAV)

#### FRONT PANEL

Slot-Loading

Load/Eject button

Busy LED

3.5mm stereo headphone jack

Rotary volume-control knob

#### MEDIA SUPPORTED

DVD single-layer and dual-layer | DVD-R and DVD-RW (read only) | CD-ROM Mode 1 | CD-ROM XA Mode 2 forms 1 and 2 | Kodak Photo CD Single and Multi-Session, CD Extra (CD Plus) | Video CD | CD-DA | CD-R and CD-RW (read only)

### PLUSES

The best DVD-ROM performance

The best CD-ROM performance

### MINUSES

No digital audio connector

No support for DVD-RAM or PD

Initial problems with Hollywood+ Revision A board

### MAXIMUM PC VERDICT

**Price** \$239 (kit); \$199 (drive); \$249 (SCSI)

**Company** Hi-Val

**Phone** 714.953.3000

**URL** www.hival.com

**Price** \$229 (ATAPI drive with Hollywood+ card)

**Company** Utopia

**Phone** 888.488.6242

**URL** www.utopia.com



**DARE TO COMPARE**

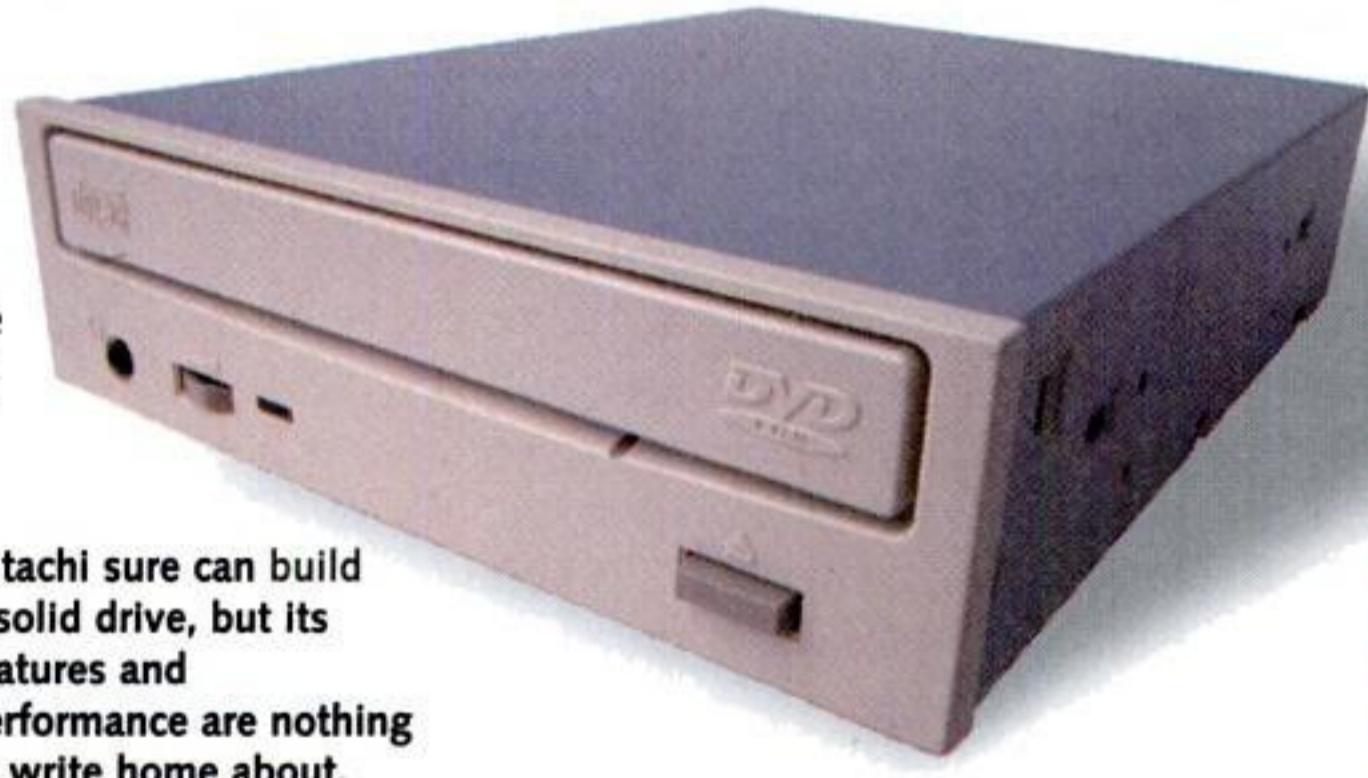
MANUFACTURER	HITACHI	PANASONIC	PIONEER
Drive Model	GD-2500	SR-8583	DVD-103S
Advertised DVD-ROM / CD-ROM speed	4x / 24x	5x / 32x	6x / 32x
<b>DVD TACH BENCHMARKS<sup>1</sup></b>			
Drive rating <sup>2</sup>	3.3x	3.4x	4.0x
Min. / Max. 32K sequential read (MB/sec (drive rating))	2.9 (2x) / 5.7 (4.3x)	2.9 (2x) / 6.8 (5.2x)	3.4 (3x) / 8.1 (6.2x)
Min. / Max. 2K sequential read (MB/sec (drive rating))	1.6 (1x) / 1.8 (1.4x)	2.9 (2x) / 3.3 (2.5x)	1.8 (1x) / 2.4 (1.8x)
Full stroke / random access times (ms)	256 / 105	313 / 87	240 / 78
1x / 2x / 4x CPU utilization	18% / 37% / 78%	11% / 19% / 36%	8% / 16% / 33%
2K / 8K / 32K burst speeds (MB/sec)	2.7 / 5.9 / 6.2	1.7 / 5.1 / 9.1	2.4 / 8.2 / 18.0
<b>CD TACH BENCHMARKS<sup>3</sup></b>			
Drive rating <sup>4</sup>	16.8x	21.7x	22.3x
Min. / Max. 16K sequential read (MB/sec (drive rating))	1.6 (11x) / 3.7 (26x)	2.1 (14x) / 4.8 (33x)	2.2 (15x) / 4.9 (34x)
Min. / Max. 2K sequential read (MB/sec (drive rating))	1.6 (11x) / 2.6 (18x)	1.3 (9x) / 1.8 (12x)	1.8 (12x) / 2.3 (15x)
Full stroke / random access times (ms)	262 / 104	177 / 89	135 / 79
4x / 12x / Max CPU utilization	1% / 3% / 5% (25x)	1% / 3% / 8% (32x)	1% / 3% / 7% (33x)
2K / 8K / 16K burst speeds (MB/sec)	3.4 / 7.2 / 8.8	3.3 / 7.5 / 9.6	2.6 / 8.0 / 12.0
<b>REDBOOK AUDIO EXTRACTION<sup>5</sup></b>			
Extraction speed <sup>6</sup> / quality	4x-8x / Excellent	12x / Excellent	12x / Excellent
<b>REAL-WORLD BENCHMARKS<sup>7</sup></b>			
Time to copy 645MB (hr:min:sec) <sup>8</sup>	00:11:50	00:14:15	00:05:17
Time to copy 4.12GB (hr:min:sec) <sup>9</sup>	00:30:59	00:15:05	00:13:22
Time to copy 7.5GB (hr:min:sec) <sup>10</sup>	01:00:48	00:47:48	00:50:49

<sup>1</sup>Tests DVD-ROM performance. <sup>2</sup>32K weighted average. <sup>3</sup>Tests CD-ROM performance. <sup>4</sup>16K weighted average. <sup>5</sup>Converting CD Audio to a WAV file. <sup>6</sup>Performed real-world captures using Xing Technologies' Audio Catalyst. <sup>7</sup>Tests the copying of real data. <sup>8</sup>Copied contents of Maximum CD 04. <sup>9</sup>Copied contents of National Geographic single-layered DVD-ROM. <sup>10</sup>Copied contents of National Geographic double-layered DVD-ROM.

**Hitachi GD-2500 DVD-ROM Drive**

Hitachi's second DVD-ROM foray yields double the speed of its first, pushing it up to 4x on the DVD-ROM side and 24x on the CD-ROM side, yet it looks like a rookie playing quarterback against the legendary "Steel" Curtain's defensive line compared to the Pioneer drive. The third-generation GD-2500, while certainly performing to spec, pales in every aspect except read speed with small 2K files from CD-ROMs. Random access times were 20% slower on average, and burst speeds were well below those of Pioneer's drive. Digital audio extraction and real-world copy benchmarks were also considerably slower.

Hitachi sure can build a solid drive, but its features and performance are nothing to write home about.



- PLUSES**  
Has a digital audio connector
- MINUSES**  
Just isn't fast enough  
No support for DVD-RAM or PD

We've tried to come up with a reason to buy Hitachi's drive, but cannot find any. If you've purchased it with a

system, know that while it works, it isn't going to "wow" you. We rate it better than Toshiba's SD-M1202 4.8x drive (6 verdict in January 1999), but would have to recommend Sony's DDU220E 5x (7 verdict in January) over Hitachi's drive.

**MAXIMUM PC VERDICT**

**Price** \$150  
**Company** Hitachi  
**Phone** 800.448.2244  
**URL** www.hitachi.com



**THE SPECS**

- INTERNAL BUFFER SIZE**  
512K
- INTERFACE**  
Bus-mastering ATAPI (EIDE)
- ROTATIONAL SPEED DVD**  
2,304 to 2,772RPM (CLV)
- ROTATIONAL SPEED CD**  
4,800RPM (CAV)
- FRONT PANEL**  
Load/Eject button  
Busy LED  
3.5mm stereo headphone jack  
Rotary volume control knob
- MEDIA SUPPORTED**  
DVD single-layer and dual-layer | DVD-R and DVD-RW (read only) | CD-ROM Mode 1 | CD-ROM XA Mode 2 forms 1 and 2 | Kodak Photo CD Single and Multi-Session | CD Extra (CD Plus) | Video CD | CD-DA | CD-R | CD-RW (read only)

**PANASONIC DVD-ROM DRIVE**

The Panasonic SR-8385 is the first DVD-ROM drive that reads DVD-RAM media (only Type-2 removable media). It's also quite the performer. Though the Pioneer drive beat it out in every test, performance was close, and with the extra DVD-RAM feature (it reads PD discs, too), we can understand why we've been inundated with requests for information on this hard-to-find drive (though Compaq bundles it).

we discovered the drive can read DVD-RAM media. If we'd suspected this back in January, we would have told you—we don't think even Creative knew.

The SR-8385 is a fine drive, despite performance lower than Pioneer's drive. But if you have mission-critical data and need the DVD-RAM capability, Panasonic's offering is tops in nearly all areas.

**MAXIMUM PC VERDICT**

**Price** \$150  
**Company** Creative Labs  
**Phone** 800.995.5227  
**URL** www.soundblaster.com



The Panasonic SR-8385 is an excellent drive That benchmarks well. The only downside is its 5x DVD-ROM performance.

Upon closer inspection, we discovered that this drive is identical to the Creative Labs/Panasonic DVD-ROM drive we covered back in January. In that review, we showered accolades on the drive, but sneered at the DXR-2 decoder board Creative bundled with it. Since then, Creative has begun offering the drive individually (see the URL below). And while Creative doesn't promise it—or even mention it—



# CompUSA American Pro

This system stands tall



**CompUSA takes aim at the top-tier systems with its American Pro.**

**PLUSES**

- Pentium III
- Busts new record in Windows applications
- TV out
- Excellent Cambridge sound system

**MINUSES**

- Cinemaster SoftDVD drops frames
- No Digital Dolby out
- CD-ROM and hard drive lag compared to the competition

CompUSA wants to show it can run with the big dogs, and its new American Pro, does a decent job.

In fact, the American Pro is so close to Pentium III-based systems from Dell and Micron that we were able to swap faceplates on the cases without problems. Inside, CompUSA follows the same special-sauce recipe used in other top-tier machines: TNT-based videocard, IBM *Ultra DMA* hard drive, three DIMM sockets, and Creative Labs' Sound Blaster Live! Value all plugged into an Intel Seattle BX 2.0 motherboard.

