

# reviews

**H**ere we are in the last December of the millennium and I find myself wondering why it is that the end of every century seems to herald some form of peaceful revolution? From the middle to the end of the last it was the industrial revolution and now, at the end of the 20th Century we're marvelling at the technological equivalent. The growth of the Internet has undoubtedly been one of the major driving forces behind this and it is this self-same, wired world that is drawing cries from pre-millennial luddites worldwide. They say it is turning us all into insular drones happier sitting in front of a computer screen than out in the fresh air or leaning on the bar of the local pub. Perhaps for some this is true, but for the vast majority it is far wide of the mark. What these people don't realise is that this situation was not arrived at by choice. The very nature of the medium forced its 'viewers' and participants to be locked to their desks by restricting them to work, library or university access – it's only in the last three years that the Internet has made extensive in-roads as far as the home is concerned. More recently, the explosive uptake of PDAs (see the **3Com Palm IIIe** on page 85) has seen the Internet break free of the lap or desktop, and the luddites can now be happy that we can at last browse and email from the pub or park. So when people look back at the end of this century from the end of the next, which revolution will they see – the one that wired the world or the one that put it in our palm?



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## VNU European Labs



VNU Labs tests all kinds of hardware and software, from PCs and modems to databases. All our tests simulate real-world use and for the most part are based on industry-standard applications such as Word, Excel, PageMaker and Paradox. Our current PC tests for both Windows 98 and NT are the SYSmark tests from BAPCo. In all our performance graphs, larger bars mean better scores.

## Ratings

- ★★★★★ Buy while stocks last
- ★★★★ Great buy
- ★★★ Good buy
- ★★ Shop around
- ★ Not recommended

# Hi-Grade Notino AS7400

If you get **hot under the collar** at the thought of a PIII-powered notebook, you won't be disappointed.

**T**he AS7400 is the first Pentium III equipped notebook that we've seen at PCW and top marks go to Hi-Grade for being so quick off the mark.

Beating at the heart of the AS7400 is a mobile Pentium III 450. This latest wonder chip from Intel includes improved intelligence for the mobile computer. The CPU is aware of whether it is being powered by a battery or a mains connection. If it's operating under battery power the CPU will run slower, thus saving power and generating less heat in the process. Once the notebook is connected to the mains the CPU will ramp up to its full speed, since battery life is no longer an issue. This makes the AS7400 an ideal desktop replacement, as it can run very fast when sitting on your desk, but will try and conserve battery life when you're on the move.

**Like the mobile** Pentium II, the Pentium III is backed up by 256KB of Level 2 cache, running at the full speed of the processor. This makes it a very nippy chip, and Hi-Grade's baby turned in an impressive SYSmark score of 197. Considering that many of the 500MHz Pentium III systems in this month's group test turned in SYSmark scores of just over 200, you're not likely to find any application that this notebook can't run as well as a desktop machine.

It's not just the processor that's impressive, though – it also has 160MB of RAM on board. With this kind of processing power and memory capacity, there really isn't anything to which the AS7400 couldn't turn its hand. It could even have a good go at 3D modelling. And in case you were wondering where all your projects would go, fear not, there's a 10GB IBM TravelStar hard disk spinning inside the chassis, so storage space shouldn't be an issue for quite some time.

However, as with any notebook computer, ergonomics are every bit as important as performance. The screen and the keyboard are paramount, and

Hi-Grade has come up trumps in both departments. The 14.1in TFT display is a fine example of its kind. The lighting is even across the entire surface and there's no sign of any dead pixels. The default resolution of 1,024x768 gives you more than enough desktop real

estate to work with. Even cutting and pasting from one window to another isn't too much of a chore. The keyboard is easy to type on with a lightly sprung action that's not too tiring to the fingers. There are better notebook keyboards, IBM and

Seimens tend to produce the best examples, but Hi-Grade has nothing to be ashamed of.

It doesn't take long to achieve a fast typing rate and thankfully the touch pad is far enough away from the space bar to avoid accidental activation. If there's one criticism, then it's the small Return key, but it's not too much of a problem.

In true desktop replacement style, both the floppy drive and the Panasonic DVD-ROM drive can be internally mounted simultaneously.

**On the left of the case** you'll find a full array of audio mini-jack connectors along with two PC Card slots, while on the right is the battery compartment.

To the rear of the unit there is a full complement of ports, including a connector for the built-in modem. There's also a TV-out port, in case you want to pump a DVD movie out to your television.

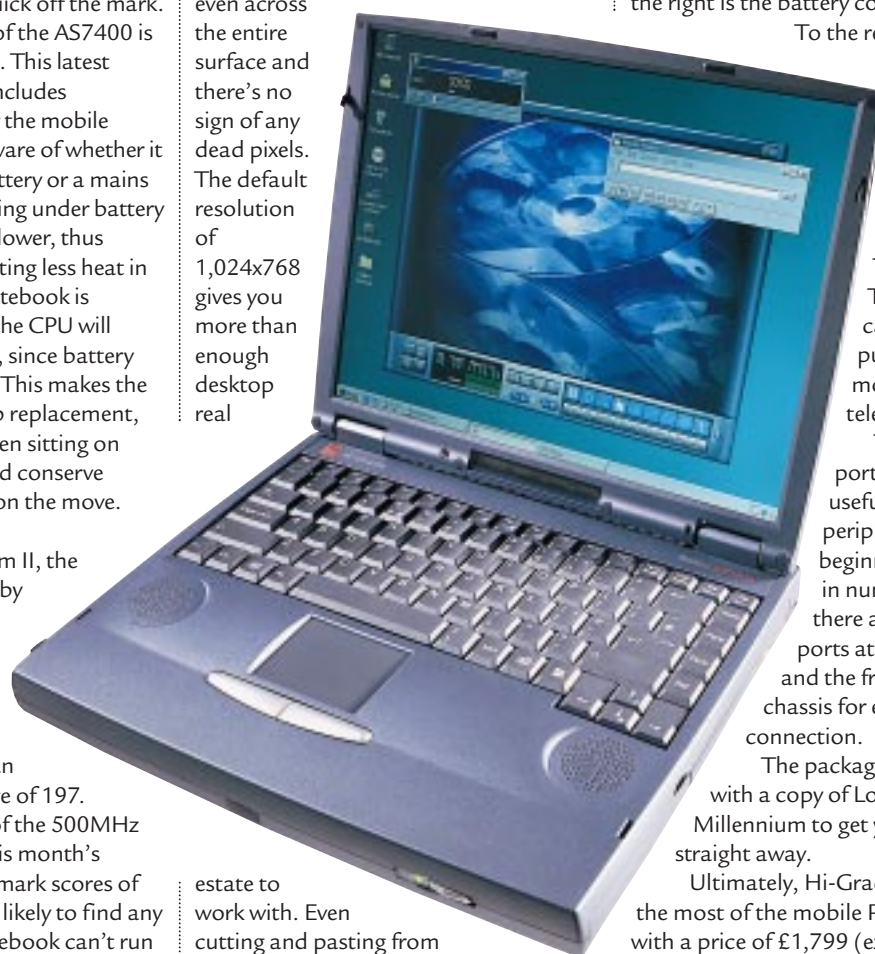
The single USB port could come in useful now that peripherals are beginning to appear in numbers, and there are also infrared ports at both the rear and the front of the chassis for easy wireless connection.

The package is rounded off with a copy of Lotus SmartSuite Millennium to get you productive straight away.

Ultimately, Hi-Grade has made the most of the mobile Pentium III, and with a price of £1,799 (ex VAT) many mobile power users will find it hard to resist.

RIYAD EMERAN

***There isn't anything to which the AS7400 couldn't turn its hand***



## PCW DETAILS



★★★★★

**Price** £2,113.82 (£1,799 ex VAT)

**Contact** Hi-Grade 0181 532 6100

[www.higrade.com](http://www.higrade.com)

**Good points** Incredibly fast and very well featured

**Bad points** None

**Conclusion** A stunning notebook computer from Hi-Grade, showing off the mobile PIII to its full potential

### PERFORMANCE RESULTS

0 100 200 300 400

**SYSmark 98** 197



# Carrera Octan M700

This **high-octane offering** should quench your thirst for PCs at the forefront of technology.

This is one of the first two 700MHz Athlon-based systems we have seen, and anything that follows has a lot to live up to. This is an exceptionally well-built machine with an immaculate interior. All cables are tied neatly out of the way of every major component, making changing the processor or memory easy.

**The processor** itself sports a huge heat sink, whilst the 128MB RAM is supplied in the form of a single module. This leaves two further slots free for future use but this initial allocation should be enough to keep you going for some time to come. There's plenty of room for expansion in other areas, too. Three PCI slots and a single shared slot remain vacant, although you would be unwise to fill the uppermost PCI slot as it would block the airflow to the graphics card heat sink.

There is only one free shared slot, but the placement of the front-panel indicator light connectors means that any ISA card

protruding more than a couple of centimetres from the end of the slot might not fit.

However, there

are only a few expansion cards still being produced in an ISA format, the most notable examples being home networking products, so it's fairly unlikely you'll need to use it.

If Carrera's engineers had been looking to cut costs they could have made do with the onboard sound and the jacks in the back of the system case. Instead, though, they went out to impress, with the addition of a Vortex SuperQuad sound card.

As far as drive bays are concerned, there's a single 3.5in and three 5.25in

external bays left vacant for future use.

The internally-mounted hard drive, meanwhile, is a UDMA66 22GB IBM Deskstar, speeding along at 7200rpm.

Backup storage is

meanwhile, is an excellent LG Studioworks 910SC. In our tests we could detect no flicker at 1,600x1,200 resolution. Its extensive OSD lets you quickly change any aspect of its working, although we found ourselves stepping through a large number of options to change even basic functions. It has uniform focus across its entire surface but did demonstrate slight moiré on all test patterns. That said, we were impressed by its colour registration – all guns were firing perfectly in line at the default setting, and it had rock steady regulation, so that even when a flashing block was applied to an otherwise black screen there was no change in the size of the image. The monitor was driven by a GeForce 256 card,

incorporating nVidia's GPU (see Evesham review, p94 for details).

In all, this is a very

impressive system and

the inclusion of a DVD-RAM drive is the sort of bold statement we would expect from a manufacturer with Carrera's reputation. This is a well thought out machine built to last for years to come.

NIK RAWLINSON

*This is an exceptionally well-built machine with an immaculate interior*

catered for with the inclusion of a Panasonic LF-D111 DVD-RAM drive, while a 5.2GB rewritable disc has been thrown in to get you started right away. Although DVD-RAM discs

arrive in their own caddy and the drive must be able to accommodate them, a simple slot in the middle

of the drive tray allows it to also handle regular CD-ROM discs. CD-ROM and DVD-RAM discs are treated as two distinct drives and the contents of Windows' 'My Computer' dynamically changes to represent the media inserted. At 5.2GB a go, you should have enough storage capacity on a single disc to back up a large chunk of your valuable data.

**The keyboard and mouse** are unremarkable but comfortable, and around the back of the case we found a parallel, two serial, two USB and a couple of PS/2 ports. The monitor,



## PCW DETAILS



★★★★★

**Price** £2,348.83 (£1,999 ex VAT)

**Contact** Carrera 0181 307 2800

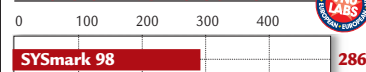
[www.carrera.co.uk](http://www.carrera.co.uk)

**Good points** Lightning-fast, good graphics card and removable storage, astounding value for money

**Bad points** None to speak of

**Conclusion** Carrera would be hard-pushed to have made it any better and it couldn't be any cheaper. A first-class implementation of cutting-edge technology

### PERFORMANCE RESULTS





# Fujitsu Stylistic LT

They say the whole is **greater than the sum of its parts** – but these parts will take some beating.

Is it a PC or is it a PDA? You'd be hard pushed to say if you've not used the Stylistic LT, for while it may be about the same size as a Psion Series 7 it's actually running a full install of Windows 98 Second Edition. What's even more impressive is that it weighs just 2.3lb and is just over an inch thick.

Its core is a 233MHz Pentium MMX with 64MB RAM. These days that might sound a bit low end, but Windows runs on it surprisingly well, and with a screen mounted suspend button that will dump the contents of the memory to the hard drive before powering down, you can come back and reboot later in as little as 20 seconds.

The panel is an 800x600 8.4in TFT display and although it suffers a little from variable light intensity and slight reflection it is very sharp and comfortable to look at for extended periods. It also has a very wide viewing angle. It's driven by a NeoMagic MagicGraph 128XD graphics chip. This is fairly old technology now, first appearing in 1997, but it has low power consumption for battery-based use, which is ideal if you're using the Stylistic LT away from its dock. It also allows for an external monitor to be attached and driven at 1,024x768.

