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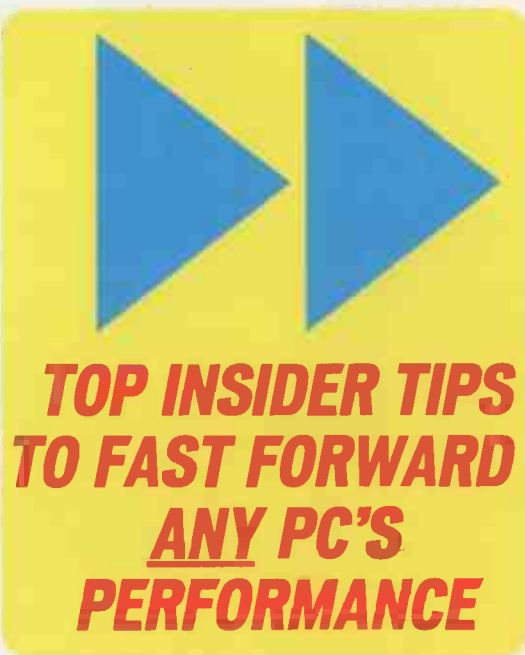
# PERSONAL COMPUTER WORLD

JULY 2002

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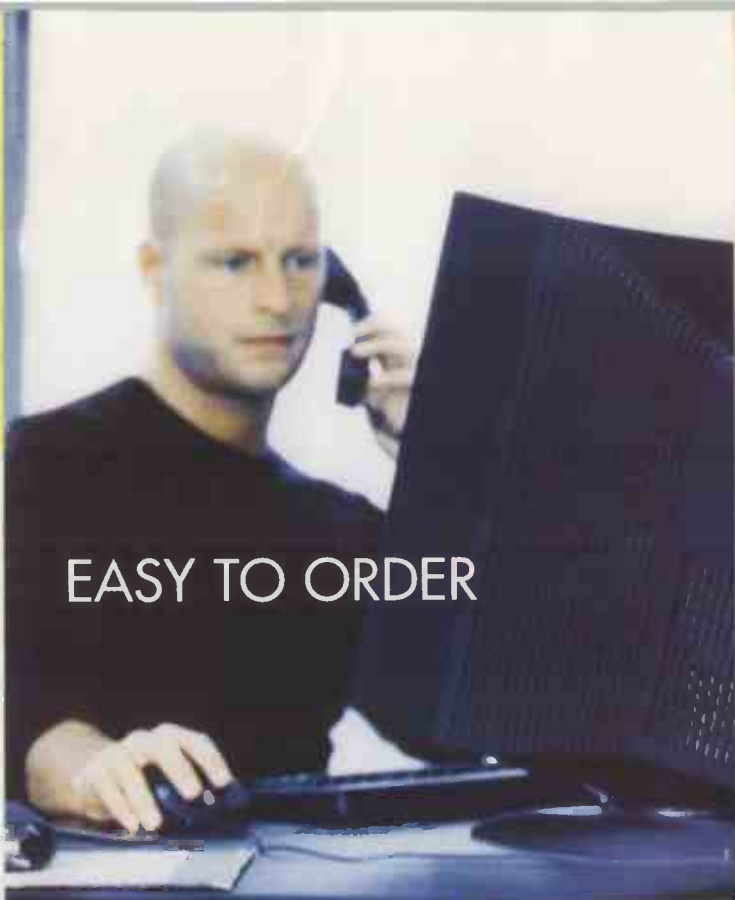
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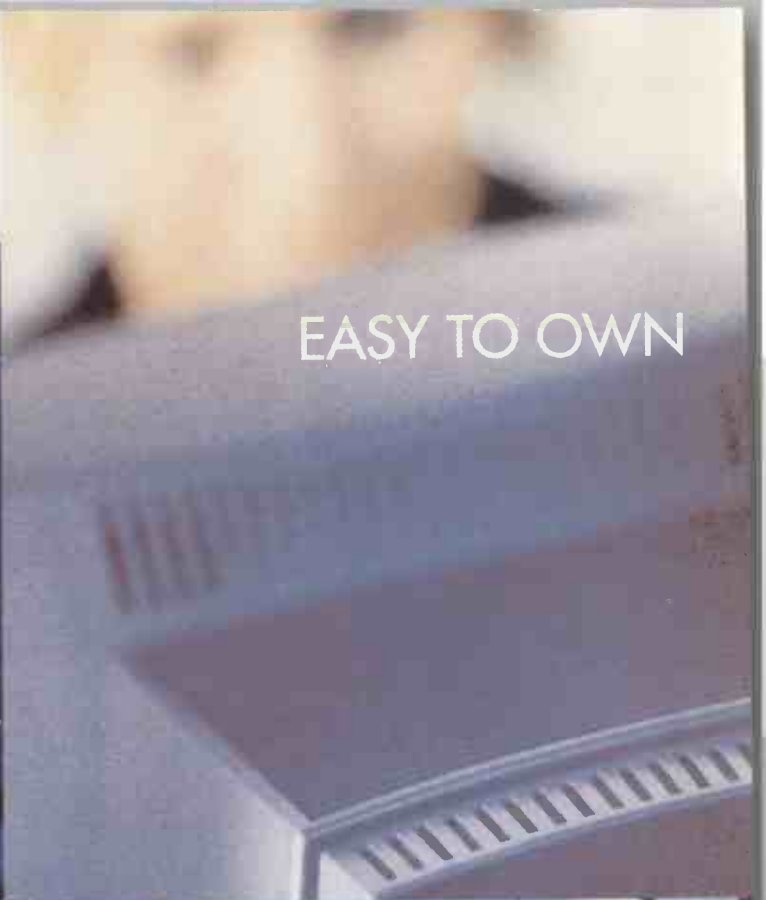


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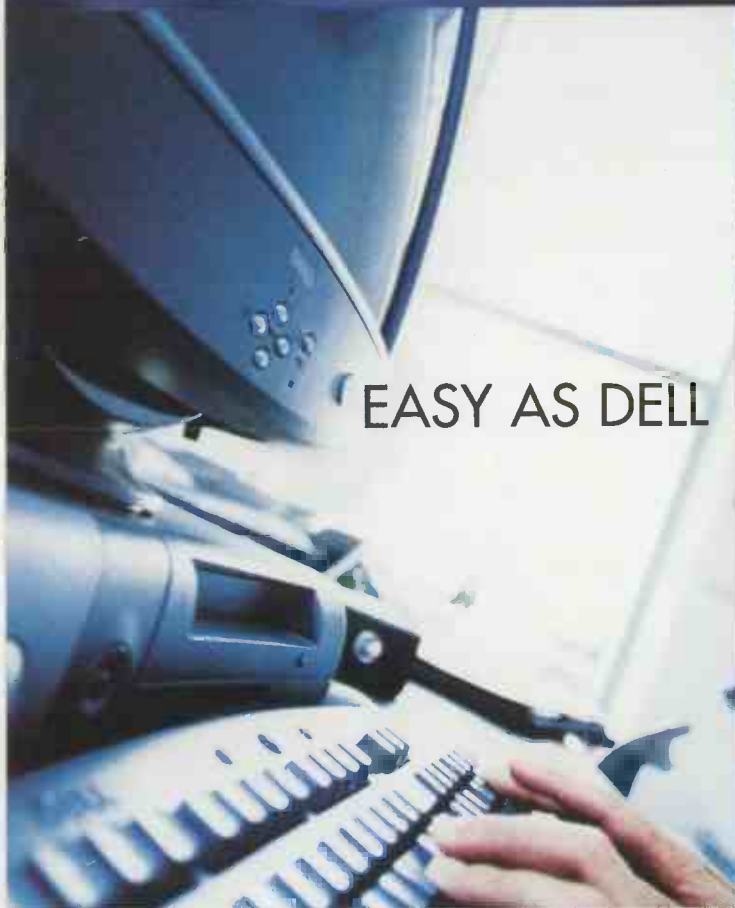
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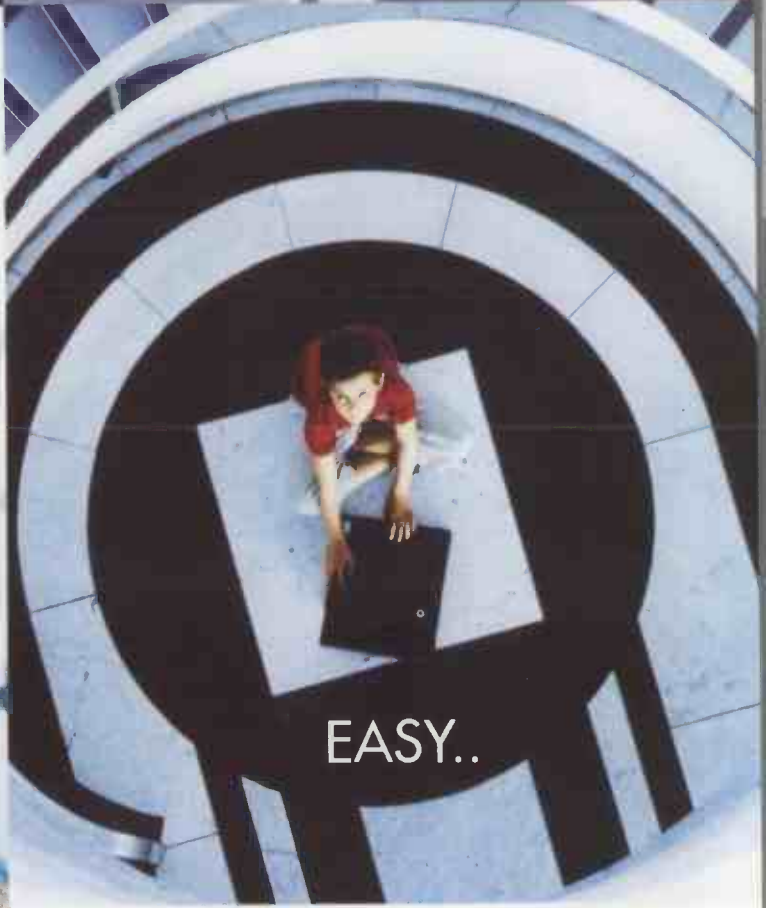
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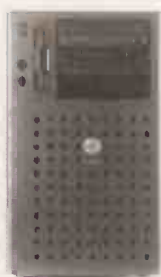
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pcwexpert opens up the world of Windows