The American Pro set a new land-speed record in our productivity suite tests. Turning in a score of 209 in SYSmark 98, the American Pro tied the Gateway Pentium III system and banished all others from our Windows applications test. We were disappointed the American Pro didn't smash the one-minute mark in our *Photoshop* test, but it still placed in the ballpark with the other Pentium IIIs.

STB's final non-3Dfx board—the Velocity 4400—shoves benchmarks aside with aplomb. Let's just say you'll be happy with OpenGL

and DirectX gaming for a while.

The system we reviewed came with NEC's 1500M flat panel. A USB hub is built into the base, and wide videocard support comes through the use of an analog SVGA connector. Although it's tempting to go with the flat panel to wow friends, a glass tube may serve you better because of the limitations of this LCD flat panel, mainly dithered color and a fixed resolution of 1024x768. However, at that native resolution, images were vibrant and crisp.

A Sound Blaster Live! Value soundcard pumps out tunes on the American Pro. The Value, basically a Live! without the fancy-pants digital connectors, features dual stereo outputs for full quad support. CompUSA pairs the Live! with Cambridge SoundWorks' Desktop Theater 5.1 system, which decodes Digital Dolby signals. Unfortunately, there's no way to pipe the digital channels into the Cambridge speakers for discrete

channels. Your DVD experience on the American Pro will be limited to simulated surround sound through the analog inputs.

DVD decoding itself was left up to Quadrant's Cinemaster softDVD. While the image quality was good for software DVD decoding, softDVD visibly dropped frames. We thought it might have been Toshiba's 4.8x DVD drive, so we swapped it for Pioneer's new 8x DVD drive, but the Cinemaster softDVD continued to drop frames.

By sacrificing a PCI slot and plugging in a card such as Sigma's Hollywood+, a user can eliminate the dropped frames and get discrete 5.1-channel sound in the deal through the Sigma's AC-3 out port.

While the American Pro doesn't shatter all the performance records, CompUSA is starting to show it can build boxes almost as good as the big boys.

—Gordon Ung

**UNDER THE HOOD**

**THE BRAINS**

CPU	Intel Pentium III 500MHz
L2 Cache	512KB closely coupled, half core speed
RAM	128MB PC100 (expandable to 384MB)
Motherboard	Intel Seattle BX 2.0
Drive Bays	Two 5.25-inch, three 3.5-inch
I/O Ports	Two USB, two serial, one parallel, one gameport

**DISPLAY**

Video	STB Velocity 4400
Monitor	NEC MultiSync LCD 1500M
Res/Depth	1024x768/32-bit

**STORAGE**

I/O	Enhanced IDE
Hard Drive	IBM Deskstar 13.5GB
CD/DVD	Toshiba SD-M1202 4.8x DVD
Removable	1.44MB floppy
Fax/Modem	U.S. Robotics V.90 56K PCI Winmodem

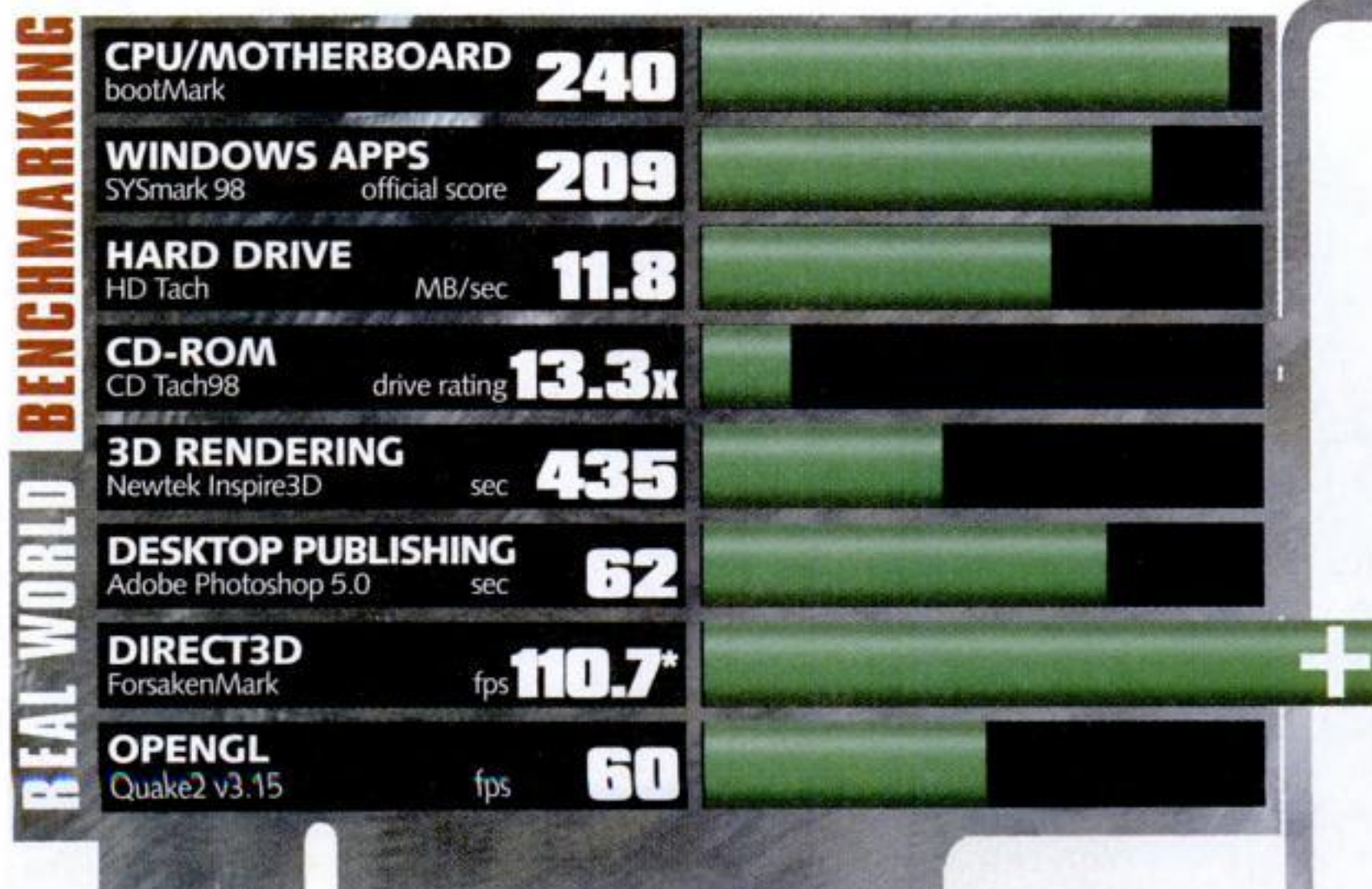
**SOUND**

Sound	Creative Labs Live! Value
Speakers	Cambridge SoundWorks Desktop Theater 5.1

**THE BUNDLE**

Windows 98   Home Essentials 98   Office 97 Small Business Edition
--

BOOT 0:59 DOWN 0:02



NOTE: \*Sound disabled

**MAXIMUM PC VERDICT**

**Price** \$3,399 with flat panel; \$2,520 without flat panel  
**Company** CompUSA  
**Phone** 800.294.4727  
**URL** www.compusa.com





**EXPANSION NOTES**

You've got room to grow with the American Pro. Two PCI and one ISA slot, two additional 168-pin DIMM slots, and a 200-watt power supply make for plenty of money to burn.

**EXPANSION MAP**

**AGP Videocard**

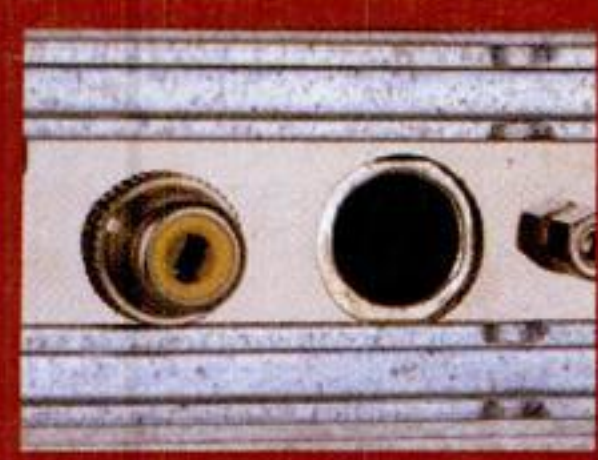
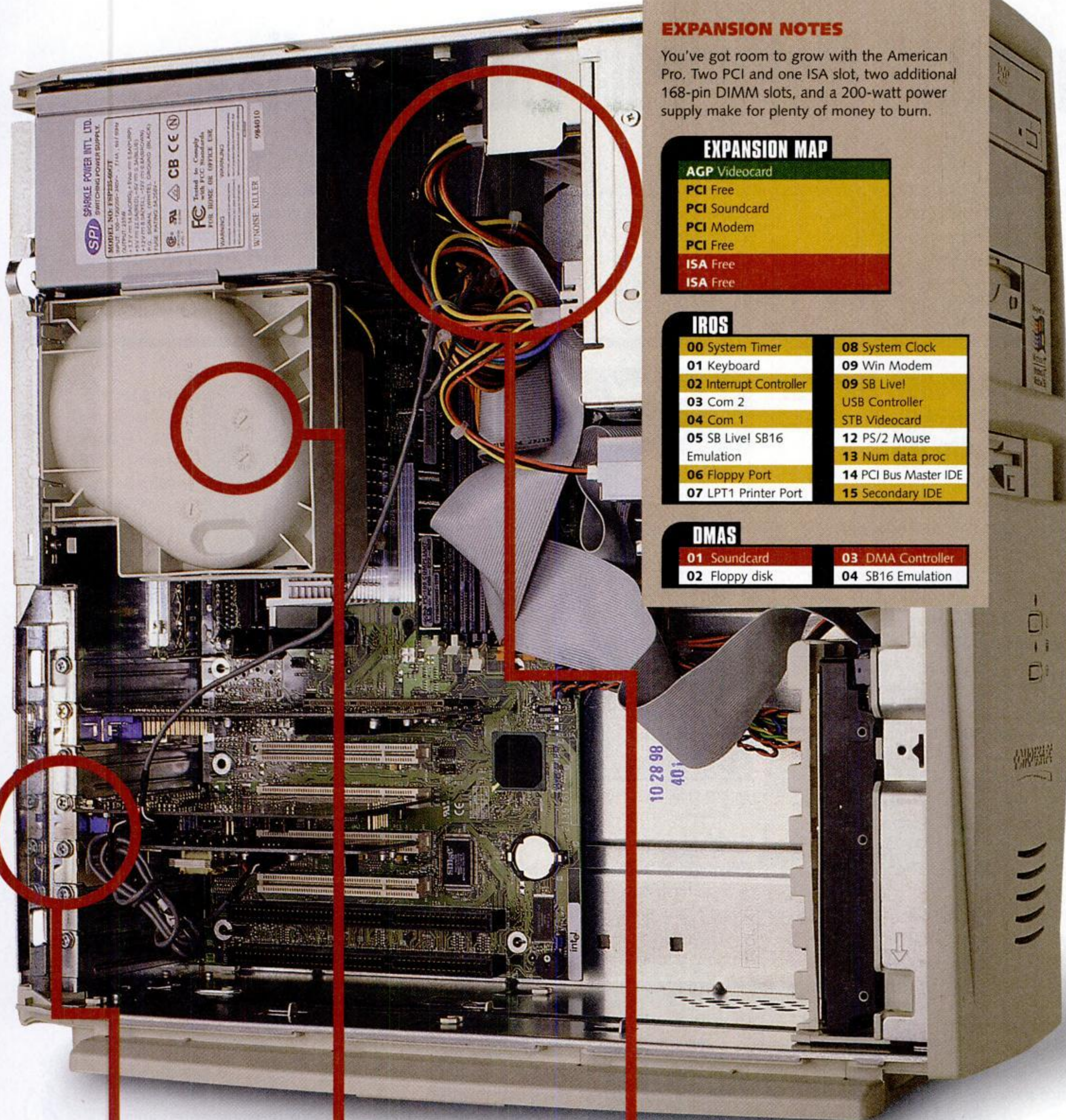
- PCI Free
- PCI Soundcard
- PCI Modem
- PCI Free
- ISA Free
- ISA Free