The panel can be detached from the base unit, which can also be used to power it and charge its battery, and it then acts like a powerful PDA. Its handwriting recognition skills aren't up to those of the Philips Nino but then it must be remembered that Windows 98 was never designed for this purpose.

If you'd rather stick to keyboard input there's a numeric hard keypad to the right of the display and when it comes across a text input field Windows will append a small button. Clicking it brings up a soft keyboard like that found in the vertical revision of Windows CE. When the Stylistic LT is docked you can take advantage of its small wireless keyboard.

Although a fraction of the size of a regular PC keyboard it should

► **DIVIDE INTO THREE AND RULE OVER THE PORTABLE PC MARKET**

pose no problems for those used to working on a Psion or LG Phenom. This runs on a couple of AAA batteries. A fully charged Stylistic LT lasts around an hour and a half on battery power, but an optional pack can increase this to three hours, and there is no need to turn it off when docking or undocking.

**When docked**, the Stylistic LT can take advantage of the base station's adjustable tilt to perfect the viewing angle. The docking port also contains a range of ports for serial and parallel connection,

external monitor, keyboard and mouse, power, 100BaseTX LAN, and an external floppy. The panel itself, meanwhile, supports a single USB port, as well as headphone and mic sockets to back up the internal speaker, a power socket, 4Mbit/sec IrDA and two Type II PC Card slots. You'd have to use one of these slots to connect an external CD-ROM drive

(not supplied) if you don't want to end up installing software over the LAN. Storage is handled by the 4.3GB UDMA hard drive.

A nice touch is the optional portfolio case, from which the Stylistic LT needn't be removed before use, making this the ideal portable 'desktop' PC. Its uses are immediately apparent, and Fujitsu is positioning it for use within environments in which 'decision support' is

a key requirement.

Doctors, for example, would be able to make ward rounds using the Stylistic LT and dock back at their desks, synchronising with the network. It's also highly desirable but unfortunately, Fujitsu is aiming it solely at the corporate market and it won't be available for home consumers.

NIK RAWLINSON

**The Stylistic LT is actually running a full install of Windows 98**

## PCW DETAILS



★★★★★

**Price** Stylistic LT including LAN £2,606.15 (£2,218 ex VAT), mini docking station £176.25 (£150 ex VAT), Slip case £78.73 (£67 ex VAT), external floppy £98.70 (£84 ex VAT)

**Contact** Fujitsu 0181 573 4444  
[www.fpsi.fujitsu.com/product/stlt.htm](http://www.fpsi.fujitsu.com/product/stlt.htm)

**Good points** Small, cute, portable

**Bad points** Not destined for the consumer market, expensive

**Conclusion** The most desirable desktop portable around

### PERFORMANCE RESULTS

0 100 200 300 400



\*SYSmark 98



# SGI 540 workstation

An affordable **graphics workstation** for the desktop.

Not so long ago, if you wanted a hi-res 3D graphics workstation, you bought a proprietary RISC-based UNIX box from companies such as HP, Sun or Silicon Graphics (now SGI) and then braced yourself when it came to asking the price. Times have changed, and thanks to factors such as multi-processing Windows NT, advanced OpenGL graphics subsystems for PCs, and powerful Pentium II, III and Xeon processors, workstations have become very affordable – well, almost. As a result, last year sales of x86-based workstations accounted for over half of all workstations shipped.

SGI broke with tradition earlier this year when it announced its first x86-based/Windows NT 4.0 workstations – the 320 and 540 Visual Workstation. According to SGI, the 540 is the only desktop PC that supports four-way SMP – it can be configured with up to four 550MHz Intel Pentium III Xeon processors and 2GB of SDRAM memory. And the entry ticket for all this costs less than £5000, which is peanuts in graphics workstation terms. It's designed to run high-end, 3D graphics-intensive applications, such as MCAD (mechanical computer-aided design), animation, 3D modelling, data visualisation and other digital content creation applications, which used to be the exclusive domain of UNIX-based systems.

The Visual Workstation is actually more server-sized, and rises more than 26in off the desktop. It's enclosed in the standard SGI space age case, with a curved grey exterior and a warped indigo side panel. When you turn the machine around and depress a button at the rear, the side panel pops off to expose a spacious interior and three open drive bays. SGI also provides six open bus slots, but these are 64bit PCI slots and can't be used with most mainstream peripherals – the installed QLogic QLA1080 LVD Ultra2-Windows SCSI host adaptor being the exception to the rule. Likewise, the system uses unique memory modules available only from SGI and a few other sources. The workstation is normally paired with the stunning 1600SW flat-panel digital display, though this is an optional extra, adding another £1,790 to the bill.

What separates the graphics workstation men from the boys is the quality of its graphics sub-system, and here the Visual Workstation's Integrated Visual Computing (IVC) architecture really stands out. Standard PC workstation architecture puts dedicated graphics memory on a

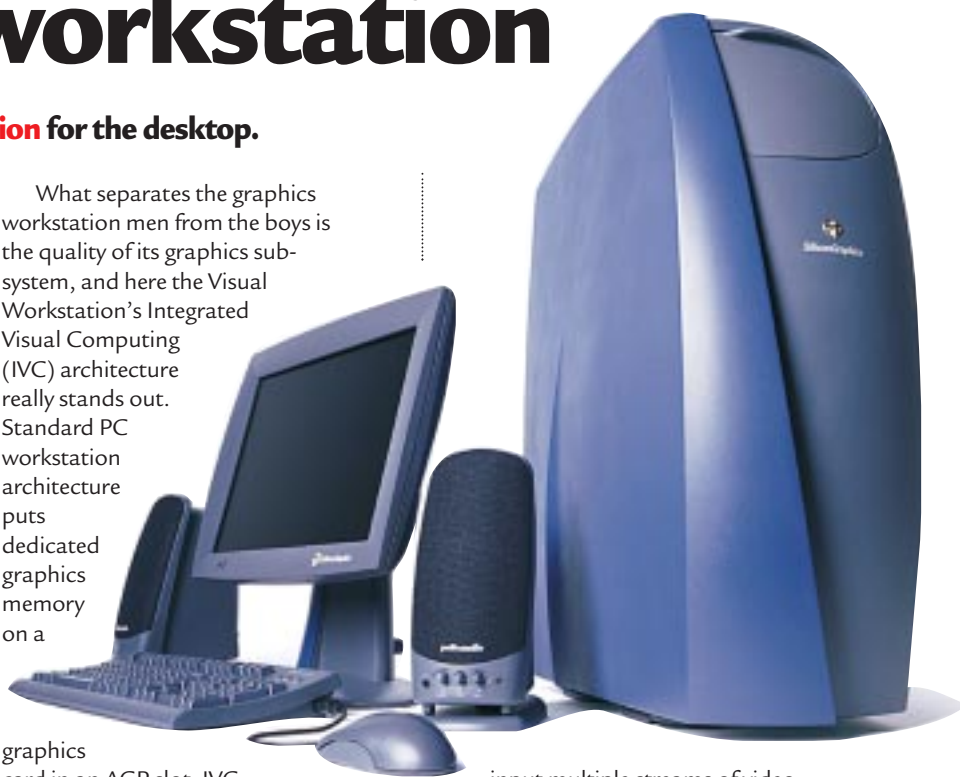
graphics card in an AGP slot. IVC is designed to take features that typically require add-in cards and integrate them into the core logic of the Cobalt Graphics chipset. The integrated features are linked by a high-speed, low-latency 3.2GB/sec graphics-to-memory interconnect and a 1.6GB/sec I/O interconnect. The bottom line is, extremely wide video bandwidth, more than six times standard AGP 2X and more than 12 times the traditional PCI bus. This is sufficient bandwidth to simultaneously support multiple streams of uncompressed NTSC or PAL video, giving graphics professionals the freedom of working in realtime with uncompressed data.

The review machine came with 1GB of SDRAM, 112Mb of which was allocated to the video sub-system. This proprietary Unified Memory Architecture, based on the Cobalt chip set, allocates CPU memory, frame buffer, Z-buffer and texture memory dynamically from the main system memory pool. This shared memory architecture makes it possible to include video as a graphics component, map video as a texture or capture and play back multiple streams of video. Audio and video I/O ports are both directly connected to the chip set – as are graphics, networking and FireWire (IEEE1394) I/O. In practice, this means that the Visual Workstation will let you

input multiple streams of video, edit them with software-based video and hardware-based 3D effects, and output them – all in realtime.

Sadly, SGI's groundbreaking flirtation with x86 and Windows NT 4.0 hasn't lasted long – as recently as September, the company announced a complete platform strategy U-turn. It has decided to jettison Windows NT 4.0 and concentrate on Irix and Linux development, while it looks for an as yet unnamed partner to share and eventually offload the Visual Workstation range onto. It seems that creative NT users just aren't turned on by sexy kit.

ROGER GANN



## PCW DETAILS

★★★★★

**Price** £5,076 (£4,320 ex VAT) (Dual Pentium III Xeon CPU 500MHz 1MB cache), 1600SW flat-panel monitor – £2,103.25 (£1,790 ex VAT)

**Contact** SGI 0118 925 7500  
[www.sgi.com](http://www.sgi.com)

**Good points** Outstanding graphics sub-system, the specification a wish-list come true

**Bad points** Proprietary features eg. proprietary DIMMs

**Conclusion** Arguably the best PC platform for realtime video-editing, the Visual Workstation offers tremendous bang-per-buck. Curiously, its ordinary graphics performance isn't exceptional, but users won't be buying it for this.

# Sharp PC-A280

Sharp by name and **sharp by nature** – the ultra-portable with the dream screen.

There are times when it's just no fun being a reviews editor, and those times are the end of a month when you have to give back a really desirable bit of kit. This month, that turned out to be Sharp's new ultra-portable – the PC-A280. It boasts features that, just a few months ago, a desktop machine would have been proud to sport, and all are packed into a 1.4kg package just 263x212x31mm in size at the bulkiest point.

The brain is a 366MHz PII, while the hard drive tops off at 8.1GB with options for 64MB or 128MB memory. If you opt for the lighter of those two configurations, you can send it back for an upgrade to 128MB, and Sharp will return it to you 48 hours later. In exceptional circumstances they should be able to reduce this to a day's turnaround.

**With such a small form factor** it's no surprise that there are no internal removable media drives. The back of the bundled external floppy has a port replicator for parallel, serial and PS/2 devices, but we were disappointed that the CD-ROM is an optional extra. With almost all current software coming on CD or DVD-ROM this could make installing new applications difficult, but Sharp explained that installation over a LAN was in mind during the design phase, so it's just as well there's a port for 10Base-T/100Base-TX connections around the back.

For a machine so small, this port is joined by a surprising range of other connections. Along the edges we find a Type II PC Card slot with CardBus support, two downstream USB ports (one on each side), headphone and mic jacks, a hardware volume control, the proprietary connector for the hot-pluggable external floppy drive and power connectors and an infra-red port that is both ASK 4Mbit/sec and IrDA 115Kbit/sec compliant. There's also an integrated 56K modem. Along the back, meanwhile, you'll find ports for a VGA monitor, network and secondary power supply.

Four lights on the front of the unit indicate the battery level. These seem to be more accurate than Windows' power management icon in the system tray: Windows told us we still had 50 per cent remaining when the PC-A280 started beeping and flashing a power warning. The standard battery has a two-hour life in continuous use and can be supplemented by an optional secondary four-and-a-half-hour pack.

**As with the PC-A250**, the most startling feature is undoubtedly the screen. Sharp makes LCD panels for other vendors, but it reserves its AGAR (Anti Glare, Anti Reflection) technology for its Sharp-branded products. This is a wise move – the image it produces is exceptional and it benefits from an almost 180-degree viewing angle. This 11.3in panel has a native 800x600 resolution in 16 million colours, and eight keyboard controlled levels of brightness. It can fold

back flat so that it runs level with the keyboard for use in almost any lighting

condition you could imagine. Our unit unfortunately had a couple of burnt out pixels in the bottom right hand corner.