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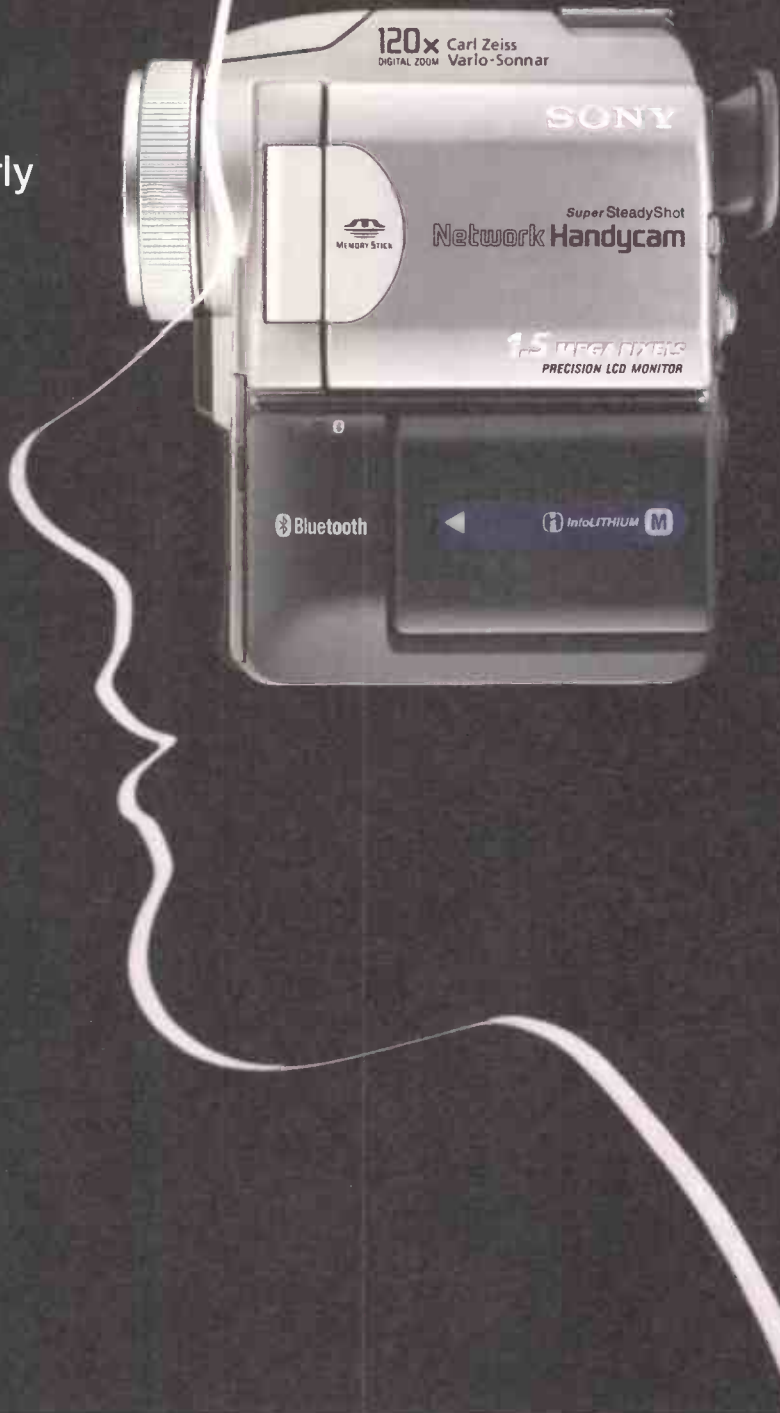
Have your say as a member of the PCW reader panel and you could win a mystery prize

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## Mega Handycam

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## Altered images

Dylan Armbrust explains some changes at *PCW* and laments the loss of Compaq

dylan\_armbrust@vnu.co.uk

**O**ver the past few months you may have noticed some subtle changes happening to *PCW*. We've changed our cover design with a new motto (PC advice for real life), revised the product rating structure, highlighted software included on our cover CD, and put more emphasis on the features a product offers rather than just on its technology and spec. All these changes have come about as a result of asking you, the reader, to give us your feedback on what you like about *PCW* and how we can make it a better read for everyone. This month, we're asking more readers to get involved in our reader panel (see page 283). All these changes have been part of a concerted effort to make *PCW* the most informative, cutting-edge and relevant computer magazine on the market.

And this issue is no different. This month sees the introduction of a full-fledged CD jewel case. Because so many of you like to file and store your copies of *PCW* and the CD-Roms that come with them, you've asked for something more durable and useful than the cardboard wallets that previously came with the magazine. Many of you also mentioned that you preferred a more resilient paper that could stand up to the rigours of a good thumb through and you'll see that we've responded to this as well.

Finally, we've completely overhauled our website, [www.pcw.co.uk](http://www.pcw.co.uk). We've updated it to bring you easier navigation, more product reviews, an enhanced downloads section, and our Eshopper buying area to help you find the products you are interested in buying online without having to spend hours searching the Internet.

We're also making it easier for you to follow up on news stories published in the

magazine as a story unfolds. You'll see that running news stories or features have a specific *PCW* number published at the bottom. All you have to do is enter the unique number in our quick search box and you'll be taken straight to the story.

More features content has made it onto the site, including our popular Retro column that looks back on the days of PC yore.

We've introduced our own Help and Advice forum so that you can ask fellow readers to get you out of a technical tight spot, or in turn share your own knowledge. There's our general Issue forum, too, where you can start your own topic thread.

While these are big changes, they won't be the only ones. Over the next few months we'll be introducing more features, such as PDA downloads and the ability to purchase and download articles in pdf form from our back issue catalogue. So I invite all of you to have a look and tell me what you think.

### Less choice for consumers

There's change afoot in the wider world of IT, too. Two of the biggest computer firms in the world, HP and Compaq, have recently completed their much reported, and disputed, merger. What the overall outcome of this massive marriage will be is anyone's guess, but the first casualty appears to be the Compaq brand itself. Once rated the second largest PC manufacturer in the world, Compaq is no more.