**IROS**

- |                                   |                              |
|-----------------------------------|------------------------------|
| <b>00</b> System Timer            | <b>08</b> System Clock       |
| <b>01</b> Keyboard                | <b>09</b> Win Modem          |
| <b>02</b> Interrupt Controller    | <b>09</b> SB Live!           |
| <b>03</b> Com 2                   | USB Controller               |
| <b>04</b> Com 1                   | STB Videocard                |
| <b>05</b> SB Live! SB16 Emulation | <b>12</b> PS/2 Mouse         |
| <b>06</b> Floppy Port             | <b>13</b> Num data proc      |
| <b>07</b> LPT1 Printer Port       | <b>14</b> PCI Bus Master IDE |
|                                   | <b>15</b> Secondary IDE      |

**DMAS**

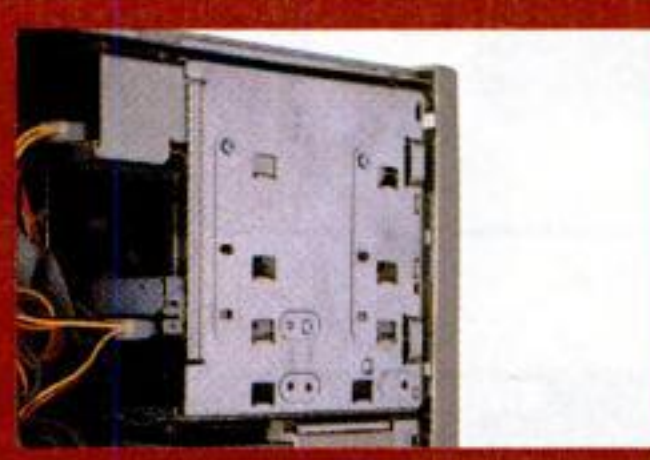
- |                       |                          |
|-----------------------|--------------------------|
| <b>01</b> Soundcard   | <b>03</b> DMA Controller |
| <b>02</b> Floppy disk | <b>04</b> SB16 Emulation |



**TV Outside** Those wacky Texans at CompUSA went with a product from their neighbors at STB and wisely chose to include the version with both composite and S-Video out for some big-screen loving.



**Check That Crazy Cap** It's a zany way to cool that Pentium III, but it gets the fan directly over the chip.



**2BR, 1 1/2 bath** You've got room for a CD burner and a couple of hard drives with the American Pro. We would like even more expansion, but no one listens to us.



**Flat Out** NEC's 1500M flat panel gives vibrant, crisp images and fair off-axis viewing, but in an age of cheap 19-inchers, this dithered baby is only for those out to impress.



# The 1999 Multimedia Encyclopedias

## Variety is the spice of life

This year's crop of CD-ROM encyclopedias gives users updated articles, fresh audio and video clips, and numerous links to the Internet that will take your research to deeper levels than you ever imagined. However, due to the 650MB space

constraints of standard CD-ROMs, multimedia encyclopedia developers have to shorten articles and limit the number of photographs compared to what you'll find in most hardbound encyclopedias. But they try to supplement their coverage with

Internet links so you can take your research beyond the discs themselves. So while they aren't exhaustive, they certainly present a good starting point to get general information on just about any topic.

—Heather Walton



### Microsoft Encarta Reference Suite 99

Encarta Suite 99, packed with up-to-the-minute

information on current events and more than enough multimedia content to keep researchers occupied for hours, stands out in this year's roundup. The discs are easy to search and packed with a wealth of multimedia features. The five-disc CD-ROM set can also be purchased as a single DVD-ROM. The Deluxe suite contains 66,000 articles, more than 70,000 sound clips, and 35,000 Internet links, and throws in *Bookshelf 99* and *Virtual Globe 99* for good measure. These amenities are strong in their own right and complement the encyclopedia well. While we reviewed the Suite edition of *Encarta*, you can also buy just the encyclopedia for \$40. Definitely a good value for your buck.

The bounty of interactive features the other contenders skimped on, such as photographs, video clips, audio files, and interactive presentations, draw you in to *Encarta 99*. It certainly was the most entertaining reference pack of this group, keeping us actively interested in the material for many hours with its bright, sophisticated interface.



The splendor of Mars from A to Z.



Encarta provides a graphically exciting opening menu, with easy access to everything.

Another compelling feature was the Virtual Tour, which features clickable tours of 30 unique locations, such as Hawaii, Mt. Everest, the Kremlin, and the White House.

The main menu is extremely intuitive. Finding a topic is as simple as typing it on the find bar. Each search is only a click away, taking less than a second to bring up anything you can throw at it. You can also search by categories, such as Sound, Article, Video, Map, and Animation. For example, our search of the planet Mars

brought up 37 articles, 11 web links, 14 book references, 10 multimedia presentations, and a slew of compelling graphs, photographs, and charts. Hundreds of other searches on an array of topics, both recent and ancient, were equally good. A search on computers brought up 927 articles,

with an excellent chronology of computer history, 18 multimedia presentations, and four web links. These articles were superbly done, giving adequate information to fill the better part of a term paper.

*Encarta's* article text is about on par with *Grolier*. It's passable, but not very deep. To compensate for this, Microsoft built in detailed bibliographies and numerous Internet links. The Internet links were exhaustive and took us through thousands of online articles.

*Encarta* is the most entertainingly browsable encyclopedia in this roundup. It's extremely easy to use and very stable, with no crashes or error messages occurring during our extensive trials. We'd go as far as to say this encyclopedia is as good as the hardcover book sets. *Encarta 99* stands above the rest.

### DARE TO COMPARE

NUMBER OF EACH:	ENCARTA SUITE 99	BRITANNICA MULTIMEDIA	GROLIER DELUXE
Articles	45,000	45,000	36,000
Video clips	90	10	163
Audio clips	70,000	none	10,000
Charts/Maps/Diagrams	10,000	1,200	1,200
Photos/Animations	16,000	8,500	15,000
Internet Links	35,000	30,000	20,000
Online Articles	21,000	28,000	22,000

### MAXIMUM PC VERDICT

**Price** \$100 Deluxe version with Virtual Globe 99 and Bookshelf 99; Standard edition \$40

**Company** Microsoft

**Phone** 800.426.9400

**URL** www.encyclopedia.com





## Britannica CD 99 Multimedia Edition

Though dubbed a multimedia encyclopedia, surprisingly, the *Britannica CD 99* contains no sound files whatsoever. And its depth of coverage was ultimately disappointing.

The Multimedia Edition contains the same 73,000 articles as the Standard Edition, but has twice the photos and illustrations, totaling 8,500. It also includes five Multimedia Presentations: the Olympics, Ecosystems, Human Anatomy, Dinosaurs, and the American Civil War. These presentations are mainly outlines and illustrations with no sound files or interactive elements, and they're only useful to someone who wants information on these topics. The Timeline is interesting, but it includes no information past 1995. This is not acceptable for a 1999 encyclopedia. The Compass section contains nicely illustrated maps and information about our world.

The interface is impressive, professional, and easy to



Britannica provides a really good layout and interface, but what does Mars look like?

navigate. The search engine was as fast as *Encarta*, bringing up any topic in less than a second. Our search on Mars found one video, one photograph, and 14 Internet links, but very little information aside from two paragraphs of text and no links to further information on the disc. We were surprised because *Britannica* claims to have the largest number of articles and the most in-depth information. The search on computers brought up 14 articles, one picture, and 55 hyperlinks (web links not related to Britannica's web site), but seemed anemic when compared with the extensive computer history offered by both *Encarta* and *Grolier*.

Other searches, on a variety of topics, were equally shallow when compared to *Encarta* and *Grolier*.

When clicking on a link to bring up a related article, more than half the time we got either the "No access to the Internet" or "Insert Disk #2" message. You'll get the most from this encyclopedia if you're connected to the web

while browsing. This put us in a quandary. Should multimedia encyclopedias be stand-alone, or do they deserve praise for integrating with the web? We think encyclopedias should be stand-alone products first and foremost. *Britannica's* complete articles should be on the two CDs. With *Encarta* and *Grolier*, there is a symbol next to the link letting you know if you'll need to go to the second disc. There is no such indication on *Britannica*, making navigating through it awkward and annoying.

*Britannica CD* is a resource hog. When we checked our system by right-clicking on My Computer and looking at properties, then the performance tab, they were down to 11%. We've never seen this happen before. With the other two packages tested here, we found the resources never dipped below 80%.

Overall, we find the error messages, the amount of system resources consumed, and the lack of long articles enough to make us pass on *Britannica 99*.

### MAXIMUM PC VERDICT

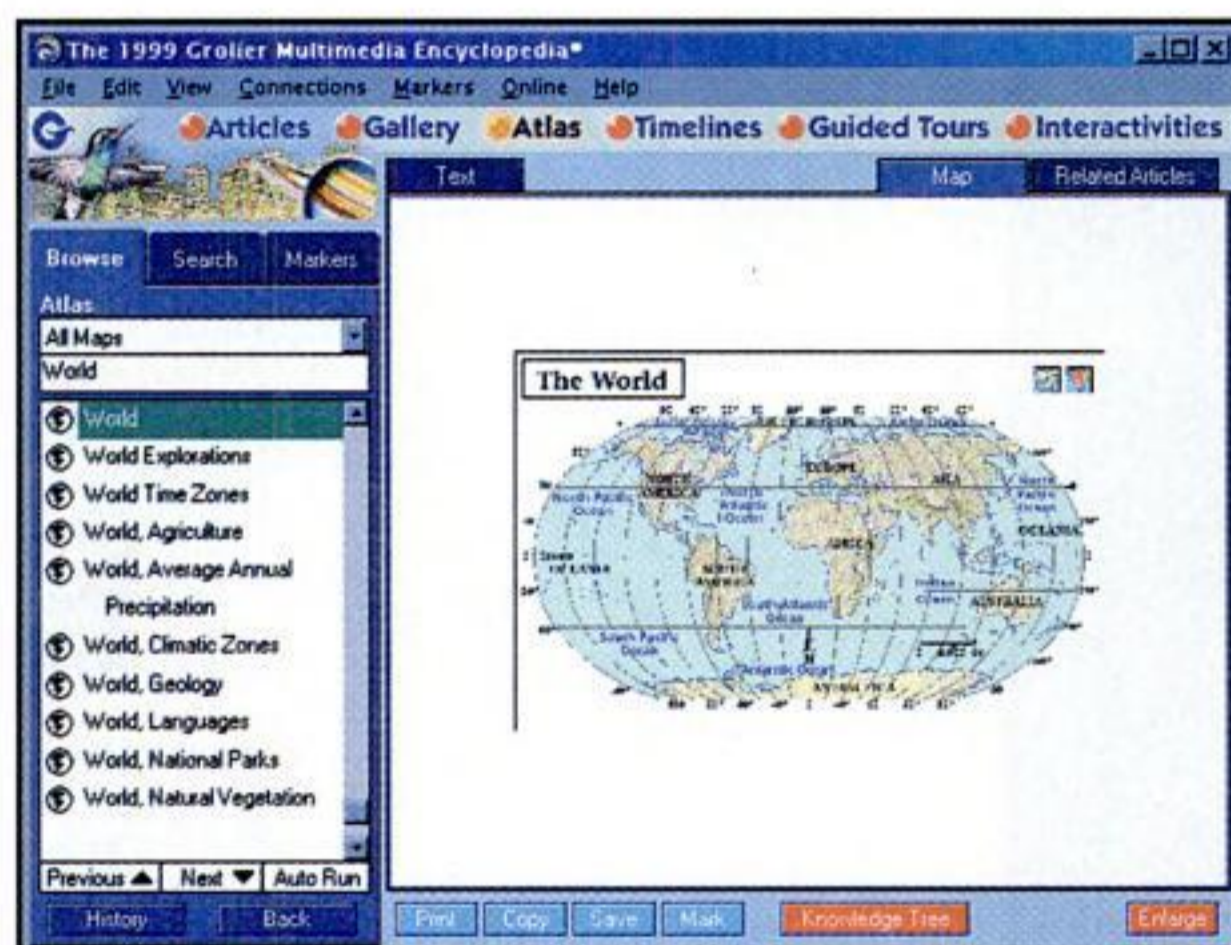
**Price** \$119 for Multimedia Edition; \$85 for Standard Edition  
**Company** Britannica  
**Phone** 800.747.8503  
**URL** www.britannica.com



## Grolier Multimedia Encyclopedia 1999 Deluxe

*Grolier Multimedia Encyclopedia 1999* comes in two varieties: a single-disk standard edition and a two-disk Deluxe edition, which includes two extra resources: the Online New Book of Knowledge, a watered-down version designed for elementary school students, and the Encyclopedia Americana Online, for more in-depth research designed for teens to adults.