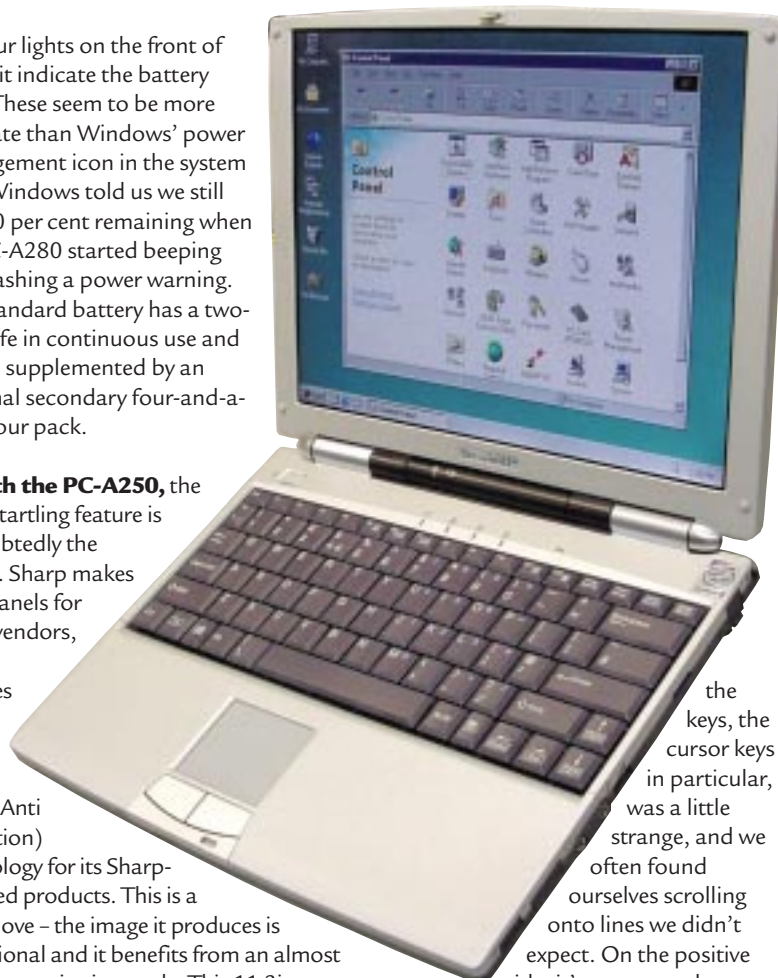
**There's little in the way** of bundled software, Windows 98 Second Edition and LapLink Pro aside, but that is not unusual for a notebook. Our only real complaint was the keyboard. If you're opting for a laptop this small you've got to accept that the keyboard will be shrunk and although the designers have managed to maintain a 17mm key pitch with 2.5mm travel we nonetheless found it difficult to use. The placing of some of

the keys, the cursor keys in particular, was a little strange, and we often found ourselves scrolling onto lines we didn't expect. On the positive side, it's got a euro key, so

it's ready for the European market or when the UK eventually takes the plunge. The touch pad, meanwhile, is excellent – smooth in use and responding well to click-taps.

NIK RAWLINSON

*The image is exceptional and it benefits from a 180-degree viewing angle*



## PCW DETAILS



★★★★★

**Price** £2,344.13 (£1,995 ex VAT)

**Contact** Sharp 0800 262 958

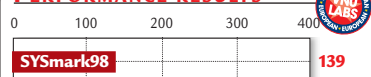
[www.sharp.co.uk](http://www.sharp.co.uk)

**Good points** Excellent screen, small form factor

**Bad points** Keyboard

**Conclusion** A sub-notebook that can hold its head up with the best of them

### PERFORMANCE RESULTS





# Panrix Fusion 600 Pro

A PC for people with wads of cash who want to have **the best technology** Intel has to offer.

**Y**et again Panrix is at the cutting edge of PC

technology, this time with Intel's latest releases. The SuperMicro motherboard is based on the latest 820 chipset that supports a 133MHz front-side bus, as opposed to the current standard of 100MHz supported by the 440BX chipset. Although the processor is still only running at 600MHz, the increased bus speed gives the CPU more bandwidth to play with and consequently increases overall system performance.

**Completing the hat trick** of new technology is the RAMBUS memory. There's a single 128MB RIMM (RAMBUS Inline Memory Module) in one of the three memory slots, but with this new type of memory, the empty slots have to be filled with blanking cards. Unfortunately RIMMs are expensive at the moment, but expect prices to drop once economies of scale start to kick in.

With core components of such a high calibre, it's not surprising that the supporting components are also first rate.

Filling the AGP slot is a Matrox

Millennium G400 Max.

This is a stunning graphics card with superb performance

in both 2D and 3D environments (see review p189). There's 32MB of on-board memory and the dual-head support lets you run two displays simultaneously. Thankfully Panrix has coupled the G400 Max with a monitor that's more than capable of showing it off. The Mitsubishi Diamond Pro 900U is a great 19in display. With a Natural Flat tube, the picture is superb with almost no screen reflection. With a high-quality display set like this you'll be able to run almost any resolution you like.

**Sound has been taken** care of almost too well. Even though there is a sound chipset hardwired to the motherboard,

Panrix has installed a SoundBlaster Live! Value card. That said, the SoundBlaster card provides two stereo outputs for use with the Creative 4-Point surround speaker package that's also bundled. The overall aural effect is pleasing but there are better speaker packages available.

The final expansion card is a Diamond SupraExpress 56K modem. With a wealth of free Internet providers to choose from these days, a modem is an integral part of any PC.

Both the 5.25in drive bays are occupied. The top bay houses a

DVD-ROM drive that's more than capable of playing movies as well as installing software. Below the DVD-ROM is a Sony CD-RW drive, another commendable inclusion that offers high capacity data transport as well as the ability to archive important information.

The hard disk is ingeniously mounted on the motherboard backing plate, leaving two 3.5in bays empty for future upgrades. However, with 32GB of storage space, it will be a long time before you'll need to think about upgrading. If you're more concerned with speed, you won't be disappointed either, this IBM hard drive spins at 7,200rpm and its GMR heads ensure a high data density.

Input devices are standard fare with a lightly sprung keyboard and a Microsoft Intellimouse.

**Rounding off the package** is a copy of Microsoft Office 2000 Small Business Edition. MS Office is the premier office suite, so having it bundled with a new PC adds a significant amount of value.

As you'd expect, performance is impressive,

although the AMD Athlon still leaves Intel's offering in the shade. That said, few users will be disappointed with a SYSmark score of 234 and a 3DMark result of 5,463.

Of course, all these cutting edge components don't come cheap, the RAMBUS memory alone adds £300 to the cost of the system. However, if you want to be the first to own the latest technology you'll have to pay for the privilege. So, if you want the latest Intel-based PC and have a chunk of cash burning a hole in your bank account, check out the Panrix Fusion 600 Pro.

RIYAD EMERAN

**A high-quality display set like this will be able to run almost any resolution**

## PCW DETAILS

★★★★★

**Price** £2,701.32 (£2,299 ex VAT)

**Contact** Panrix 0113 244 4958

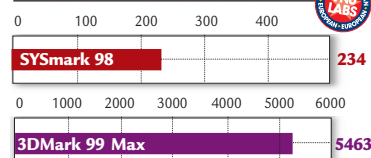
[www.panrix.com](http://www.panrix.com)

**Good points** Latest technology with great support components

**Bad points** Expensive

**Conclusion** Cutting-edge components and excellent build quality add up to a great machine from Panrix

### PERFORMANCE RESULTS



# Sony Cybershot DSC-F505

An impressive digital camera that **breaks new ground** in all areas – it's zoomin' marvellous!

It seems amazing that Sony has squeezed so many features into such a small package. The main elements of this new camera fit into a body just 110x40x55mm, and the lens on the front housing holds no less than seven individual lenses with a focal length corresponding from 38mm to 190mm in a conventional film-based camera. This can swivel through 140 degrees and facilitates a 5x optical zoom which, when combined with the 2x digital zoom offers a stunning 10x zoom – far more than is found on any other digital camera.

## The 2.1 megapixel 0.5in

CCD has been custom designed for digital photography, and in our tests it produced razor-sharp results. 2.1 megapixel equates to a 1,600x1,200 resolution and in 24bit colour you should have no problems outputting snaps as regular photo-sized prints.

While using the full 10x zoom produced slightly fuzzy pictures as a result of the digital manipulation, those at 5x and less were crisp and well-defined. The digital zoom can be deactivated so that you don't find yourself straying into its territory unexpectedly, leaving only the 5x optical function enabled.

In macro mode the auto-focus function will quite happily cope with images as close as 8cm, and in regular use this is supplemented by a manual focus ring. If simply defocusing your images is not arty enough it also has options for solarised, monochrome, sepia and negative images.

Images are written to Sony's new proprietary Memory Stick. This slim, purple medium – just 5cm long by 2cm wide – boasts impressive data transfer rates, writing a



1,600x1,200 resolution image in two seconds. The supplied 4MB Stick has room for 15 standard or eight fine shots at this resolution, increasing to 63 standard and 38 fine at 640x480. The optional 64MB Stick raises this to 260 standard/140 fine and 1050 standard/630 fine at 1,600x1,200 and 640x480 respectively. Sony is set to introduce a 256MB Stick next year,

making these already impressive figures seem poor by comparison. Images can

be retrieved in a number of ways. The easiest is undoubtedly the optional PC card or floppy disk adaptors, but its cheaper to use the bundled USB adaptor.

The 2in TFT is the only viewing option – in common with the original Cybershot.

There is no optical viewfinder. Considering the excellent lens array we feel this omission can be excused on this occasion and the supplied InfoLithium battery manages to boast an impressive 50min or 1,000 shots between charges, even with the backlight turned on. A clever flap in the battery

compartment door lets you run it off the mains for single-location photo shoots. The InfoLithium battery brings with it a number of benefits, including visual feedback on remaining battery life, and the LCD's graphical image of the Memory Stick gives an at-a-glance impression of the remaining storage space.

Perhaps most impressive is the F505's ability to record MPEG-1 movies, complete with audio. Up to 42 minutes can be stored on the optional 64MB Stick at 160x120 resolution. If you use the 4MB configuration this drops to 2min 40sec, but if you intend to email or post your results on the Internet, you'd be unwise to use much more than this.

This is undoubtedly an important camera in terms of digital photography technology and it incorporates a wide range of innovative functions in a relatively compact form factor. For the professional film photographer who has yet to be sufficiently impressed by the new digital world, this may be just what the market has lacked, yet it is simple to understand and easy enough for the more ambitious beginner to get to grips with in no time at all.

NIK RAWLINSON

## PCW DETAILS

★★★★★

Price £822.50 (£700 ex VAT)

Contact Sony 0990 424 424

[www.sony.co.uk](http://www.sony.co.uk)

**Good points** 10x zoom, MPEG-1 recording, crisp images, good price

**Bad points** Lack of optical viewfinder may deter some potential users

**Conclusion** A first-rate camera that will appeal to the professional photographer



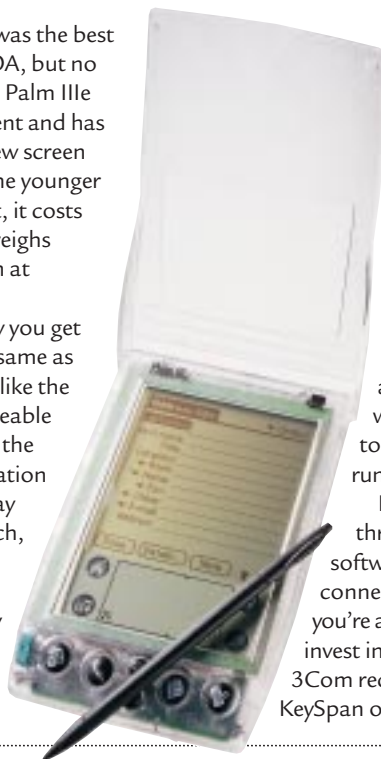


# 3Com Palm IIIe

3Com has **re-invented the Palm III** and the future looks clear for the hand-held market!

**T**he PalmV was the best looking PDA, but no more – the Palm IIIe has gone transparent and has taken that great new screen with it. Aimed at the younger ‘consumer’ market, it costs just under £200, weighs 168g and checks in at 11.9x8.1x1.8cm.

For your money you get 2MB of RAM, the same as the PalmV, but, unlike the V, it is user-upgradeable to 4MB, matching the standard configuration of the IIIx. 2MB may not sound like much, but it’s more than enough for the average user, easily squeezing in 6,000 addresses, 3,000



appointments (about five years’ worth), 1,500 to-do items, 1,500 memos and 200 emails, although this obviously depends on how much your email contacts waffle on. It runs off a couple of AAA batteries, which 3Com claims will last the average user two months, so they can be replenished almost anywhere in the world, unlike the V that has to be docked every time it’s running low on juice.

Desktop connectivity is through the standard Palm software and physical connection is via the serial port. If you’re an iMac user you’ll need to invest in a USB adaptor, which 3Com recommends you buy from KeySpan or Entrega.