It seems that even though the pace of computer technology is unabated, with ever faster speeds and better features attained by PCs, software and the like, our choice of who to buy them from is diminishing. Here in the UK we recently saw Tiny go into administration, only to

**We've completely overhauled the *PCW* website with more news, features, downloads and extras**

have its assets and brand name snapped up by Time Computers.

So that's two fewer PC firms on the market. Sure, HP will keep some of the Compaq brand alive, particularly on the consumer side of its business, and Time will be promoting the Tiny brand as a low-cost option, but the fact remains that there's now less competition out there to keep prices potentially lower and to drive innovation.

When it comes to the computer business, its one advantage is that it is constantly moving forward, pushing the boundaries of technology. If we matched the pace of car development to computers, we'd all be driving around the world close to the speed of light using cars with fusion motors. My worry is that when you get fewer, but bigger, players around, they slow down their pace of development, take the safe road and we all end up with a mediocre choice of products. Can you imagine how much worse the broadband Internet access situation would be if BT weren't forced to compete? We'd all probably still be using 33.3Kbits/sec modems paying 5p a minute in access charges.

Don't get me wrong, I'm not advocating state intervention in the affairs of computer vendors. It's survival of the fittest, especially in the world of technology. I'm just lamenting the fact that there's going to be one company instead of two, trying to push the envelope of technology and competition – seeing who can out-do the other. And on the high street we, the consumer, will have less choice when we're shopping around. I, for one, will miss the diversity. Goodbye Compaq. You gave us technology journalists a great ride, but the journey is now over. You'll be missed. Rest in peace.

**PCW**



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## EDITORIAL

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## July

# COVER DISC



## Turn to p280 for more info >

Here's a taster of what's on the cover disc – turn to the pages at the back of the issue for details

### Full versions

#### GSP Family Tree

GSP's genealogy software will speed your ancestral research by helping to organise data. Using this package you can produce high-quality, professional-looking family trees. Features include: research facility, 'Tree Detective', new tree styles, individual record sheets, picture compatibility and links to popular UK genealogy websites.

#### Security & Standards Growl II

Is the website you're visiting legal and secure? Which trade associations and merchant agreements (credit cards) really are connected to the site? Is the site actually a clone of the real thing? Security and Standards' Growl offers a simple 'traffic light' system indicating the level of security in place at any website you visit.

#### Project Companion

Project Companion is a valuable, yet free-of-charge, source of hints, techniques and terminology for Microsoft Project users. The 26 topics within Project Companion have been chosen to illustrate best practices in applying Microsoft Project to a real environment – working on real projects.

Turn to p280 >

### Trial versions

#### Nero 5.5

Nero is a solution to all your CD recording needs. And now, version 5.5 has full support for recording both data and video DVDs. Nero can create or copy virtually any CD or DVD. Whether you want to back up your hard drive or compile collections of your favourite music, Nero 5.5 can cope.

#### Edit Studio 3

Capture clips from a digital video or analogue capture card and arrange them using Edit Studio, or apply transitions, titles and effects. Then build the movie to a file, send it to your camcorder or put it on a website. Edit Studio can edit movies in timeline and storyboard modes. Many items, effects and transitions can be layered, giving total control.

#### WinOn CD 5 Power Edition

This multimedia software tool lets you create your own projects with music, video and photos – now sporting a more user-friendly interface. Edit music and create video CDs, DVDs, backups and copies. Includes Roxio DirectCD, CD Emulator, CheckCD, Video CD Player, VCD Photo Album, VCD Music Album and MP3 Project.

Turn to p281 >

### Powerstrip

Powerstrip provides a pop-up menu providing access to 500 controls over your display hardware, including sophisticated colour correction tools.

Turn to p281 >

### On the DVD

There's everything that's on the CD-Rom, plus all the following on this month's DVD-Rom.

#### Viewlet Builder 2

Viewlet Builder is the powerful, yet simple tool for creating Viewlets – compact animated movie files. The enhanced features of this Freeware Edition are a great introduction.

#### Mandrake Linux 8.2

Mandrake Linux is a preconfigured graphical Linux operating system. It's easy to install, use and is stable. We featured version 8 on last July's DVD-Rom, and it also received PCW's Editor's Choice award.

### Plus...

Essentials – more than 50 utilities and add-ins; group tests; shareware and freeware and games demos, including 2002 FIFA World Cup, Beam Breakers, The Secret of Nautilus, Universal Monsters, Blood Omen 2 (trailer) and Freedom Force.

Turn to p282 >

### Using the cover disc

The PCW cover disc uses a web-browser-style interface. To get full functionality, you'll need to use Microsoft Internet Explorer (version 4 or later). Unfortunately, Netscape doesn't properly support this software. However, we have also provided links to the featured programs so that you can still copy them to your hard disk or install them manually (the standard download dialogue box will appear). Programs can be found in the \software\ folder on the disc.

### Starting the disc

The CD-Rom (or DVD) should auto-start. If it doesn't, double-click the CD-Rom/DVD icon in My Computer, or run pcw.exe on the root of the disc.

### Problems?

Please note that we cannot give support on individual programs contained on this disc. If you have problems running the disc or any of its content, please note these guidelines:

**FAULTY DISC >** If the disc is physically damaged and will not load, return it to this address for a replacement:

PCW July cover disc  
ABT, 306 St Mary's Lane  
Upminster, Essex RM14 3HL

quoting reference 'PCW Vol 25 No 7'.

#### PROBLEMS INSTALLING/RUNNING THE

**SOFTWARE >** Check the support page on the disc, or check the manufacturer's site.

**GENERAL DIFFICULTIES >** Call 08700 885 995 (9.30am to 5pm Mon, Tues, Thurs & Fri; open until 8pm on Wed and 10am to 2pm Sat). Or email us at pcw@vnusupport.co.uk.



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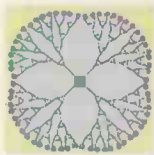
CLIVE AKASS REPORTS

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### SPECIAL REPORT



This dendrimer and other exotic carbon-based molecules could lead to spray-on circuits and

screens. It's early days yet but you can start thinking about flexible screens, dynamic wallpaper and, er, high-resolution cyberskin. Just don't ask where that may lead. Clive Akass writes on the emerging world of organic logic in a two-page report starting on page 26.

## Freerise cable

NTL is to sell cable broadband access via Freerise, it announced as we went to press. See also page 28



## Portable screens turn over a new leaf

You may have read about the idea in *PCW*, well here's one implementation of the reality. Samsung SDI spent more than £1m developing this 6.7 x 5in screen that folds along the middle and is designed for ebooks. It goes into production later this year. Dual screen: page 19; flexi screens: page 26

## Wifi hotspots threaten 3G billions

**B**T plans to launch fast Wifi access at airports, shopping centres and cafes in a move that could undermine the financial viability of 3G (third generation) links – giving operators (including BT) less chance of recouping the £24b they paid for 3G licences.

The rollout at 400 Wifi 'hotspots' later this year is nowhere near big enough to dent cellular revenues. But in parts of the US Wifi hotspots have spread out to cover districts, and enthusiasts expect them to eventually cover entire cities.

Ironically the announcement by BT Retail came only days before the

lavish launch of BT's demerged cellular arm MMO<sub>2</sub>.

Wifi (802.11b) links are rated at 10Mbps/sec, with real transfer rates at around half that. BT is expected to offer 2Mbps/sec – still five times faster than predicted 3G speeds.

There would be huge problems in scaling up Wifi to cover cities. Billing under the BT Retail system is simply a matter of prepaying for a day's access at one site; charging for roaming access, where you may cut across many network nodes, would be far more complex. But it could provide new revenue streams.

In one scenario all home and

office broadband access boxes would pack public wireless access and would be subsidised by public data revenues.

Wifi as it stands could not cope with such user densities. It has only three non-overlapping channels and there are already crowding problems (*PCW* number 1131203). Wifi devices in effect shout to their maximum range, limiting the number of possible users in an area.

European amendments to 802.11a (aka Wifi5), which is 10 times faster than 11b, ease these problems by matching power to current needs and dynamically selecting frequencies to minimise contention. The standard, which also offers more channels than Wifi, is still going through its European approvals process.

In any event 3G access, which is probably at least two years away, is going to face competition from wireless links up to 50 times faster in the very cities where operators hoped to recoup their vast investments.