The main interface is simple to use, even child-like, but lacks the pizzazz of the other contenders. *Grolier's* search engine was just as fast as the others. Our search on Mars quickly brought up the largest article of all the encyclopedias with more than 20 referenced books, five photos, and one chart. The article was the most in-depth and offered detailed photographs and references. Our search on computers brought up more than 500 articles, three charts, five pictures, and 15 hyperlinks. We found the articles on computer history forthright and fascinating. However, unlike *Encarta*, which uses an intuitive outline format, *Grolier's* search capabilities are more involved. Searching through 500 hits quickly became cumbersome. We also couldn't scroll down any article with the cursor keys, forcing



Gee, we hope our world isn't that plain and dull!

us to use the mouse, which became tiring. *Grolier's* articles themselves are comprehensive and provide content suitable for high school and junior college students.

There are 36,000 articles on the disc and 22,000 online. There are also 15,000 images, 50 guided tours, 163 videos, 1,200 maps, and 10,000 sounds. A feature on the *Grolier CD* worth exploring is the Gallery, which holds all the images, with brief descriptions for each. Most of these images are hand drawings, not photographs, and aren't as inspiring as those found on *Encarta* or *Britannica*. The Atlas is primitive in design,

but reels in a boatload of information and detailed maps of the world. The timelines are accurate and up-to-date with plenty of information all the way up to the end of 1998. The guided tours and interactives are also interesting, but there's little in the way of multimedia to bring them to life as with *Encarta*.

*Grolier* has a static, cartoonish interface. On the other hand, the articles are complete and comprehensive, offering hundreds of matches per topic. *Grolier* lacked enough images, video, sound, and interactive material to keep us interested for more than 25 minutes. Still, if you don't care about multimedia content or still have a 486 machine with limited hard drive space, this is a good choice.

### MAXIMUM PC VERDICT

**Price** \$40 for Deluxe Multimedia Edition, \$30 for Standard Edition  
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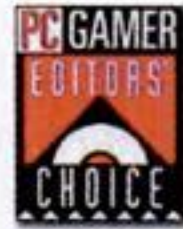
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**-PC Gamer, January 1998**



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**-Computer Gaming World, July 1998**

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**-BOOT Magazine, July 1998**



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# Palm V

## Little, yellow, not-so different

In its stylish brushed-steel skin, the new flagship of the Palm PDA line is sure to turn heads, but poor design and a lack of horsepower make the Palm V unlikely to change the minds of current PDA owners.

The slender new design (nearly half the thickness of previous Palm PDAs and weighing less than five ounces) initially seems a good thing. To preserve the svelte form-factor, the Palm V ships with a removable thin flip cover that slides into one of the channels that run down either side of the unit. This ill-conceived cover actually presses the front buttons when closed and pocketed, activating the PDA and draining battery life. And it can induce an incessant and annoying

beeping.

Luckily, this shortcoming is somewhat addressed by another design change. This year's model replaces the ongoing expense of AAA batteries with a built-in lithium-ion that recharges during sync sessions.

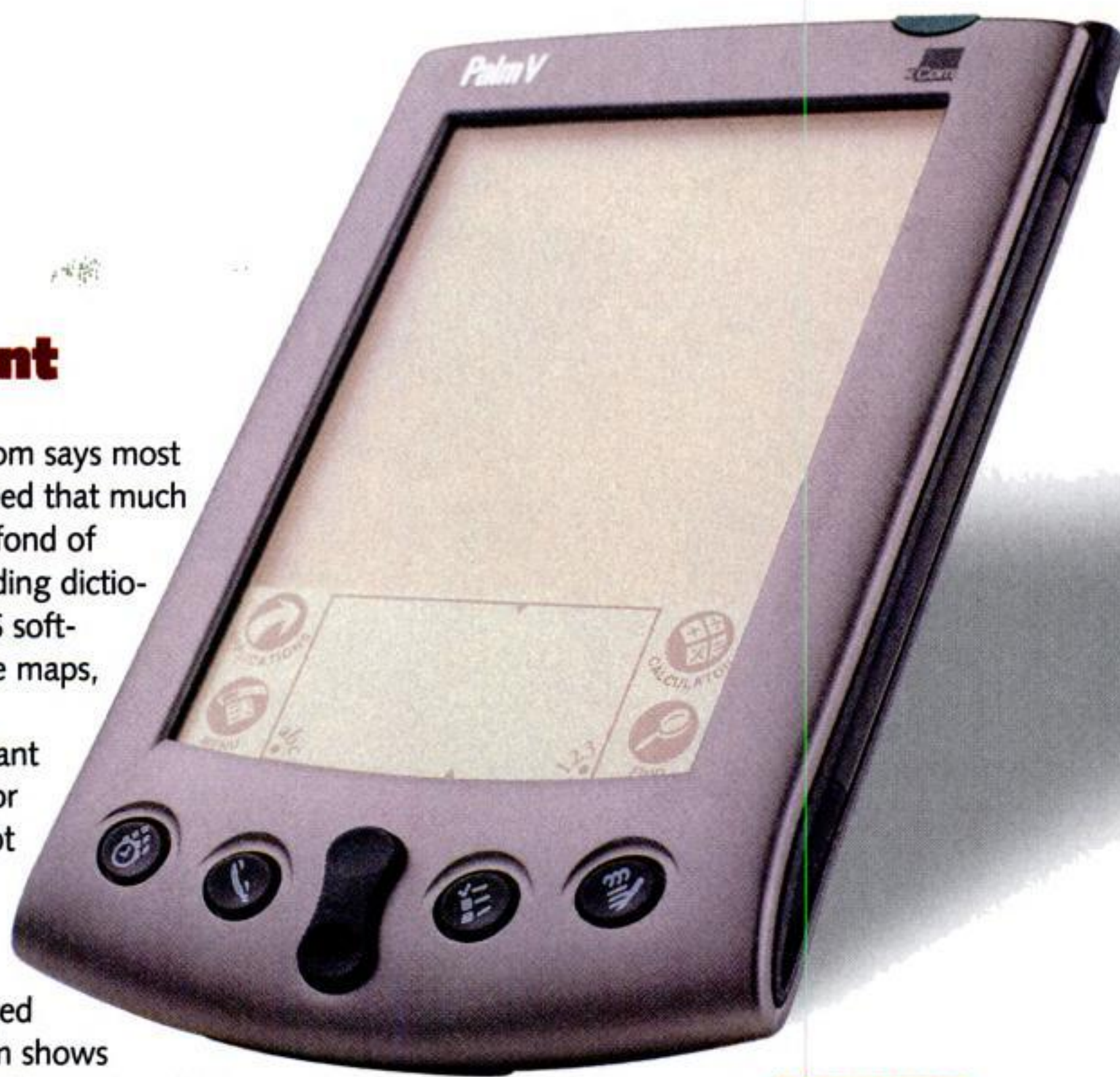
Also absent is the pre-Palm III memory-expansion door. And don't bother looking for a CompactFlash or SmartMedia slot. These are especially painful omissions given the meager 2MB of memory the

unit ships with. 3Com says most customers never need that much storage, but we're fond of reading novels, loading dictionaries, running GPS software with extensive maps, and playing robust games. The significant memory required for these activities is not even an option with the Palm V. The Palm won't become a full-fledged platform until 3Com shows some vision and builds overhead into the hardware.

Once you fire up the Palm V, the most important improvement is the screen. Though it hasn't taken the color plunge, Palm has upgraded the dark green screen to a yellow-masked model that significantly improves contrast and legibility. The backlight has been inverted, so text appears illuminated on a dark background. This feature helps in relatively dark environments, but actually makes the screen more difficult to read in low-light situations.

Under the hood, the DragonBall RISC processor has received a modest MHz upgrade that should be perceptible to monster database crunchers. And for the first time, a major Palm model is not accompanied by a new OS, although an *Outlook* conduit is now available.

A slim new \$169 33.6 modem attaches onto the back, making the complete package only slightly thicker than the original model. Unfortunately, neither the modem nor the Palm PDA ships with e-mail client software.



### The latest svelte supermodel from Palm favors looks over brains.

Perhaps the most annoying design decision is the flare that widens the bottom of the unit. Not only does this not follow the natural curve of your hand, as the Palm III design did, it makes the Palm V incompatible with previous docking cradles. This is a major hassle in homes or offices where people share a cradle.

Buckling under the weight of the biggest price tag ever affixed to a PDA from Palm, the Palm V has nothing over the significantly less expensive Palm IIIx (see sidebar), other than a sleek appearance.

—Brad Dosland

#### THE SPECS

##### SCREEN RESOLUTION

160x160  
Four-level gray

##### I/O

IrDA port | docking port

##### REMOVABLE STORAGE

None

##### DIMENSIONS

4.5x3.1x.04 inches  
4 oz.

##### ACCESSORIES

Docking cradle | cover

#### PLUSES

Sleek size  
Lightweight  
Bright screen  
Built-in lithium ion battery

#### MINUSES

Poor body design  
Cradle not backward compatible  
Inverted backlight problematic  
Only 2MB of memory  
No OS revision



### PALM IIIx: MORE BOUNCE TO THE OUNCE

At first glance, you might mistake the Palm IIIx for its x-less predecessor, but under the flip-up hard cover this PDA is a real muscle machine.

This latest rev has the same bright screen and faster processor as the Palm V, but doubles the memory to a comfortable 4MB. This memory, previously parked on a card in the expansion slot, lives on the redesigned mainboard, opening the slot to peripherals such as additional memory to pager cards.

Just as in the Palm V, the OS is stalled at v3.0, with an *Outlook* conduit cherry on top. Still, in terms of bang for the buck, this

modest upgrade is the best Palm PDA money can buy.