It’s a shame 3Com didn’t see fit to make the docking cradle transparent, too. As it’s aimed just as much at the Mac market as PC users, we were disappointed to find the same black design as that bundled with the regular PalmIIIx hiding at the bottom of the box. Sold exclusively through Dixons, this has quickly become our PDA of choice.

NIK RAWLINSON

## PCW DETAILS



**Price** £199.99 (£170.20 ex VAT)

**Contact** Palm 0800 731 1064

[www.palm-europe.com](http://www.palm-europe.com)

**Good points** Good-looking, fast, great screen

**Bad points** Less memory than the IIIx, but then it costs a lot less, and 2MB is more than enough for most users

**Conclusion** 3Com is undoubtedly onto a winner here



# Oregon Scientific Osaris

An **affordable, useable** PDA for low-end users.

**T**here are two questions you need to ask yourself before buying a PDA, or indeed any computer equipment: is it good value for money and does it fulfil your needs? The first question we can help answer, but the second is down to you, the consumer.

The Osaris is not Oregon Scientific’s first outing into the PDA arena, but it is its first implementation using Symbian’s Epoc operating system (as seen in the Psion Series 5). The machine is small enough to fit in your pocket, features a decent keyboard (not sparking any memories of Sinclair’s ZX Spectrum) and sports a ‘quarter’ VGA screen at 320x200 pixels. Unfortunately the wealth of Epoc software available is unlikely to run unmodified on the smaller screen, although the major software houses are steadily addressing this issue.

The Osaris runs Epoc release 4 (not release 5 as seen in the Series 5mx), which means it addresses the former shortcomings of previous releases (eg user-

definable wallpaper, templates in word, sort in sheet) but does not include the newer web browser or a Java virtual machine.

To see how fast the machine was, we ran a small program that tested the time taken to sort a set of numbers and draw to the screen. The Osaris took 730 seconds to run the test. In comparison the Series 5 took 900 seconds with the 5mx storming home after only 367 seconds.

For only £200 Oregon Scientific has put together a machine that represents terrific value for money. If you are looking for a cheap Series 5, then you’ll

be a bit disappointed. If, however, you are in the market for an affordable, easy to use PDA with a good keyboard and excellent operating system then the Osaris is certainly worth a look.

WILL HEAD



## PCW DETAILS



**Price** £199 (£169.36 ex VAT)

**Contact** Oregon Scientific 01628 680424

[www.oregonscientific.com](http://www.oregonscientific.com)

**Good points** Epoc operating system, affordable, good keyboard

**Bad points** Small screen

**Conclusion** A cheerful, affordable PDA. It’s no Series 5, but the price reflects this

# Atlas Meridian A700

**Invest in your future, because here's a machine that will take some catching up.**

**T**he release of AMD's Athlon shook up the processor market. It has a new design and outperformed Intel at equivalent clock rates. AMD's relentless drive to increase its high-end market share continues with the release of its latest Athlon, clocked at 700MHz. This seventh generation processor has performed consistently well in our lab tests, and the 700MHz version certainly shifts. The SYSmark score is one of the highest we have seen, confirming the Athlon's status as a market leader.

The MSI slot A motherboard has more than enough slots for the average user. Even with everything taken into consideration, two PCI and an ISA slot remain free, and there is little that you could add to this wonder machine.

The full-size tower case is an excellent choice. Despite being so well stacked, there are still free drive bays – two free 3.5in bays above the system fan, one external 5.25in bay and one internal 5.25in bay.

**The component that screams** quality the loudest is the 19in Taxan Ergovision 980 TCO99 monitor, the winner of last month's monitor group test. The Diamondtron Natural Flat aperture grille screen is nearly flawless, and even those using it for brief periods will notice the difference. Our tests

showed its only sticking point to be minor problems with moiré. The OSD is excellent, providing easy access to the extensive array of controls, and the rest of the machine is similarly impressive.

A third-generation Hitachi GD-2500 DVD drive occupies one 5.25in bay. Combined with the 32MB Matrox G400 Max dual-head graphics card, it will enable you to watch DVDs with no dropped frames. This excellent G400, combined with the 3D Now! instructions that are an integral part of the Athlon, really helped this machine to fly on our standard 3D Mark 99 Max graphics benchmark. It managed to beat an Intel Pentium III 600Mhz based on the 820 chipset with the same graphics card by a clear 400 points.

Adaptec has provided the SCSI controller, and the years of experience it has built up constructing such cards makes it a highly reliable choice. An 18GB IBM SCSI drive, meanwhile, is located in a drive bay above the system fan at the rear, keeping the SCSI cable well out of the way of the motherboard.

**We were pleased** to see that Atlas opted for a SCSI drive. If you are spending this much money then you may as well go the full distance and opt for the fastest hard drive. Our only complaint is that Atlas has installed the generous 256MB RAM as two separate DIMMs, leaving one memory slot free. This is a fairly minor point, however. The excellent Aureal

Vortex 2 soundcard sits in a PCI slot. In addition to all the usual ports, it has an optical out port, useful for your minidisc player if you have one. Gamers will appreciate the A3D support this card provides.

No system is complete without a modem and this one has a standard LT V.90 Winmodem sitting in a PCI slot. For back-up, you can turn to the ADR OnStream tape drive with a whopping 30GB capacity. This can easily cope with backing up the hard drive and is an excellent addition.

**Atlas is determined** to make this one of the safest machines around, and has added another backup device, an AOpen CD-RW. Using a CD-R disc, this lets you create archives of your files that cannot be changed – meeting many legal requirements. Lotus SmartSuite comes pre-installed. This is a worthy office suite that will enable you to perform most office tasks.

If you have cash to burn and are looking at purchasing the best machine money can buy, then this is an excellent choice. It has everything that you need – the latest processor, sound and graphics cards together with some excellent backup devices and a gorgeous monitor. This system is as future proof as you are going to get and is well worth the asking price.

JASON JENKINS

## PCW DETAILS

★★★★★

**Price** £3,006.83 (£2,559 ex VAT)

**Contact** Atlas 07000 285 275  
[www.atlasplc.com](http://www.atlasplc.com)

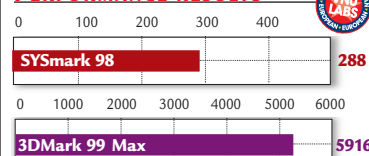
**Good points** Processor, monitor, graphics card, soundcard, back-up devices

**Bad points** Very expensive, but you get what you pay for

**Conclusion** A very impressive all-rounder.



### PERFORMANCE RESULTS



# Dell Inspiron 7500

Inspired? You will be with this **heavy-specced** notebook.

**D**ell has a reputation for releasing impressive notebooks and it has strengthened its product line further with the addition of the Inspiron 7500. If you want to jump straight to the most striking aspect first, we'll start with the screen.

This 15in SXGA Hi-Res TFT display overhangs the machine's main body in line with those found on many of Dell's recent offerings and it offers a razor-sharp 1,400x1,050 resolution image that can only be described as astounding. It also has 15 per cent more pixels than on a standard 1,024x768 15in display. It's driven by an ATi Rage Mobility-P AGP chip with either 4MB or 8MB memory onboard.

**It's not a particularly** beautiful machine and would definitely look more at home in the factory than the executive boardroom. Looking closer, though, you'll soon start to spot those trademark Dell additions that make it the notebook of choice for the mobile power user. At its core beats a 466MHz Celeron, propped up by 128MB RAM, which no doubt helped it attain a very respectable SYSmark 98 score of 175. In the unlikely event that you turn your nose up at this, you could always go for the 450MHz and 500MHz Pentium III options instead.

In terms of storage, the Inspiron 7500 features the most capacious mobile hard drive on the market, topping off at 25GB in ATA-33 format. What's really clever, though, is the unique MegaBay, allowing you to install two further hard drives to increase the maximum capacity to 75GB. This can also take an Iomega Zip drive and, to rival conventional desktop configurations, it can handle four spindle (desktop) drives when running on external power.

An alternative would be to fill it with a second battery and increase the 7500's between-charge working life. Looking to the future, the Inspiron 7500 has another trick up its sleeve: the largest single SODIMM in a mobile machine. Its exclusive 256MB module makes notebooks with 512MB memory a reality.

Along the left-hand side you'll find a couple of Type II PC card slots. As far as external communication is concerned

you should need neither, as the unit includes an integrated 56K V.90 PCI modem and an optional port replicator adds 10/100 NIC and S/PDIF connectors. The full-size keyboard is easy to type on but not overly comfortable. It has very little 'give', but is well organised, and the glide pad is very precise and responds well. Around the back there are ports for serial, parallel, USB and PS/2 peripherals and the port replicator. The S-Video port means you

can also use the optional DVD module to watch movies on your TV.

The internal speakers are excellent, and the unit also has options for line out, headphone and mic jacks beside the PC Card slots, and a hard-wired volume control.

**It's heavy**, but then this sort of desktop replacement machine is not really intended for use on the move – you'd use it in the office and then transport it to the next place you wanted to use it. In all, this is a well-thought out and well-constructed machine. It does well to continue the Dell tradition of building mobile computers that are almost as expandable as their desk-bound relatives, with options for Zip, SuperDisk and standard hard drives.

Our only real gripe with this machine was the keyboard, but this was minor and as most of its use will be at a desk you can easily invest in an inexpensive external keyboard for use at your base location. After sales care is in the form of Dell's standard three-

year, return-to-depot warranty, but different options allow you to upgrade to a next-

business-day, on-site maintenance agreement or there is an International Traveller's Warranty, which gives you access to on-site repair in 34 countries worldwide.

NIK RAWLINSON

## PCW DETAILS

★★★★★

**Price** £2,466.33 (£2,099 ex VAT)

**Contact** Dell 0870 152 4350

[www.dell.co.uk](http://www.dell.co.uk)

**Good points** Expandability, excellent display

**Bad points** Disappointing keyboard and it's quite heavy

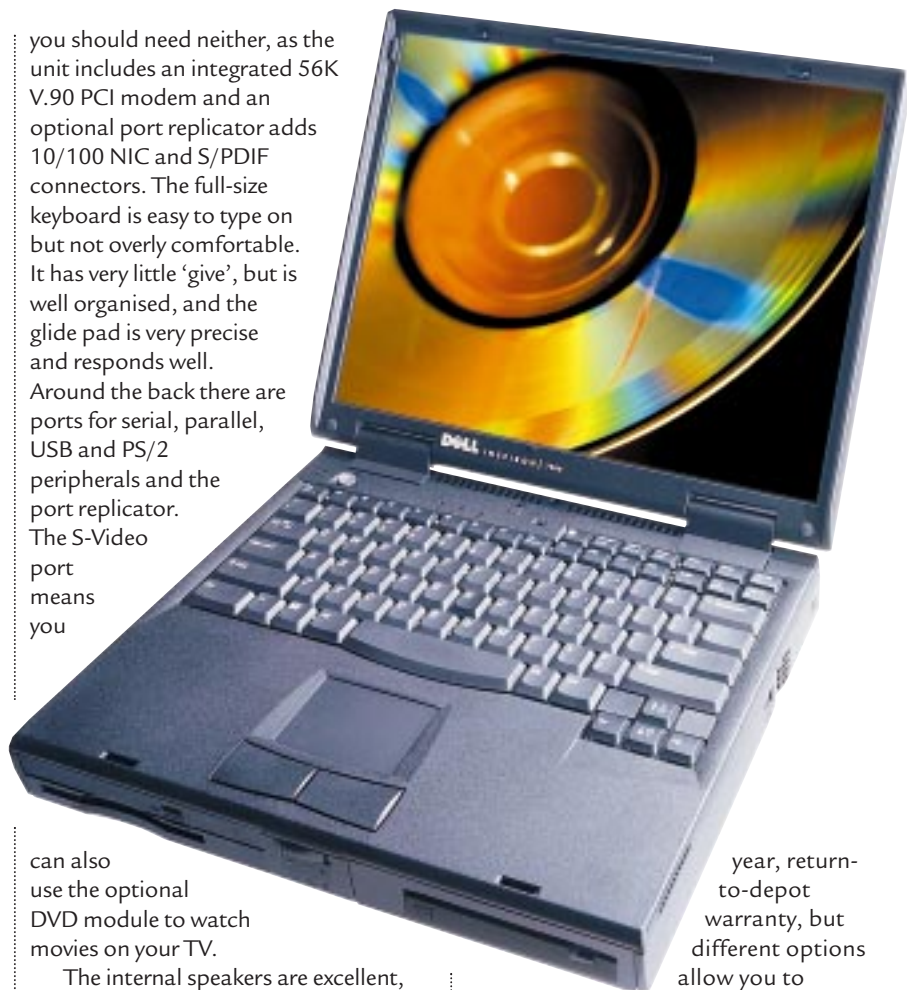
**Conclusion** A good desktop replacement

## PERFORMANCE RESULTS

0 100 200 300 400

**SYSmark 98**

175





# Evesham Vale GeForce 650

A sprightly processor and a **cutting-edge graphics** card put Evesham in the fast lane.