The issue is not so much whether 3G looks dated before it is born, but whether the thinking and regulatory structures that produced it are stuck in the past.

There are moves for a more coherent, holistic approach to matching available bandwidth and transmission systems to needs (see my *PCW* predecessor Guy Kewney's site at [www.newswireless.net](http://www.newswireless.net)).

Clive Akass

## Numbers are up for new-look *PCW* site

You will see references to *PCW* numbers at the foot of some stories in this month's News section. These will save you work if you want to find out more information on the story from a source, or a fuller version, in the online database powering our new-look site at [www.pcw.co.uk](http://www.pcw.co.uk).

Rather than get you to type out a long complicated web address

we have put a little box at the top left of the screen (see left). All you need to do is to type in

the number and click Go. This feature and the new look are only part of the revamp story. We want to improve the integration between

the printed *PCW* and the site, to bring you timely news and views to a degree that is not possible in a printed monthly title.

We also want this to be *your* site; somewhere where you can give us feedback, discuss issues with other readers, and find advice and answers to your computing problems. Like all publishing houses, our parent company VNU has had to tread a tricky line with its online media. A major issue has been whether to focus resources on a central site, or risk dissipating them by pushing individual magazine sites.

For some time the *PCW* site has been a satellite of the much larger

VNU one. The advantage was that you got access to features and news you may have missed in our sister publications. The disadvantage was that the site became distanced from the magazine and to an extent from you, the reader.

This has now changed and we hope to bring you the best of both worlds, acting as a window on all VNU resources while retaining our unique *PCW* perspective.

We are not trying to do everything at once and you will see changes and new features at our site over the coming months. If there is a feature you would like to see, tell us about it. We want the site to work for you.

Enter PCW article number here

Go



## Short stories



### HANDS-FREE HEADSETS

Phone-packing PDAs are likely to increase the use of hands-free headsets which, for those lacking Bluetooth, involves wires hanging from your ears. The snag is that you can look like a maniac walking along, talking to thin air, flourishing your liberated hands to stress a point.

The answer (*writes PCW's fashion correspondent*) is to have a headset that is at once elegant and visible, an unspoken statement of your sanity and dynamism. So argues Jabra, which has introduced a new range into Britain. The £19.99 Earwrap, pictured above, is one of them. [www.jabra.com](http://www.jabra.com)

### 360GB DRIVES

Fujitsu says it is on course to make 360GB 2.5in drives within four years, after achieving a record-breaking data density of 300Gbits per square inch. [www.fujitsu-europe.com](http://www.fujitsu-europe.com)

### THEME MACHINE

A £10 Theme Manager from BVRP Software allows you to change features such as the desktop background image and text colour on organisers running Pocket PC 2002.

### JUST THE JOB

Fancy being a BBC governor, or helping to run your local school? A new website at [www.justdosomething.net](http://www.justdosomething.net) has been set up to point volunteers to more than 36,000 public appointments.

## AMD opens a second 64bit front

**A**MD has announced names for its soon-to-be-launched 64bit eighth-generation x86 processors – and opened up a new 64bit front challenging Intel's Xscale processors in the handheld market.

AMD's enterprise-class x86-64 chips, codenamed Sledgehammer, will be branded Opteron, meaning 'the best', when they launch early next year. They will use the next-generation Hypertransport bus.

Their desktop-class siblings, codenamed Clawhammer, will be branded 'eighth-generation Athlon' and are set to ship late this year.

Both lines are designed to compete with Intel's 64bit Itanium and high-end P4s. AMD says the fact that its products run both 32bit and 64bit x86 apps natively provides a smoother upgrade path than Itanium, which can run x86 code only in emulation mode.

Meanwhile AMD's purchase of a company called Alchemy has given it a foothold in the handheld market. Alchemy specialises in chips using Mips core logic, a rival to the ARM cores used by Xscale.

AMD has launched Alchemy's latest Au1100 system-on-a-chip, designed for handhelds and webpads but based, like Xscale, on a 32bit architecture. But it says it will also build handheld processors using Mips' 64bit architecture.

Mips has been developing 64bit designs for 10 years. ARM argues that 32/16bit chips offer the best



Alchemy's Mips-based Au1500, sibling to the just released Au1100, is set to ship later this year

balance of power drain, cost and performance for current tasks..

John Cornish, ARM's director of CPU programs, points out that the latest ARM1026EJ-S and next-generation ARM11 have a 64bit memory bus 'to deliver high bandwidth and performance without the power and cost penalties of a full 64bit processor.'

The ARM1026EJ also packs ARM's fast Jazelle Java engine, which Cornish cites as another example of how ARM adds features selectively to optimise performance. These arguments, whatever their

merits, may go unheard if AMD-powered 64bit handhelds go head-to-head with 32bit ARMs. It would be ironic if buyers assume 64bit is better than 32bit, as AMD has been foremost in arguing that simple metrics like this are a poor measure of processing power.

● AMD will phase out its Duron range by the end of this year, chairman Jerry Sanders has said.

### BANIAS IS BORN AMID NEW MOBILE LAUNCHES

Intel has made a prototype of the chip codenamed Baniyas, its first x86 processor designed from scratch for mobiles.

It will launch next year with the Odem chipset and will pack support for Wifi networking. The news came amid a flurry of new releases from Intel,

including 1.4GHz, 1.5GHz, 1.8GHz versions of the mobile P4, and two low-voltage, low-drain mobile PIII processors clocking 800MHz and 933MHz. Also launched were 2.53GHz and 2.4GHz versions of the P4 desktop processor (see reviews pages 48 and 51).

## In and outs of the HP-Compaq merger

Several product lines are to disappear with the absorption of Compaq into HP, in the largest merger in history. Compaq was itself swollen by recent mergers with enterprise systems specialist Tandem and the huge Digital Corporation.

The deal will cost an estimated 15,000 jobs worldwide, but it was not known how many of these would be in Britain. The Compaq name will survive as a brand in product areas where it is considered dominant.

One surprise is the fate of HP's Omnibook brand, which has been erratic over the years but had

occasional flashes of brilliance – early models were among the first to recognise that people actually wanted notebooks to be portable. It is to be phased out in favour of Compaq models which have hardly covered themselves in glory.

More understandable is the dropping of the Jornada handhelds in favour of Compaq's highly successful Ipaq range.

HP, which co-developed the 64bit Itanium with Intel, will still launch the next generation of Compaq's 64bit Alpha processor, according to US reports. But the company will

focus on moving its high-end server lines to the Itanium.

Both HP and Compaq brands will continue on home PCs, but Compaq technology will dominate in business PCs and high-end servers. The HP brand will be used for printers.

Carly Fiorina remains as HP's chief executive and Michael Capella, her opposite number as Compaq's former chief executive, becomes president. Fiorina said the enlarged company would invest \$4b a year in research and development and cut operating expenses to total 17 per cent of revenues at most.

See Mark Walsh page 44.

## BT lets you spend a penny online

**B**T has become the second phone company to launch a scheme to enable users to spend small sums on the web – which could be vital if ecommerce is to go fully mainstream.

Micropayment systems have been around for some time, but none has come close to being accepted as general currency. Credit-card transaction costs are too high to allow their use as small change.

Now BT has adopted a 'click and buy' system, run by the German firm Firstgate, which debits small sums from your bank account. Later you will have the option to have the charge added to your phone bill.

First you have to set up a free account with BT's micropayments service, giving your bank or credit-card details. You'll then get a password and user number. Then simply click on the BT logo on participating sites to make a payment.

Ian Price, head of micropayments at BT, admits that the password

system can get dodgy if user numbers get into the millions as the chance of hitting a valid combination at random goes up. However, the system is primed to spot repeat tries and eventually authentication certificates will be introduced.

He said BT had looked at 'wallet' systems in which you can spend up to a pre-paid amount. 'The problem is that a customer who doesn't have enough in the wallet tends to move off without purchasing. Our system

is post-payment, which allows you to spend up to your credit limit.'

The system will go live in September. Vodafone already has a system called m-Pay that allows users to spend as little as 5p at participating sites; the charge is added to their mobile phone bill.

Price says only a tiny commission will be charged per transaction. However, BT's partner Firstgate is said to charge up to a 40 per cent commission on sales in Germany.

## Touching story of rubber phones

A vibrating rubber mobile phone allows people to transmit ideas, thoughts and feelings to each other, claim researchers at the Tangible Media Lab at the Massachusetts Institute of Technology.