#### MAXIMUM PC VERDICT

Price \$369  
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5

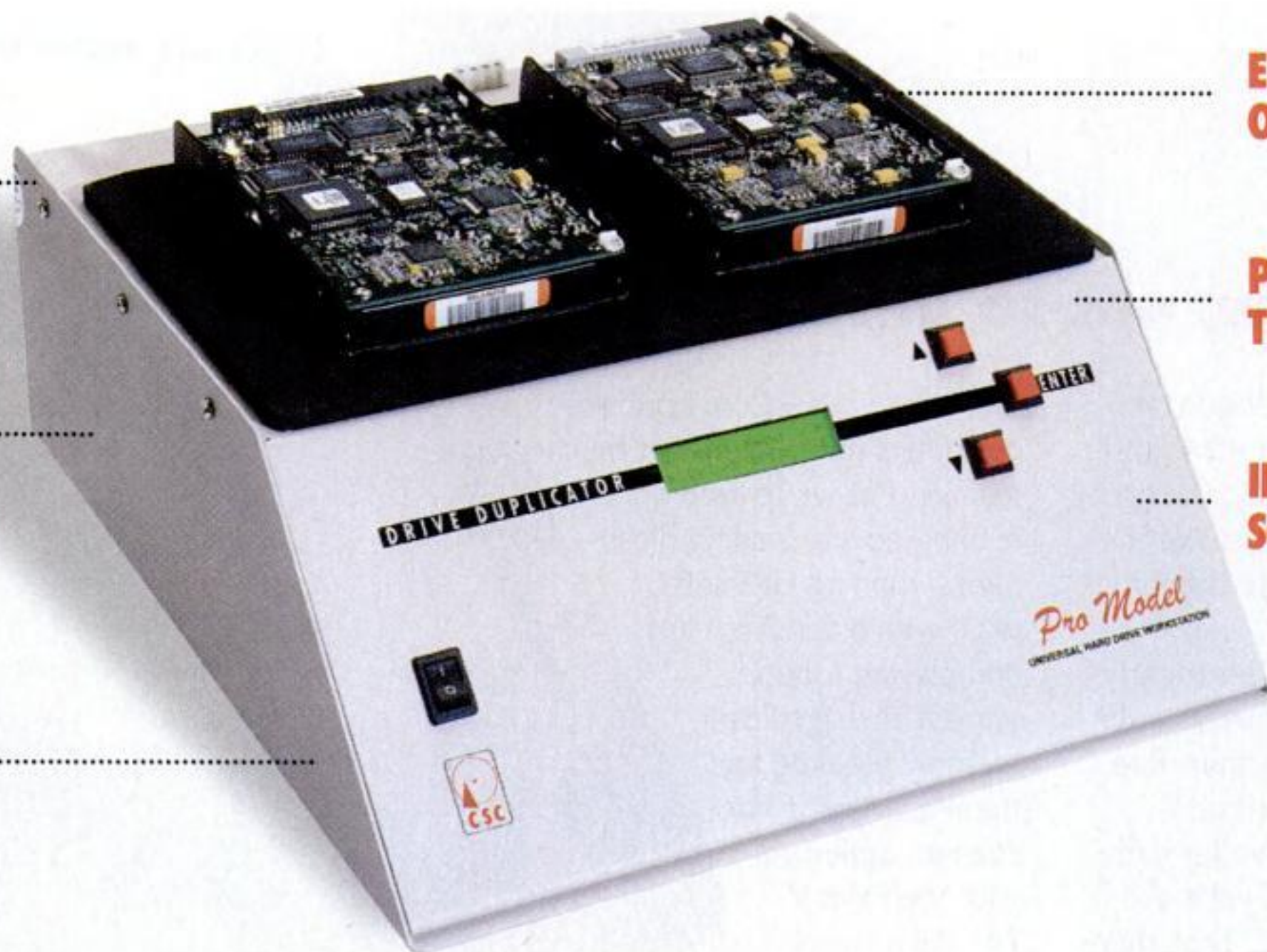
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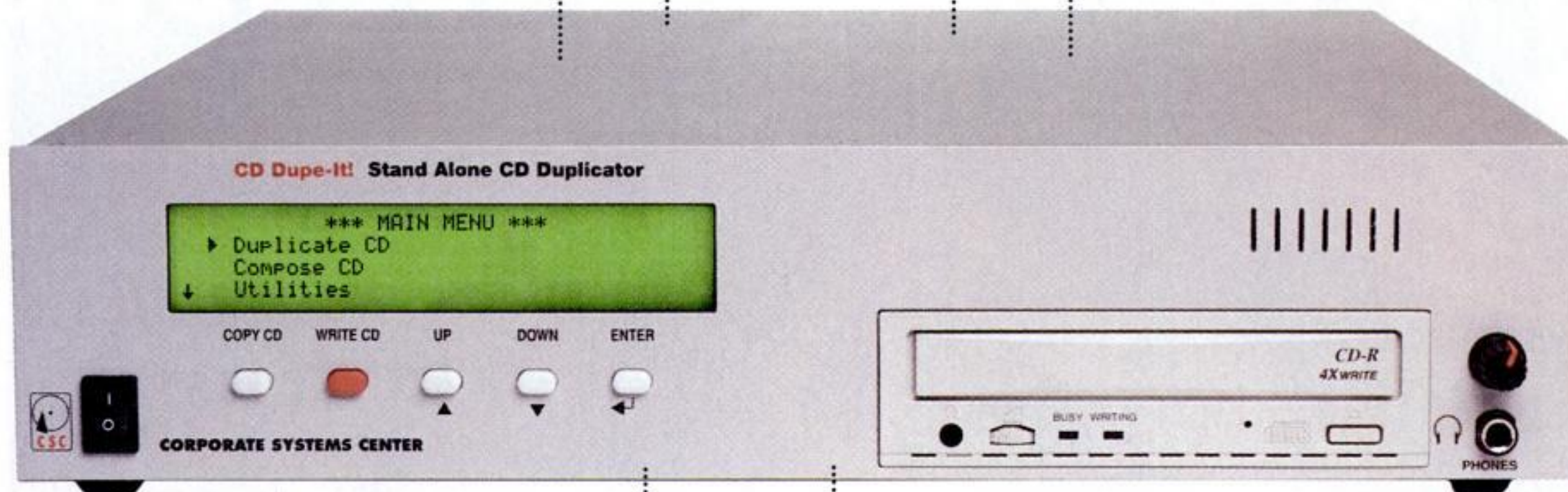


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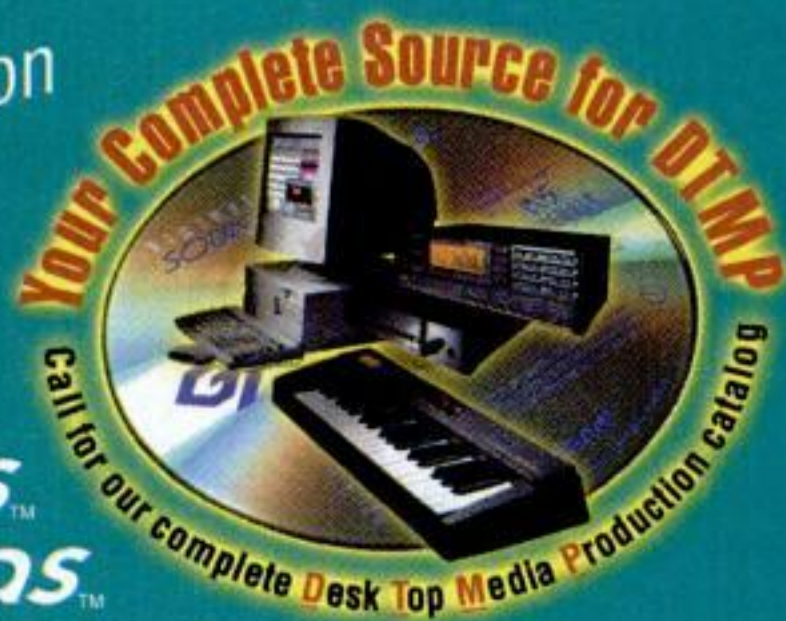
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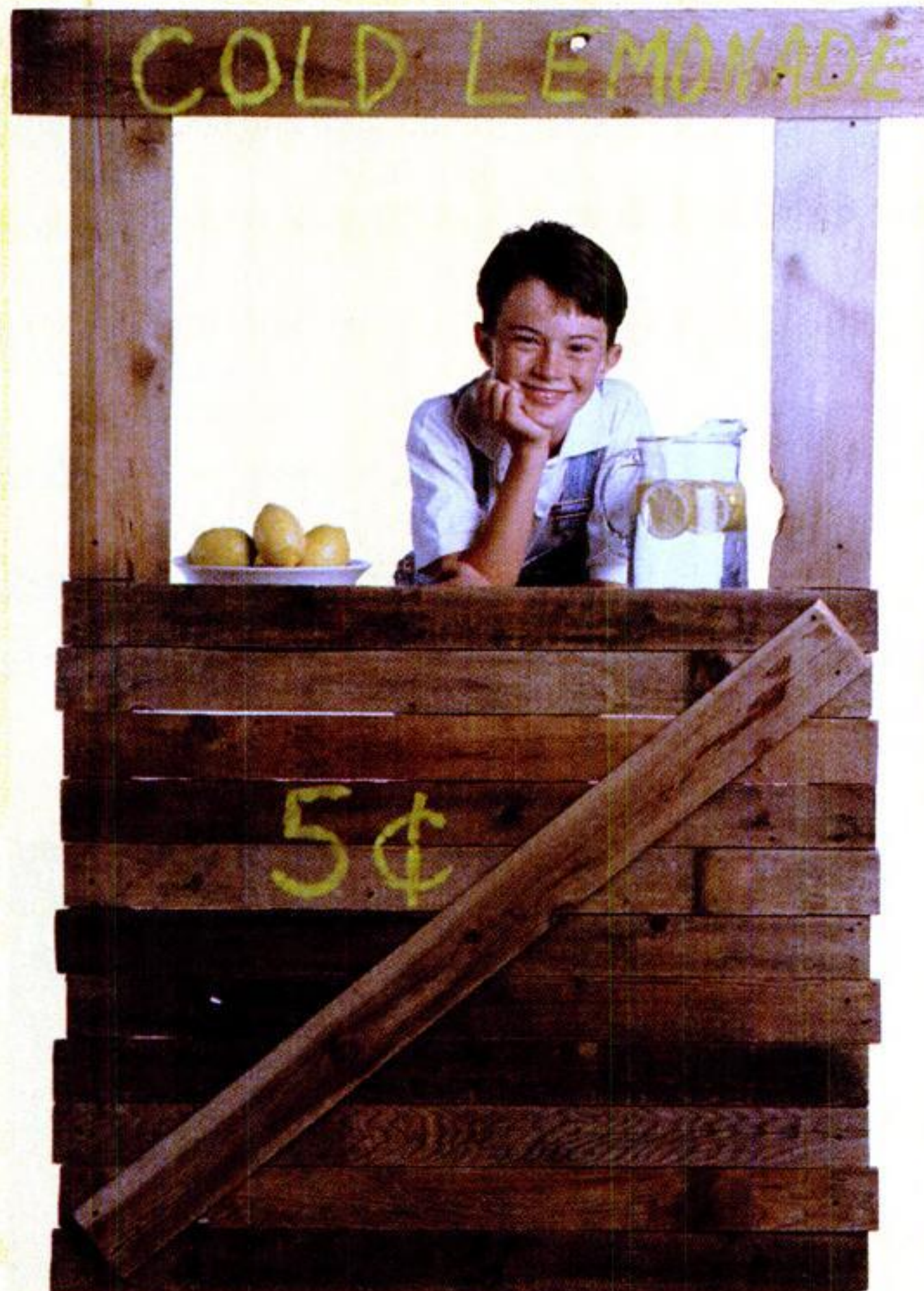
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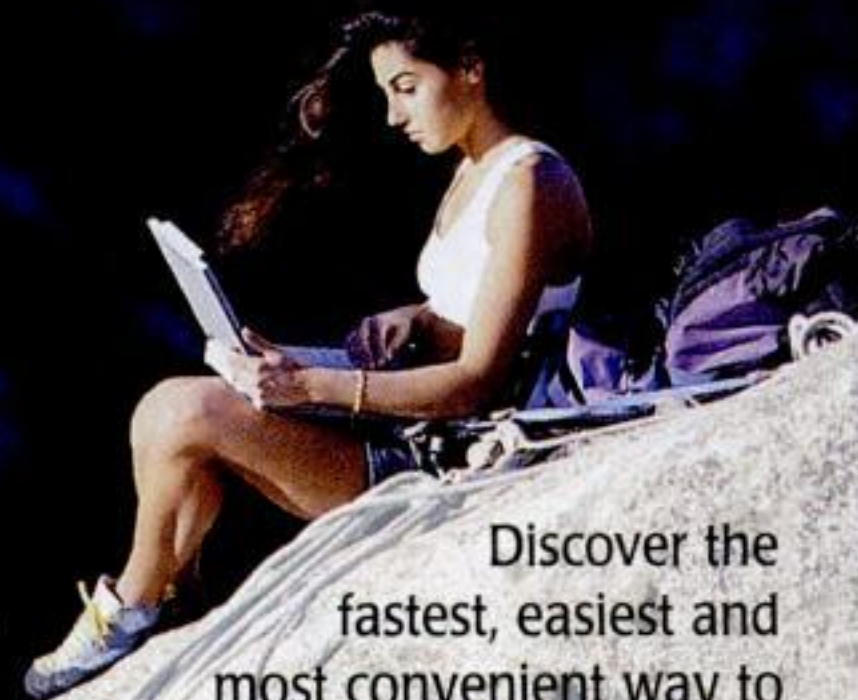
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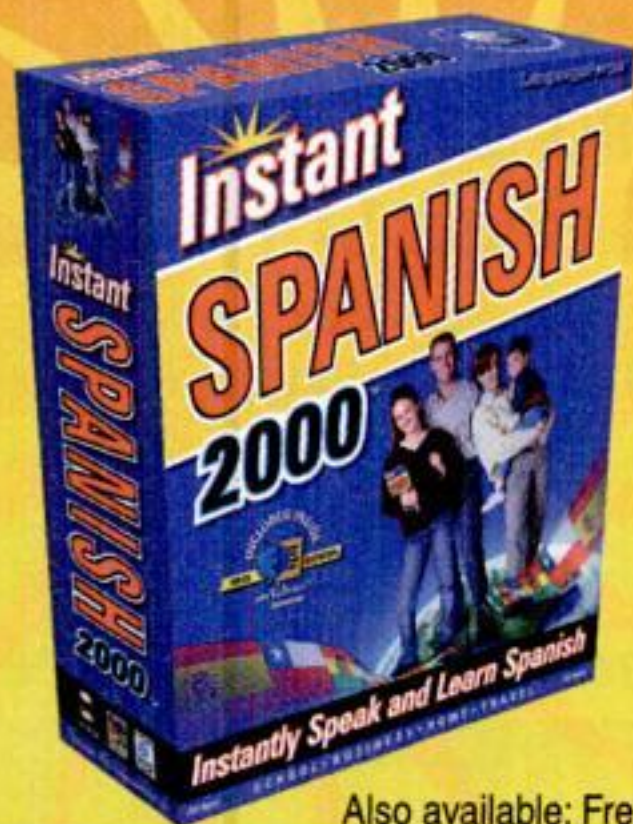
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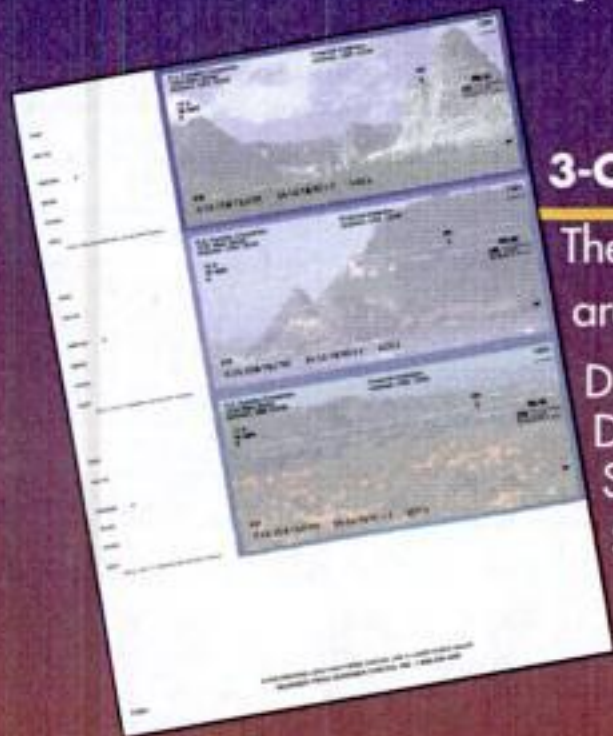
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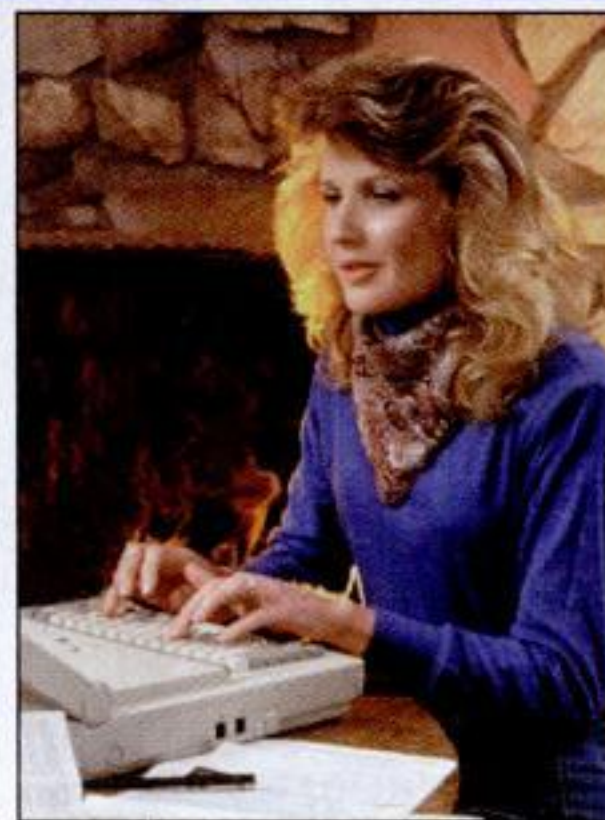