**W**hat makes this PC special is not so much the 650MHz Athlon processor, but the graphics card, one of the first GeForce 256 cards – codenamed NV10 – we've seen. This is the first Graphics Processing Unit (GPU), which integrates the whole 3D pipeline onto a single chip. This means it delivers from two to four times the triangle rate (15 million per second) to build up more detailed scenes, while leaving the CPU free to deal with behaviours and animation.

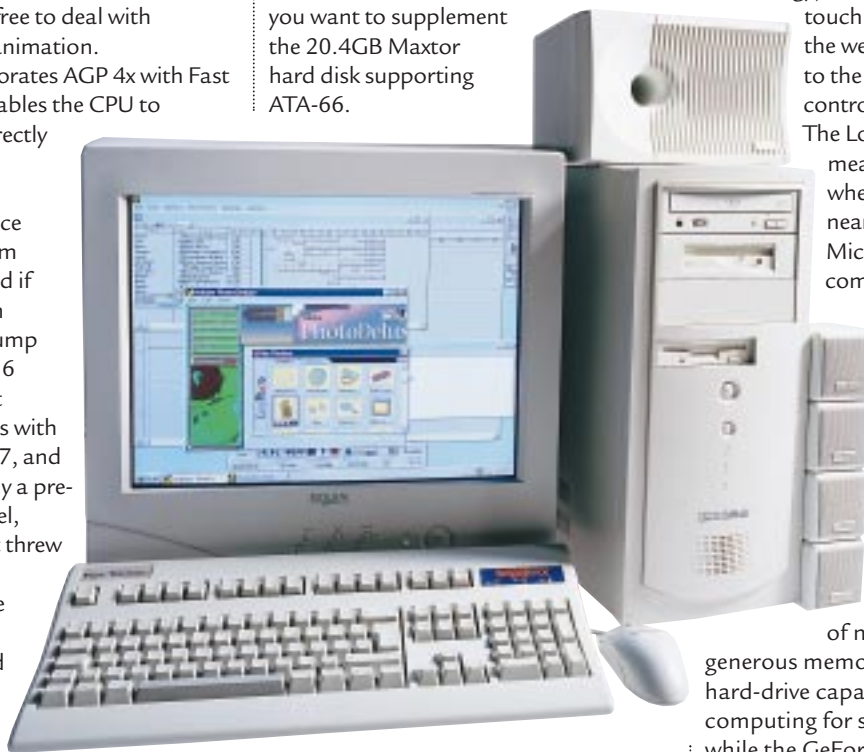
It also incorporates AGP 4x with Fast Writes, which enables the CPU to communicate directly with the GPU, bypassing main memory and hence maximising system performance. And if your monitor can support it, it'll pump out a 2,048x1,536 image at 75Hz. It arrived in our labs with a beta of DirectX7, and was unfortunately a pre-production model, both factors that threw up a number of problems, but we were eager to see how it performed in a real-world environment, nonetheless.

**Wanting to see** what the card actually looked like, not just how it performed, we tried to remove the case, which turned out to be more difficult than expected. Only after three people had tried tugging and pulling in every direction imaginable did it finally shift for us, enabling us to probe the machine's inner workings. We couldn't really call this the tidiest PC we have seen. Its internal power cables were tied into a bunch that obstructed the free memory slots and, rather than being traced around the edge of the case, the CD audio cable was dragged in front of the graphics card.

Built on a Microstar MS6167 motherboard, it sports plenty of room for expansion. Of the three DIMM slots,

two remain free and 128MB of RAM fills the third. We also found two free PCIs, one free ISA and one free shared slot, even after Evesham had installed the Diamond SupraExpress 56i Pro modem and Creative Labs' SoundBlaster Live!. A nice touch was the inclusion of a socket doubler for the modem.

There's a free external 5.25in bay, and one internal 3.5in bay left vacant for a second hard drive, if you want to supplement the 20.4GB Maxtor hard disk supporting ATA-66.



Back-up storage is taken care of by the ubiquitous Zip drive. While not as capacious as the Orb drives we have seen in many Evesham machines of late, it is widely accepted – more so, even, than the higher capacity Zip250. The BIOS supports booting from the Zip and upon arrival it was given third priority behind the floppy and hard drives. Entertainment comes courtesy of a Pioneer DVD-114, so you can choose whether to while away the winter evenings in front of a film or trawling through an electronic encyclopaedia (neither of which are bundled).

**The monitor** is an excellent Taxan Ergovision 980 (Editor's Choice, *PCW*, November 1999, review on p208). This DiamondTron unit with an 18in viewable

diagonal has no difficulty attaining a flicker free resolution of 1,600x1,200 and the extensive OSD even offers an option for altering corner colour purity. It caters for D-SUB and BNC connections and integrates one upstream and four downstream USB ports.

Key Tronic makes the supplied 'ergoforce' keyboard, with the keys benefitting from VFT (variable-force technology), which means the keys a touch typist would press with the weaker fingers are lighter to the touch than those controlled by the index fingers. The Logitech mouse, meanwhile, features a scroll wheel, but it comes nowhere near to the standard Microsoft mouse in terms of comfort. Around the back of the casing, there's the usual parallel, twin USB, two 9-pin serial and dual PS/2 ports.

All things considered, this is a well-thought out and well-built machine. Evesham should be applauded for its early adoption of new technology. The generous memory allocation and hard-drive capacity should keep you computing for some years to come, while the GeForce 256 will appeal to gamers and power users alike.

NIK RAWLINSON

## PCW DETAILS

★★★★★

**Price** £2,446.32 (£2,099 ex VAT)

**Contact** Evesham Vale 01386 769600

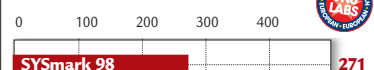
[www.evesham.com](http://www.evesham.com)

**Good points** Industry-leading technology, great monitor

**Bad points** Fiddly case, disappointing mouse

**Conclusion** A first-class PC with a generous amount of space for expansion

### PERFORMANCE RESULTS



# HP Pavilion 8530

A PC designed to **fast-track you onto the Internet** with more curves than a plate of spaghetti.

**H**ewlett-Packard could never be accused of building boring beige-boxed PCs, and the new models in the Pavilion range with their curvy grey and white styling and translucent smoked front covers are no exception. We took a look at the top-of-the-range 8530, which – along with the 8520 – features a 466MHz Intel Celeron processor and 64MB of RAM.

**In our Lab tests**, the Celeron proved a reasonable performer. With a SYSmark 98 score of 164 it was almost as impressive as a similar speed PIII. The Pavilion's graphics chip is integrated on the motherboard and has a dedicated 8MB of RAM, with access to a further 3MB of system memory. Even at this price point, many PC's come with 16 or 32MB cards, putting the Pavilion in the shade, but we still found it to be a reasonable performer, despite the fact that it kept crashing our 3DMark 99 Max bench testing software. However, if the latest 3D games are your thing, it may be worth considering the Pavilion 8520, which includes an 8MB ATI Rage Pro Card, that can always be upgraded later.

Getting started was a simple matter of matching up colour-coded cables and ports and, once up and running, it was obvious that HP has thought long and hard about how its PCs will actually be used. The top end Pavilions feature a serial port at the front of the tower case, as well as at the back, and this is ideal for connecting digital cameras. They've done the same with the USB ports. There's even a compartment, which can hold up to nine CD-ROMs on the top of the tower unit.

**HP has designed** the Pavilion with the Internet firmly in mind, describing the keyboard as an Internet steering wheel, but if Damon Hill was confronted with one of these, chances are he'd feel short changed. Essentially HP has added extra shortcut keys for the most popular functions and for HP's favoured websites to an ordinary keyboard. It's a nice idea, as it makes it easy for novices to get started with their new machine, and you can always customise the keys to suit your own needs later. We particularly

liked the Send Fax key, which initiates the necessary wizard, as sending a fax using your PC can flummox even advanced users.

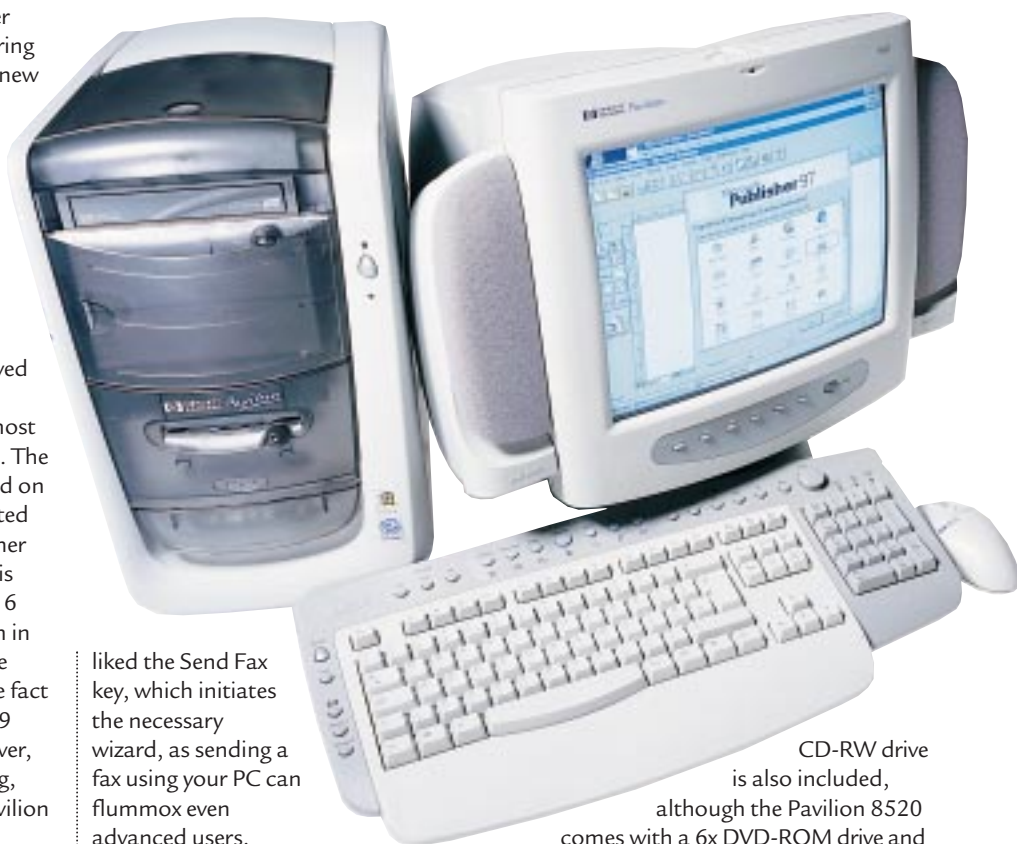
The Pavilion comes with a 56K modem and local call Internet access from BT Click. With this in mind, it seems a little strange that the keyboard shortcuts for news, weather and shopping are linked to Yahoo! web pages, but as you'll probably soon change them to your own favourites, it's no major criticism. The addition of a wheel mouse for scrolling down long web pages is always a popular choice, and once you've used one you'll soon wonder how you lived without it.

**Like most 15in monitors**, the one supplied proved to be quite flickery at high resolutions, but at 800x600 the picture was reasonable enough. We liked the fact that the Pavilion's speakers clip onto the side of the monitor, saving valuable desk space but, as with the graphics chip, the Pavilion's wavetable soundcard is integrated with the motherboard, making future upgrades more fiddly.

The 8.4GB hard disk that comes with the 8530 is not vast by any means, but should prove more than adequate. A fast

CD-RW drive is also included, although the Pavilion 8520 comes with a 6x DVD-ROM drive and a larger 10.2GB hard disc for the same price, if you'd prefer. Expansion possibilities are fairly limited, with just two free 5.25in drive bays and one spare DIMM slot, and adding any extras would involve wading through what can only be described as a jungle of internal cabling.