They claim touch allows for more personal communication, and could enable remote communication for the deaf. Their prototype phones have five tiny finger pads that react

to the amount of pressure applied on them. The harder a caller squeezes, the more the corresponding pad on the other phone vibrates.

During testing, users are said to have come up with ad hoc codes to interrupt, agree with or sympathise with the other speaker. At the very least it is a novel way of keeping in touch.

PCW number 1131304

## NOTEBOOK THAT SEES DOUBLE

Folding screens are usually seen as a way of getting a notebook-class display onto a pocketable device, such as that pictured on page 17. The idea behind this model from US-based Estari is rather different. It is, as you can see, more dual-screen than folder and is far from pocketable.

The 2-VU notebook's twin 15in displays allow users to page through two ebooks at once, or view two consecutive pages like a paper book, or read one book with one screen while taking notes in another.

Estari plans handheld and 'portable desktop' versions. The XP-based 2-VU comes with document-management software, which is an Estari speciality.



The model will ship in the US this year but prices have yet to be announced. [www.dualscreen.com](http://www.dualscreen.com)

## Surfers full of Eastern promises

A spate of web virtual 'marriages' has prompted Chinese gossips to see red. The nuptials have no basis in law but are causing real marriages to founder, Chinese newspapers report.

One woman divorced her real husband because of his virtual polygamy, and a childless woman hit the headlines when her husband's net 'wife' had a virtual 'baby'.

Some men are thought to have seven or eight 'wives' on the Internet. Others have bequeathed

property to their web spouses rather than their real-life families.

Some newspapers have called on the government to act, claiming that the situation has got out of hand. One editorial thundered: 'While reports of westerners having Internet affairs is not new, it is part of Chinese culture that marriage seems to be a part of the fantasy.'

Presumably Chinese women are also having bigamous web marriages but the editorials only complain about men. **Nick Farrell**



'Confucius he say: Chinese man with eight virtual wives no worse than British man with one PC widow'

## Short stories



### CAMERA PRICES DROP

In yet another sign that the price of digital cameras is falling, HP is selling this 1 megapixel point-and-shoot camera for £99. The PhotoSmart 120 boasts 4MB of Ram and a 3.6cm LCD screen. In addition to taking stills it can shoot 35 seconds of video.

### STRANGE TRUST

Two out of three people passing through Victoria Station gave complete strangers their network password when asked for a survey by the organisers of Infosecurity Europe 2002.

### CRAWLING HACK

Columbia University researchers have created a virtual reporter that trawls the web for stories, then edits and rewrites them. They say the Newsblaster software will not replace human reporters because it makes too many mistakes – but it could be used to aggregate stories on the web. PCW number 1130816

### SUPERCOMPUTER CROWN

NEC is claiming the title for the fastest-ever supercomputer with a machine called an Earth Simulator that runs at 36,500 Gigaflops – three times more powerful than IBM's best.

The machine at the Yokohama Institute for Earth Sciences covers a floor space as large as a football field. It is capable of running global simulations across its 5,104 purpose-built processors and can pinpoint patterns that were previously invisible to meteorologists.

PCW number 1131130



## Short stories

### LOTS OF TROUBLE

Half of all web fraud involves online auctions, says a report from the US Internet Fraud Complaint Center. Nearly one in four auction complaints were about non-delivery and non-payment. The figures may have been distorted by the fact that Ebay, the largest online auction site, shares information with law enforcement agencies.

The next biggest scam is the 'Nigerian letter', promising large sums of cash in return for bank details. It sparked one in six complaints and cost victims an average \$5,575 (£3,880).  
PCW number 1130837

### PIRATES BEWARE

A bill to increase the maximum penalty for software piracy from two to 10 years has passed its Third Reading in the Commons and is expected to become law this year.

### STORAGE CUBED

IBM has developed a cube-shaped storage system that can be stacked like Lego blocks to provide 32terabytes of storage. Each cube holds 12 100GB hard drives (totalling 1.2TB), plus 1GB of Ram, and an Intel processor. They can be stacked in a block of up to 27. A water pipe runs between each layer offering quiet cooling without a fan.  
PCW number 1131263

### RAM 'CARTEL'

Some memory vendors have done deals to inflate prices, claims Dell chief Michael Dell. 'I think we saw cartel-like behaviour by a couple of D-Ram suppliers,' he said. 'It appears to have been successful for a very short period of time.'

Memory prices have more than tripled since November, but have begun to fall again. Dell said he would diversify his suppliers to protect prices.  
PCW number 1131415

## Holo gigadrives 'ship in two years'

**H**olographic storage offering capacities at least 20 times greater than today's DVDs could be available within two years, developers say. A prototype drive called Tapestry, storing 100GB on a CD-size disc was demonstrated last month by Inphase Technologies, a company formed in 2000 to exploit developments at Lucent's Bell Laboratories. A major shareholder is storage media giant Imation.

Inphase has developed a new type of photo-polymer for the recording layer and is claiming transfer rates of 20Mbytes/sec. The technology depends on low-cost robust red and blue lasers developed for DVD and Blu-Ray recorders. The product will be targeted at the professional market, with drives costing up to \$10,000 (approx £7,000 – about the same as early DVD recorders) and 100GB discs at \$50 (£35) each. Disc capacities will eventually go into the terabytes, the company says.

Inphase strategic marketing director Chris Pfaff said: A 'prosumer/consumer device' could appear within three to four years and that the technology will surpass Blu-Ray, itself seen as the next-generation DVD.

Meanwhile a Cambridge company called Polight says it



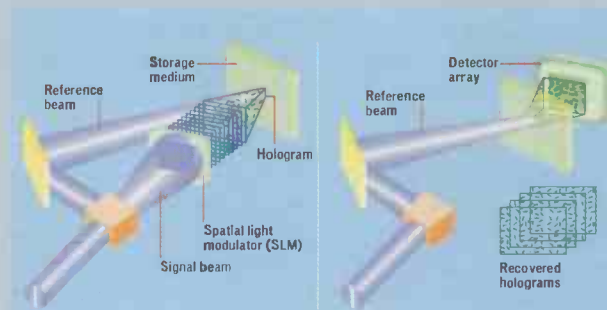
Tapestry – the prototype drive

## Klez revives threat from vicious old viruses

Dangerous variants of the Klez virus that swept the world last month were still appearing as we went to press. They consisted of a cocktail of Klez and other, older viruses to which they are giving a new lease of life.

Klez essentially offers a delivery system for other viruses, including

### HOW HOLOGRAPHIC STORAGE WORKS



The data to be stored is split into 'pages' consisting of an array of 0s and 1s. Each page is passed to a spatial light modulator (SLM) that translates it into an array of 1.3 million pixels that pass or block light according to bit value.

A prism splits light from a coherent laser source into two beams, called the reference and signal beams. The signal beam passes through the SLM and emerges patterned with the data.

The two beams intersect to produce an interference pattern – the hologram – which is

recorded, as shown in the left half of the diagram. The data is read (see right diagram) by passing a reference beam through this pattern onto a detector array.

Inphase claims this simultaneous readout of 1.3Mbit blocks can result in transfer rates of hundreds of megabytes per second. Massive data densities can be achieved because many pages can be stored in the same micro-block of the recording medium by varying the wavelength or angle of the reference beam.

is on schedule to produce 500GB holographic discs by 2004 using a special glass called Holonide which it says has advantages over the Inphase polymer.

Chief executive Michael Ledzion explained: 'Polymers tend to shrink under the influence of a laser. This can cause problems if you are storing a lot of data in the same volume (a feature of holographic storage – see diagram above) because your second write pulse can distort the image of the first. This does not happen with Holonides.'

Holographic drives are harder to make than DVD drives because of the need to vary the angle or wavelength of the laser to gain maximum storage capacities (see explanation above). But Polight is not in the business of making drives. Instead, said Ledzion, it designs media to a 'generic specification' around which manufacturers can build drives. And initially they will use cheaper green pulse lasers. Drives will be targeted at the corporate archive market.

[www.inphase-technologies.com](http://www.inphase-technologies.com)  
[www.polight-technologies.com](http://www.polight-technologies.com)

'Older and even forgotten viruses like CIH or MTX now have a modern means of transportation.