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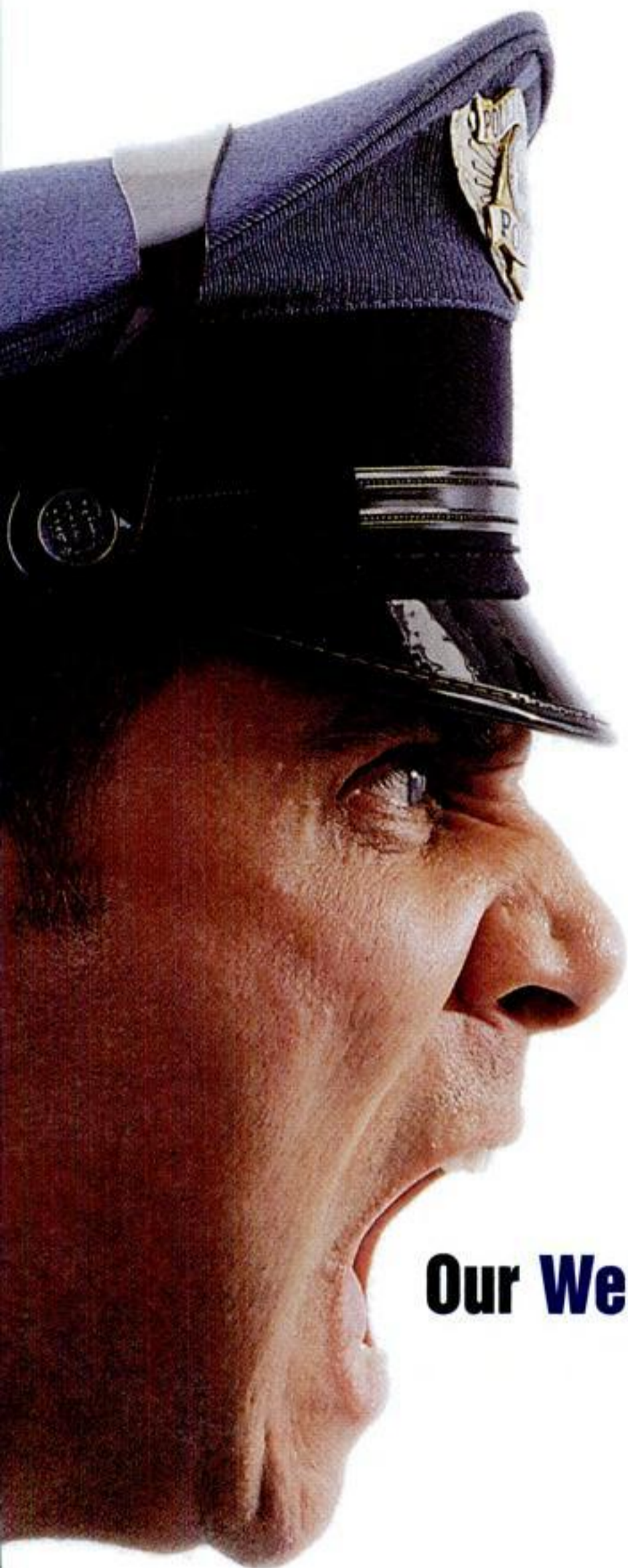
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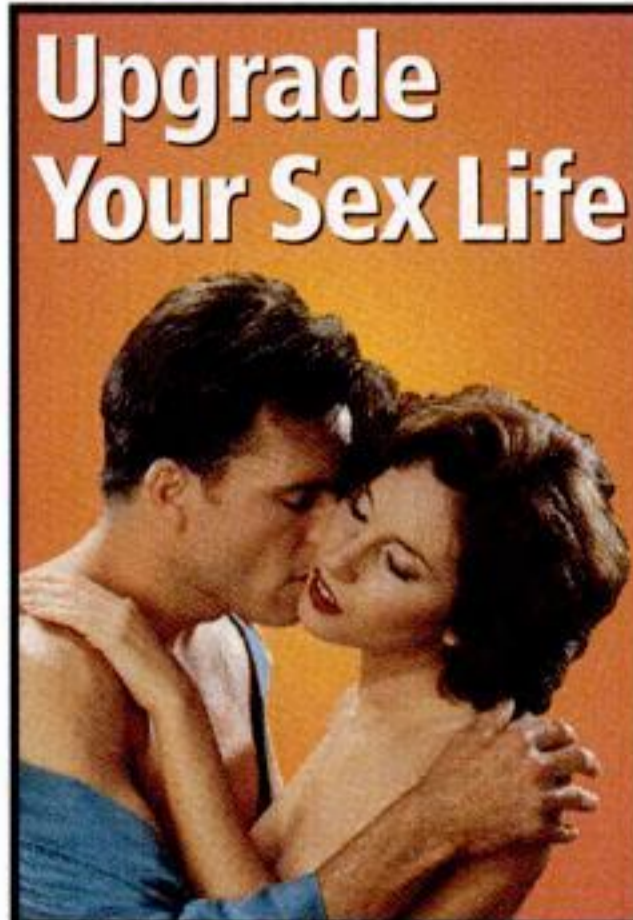
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# TERMINATOR

## Tech Terms Revealed ▶

Technical terms found throughout MAXIMUM PC are underlined and in blue. Hyperlink back to here for revelation and further explanation. Terms appearing in **blue** within the Terminator are updated definitions of previously explained concepts. The extended Terminator (with terms not found in this issue of the magazine) is also found online at [www.maximumpc.com](http://www.maximumpc.com).

### A

**AGP** Accelerated Graphics Port is an expansion bus developed by Intel specifically for the videocard subsystem. It operates independent of the PCI bus and normally runs at 66MHz (i.e., 1x). Whenever you see multipliers attached to AGP, such as 2x or 4x, they are referring to how much faster the bus will run—2x means 66MHz x 2, or 133MHz.

**alpha-blend** The ability to give a pixel a value that will render it solid, invisible, or partially transparent. The process is often used in games to depict special effects, such as explosions and weapon discharge. When mapped onto polygons, alpha-blending can simulate semi-transparent objects, such as water and glass.

**anisotropic filtering** Conventional texture filtering techniques do not compensate for anisotropy—the elongation of the screen pixel when it is mapped into texture space. This results in either blurring or aliasing, depending on the choice of texture level of detail. To achieve sharp textures, a card can use anisotropic filtering, a process that involves an elliptical kernel whose shape and orientation depends on the projection of the destination pixel onto the texture map.