RICHARD MCPARTLAND



## PCW DETAILS

★★★★★

**Price** £899 (£765.11 ex VAT)

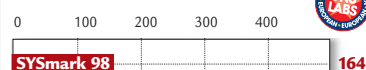
**Contact** Hewlett-Packard 0990 474747  
[www.hp.com](http://www.hp.com)

**Good points** Good-looking tower case, easy to set up and use

**Bad points** Integrated sound and graphic capabilities, limited expansion potential

**Conclusion** A great-looking PC, with the emphasis firmly on ease-of-use, the Pavilion 8530 suffers slightly in terms of specification and limited expansion possibilities

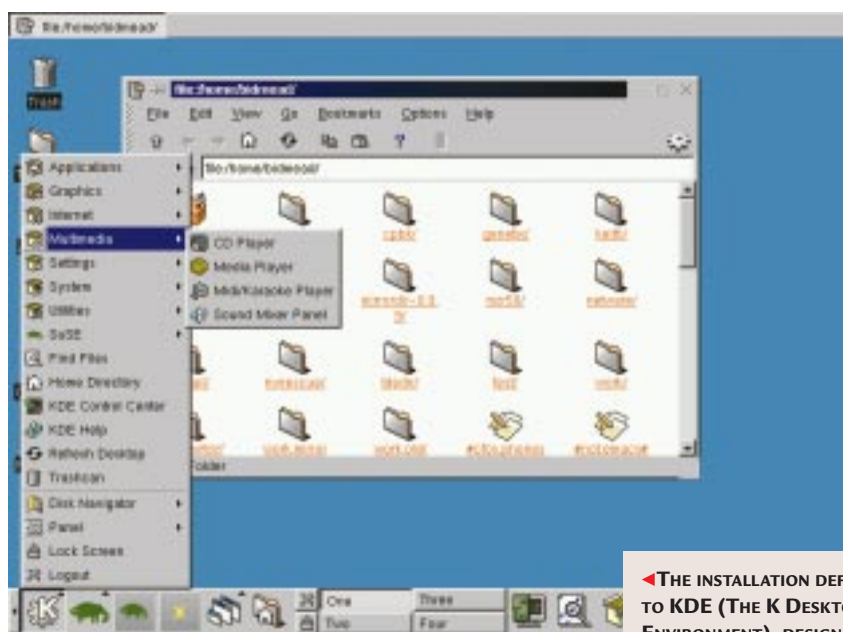
### PERFORMANCE RESULTS





# SuSE 6.2

SuSE has a **SaX-ey configuration**, a lovely YaST and is an absolute dream to install.



◀ THE INSTALLATION DEFAULTS TO KDE (THE K DESKTOP ENVIRONMENT), DESIGNED TO MAKE WINDOWS USERS FEEL AT HOME

**S**uSE Linux is the European contender among the three leading commercial Linux distributions, which also include the US offerings, Red Hat and Caldera. If you don't want to pay upwards of £30 for a commercial Linux distribution containing CDs and manuals, you can download the entire operating system from the Internet, free of charge. To add to the fun you can also buy a cheap CD containing almost everything in one of the commercial distributions, but without the manual or support.

The newest twist is the arrival of second-tier distributors like Mandrake, which take an existing packaged distribution (in Mandrake's case it's Red Hat), add its own tweaks, and repackage the whole thing under its own brand name. Linux detractors call this multiplicity 'market confusion'. For the friends of Linux it's just free choice in a free and open market. All these roads lead to just about the same Linux.

**As you might expect** from its Teutonic origins, the SuSE distribution (pronounced 'ZuZ-eh') is meticulously organised. The installation, which runs like clockwork across a wide range of PC hardware, is driven by a special SuSE utility called YaST (Yet Another System Tool). YaST is distributed with source code, but under a restricted licence that

lets you copy it freely, except as the basis of a SuSE-like second-tier commercial distribution, an arrangement that seems to be designed to prevent a Mandrake equivalent of SuSE. A pity, because the resonance between Mandrake and Red Hat (which of course is free to borrow Mandrake improvements and in turn improve on them) is already delivering real benefits to users.

**Wisely, we think**, SuSE keeps the basic installation as a simple, character-based menuing system, and backs it up with plenty of solid advice in the 400-page manual. Perhaps the trickiest part of any installation is the process of setting up the X graphical interface. For this SuSE has developed its own – unlike YaST, freely licenced – setup utility, SaX (the SuSE Advanced XF86 Configurator).

For most of the graphics cards we've come across, SaX is the slickest way of setting up your configuration. But for our initial installation of SuSE 6.2 we didn't need it, because we were putting the distribution to a much harder test. Offering the installation a completely clear patch of hard drive and letting it do its stuff is a relatively easy ordeal; the acid test is seeing if it can be intelligent about updating software that's already in place. Our last attempt to upgrade to Caldera 2.2 from its own previous release failed

and we had to do a complete reload. We wondered how SuSE would cope with upgrading an older SuSE installation on an ageing Siemens Nixdorf Scenic 500 laptop. And this wasn't just the previous SuSE distribution; we were jumping across four generations from 5.2 to 6.2.

Then, 35 minutes after booting from the first of the six CD-ROMs we had a flawlessly working Linux installation. Our 1GB drive, half of it reserved for Windows, had room of course for only a tiny portion of the 1,300 applications and utilities on the CDs, and using the foolproof RPM packaging system to add and subtract applications, we're still picking our way through the main offerings. As well as free software

regulars such as Apache, Samba, Gimp and a myriad of others, SuSE 6.2 includes commercial packages such as WordPerfect, StarOffice, Netscape, the ADABAS,

Sybase and Informix relational databases and Applixware. Oh, and there's the IBM ViaVoice developer's kit, the Netbeans Java IDE and a time-limited trial version of VMWare.

CHRIS BIDMEAD

## PCW DETAILS

★★★★★

**Price** £32 (£27.23 ex VAT)

**Contact** SuSE GmbH +49 991 740 5331

[www.suse.com](http://www.suse.com)

**System requirements** Intel 486 (or equivalent) or better. 32MB of RAM (16MB without X). 300MB disk space (720MB recommended – up to 4GB if you want to install everything). There may be some incompatibilities with the very newest hardware like 3D video cards – check the Linux Hardware Compatibility HOW-TO at [www.linuxdoc.org/HOWTO/Hardware-HOWTO.html](http://www.linuxdoc.org/HOWTO/Hardware-HOWTO.html).

**Good points** Simple to install distribution based on the new 2.2.x Linux kernel, with a huge number of additional utilities and applications at an excellent price

**Bad points** The YaST licence terms are non-free. The cardboard case for the six CDs doesn't hold them firmly and they tend to drop out

**Conclusion** If you're looking for an easy to install Linux distribution with a comprehensive manual and 60-day installation support by email, fax or phone, SuSE 6.2 represents a real bargain



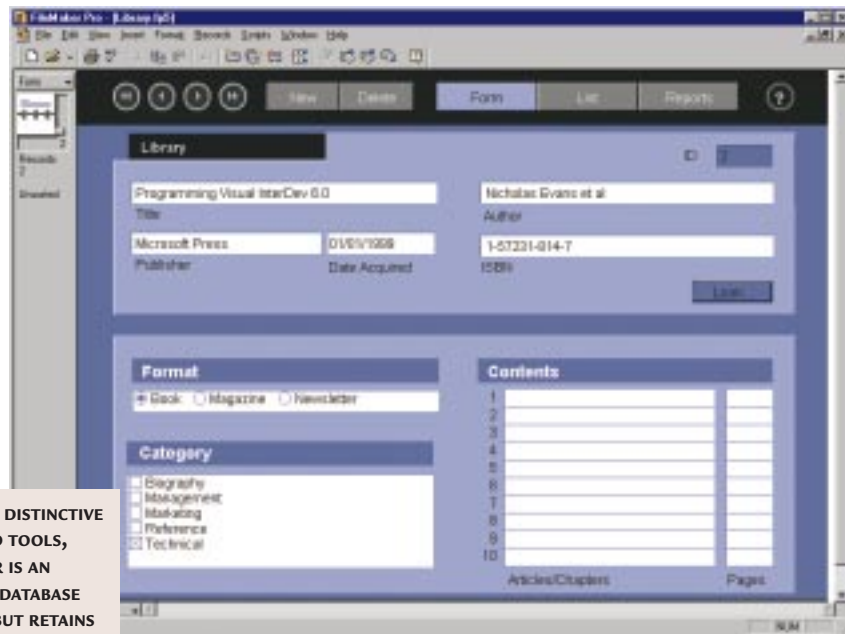
# FileMaker 5.0

Software that makes the **impenetrable world** of database management approachable.

**F**ileMaker Pro reigns supreme on the Macintosh, being almost the only choice if you want a desktop database manager. Combining ease of use with great performance and a surprising depth of features, it is everything a Mac application ought to be. For many years FileMaker has also been a Windows product. It works just like the Mac version, and is ideal for mixed-platform data sharing, but does not fit as comfortably into Windows as it does on its home platform.

Version 5.0 aims to set that right, at least from a functional point of view, by providing new ways to integrate FileMaker with other Windows applications. In a nod towards Windows, FileMaker now has floating and docking toolbars as well. It still feels Mac-like, but it's none the worse for that.

► **WITH ITS DISTINCTIVE FORMS AND TOOLS, FILEMAKER IS AN EXCELLENT DATABASE MANAGER BUT RETAINS MAC-LIKE FEATURES EVEN ON WINDOWS**



**FileMaker's great strength** is that it requires the minimum of database skills to achieve successful results. When you define a new database, there are only a few simple field types to contend with, and there is no need to specify indexes as FileMaker creates these for you.

Text fields are of variable length, so you do not need to guess in advance what the maximum size of a field needs to be, and there is no distinction between ordinary text fields and long memo fields. Rich formatting is supported. In FileMaker, every word is indexed if need be, for fast free-text searching. Every FileMaker database is automatically linked to a form. The intuitive query by form, where you enter the values you want to match in order to perform a search, also comes for free.

Features such as these make FileMaker the ideal database for novices. The only competitor to come close is Lotus Approach, but FileMaker is smarter and more powerful. Advanced users will find that FileMaker goes a long way before conceding to more developer-oriented rivals. FileMaker Server supports up to 250 simultaneous users. There is a scripting language that is ideal for high-level database functions, and developers can compile their own extensions by acquiring the developer version.

FileMaker also has a superb web sharing option, which uses a built-in web server for instant intranet publishing. The basic version allows up to 10 different workstations to connect per day for the price of a single licence, and uses XML and Cascading Style Sheets for the generated web pages. However, you are limited to Internet Explorer clients until Netscape 5.0 appears, but there are big gains in appearance and possible customisation.

**Toolbars aside**, FileMaker Pro 5.0 looks similar to its predecessors. Internally the changes are more substantial, and FileMaker is now coded in C++, apparently to make an easier transition to future Unix-like versions of the Mac OS.

There are two new features of importance to Windows users. First, a new ODBC driver lets you get at FileMaker Pro data from any ODBC-capable client application. This includes Microsoft's OLEDB provider for ODBC, so you can get at FileMaker databases from Visual Basic, Access, Microsoft Office, and in Active Server Pages – Microsoft's dynamic web publishing technology.

The other big new feature is support for COM automation. This lets you control FileMaker and read its data from automation clients, which includes most Microsoft applications and development tools such as Visual C++ and Delphi. The

object model on offer is limited, but does include the ability to run FileMaker scripts, opening the door to custom solutions.

These two features may seem invisible to many FileMaker users. They are important though, since they remove one of the last objections to use of FileMaker in Windows. If you need productivity and rapid deployment, rather than the last word in power or programmability, then FileMaker Pro should be your first stop.

TIM ANDERSON

## PCW DETAILS

★★★★★

**Price** FileMaker Pro 5 £233.83 (£199 ex VAT). Forthcoming Unlimited Web Server and Developer versions, prices not yet available

**Contact** FileMaker 0845 603 9100 [www.filemaker.co.uk](http://www.filemaker.co.uk)

**System requirements** A 486/33 with Windows 95, 98 or NT, 16MB RAM, 20MB hard disk space

**Good points** Ease of use, simple web sharing, and at last the ability to access FileMaker data from other applications

**Bad points** More expensive than the competition, has a limited scripting language, and still looks like a Mac application

**Conclusion** Still a great product, and with ODBC and COM automation hard to resist even on Windows

# MGI PhotoSuite III

A software upgrade with a **web-oriented facelift** and a very useful Help function.

It's little more than a year since MGI revamped PhotoSuite. The complete makeover turned version 8.05 of a non-descript image editor into PhotoSuite II – a well styled, project-based photo-editing suite aimed squarely at the consumer.

PhotoSuite III is a less ambitious upgrade. The interface has been

select Get from the navigation bar the activity panel displays six buttons allowing you to choose the source of the file you want to open, be it on your hard drive, scanner, digital camera or whatever.