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PCW number 1131458

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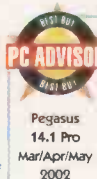
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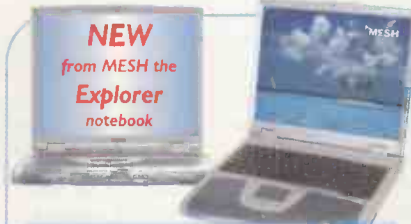
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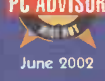
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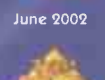
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JULY 02 R



## Displays take a LEP in the dark

Flexi-screens and dynamic wallpaper are two prospects of the emerging world of carbon IT. Clive Akass reports

**J**eremy Burroughes first saw the light in 1989, when he was testing the electrical properties of some materials at Cambridge's Cavendish Laboratory. At first he thought the green glow was a reflection from a nearby monitor. But as he moved closer he realised it came from a polymer under test.

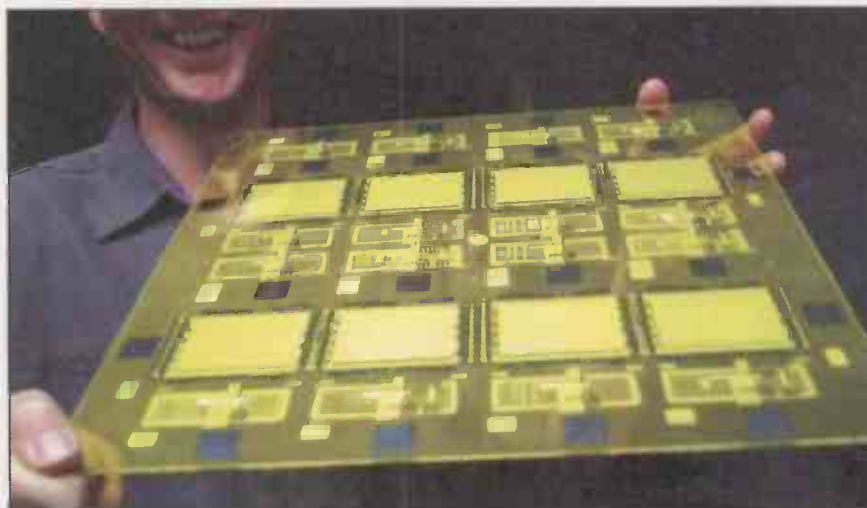
In a Eureka moment of a kind few researchers experience in a lifetime, Burroughes had discovered the basis of a display technology that could change the shape of computers and the way we use them. And the light-emitting polymer (LEP) he found is only one example of a vast range of carbon-based materials that could have a great impact by enabling the production of cheap spray-on logic (see opposite).

Burroughes still sounds bemused when he recalls seeing that first glow. 'There was tremendous excitement at the lab. Everyone burst in to look at the light. Within minutes people were scribbling down lists of applications.'

The surprise was greater because US researchers had recently concluded that it would be impossible to inject the electrons into the polymer that would be necessary to generate light. Burroughes, his research director Richard Friend, and a colleague formed a company called Cambridge Display Technology (CDT) to exploit LEPs, a subset of what are now called organic light emitting devices (OLEDs – see box below right). Last month CDT opened an £18m pilot plant at Grantchester, near Cambridge, to hone the manufacture of LEP screens – one of several projects across the world stemming from that one moment of discovery.

LEPs have several advantages over liquid-crystal displays (LCDs). They generate light, rather than selectively blocking it, and so are inherently more efficient and require less battery-draining power for a given amount of light. They also switch about 100 times faster than LCDs, making them better for video.

Moreover, polymer screens are potentially much cheaper to produce, and not only because they are simpler. LEPs are soluble and can be made into 'inks', allowing screens literally to be



LEP screens in production at CDT's new plant. Displays may one day be printed like newspapers

printed using adapted inkjets. A CDT partner helping to pioneer this approach is Seiko-Epson.

More startling still, LEP layers may eventually be mass printed like newspapers. The definition will not be high, at least initially, but you can start thinking about wall-sized displays, dynamic wallpaper, and light-emitting curtains – LEPs can be used as a simple light source. Most exciting for those interested in the evolution of mobile computers is the possibility of flexible screens that might be scrolled up and put into your pocket. As *PCW* has pointed out before, this could blur the distinction between a handheld and a notebook – or, more likely, introduce a completely new class of machine (see [http://images.vnuet.com/v5\\_static/pcw/pdf/Universalinterface.pdf](http://images.vnuet.com/v5_static/pcw/pdf/Universalinterface.pdf)).

But David Fyfe, chairman of CDT, is anxious to play down the prospect of flexible screens for the short term. LEPs are very sensitive to water and currently need to be encapsulated in glass, as no known plastic approaches its impermeability.

Fyfe points out that a lot of people are working on the problem, including DuPont, a major CDT licensee well versed in material science. He said: 'I don't think DuPont would be in the business if it did not think a flexible substrate is possible.' Another licensee is Osram, which, like DuPont, is a newcomer to screen technology. Fyfe said LEP technology, with its completely new manufacturing processes, gave newcomers a chance to enter the display business on the same level as old hands. The Taiwanese are very interested in manufacturing but the Japanese seem to be holding back, said Fyfe. 'I think they have too much invested in LCDs.'

Indeed the LCD is likely to rule for some time before alternatives start to dent its market share. CDT still has to increase the lifetime of the blue

element of its full-colour screens and improve their efficiency. Fyfe admitted: 'Currently only 30 per cent of the light gets out of the device. We want to push that figure up.'

But an LEP screen has already been used on a Motorola phone, and similar sizes will start to appear later this year from the likes of Philips. PDA screens are at least a year away and no-one is placing any bets on when larger sizes appear. But they are coming soon and they will put current screens in the shade.

### GREAT BALLS OF FIRE...

Organic light emitting devices (OLEDs) use carbon-based materials with photo-electric properties similar to the LED lights on your PC: they glow when they pass current. But they are far more versatile. Cambridge Display Technology's (CDT's) light-emitting polymers (LEPs) are called 'big molecule' to distinguish them from 'small-molecule' OLEDs developed by Kodak (polymers – familiar in the form of plastics – consist of molecules built around long chains of carbon atoms). Kodak has already demonstrated full-colour OLED screens big enough for a sub-notebook. As with LEP screens, the most striking thing is that they can be viewed from a wide angle.

CDT believes its technology has the edge as its screens can be printed (see above) while Kodak's requires a more expensive deposition process. A company called Opsys, in conjunction with St Andrews and Oxford Universities, is working on an exotic class of molecule called light-emitting dendrimers that it says combines the best of both technologies. A dendrimer (see



A watch using a full-colour LEP screen

We could soon be able to print out high-resolution cyberskin. Just don't ask where that could lead

## Let us spray for all manner of smart surfaces

**S**oluble semiconductor polymers are bringing a new versatility to the printed circuit, traditionally a template of interconnections onto which components can be soldered. Now components themselves can be inkjet-printed to produce a wide range of devices, from intelligent labels to 'cyberskin' and other smart surfaces.

It is becoming possible to draw up a logic circuit or even a custom chip in a computer-aided design package and print it out fully formed on an inkjet, according to Tracey Stephens, marketing manager of Plastic Logic, a spin-off from the same Cavendish Laboratory that spawned Cambridge Display Technology (CDT).

The technique is never going to replace silicon but it looks good for mass-produced throwaways, such as smart tags, or for niche products that would be uneconomical in silicon. A target application is to produce active-matrix drivers for LEP screens of CDT, which owns a slice of Plastic Logic. This would enable both the light-emitting and driver layers to be sprayed on, avoiding a series of costly lithographic processes.

The idea of printing logic is even older than LEPs; but researchers quickly found that inkjets, though precise enough to print pixel matrices, lack the resolution needed to trace the microstructure of a useful transistor. Finding a way round this has been one the major breakthroughs exploited by Plastic Logic (see box above right).

### ALL THE NODES THAT ARE FIT TO PRINT...

This picture of a Plastic Logic transistor shows the problems of printing circuits. The blobs on either side of the thin central straight line were squirted by inkjet and are the source and drain of the transistor. You are viewing them through the third element, the gate. The transistor turns on (ie current flows across the channel between the source and drain) when a suitable voltage is applied to the gate.