**anti-aliasing** A technique that smooths the edges of diagonal lines on the screen. Without anti-aliasing, diagonal lines often have a “jaggy” appearance caused by the stair-step effect of the pixels. Anti-aliasing blurs the edges of the lines. In 3D graphics, bilinear and trilinear filtering provides anti-aliasing for textures.

**API** Application programming interface. A collection of sub-routines—usually part of an operating system—that application programs can call upon to perform common tasks. For example, a program might call an API routine to display a window on the screen. APIs reduce the amount of code programmers have to write.

**artifact** Graphical flaw caused by the shortcomings of a compression technology. Often manifested as blotchiness in what should be a solid color.

**ASPI** Advanced SCSI Programmer's Interface. It defines a set of software primitives (command) and data structures or an application to use when communicating with SCSI host adapters to be SCSI host adapter-independent.

### B

**bitmap** A graphic image represented by rows and columns of dots. Each dot's value is stored in one or more bits of data, and the more bits used to represent a dot, the more colors and shades of gray that can be represented in the image. Generally, monochrome images have one bit representing each dot. When representing colors and shades of gray, each dot requires more than one bit of data.

**buffer underrun** A condition in which the recorder empties its buffer before the burn is complete.

**bursts** Burst speed is the rate at which data can be accessed from the drive's own cache.

**bus** An electrical pathway over which the components inside a computer communicate with each other. There are many types of buses. Examples include the PCI bus (which supports PCI slots) and the CPU's system bus (which the microprocessor uses to communicate with the rest of the system).

**bus protocol** A set of standard instructions used to transfer data across a bus interface. See bus.

### C

**CAV** see Constant Angular Velocity  
**CD Text** An expansion of the CD audio format which adds information such as artist names, and album and song titles to the table of contents. New CD Text-enabled players can then take this info and display it during playback.

**CLV** see Constant Linear Velocity  
**colored lighting** The first 3D games used simple white light to illuminate objects and cast shadows. With the advent of faster CPUs and 3D hardware acceleration, games now have the raw power to mix different colored lights to achieve more spectacular ambient effects.

**Constant Angular Velocity** CAV CD-ROM drives spin the disc at a constant speed, so the data rate increases as the pickup moves to

the outer edges of the disc. Constant motor speed also eliminates the need for settling of the optical pickup after seeking data, resulting in an improved access rate. CAV-based drives are simpler to design and produce because the motor doesn't need to change speed.

**Constant Linear Velocity** CLV drives vary the speed the disc is spinning at so that the data rate of the drive is constant. The drive rotates the disc faster when reading the inside tracks and slower when reading the outside tracks as more data is pumped through the head. This is to ensure a constant data rate regardless of where on the disc it's being accessed. CLV-based drives generally encounter latency at high speeds when the rotational speed needs to be changed.

**core** The main logic circuits of a microprocessor chip (CPU). The term usually refers to the microarchitecture (internal design) of a CPU, exclusive of buses and caches. For example, Intel's Pentium II and Celeron processors have virtually identical cores, even though they have different configurations of L2 caches and buses.

**core-logic chipset** Two or more chips on the motherboard of an IBM PC-compatible computer that connect the CPU to other system devices. The system chipset defines many of the features of a PC, how much main memory (RAM) it can hold, how many expansion slots it has, how much memory it can cache, and so forth.

**CPU** Central processing unit. Another term for a microprocessor chip.

### D

**daughtercard** A circuit board that plugs into a larger circuit board. The main circuit board inside a PC is known as the “motherboard” or “mainboard”; an example of a daughtercard is a Pentium II or Celeron cartridge. (The daughtercard is inside the cartridge housing.) PCI cards generally aren't called daughtercards, though.

**digital audio** Digital or Redbook audio is the audio standard used to notch the tracks of commercial CDs.

**Direct3D** A subset of Microsoft's DirectX API. This interface allows developers to use hardware acceleration for 3D graphics, which helps

games run faster by offloading the 3D processing onto a dedicated piece of hardware.

**disc-at-once** A method of writing CDs where one or more tracks are written in a single operation without turning off the laser.

**dithering** When an image's color depth is lowered from a higher count to a lower count, it is said to be dithered down. When this happens, any lost color data may be seen by the naked eye as dotted patterns or extraneous artifacts.

**Dolby Digital 5.1** A digital surround-sound audio specification that provides for six discrete channels, including two rear-placement effects channels and a low-frequency effects channel.

**DSP** Digital Signal Processor. A specialized processing unit generally used to perform just a few functions but at incredible speeds. DSPs are often found in cellular phones, fax machines, and soundcards. Digital Signal Processing is often used to denote conversion of an analog signal to digital. More commonly referred to in soundcards for processing of sound.

**DVD** Digital Versatile Disc. It's the next-generation CD-ROM, storing more data per disc, and also a possible replacement for video tapes, especially in the rental business. By using multiple layers and both sides of a disc, DVD can store 4.7GB to 17GB of data, while CDs are limited to a maximum of 682MB.

### E

**EIDE** Enhanced Integrated Drive Electronics. A motherboard interface for connecting hard drives, CD/DVD-ROM drives, and removable storage devices.

**electro-planar** A flat-panel speaker technology that uses a magnetic field to vibrate a diaphragm, creating sound.

**engine** The underlying programming code that drives a game.

### F

**FM Synthesis** Frequency Modulation Synthesis. A music simulation technique that approximates the sounds of real instruments by bending raw electronic wave forms. Wavetable synthesis, which uses samples of real instruments, is preferred.

**foundry** A factory that makes computer chips. Also known as a “fab” (fabrication plant). It's the place where the people in the dust-proof





"bunny suits" work, as seen in Intel's TV commercials. Building and equipping a modern foundry can cost \$1 billion to \$2 billion.

**H**  
**high polygon counts** The number of texture-mapped triangles (otherwise known as polygons) that make up an object or character. When this number is high, the objects and characters are more detailed or more objects or characters are on-screen.

**I**  
**IEEE 1394** Also known as FireWire in the Macintosh market. A high-speed bus protocol that transfers data at up to 400Mbps per second. 1394 is a fast interface for digital-video peripherals and may someday be used for high-speed modems.

**ISA** Industry Standard Architecture. Hailing from the early days of the PC, the ISA bus runs at from 8MHz to 10MHz with a maximum throughput of 8MB a second. Think slower than a Yugo.

**ISO** ISO 9660 is a specification defined by the ISO standards organization that outlines how a CD-ROM directory format is to be laid out and read between different computer systems. Using the ISO 9660 standard CD-ROM file format, virtually any computer can read a CD-ROM disc. ISO is a least-common-denominator file system 8-dot-3 naming conventions (limited to uppercase letters A to Z, numerals 0 to 9, and the underscore character), and subdirectories are limited to eight levels deep. A disc that is written to the ISO 9660 specification will read on any ISO 9660-compliant drive.

**L**  
**lands** Pits are the tiny indentations burned into a CD-R/CD-RW's recording layer and lands refer to the area between pits. In terms of data storage, think of them as binary ones and zeroes. As a CD-ROM drive's laser passes across the reflective surface of the media, the pits cause variations in the reflective light, which the sensor reads as the binary ones and zeroes of the original data.

**Level 2 (L2) cache** The second-fastest memory available to a microprocessor (second only to Level 1 cache). It usually consists of SRAM chips near the processor, although some recent processors have on-chip L2 caches. Because the CPU runs faster than the memory bus—say 400MHz vs. 100MHz—cache becomes useful to temporarily store instructions and data, making sure the CPU has a steady supply of material to churn while memory catches up. Also known as secondary cache.

**M**  
**mip-mapping** Technique used to generate scaled texture maps that

involves creating sub-images sized for every inverse power of two, i.e. 1/4, 1/16, 1/32, etc. The process of creating a mip-map takes time, and larger textures will require longer.

**mixed-mode** A mixed-mode disc contains all of its data on track one and digital audio fills the rest of the tracks.

**MPEG** Moving Picture Experts Group. The name of a family of standards used for coding audio-visual information (movies, video, and music) in a digitally compressed format.

**MPEG-2** An widely supported audio/video standard formulated by the Moving Picture Experts Group. It defines methods for compressing and decompressing audio and video data to conserve resources in computers, digital TVs, and other multimedia devices.

**MP3** MPEG Layer 3. An audio compression format that can reduce a four-minute song into a 4MB file of near-CD-quality music—perfect for sending across the Internet.

**O**  
**OpenGL** Open Graphics Library. An easy-to-use (for programmers anyway) graphics API created by Silicon Graphics. It's generally accepted in the high-end workstation market. In the Windows 9X world, OpenGL plays David to Microsoft's Direct3D Goliath or vice versa.

**P**  
**packet writing** A method of writing data onto a CD in small increments. This is very different from track-at-once and disc-at-once methods. The packets of data written are either variable or fixed length.

**PD** Phase-change Dual disk. A rewritable optical disk standard from Panasonic introduced in 1995 that incorporates phase-change technology. PD cartridges are 5.25 inches and can hold up to 650MB. It can also be rewritten to approximately 500,000 times. PD drives became a niche technology used primarily by graphic and print houses.

**Phase Change** A rewritable optical disk technology developed by the Panasonic division of Matsushita. Unlike magnetic disk media, a high-intensity laser pulse is used to change the bits on the surface of the media from a natural crystalline reflective state to an amorphous dull state which doesn't reflect light. A low-intensity laser pulse is then used to read the data in the amorphous state while a medium-intensity laser pulse is used to restore the crystalline structure (which would happen in a format). The technology is used by Panasonic's PD drive, CD-RWs, and DVD-RAM drives.

**pipeline** An assembly line for program instructions. A pipelined function unit in a microprocessor separates the execution of a program

instruction into multiple stages. Instructions flow through the pipeline like cars on a factory assembly line multiple instructions are in various states of completion.

**pits** Pits are the tiny indentations burned into a CD-R/CD-RW's recording layer and lands refer to the area between pits. In terms of data storage, think of them as binary ones and zeroes. As a CD-ROM drive's laser passes across the reflective surface of the media, the pits cause variations in the reflective light which the sensor reads as the binary ones and zeroes of the original data.

**pixel** The smallest unit of resolution on a video screen. Everything on the screen is formed of pixels. More pixels are better, because the screen can display more detailed images. Screen resolution is often expressed in pixels—1024x768 means a screen displays 1024 pixels horizontally by 768 pixels vertically, for a total of 786,432 pixels.

**R**  
**RAMDAC** Random Access Memory Digital to Analog Converter. The chip on a videocard that converts the bits of a digital image into an analog signal. It maintains the color palette and determines refresh rates. The faster the RAMDAC MHz, the higher the refresh rate your system can handle.

**R&D** Research and development. R&D is a company's investment in better technology and new products.

**S**  
**socket** An interface for a computer chip on a circuit board. Chips plug into sockets and communicate with other components by transmitting signals through their pins and the circuits etched onto the board. Some chips are soldered permanently in place without sockets.

**stencil buffer** A small chunk of closely coupled RAM used for storing data that will be quickly compared to incoming data and changed as needed. A stencil buffer could be used to hold data for simulating realtime changes in a chunk of a scene, such as a mirror or shadows. Any changes can be quickly changed and the output can accurately reflect these changes.

**T**  
**texture** A graphical element, usually a bitmap, mapped onto a polygon in 3D space.

**370-pin socket** An unofficial term for a 370-pin CPU interface introduced by Intel in 1998. Sometimes it's called Socket 9, because Socket 8 was the Pentium Pro's interface and Socket 7 was for Pentium-class CPUs.

**tosser** A badly burned gold disc. No amount of first aid can save it.

**track-at-once** A method of writing CDs where the laser is stopped after

every track (data or audio) has been written, creating a gap between each two-to-three-second audio track.

**transfer rates** The speeds at which data can be transferred across a bus interface or network. Typically measured in megabits per second.

**trilinear filtering** A method to make textures appear less pixelated. It involves applying a bilinear filter to two mip-maps on either side of a texture. The resulting filtered texture is then filtered again, hence the "tri" in trilinear. Trilinear filtering is processing intensive, but results in a smoother overall look.