Having 'Got' your picture, the activity panel automatically progresses to the prepare stage, which offers seven functions including Rotate and Crop,

page relevant to the activity. So, if you're trying to clone and get stuck, selecting Help takes you to the clone page.

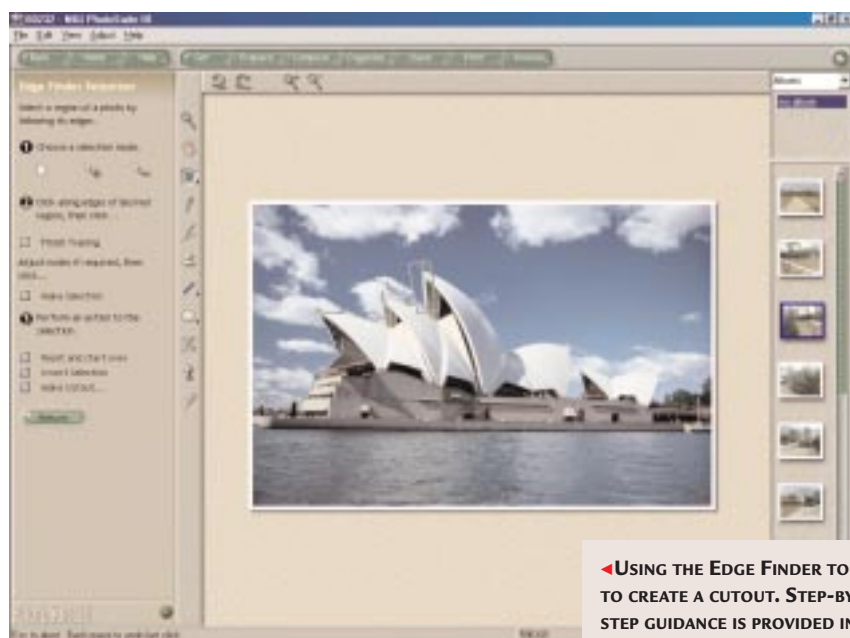
If you're feeling confident you can jump straight in by selecting a tool and getting on with it. In this case the activity panel provides the same appropriate step-by-step help for the selected tool.

Compose is where you'll find projects such as greetings cards, invitations and calendars and is probably the weakest part of PhotoSuite III. While the projects are simple to complete, the collection of templates is, by today's standards, thin. To include only one template for a birthday party invitation, which is probably the most likely use of this kind of thing, is just daft.

**PhotoSuite succeeds** much better when it comes to organising and sharing photos. It provides straightforward tools for organising pictures into albums and you can present slideshows with fancy transitions between slides either automatically, or using a VCR-style control panel. These features will be of great value to digital camera users as will the direct input support for certain models of Kodak, Sanyo, Agfa, Olympus and Epson digital cameras. Owners of other models can use the conventional twain route.

If you're using an ATi RagePro graphics card, you'll need to get up-to-date drivers from the ATi website. Given the ubiquity of the ATi card this will be a nuisance to many users and hopefully MGI will fix the bug soon.

KEN MCMAHON



◀ USING THE EDGE FINDER TOOL TO CREATE A CUTOUT. STEP-BY-STEP GUIDANCE IS PROVIDED IN THE ACTIVITY PANEL

reorganised to accommodate an expanded list of tools and features – the most notable of which are Phototapestry and Stitching. The first lets you create one big picture from lots of smaller ones, the second is for combining a number of adjacent shots into a panoramic vista.

PhotoSuite III also looks different, although not necessarily better. Version II's neat buttons and icons have been replaced with a browser-style interface with a navigation bar and big green buttons that light up when your pointer rolls over them. This provides improved guidance – an activity panel to the left of the edit window takes you through the various projects and editing processes in a step-by-step fashion.

**There are seven activities** – Get, Prepare, Compose, Organise, Share, Print and Browse – accessed from a navigation bar above the editing window. The activity panel is context-sensitive, so, for example, when you

Touch-up, Cut-outs, Special Effects, Stitching and Phototapestry. Click on any one of these and you get a further button list of options. Touch-up for example, includes options for the removal of red-eye, scratches, blemishes and wrinkles as well as touch-up brushes, filters and cloning. Select one of these and you then get a three or four-step guide.

**At each step** of the process the tools you need are provided on the activity panel itself. So, when you clone you are first told to click and set the origin, then choose a brush. A slider is provided for adjusting the brush size and opacity and clicking on a palette provides differently shaped and feathered brushes. When you've finished, clicking return takes you back to the previous menu – in this case the various Touch-up options.

If you need more guidance, the Help button on the navigation bar opens a separate Help window, which opens on a

## PCW DETAILS

★★★★

**Price** £49 (£42.55 ex VAT)

**Contact** MGI Software 01628 680227  
[www.mgisoft.com](http://www.mgisoft.com)

**System requirements** PII 166Mhz, Win95, 98 or NT4, 32MB RAM, 80MB disk space

**Good points** New Tapestry and Stitch features, album and slideshow facilities

**Bad points** Crashes with some ATi graphics cards, poor collection of project templates

**Conclusion** Unless you really need the new features, stick with version II – it's only £29.99

# Emagic Logic Audio Gold 4.0

Could this be a case of the sequel being better than the original? It's music to the ears.

Ever since Logic migrated from the Atari ST, the program's development on PC has lagged several versions behind the Mac. This is set to change with the release of version 4.0, though. Not only has the package undergone extensive cosmetic surgery, its code has been rewritten to bring both platforms in line. While we'll be looking at what Logic Audio Gold now has to offer, note that MicroLogic, Logic Audio Silver and Platinum have had much the same treatment.

Behind that cushy facelift are scores of improvements, both to the user interface and to the program's ever-growing arsenal of features. This is first apparent in the Arrange window. New colours and casual design tweaks give the package a more modern feel, but more significant is that the menu structure has had a major reshuffle. The purpose of this is to group related commands in the same place. For example, there is now a global Audio menu from where you can access the audio mixer, sample editor, audio-input monitoring and audio preferences. It's much more logical this way!

The transport bar has also been reworked. Besides a new look, multiple instances can be opened simultaneously and configured to display any transport function, such as SMPTE time position, MIDI activity and current locator points. Additionally, the bar ruler across the top of the screen now changes colour to indicate transport mode. When record is activated it turns red, yellow indicates solo and blue is for external sync. In the track list there is a new Record Enable button. This allows several instruments (audio or MIDI) to be recorded to separate tracks simultaneously.

Emagic has clearly gone to work with the colours here, but these are most useful in the Matrix editor. It's now possible to view velocity values and different objects in full colour. This makes a huge difference when editing multiple parts, making it clearer to see which events belong to which tracks.



► LOGIC IN FULL EFFECT.  
NOTE THE DIFFERENT  
TRACK SIZES IN THE  
ARRANGE WINDOW

Another welcome improvement is that individual tracks can be resized in the Arrange window. This enables you, for example, to zoom into an audio track to enter Hyperdraw envelopes while viewing other tracks at regular size.

Logic now supports 24bit/96KHz operation and is compatible with Steinberg's Audio System Input/Output (ASIO) standard. If your sound card comes with ASIO drivers, latency (the time it takes for audio to arrive at your speakers) is vastly reduced. Although figures vary for different sound cards, Terratec's EWS88MT ASIO driver has a latency of just 8ms compared with 750ms for the standard MME one. There was also talk of VST plug-in support for this release, but it hasn't been implemented yet. Emagic says it's working on it.

**Logic Gold now comes** with 26 audio effects. Some are rewrites of old plug-ins that use fewer processor overheads, while others are new altogether. These include a noise gate, compressor, expander, overdrive, reverb and tape delay. The graphics are visually stunning and, in many cases, the layout of parameters are just as they would be on a real hardware device. All parameters can be automated alongside audio and MIDI-mixer tracks. However, the effects are not DirectX or VST compatible and cannot be used inside other applications.

We've spent three days playing with this release and must conclude that the enhancements (both visual and functional) make the program much easier and clearer to use. We suspect most users will admire the new look, but should you prefer the old style the option is available via the Settings menu. For us, though, the real joy of 4.0 is the new effects – they sound great. The only real problem we came across was when using ASIO drivers. On several occasions we got the message 'failed to synchronise audio to MIDI', which stops play. A call to tech support proved inconclusive, so for the time being we'll be using the slower MME drivers.

STEVEN HELSTRIP

## PCW DETAILS



**Price** £399 (£340 ex VAT);  
Upgrade from 3.5 £69 (£58.72 ex VAT)  
**Contact** Sound Technology 01462 480 000  
[www.emagic.de](http://www.emagic.de)

**System requirements** Pentium II processor, 128MB RAM, audio and MIDI capability, fast hard disk

**Good points** Pro-quality effects, powerful sequencing features, full automation, highly configurable

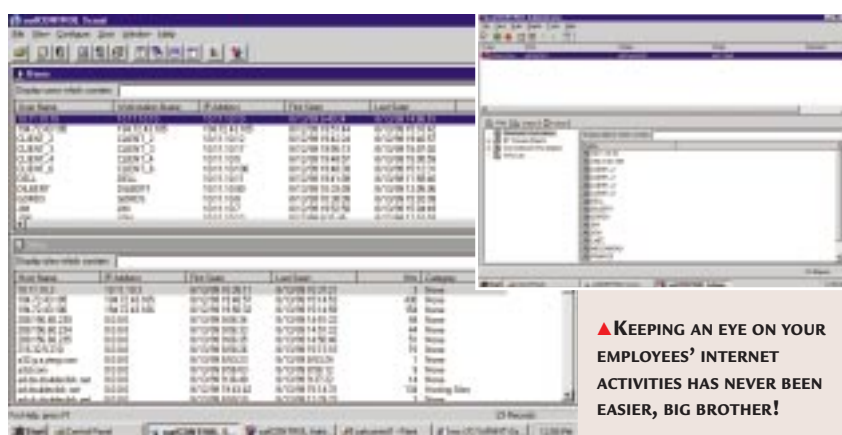
**Bad points** No support for VST plug-ins (yet), occasional audio drop-outs

**Conclusion** If you're a dedicated Logic user, version 4.0 is an essential purchase. Well worth the £69 upgrade



# JSB Surfcontrol and Netsiren UC2

Stop people seeing what they shouldn't and **wasting time** at work and at home.



The Internet is a great source of information, but it serves as a distraction from work, and a potential source of illicit material in the home. What is needed are tools to help enforce a sensible Internet policy, and we have two such products here: one for the home, and one for work.

SurfControl from JSB is aimed at businesses and restricts Internet access, either for certain sites, or people. Sounds clever, but how does it work? It's quite simple, once you understand the basics. Ethernet networks work on the basis that when a person transmits, everybody else on the same segment receives a copy of that packet. A segment contains every computer connected to the same hub. Switches split the network into these different segments.

Upon receiving a packet your network card usually dumps data it was not meant to have. SurfControl, however, keeps every packet which arrives (Promiscuous mode), allowing it to monitor Internet activity within the segment. Should it find a request for a website it should be blocking, it sends out a cancel request to the contacted web server, and a message to the client who initiated the session informing them that access is denied.

Installation is very easy: simply insert the CD, enter the serial number and reboot, and everything should be up and running. From this point on control is achieved through two programs: the monitor, and the rules administrator. The monitor allows you to view a list of

users who have accessed the web, and websites accessed. You can select who to monitor and who to ignore.

Real control is through the rules administrator, which is where you set up access. This is really a matter of dragging and dropping users, and websites, and selecting 'allow' or 'deny'. It's a simple system, but quite powerful in what it allows you to do. The only real trouble that we had was in restricting access to workstations based on their NetBIOS names. It's a competent enough system, although only really recommended for SMEs as higher network traffic could be a problem for the way the system works.

**As a comparison Netsiren's UC2** serves as an aid to parents. The aim of the game here is no longer prevention of access to material, but monitoring of what has been accessed. The hope is that parents can then view what has been going on, and talk to their children about what they have been viewing.

The program is painless to install, and starts working immediately on reboot. The only program that parents will then ever need load is the password-protected application to view everything that has been monitored. The monitor allows the user to select a type of content, such as web, ftp, mail, and see what transactions have taken place by presenting the user with, for example, a list of files accessed over the Internet. Should you then find something of interest, you can simply select a file while UC2 displays what it is

in another window. For this to work you'll need to be connected to the Internet as UC2 only stores a list of sites visited, not all the files, which saves wasting disk space. In fact, the only thing that UC2 stores in its entirety are emails. The usual keyword search tools are included, and you can call up statistics on which web page was visited the most.