The channel has to be no more than five micrometres wide, well beyond the accuracy of an inkjet. Plastic Logic gets round this by tracing the channel patterns with a material that repels the water-based polymer 'ink'. Prototypes used expensive



lithography to get these patterns, which rather defeats the object, but Plastic Logic has developed an alternative method that it is currently keeping to itself.

Another breakthrough was to find a way of allowing an inkjet head effectively to 'see' where it is printing, avoiding the tricky and expensive registration issues of lithographic printing.

A third has been to find a way of producing 'via holes' to hold non-printable components or connect different circuit layers. Stephens stresses that the technology is still under development and will not go commercial until late 2003 at the earliest. First applications are likely to include electronic tags; next will come Smart cards, low-

capacity memory and sensors – one suggestion, post 11 September, was for an Anthrax detector. OLED displays, custom chips and perhaps processors are possible within four or five years.

Other suggestions include smart delivery systems for drugs, giving patients the correct dose on schedule, packages that announce when they are getting empty or games printed on the back of food packages.

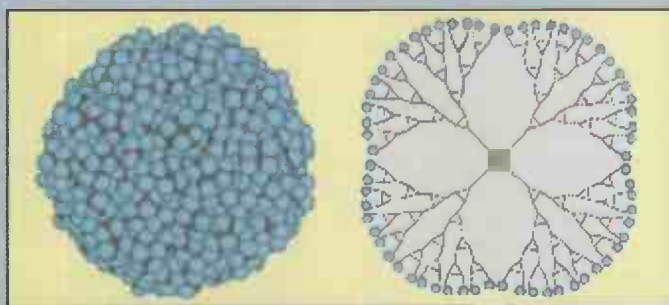
Printed circuits are not limited to logic. ID tags could include an RF module that allows wearers to be tracked round a site. (Perhaps something similar could be used to allow lost socks to trace their partners.) A combination of LEPs and printed logic could turn almost any object, including items of clothing or jewellery, into a dynamically changing display.

Printed circuits do not share the encapsulation problems of LEPs and can use plastic substrates, which leads to other intriguing possibilities. Set sensors into a flexible mesh of surface logic and you get a kind of cyberskin that could increase the resolution of devices that transmit or receive body movements and tactile pressure. The possibilities are endless.

More prosaic are smart surfaces of a kind also being investigated at Cambridge. They consist of a matrix of contacts that automatically configure themselves to deliver services to devices placed in any way on the surface. This would enable your mobile phone, for instance, to synchronise and start charging itself as soon as it is put down. One thing Plastic Logic certainly does not lack is ideas on how to use the technology. 'It seems everyone who comes to visit us comes up with a new suggestion,' said Stephens.

**Go to [www.pcw.co.uk](http://www.pcw.co.uk) for a hyperlinked version of this report**

### ...LIGHT-EMITTING DENDRIMERS AND OTHER EXOTIC ORGANICA



The dendrimer ball-molecule (left) consists of a light-emitting core surrounded by branch-like dendrons (right)

picture) consists of a light-emitting core surrounded by charge-carrying branch-like structures called dendrons reaching out to a surface of atomic clusters that repel each other to produce a large, sprung, ball-like molecule. Osys says the core can consist of the kind of material Kodak uses for its small-molecule screens.

The surrounding molecular structure separates each light-emitting element and provides solubility that enables LEP-style printing of screens. The core can be adjusted for qualities such as colour

without affecting the outer structure. But dendrimer technology is less mature than LEP and is likely to take longer to translate into products.

A US company called Universal Display is also working on flexible OLED screens and has produced moulded screens for use in military head-up displays. Similar mouldings could transform dashboards and even cartons into dynamic displays.

In a future issue we'll let you know about another potentially revolutionary carbon-based technology based on nanotubes.



## 'Use IPv6' plea to boost web phones

Microsoft is trying to kickstart the rollout of Internet Protocol v6 (IPv6), which is set to supersede the current IPv4, in a bid to alleviate a shortage of web addresses and improve multimedia delivery.

IPv6 can label data packets according to priority, allowing the timely delivery of voice and other multimedia data streams, which tend to get broken up under IPv4. This could lead to huge changes in the way we use the web, with a drift from the plain-old telephone (POT) to Voice-over-IP and videophones.

This in turn would play havoc if it happened quickly. POT revenues would plummet and the 500K 'broadband' would start to look slow and lopsided – videophones eat bandwidth in both directions.

But IPv6 is designed to be phased in, and Microsoft fears it is taking too long. Engineers at the Windows Hardware Engineering Conference (Winhec) were urged to support IPv6 in new hardware and applications.

Microsoft's enthusiasm stems from a hope that the PC will be the new phone, with people communicating via text, voice and video messaging systems built into its operating systems.

But a more pressing need is for IP addresses – those provided by IPv4 could run out within a year. IPv6 uses 128bit addressing which provides billions of a dross per person.

## New deals start rush to broadband

**P**rice cuts and self-installs seem to have kicked off broadband use in Britain at last. BT reported that wholesale orders were running at 10,000 a week – and escalating.

The rush seemed to catch both BT and suppliers by surprise. Several vendors reported delays of up to two weeks for the delivery of kit. There was a big demand for routers and hubs that allow several users to share a broadband link – making it potentially cheaper than dial-up.

Of course, bandwidth as well as cost has to be shared, but the fact that a connection is always on can be as much a benefit as bandwidth compared with a dial-up link.



Devices such as this Actiontec Wifi access point and router can help spread broadband costs

The online store Solwise reported a shortage of the microfilters needed to adapt phone extensions. Freeserve began selling £84.99 broadband start-up kits through Dixons, PC World, The Link and Currys stores across Britain, linked to a £29.99 a month service – much the same as other major vendors like BT Openworld.

BT Retail offered a 'no frills' service at around £2 a month cheaper but links are available for as little as £22 a month.

Charles Raube, head of Telewest Broadband, which offers a £25-a-month cable service, dismissed the BT Retail offer as 'sub-standard'. But the base prices for cable are contingent on users buying into a TV package, standalone broadband cable links cost £29.99 a month.

However, Telewest has launched an introductory offer of £13.48 a month for the first three months, with a return of a £50 install fee if the customer is not satisfied.

● See Gordon Laing's rundown of the options available in a four-page special feature starting on page 89.

## Contentious issue of cable versus DSL

The rush to broadband has given many people the problem of whether to go for an ADSL or cable link. We have used both a business-class ADSL package from BT Openworld and a Telewest Blueyonder link, and have found little to choose between them.

The ADSL is much more reliable than in its early days but we very occasionally lose the connection; usually this is restored by the simple expedient of resetting the router. This seems to happen slightly more often with cable, but again a reset does the trick. BT claims that ADSL is less vulnerable to contention, the network equivalent of traffic jams: with cable you are in effect sharing a local area network with your neighbours. I have heard people complain of cable slowdowns; but

this can happen with ADSL too – the difference is that the contention is on the link from your local exchange to the backbone.

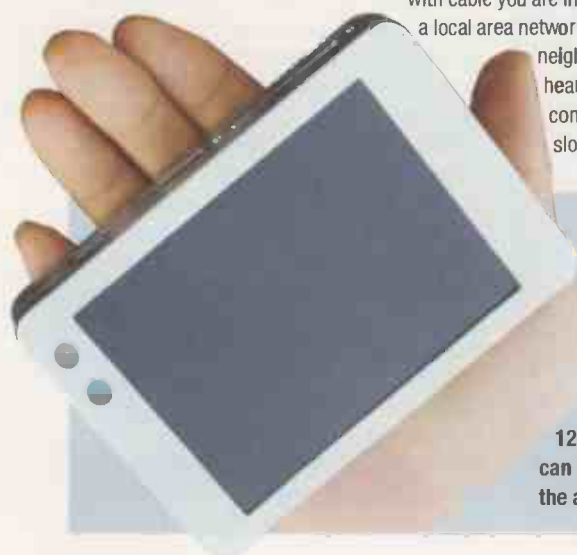
This is likely to become more of an issue as more people use broadband. Therefore, you should bear in mind that some of the cheaper packages have higher contention ratios – that is, more people are sharing the line.