**TSR** Terminate and Stay Resident. A small DOS program that loads into system memory during startup.

**U**  
**UDF** Universal Disk Format. A new file system used for CD and DVD rewritable technology—compatibility with ISO 9660 for both reading and writing is ensured. UDF is for optical media developed by the Optical Storage Technology Association (OSTA). It overcomes the small partition sizes of ISO 9660 and can be read and written to on all the major operating systems. Full support for Unicode is included, allowing for all special characters and multi-language applications. This means that a disc written on a Macintosh will finally be readable in a Windows machine. Long filename support is also supported with up to 255 ASCII characters or 127 Unicode characters. UDF also gets rid of the directory depth limitations of the older ISO-9660 technology and utilizes space far more efficiently.

**W**  
**words** If you can read this, you know what they are.

**Z**  
**z-buffer** In a 3D videocard, local video memory is often used to form a frame-buffer, which stores data required by a 3D card in order to properly render a scene onto your monitor. With the advent of texture-mapped polygons interacting in a 3D world in realtime, the need to have a buffer with which to track positioning became a necessity. A z-buffer stores the z-axis value (front to back) of a pixel on-screen—this value is compared with incoming z-value data to determine whether the pixel will be drawn, and how overlapping pixels will be presented. A z-buffer's accuracy is dependent on how the 3D accelerator handles z-buffer calculations, and how much memory is allocated to it. Higher color-depth rendering requires more z-buffer memory, as the amount of pixel information is made larger with more color usage. It speeds up 3D gaming by not rendering the parts of a scene that are obscured by other objects.



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MAY 99 MAXIMUM PC



People like to think Microsoft and Intel conspire together to dominate the computer industry. Actually, the companies interact like two superpowers, constantly on the verge of war.

Each company has a team of ambassadors dedicated to keeping relations on an even keel. (Tellingly, these diplomatic corps are stationed in Redmond.)

While at the Empire, I was in an executive meeting with Bill Gates in which it was clearly stated that Intel should be regarded as Microsoft's biggest competitor in the coming months.

Why? Intel needs software that consumes CPU cycles and takes advantage of new hardware features to sell wave after wave of parts. On the other hand, Microsoft doesn't give a damn what Intel needs. Bill just wants Intel to stay out of the software business. Still, the companies live in passive symbiosis because Intel enables Microsoft to slop out bloated applications with no dire consequences. This interdependence is disrupted whenever merely accelerating the bloatware doesn't offer consumers enough value to force them to buy Intel's latest CPU.

Video on the PC is a prime example. Microsoft never really cared about it, but Intel embarked on a variety of video-related projects. It created the Indeo codec and started work on a driver architecture for video playback. Really, Intel wanted better video on the PC because video codecs were such a great way to mop up CPU cycles. Microsoft couldn't abide Intel creating driver architectures for Windows, so an emissary was dispatched to negotiate a

developers. What followed was the Cuban Missile Crisis of multimedia.

Intel had announced Native Signal Processing (NSP), an architecture that was ahead of its time, allowing low-cost multimedia PCs to perform audio mixing, video decompression, compositing, and 3D rendering—without dedicated multimedia hardware. Upon my return, I hit the intruder alert button: Intel was planning a major incursion into the operating-system business by usurping multimedia from Microsoft. While Intel only wanted Microsoft's support, this really served to throw fuel on our budding GameSDK effort. Craig Eisler, Eric Engstrom, and myself sat down and outlined a multimedia driver architecture that would become DirectX. While this was going on, empire emissaries were dispatched to Intel to express displeasure with the CPU giant for making such an aggressive

move on Microsoft's platform. I fired up game developer conferences for Microsoft and spoke about DirectX at all of Intel's events. It was a weird "competition" because Intel was more than happy to finally have Microsoft devoting so much attention to multimedia, even if it was to crush its own NSP initiative.

Shortly after announcing NSP, Intel launched 3DR, an effort to get game developers to use Intel's 3D rendering libraries. It was a preemptive effort to bind developers to Intel's software rasterizer before the first generation of 3D hardware accelerators hit the market and began offloading work from the CPU. The threat

## The Wintel Missile Crisis

UNEASY PARTNERS FACE OFF WITH A FINGER ON THE BUTTON

"treaty." And it was decided Microsoft's multimedia group would jointly develop the technology with Intel. This became DirectDraw under Microsoft, but Intel was happy because its minimal effort invested in some crappy video code had successfully goaded Microsoft into committing more resources into CPU-hungry multimedia.

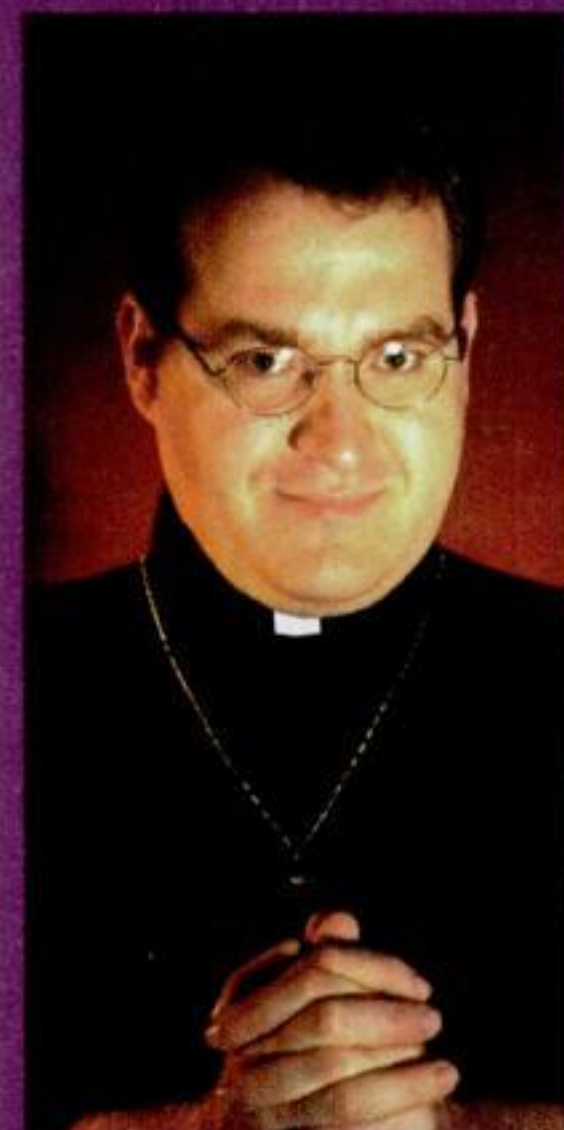
In fact, it could be said that Intel was largely responsible for creating my job of "Game Evangelist" at Microsoft. Intel was organizing a conference encouraging game developers to support a new multimedia driver architecture it was creating for Windows. Microsoft was asked to send a speaker. Microsoft certainly wasn't eager to support Intel's little driver initiative, but for the sake of diplomacy, intelligence gathering, and making sure Microsoft's message to these developers was clear, they decided to send somebody on very short notice. They needed somebody who understood multimedia and could do a convincing presentation off the cuff. So I became the empire's "game evangelist." Years later, I realized Intel's conference was as much a show for Microsoft as it was for the game

**Intel was planning a major incursion into the operating-system business. Not only would it usurp multimedia from Microsoft, it was also a really bad idea.**

of Intel commandeering the consumer 3D market led to the creation of Direct3D for Win95.

The situation came to a head when Microsoft's Paul Maritz contacted Intel's Andy Grove. A strong discussion on the subject of meddling with the Windows platform led to rumors that Intel's multimedia initiatives were dead; it was just a matter of Intel making a quiet and graceful transition to "partnering" with Microsoft to support DirectX.

Still, Intel got what it wanted all along. ●



**ALEX ST. JOHN** was the architect of DirectX while an evangelist at Microsoft. Since leaving the empire, he has remained a player, brokering many deals in the industry. Reach him at [saint@maximumpc.com](mailto:saint@maximumpc.com).

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- Internal 56K Capable<sup>11</sup> V.90 Fax Modem with Trial Offer ConnectDirect Internet Access<sup>14</sup>

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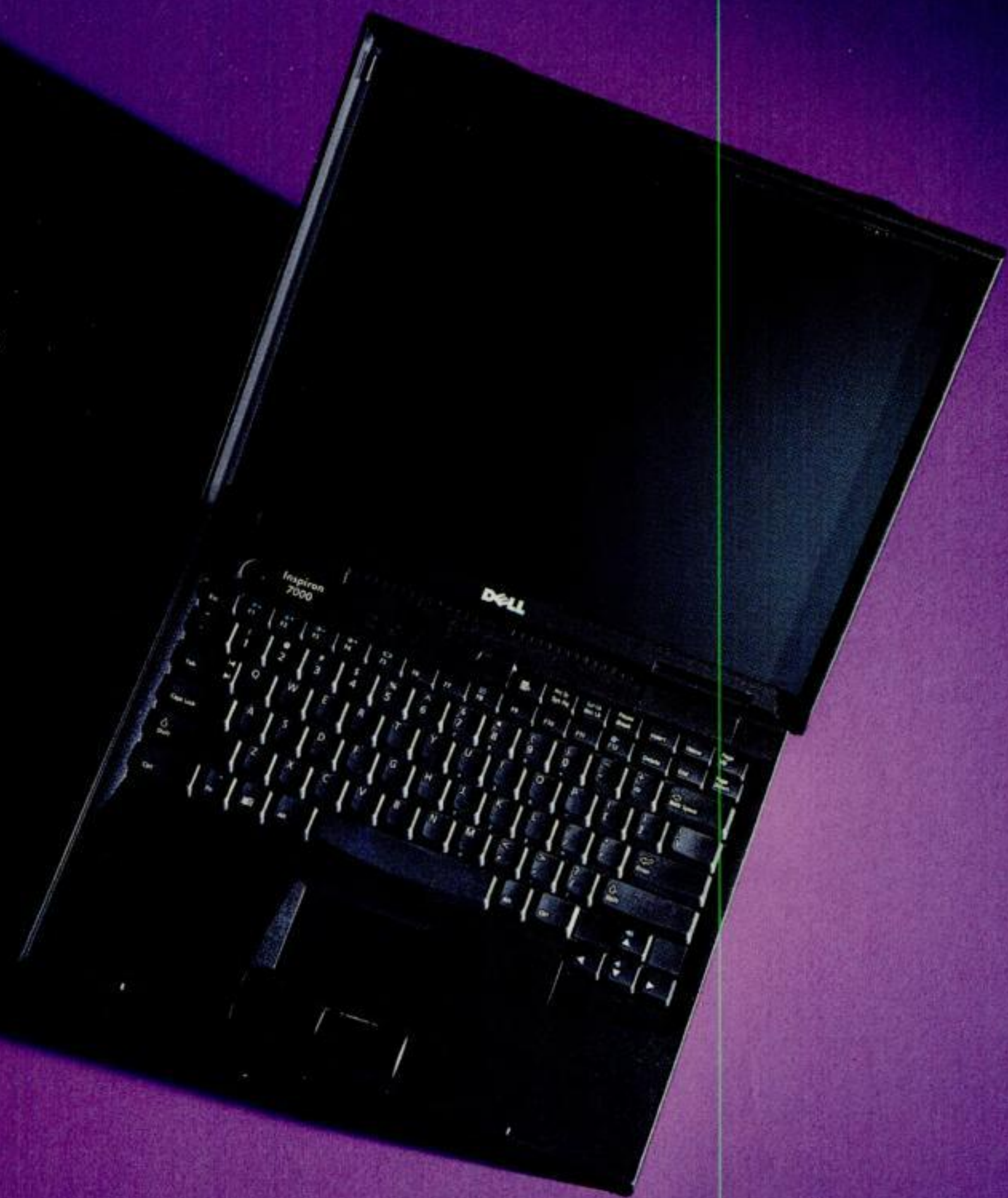
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