The software isn't infallible, and a smart child could get round it, but for the most part it serves both to warn children that you know what is going on, and to give you some peace of mind knowing what your children are looking at. Its simplicity makes it worth a look.

DAVID LUDLOW

## PCW DETAILS

### JSB Surfcontrol

★★★★★

**Price** £1,404.13 (£1,195 ex VAT)

**Contact** JSB 01260 296 250

[www.jsb.com](http://www.jsb.com)

**System requirements** Microsoft Windows NT4 (server or workstation), Pentium 200MHz, 64MB of RAM, 1GB of free disk space, Promiscuous mode network card

**Good points** Easy to install. Simple rules-based system that can give a lot of power

**Bad points** Rules administrator can be annoying when defining access privileges

**Conclusion** Good overall product that keeps your employees away from sites they shouldn't be visiting. Better suited to smaller networks, as a standard server could have trouble coping with large amounts of traffic

### Netsiren UC2

★★★★★

**Price** £34.08 (£29 ex VAT)

**Contact** Netsiren 0207 423 0523

[www.netsiren.com](http://www.netsiren.com)

**System requirements** Microsoft Windows 95/98, Pentium 100MHz (Pentium 233MHz recommended), 16MB of RAM (32MB recommended), Microsoft Internet Explorer 4.0 or higher installed

**Good points** Simple to use, the install takes care of everything for you, and no configuration is needed

**Bad points** Could be bypassed

**Conclusion** Allows you to verify where your children have been, while the threat of being monitored should keep them away from sites they shouldn't be looking at. Definitely worth a go



# Removable media vs removable hard disk

Should your PC end up on the **operating table** what can you do to ensure a full data recovery?

**T**he price of hard disks is dropping fast and their sizes are increasing with equal speed, so for most users, storage is no longer a problem. You can easily fit all the applications and data you need onto your hard disk, but how safe do you feel keeping all your metaphorical eggs in one basket?

Let's face it, there is a myriad accidents that could befall your data. The hard drive could fail for many different reasons, your PC could be stolen or your building could be hit by flood or fire. If something happened to your data, how hard would it hit you? Home users will doubtless be gutted, but if you run a business, data loss could mean substantial financial loss. A recent Veritas survey in the US estimated that

96 per cent of small to medium-sized businesses never recovered from a catastrophic data loss, lasting only a few months before going bankrupt.

**So the question is not whether** you should back up, but how. Over the past few years several removable media drives have come onto the market and, for many users, these are an obvious choice when backing up and archiving data. Iomega Zip and Jaz drives, CD-R and tape drives can all be used for backing up and archiving data, although only write-once media like CD-Rs are admissible in court as evidence.

The argument for using removable media for backup is simple. The disks

can be removed to a safe place after each backup, so should there be, for example, a fire in your building, you will have the backup disks stored in a fire-proof safe or in a separate building altogether. This way, whether the disaster is as mild as a hard disk failure or as severe as your entire premises burning to the ground, you still have your data and can keep your business running.

Most removable media drives only have space to store the data, especially given the increasing size of applications. Office 2000 Standard Edition will take up 189MB, SBE needs 360MB, Professional 391MB and Premium a massive 526MB if you install the complete package from all three CDs. Even Photoshop 5.5 gobbles up 125MB

while Windows 98 eats up to 315MB, depending on the configuration of your machine. The files created by these bloatware applications also grow increasingly in size. For example, with regular use of Photoshop you can quickly build up several hundred megabytes worth of files. Creating a whole image of your hard disk is often not practicable using removable media, and backing up your data alone will still require a good amount of storage space.

**In the event of a hard disk failure** the first step to recovery using removable storage media is getting hold of and fitting a new hard disk. You will then have to reinstall Windows and all your applications before you can even contemplate restoring your data. In most cases this means long periods of non-productivity for you and your staff waiting for the new machine to be ready and the data restored, and when time means money, wasted hours eat into company profits.

With the price of hard drives dropping so rapidly, could you not use a removable hard drive for backup instead? Any hard disk can be turned into a removable disk by fitting it in a removable case. This sits in a 5.25in front-facing bay and allows the drive to be pulled in and out of the case just as you would take removable drive media in and out of the drive. A removable hard disk casing kit costs just £8 ex VAT from Insight <[www.insight.com/uk](http://www.insight.com/uk)> and allows you to swap a hard drive in and out of the machine quickly and easily. In fact to all intents and purposes it then becomes a removable media.

Creating a back-up image

is as easy as creating a backup of your data and several utilities exist which will copy the entire contents of your hard drive, including all system information, from one drive to another. Drive Image from Powerquest will do just this for you in one very simple movement. Should you have a hard disk failure, the old hard disk can be replaced with the backup drive by simply swapping one drive for the other, and you can then use the drive immediately, with access to all your files without having to go through the whole system rebuilding rigmarole that would be required with removable media disks.

**There is now a convincing** cost argument in favour of hard disks instead

of other removable media. You can now expect to pay around £8 ex VAT per gigabyte for an EIDE hard drive. If you go for an ATA-66 drive, you will not pay a huge premium – just a matter of a few pounds more than for an older ATA-33 drive, although SCSI drives will cost you around £25 per gigabyte.

Compare this with prices for removable media disks. An internal ATAPI 250MB Iomega Zip drive costs just £100, but a single disk costs £13, over 16 times more expensive than hard drives per megabyte. A single 2GB Jaz disk costs £65 ex VAT and £159 for a three-pack, more per gigabyte than a SCSI hard drive. Jaz drives will cost you around £215. Tape is equally expensive, costing between £30 and £42 ex VAT for Colorado media. You also have to factor in the price of the drive itself.

Hewlett-Packard Colorado tape drives with a 5GB maximum capacity can be bought for around £100 – about the same price as a Zip drive.

Size-wise hard disks are also a good bet. Current hard drives are huge, with SCSI hard drives coming in sizes up to 36GB and ATA-66 drives available up to 37GB. While you can get huge tape drives, these are infinitely more expensive than a hard drive, with 70GB drives costing well over £3,000.



**JAZ DRIVES OFFER SERIOUS DATA STORAGE POTENTIAL, BUT AT A PRICE**

However, the size of the backup media you need will depend greatly on the kind of installation you have. If you have a 4GB hard drive that is groaningly overloaded, you will need a large media type to back up onto, unless you want to have to wait around and swap disks a few times throughout the backup process. Here we are looking at a hard drive or tape.

However, if you have less than 2GB to

back up then something like a Jaz drive would be a good bet, as you could fit a full disk image onto one disk.

However, if you use a Jaz drive on a larger installation, you will have to swap disks or save your data only, meaning a longer system reinstallation if the worst comes to the worst. Zip drives are frankly far too small to be used for anything but saving the odd file and are certainly not big enough for full bodied backup.

**If you are going to be backing up** your data on regular basis, then speed is of the essence, especially if the removable

***Zip drives are too small to be used for anything but saving the odd file***

**▼ THE RISK OF THE HARD DISK: LOW COST AND CAPACITY VERSUS BRITTLINESS**





disk is then going to be taken to another building or locked in a safe overnight. After all, you would not want the backup disk still sitting in its drive if the building went up in smoke. Zip drives, particularly the parallel port versions, and CD-R drives, are not particularly fast and, of course, you need to be there while they back up, especially with smaller 100MB Zip drives, where the media will have to be changed several times before a complete backup has finished. Jaz drives reach speeds similar to hard drives, however and, provided the entire backup will fit on one disk, you will not have to sit there waiting to swap disks.

Finally the life of the disk has to be taken into account. With careful handling a hard disk should have a longer life span than any of the removable media types. Obviously, CD-R can only be written to once, while CD-RW can only be written to a few times over. Iomega quotes a shelf life of 10 years for Zip disks, although as with any floppy-type media there is a finite number of times you can write to the disk before it starts to deteriorate. Most tape drives can be written to just 80-200 times. Compare this to the average hard disk to which you read and write many thousands of times every day.

So from a cost, space and speed point of view hard disks win out every time. However, there is one huge problem with using them as a back-up device that is going to be taken in and out of a machine – their fragility. The very fact that hard drives have to be backed up at all speaks volumes about this. The disks themselves are wafer thin and can be easily damaged if knocked too hard. And if you damage any of the

interface pins, the drive will no longer be accessible. This does not bode well for a drive that is going to be pulled in and out of a

removable bay every day. And it is in this way that those drives designed specifically for backup, while not entirely damage-proof, do still score points over hard disks.

There are also other reasons for having Zip, CD-R and tape drives as part of your system. Zip and CD-R disks are useful not only for backing up data, but also for transferring larger files from one computer to another. So you can give large database files to your colleagues, or take your PowerPoint presentation to a remote venue without having to lug a notebook with you, then leave the presentation with your clients afterwards. You can create boot disks on Zip drives to solve any virus problems, and it would also be useful to keep a copy of the drivers you need on this same Zip disk to recover from operating system foul-ups.

Jaz drives with a 2GB capacity can be used to do a complete data backup but can also be used to store applications not used regularly. As they are intended to run like hard drives, Jaz drives are just about fast enough to run programs, allowing you to save



◀ PANASONIC'S SUPERDISK 120 PROVIDES 120MB ON A DISK THE SAME SIZE AS A FLOPPY

seldom-used applications there rather than

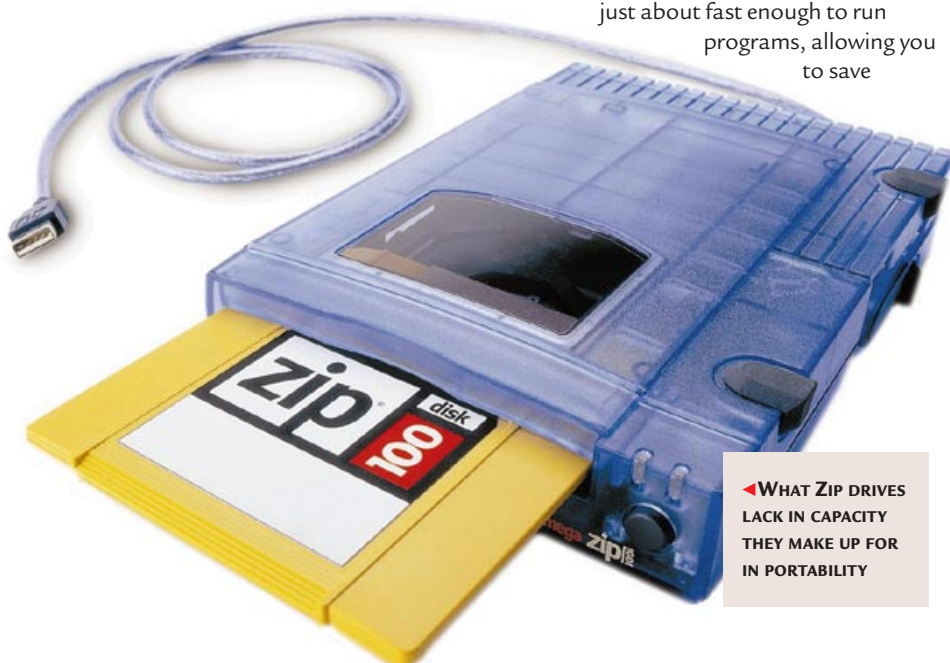
on the hard drive. And, of course, as with Zip drives, you can also boot from Jaz drives, so they can be used to create recovery disks for your system to solve any virus or operating system problems.

**Tape drives, meanwhile,** where capacity can go up to 70GB, remain excellent for backup and for archiving data. Hewlett-Packard's Colorado drives, with maximum capacities of 5GB, 8GB and 14GB cost £119, £134 and £182 ex VAT respectively and all now feature One Button Disaster Recovery, which does exactly what it says – restores your entire system at the touch of a button, so apart from the time spent adding in a new hard drive to your PC, recovery should be pretty quick.

Perhaps the ideal scenario would be to use a combination of hard disk and removable storage to fulfil your back-up and restore needs. This will mean two back-up routines, however, first mirroring the image of your hard drive to a removable hard disk maybe once every week or two weeks, copying your operating system, applications and all your data to that point. Secondly, you should back up your most recent data on a daily basis to a removable media disk. This should shorten the daily routine.

Should the unthinkable happen you will have a new hard drive ready, with an image of your operating system and applications and most of your data which can be quickly installed. This will give you a working system so you will not lose valuable working time. You will then be able to restore your most recent data from a removable drive, making sure that you have a fully working and up-to-date system within an hour or so.

ADELE DYER



◀ WHAT ZIP DRIVES LACK IN CAPACITY THEY MAKE UP FOR IN PORTABILITY