Fergal Butler, Telewest's head of Internet strategy, denies that the problem is worse on cable, but says it is difficult to reduce the issue to simple terms like contention ratios, because you are comparing two different ways of managing network capacity. 'We have a policy of resectioning [reducing the number of users in the loop] when bandwidth usage reaches 85 per cent,' he said. 'I'm bound to say we have not had an instance of any section getting

anywhere near that.' But he admits that this system is based on overall traffic and cannot dynamically kick in to cope with bursts of activity – but then nor can ADSL.

Both Telewest and NTL, Britain's other big cable company, have had to restructure to cope with dire financial problems, which may put off some users after the fall of ITV Digital. But as demand for bandwidth soars and today's 500K links begin to look like a crawl, they have far more headroom than BT – at least on its current infrastructure.

Only a fraction of the cable bandwidth is used for broadband and much of the rest is squandered on little-used TV channels, many of which are only on for part of the day and not at all at night. Butler says Telewest is looking at ways of using the system a bit more imaginatively.



## OQO CUES NEW MULTI-MODE FORMAT

Microsoft showed off yet another computing form factor at Winhec (see above left), in the wake of its Mira and Tablet PC designs for untethered PCs.

The nine-ounce OQO measures just 12.4 x 7.4 x 2.3cm (4.9 x 2.9 x 0.9in) and can be used as it is, or as a notebook, with the aid of a special enclosure, or as a

desktop with the aid of a cradle linked to a screen and keyboard.

It packs a 4in VGA touchscreen, 256MB of Ram, a 10GB drive, Firewire and USB support, plus Wifi and Bluetooth links. It is driven by a 1GHz Transmeta processor. The first products are set to ship later this year. [www.oqo.com](http://www.oqo.com)

As used by the likes of  
Aramiska... a Eutelsat satellite



## Satellites plug the gap

**V**endors of satellite services are falling over themselves to cater for the third of the UK that lacks access to broadband land lines. BT was on schedule to enable a further 100 exchanges for ADSL by the end of May but that still leaves out some eight million homes – not counting businesses.

Start-up costs for satellite links are higher but businesses in some areas qualify for subsidies through regional development agencies. Blocks of flats and even villages can share both the cost and bandwidth of a satellite link (and, by setting up as a company, may get a grant).

Early satellite access tended to be download only, so you had to use a dial-up line for the uplink. Two-way services are now available, though uplinks are still slower.

BT Openworld's 500/1 service is among the cheapest at £69.99 500/150Kbits/sec (up/down) link plus £899 for kit and installation. It caters officially for a single PC, though it is unclear how you can be prevented from hooking in a small

network. Openworld's 500/4 service, which is designed for networks, costs £139.99 a month plus £1,299 start-up.

Aramiska has five packages, all with a £500 start-up fee, ranging from £199 a month for a 256/64Kbits/sec link to £549 for a 2,046/320Kbits/sec. These use the DVB-RCS transmission standard, rather than the older VSAT like BT Openworld, and come equipped for a network of up to 30 PCs (extendible in the more expensive packages to 100 PCs) with a mail server, and remote mail access, with firewalls at both the head and home ends.

The entry-level Aramiska packages charge £15 for each 100MB above 1GB per month; the company also offers its entry-level deal at £99 a month, with an unsubsidised £3,500 start-up fee.

Bentley Walker offers VSAT services starting at £71 a month. All these prices exclude VAT. Details are at [www.bentleywalker.com](http://www.bentleywalker.com), [www.btopenworld.com/satellite](http://www.btopenworld.com/satellite) [www.aramiska.net](http://www.aramiska.net)

## Sendo may do an organiser

UK smart phone developer Sendo may bring out a PDA if it thinks there is a market for one. 'We have not ruled anything out,' said Ron Shaffer, senior product manager of the about-to-be-launched Sendo Z-100.

This is an organiser in the format of a mobile phone, as opposed to the new generation of PDAs which can also be used as phones, like O<sub>2</sub>'s XDA or Handspring's Treo. The big question is which format will win, or whether they will coexist.

Shaffer inclines to the latter view. 'But we think that the phone format

will sell more,' he said. Prices of both formats will start at around £400 and may cost much more, depending on the subsidy from the service provider.

A fall in the price of integrated Bluetooth (and possibly Wifi) links may favour the PDA format by allowing people to use wireless headsets and leave the handheld in their pocket. Bluetooth already costs as little as £10 a device.

Sendo's Z100 is virtually alone in using Microsoft's PocketPC 2002 phone edition.

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## Hailstorm abates in security storm

Microsoft has dropped its Hailstorm project of creating an online database of personal information on ecommerce users, following protests from privacy groups.

The Electronic Privacy Information Center (Epic), one of 16 consumer organisations that filed complaints with the Federal Trade Commission, said Hailstorm could not protect privacy and security.

Rob Enderle, an analyst at Giga Information Group, said Microsoft will be focusing on other organisations, such as banks, to hold information. He added: 'We really didn't think many would trust Microsoft, or any vendor, for this anyway.'

PCW number 1130855

## Explorer peril

The 'Back' button in Internet Explorer (IE) can be dangerous for your data, according to research from Andreas Sandblad, of the University of Umea in Sweden.

He says code injected into a hyperlink or URL can be set to trigger when the Back button is clicked. The danger comes if you hit the Back button after a page fails and you get a 'this page cannot be displayed' error.

This allows rogue code be executed on the local computer. All versions of IE are thought to be affected, although some code will only work on certain versions of Windows. Microsoft has not responded to alerts about the issue.

Currently the only work-around is to disable active scripting in the browser or stop using the Back button.

James Middleton

PCW number 1131017

## AOL loses \$54b

Microsoft's woes (right) are nothing compared to those of rival AOL Time Warner. It posted a phenomenal loss of \$54.2b for the first three months of this year – the biggest in US history. AOL online services are one of the poorest performing parts of the company.

PCW number 1131245

## Xbox loses first battle of console war

Microsoft's hopes of dominating the console gaming market hit a major obstacle when poor sales of its Xbox prompted the Redmond giant to cut £100 off the retail price, barely six weeks after it was released.

As of 26 April it was possible to buy the console for £199, a price that brought it into line with Sony's market leading Playstation 2 (PS2). Despite initial claims from Microsoft that it was pleased with the launch sales of the console, it's believed pressure from games developers and the subsequent launch of Nintendo's Gamecube prompted the price cut.

A week later Nintendo retaliated by announcing that the Gamecube would retail at £129, rather than the widely speculated £159, on its 3 May release.

Despite Xbox selling well in North America, where it launched last November, Microsoft has struggled to get a significant foothold in Europe where it launched on 14 March and in Japan, home to Sony and Nintendo. Sales in Japan were hit following reports that the machine left some DVDs and game discs with scratches, a problem that Microsoft sought to remedy. Last month sales of the Xbox in Japan were reportedly left flagging behind the older PSone console and the now defunct Dreamcast.

Despite a major marketing push by Microsoft the Xbox has failed to meet forecasted targets of six million units throughout Europe by June, prompting the company to lower its expectations. A high price tag and the appeal of

the Gamecube are believed to have kept consumers cautious, while PS2's 18-month head start has proved tough to crack. This despite the fact that the Xbox's 733MHz processor, Nvidia chipset, hard drive and broadband capability make it the most powerful console on the market.

Microsoft, it would seem, still has a formidable task ahead of it. As Bill Gates digs in for the long term however, Sony, which has 10 per cent of the European market, has already returned to the drawing board and is in the process of designing Playstation 3.

Xbox owners who had bought the console at its original £299 price point can contact Microsoft in order to claim a 'thank you' package of games and hardware worth £115.

Andy Stewart

## Gates stands tall as skeletons rattle

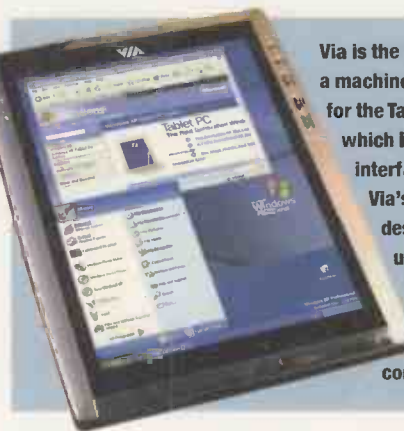
The Xbox has been only one of Microsoft's woes over the past few weeks, with lawyers at the seemingly endless anti-trust hearings seeking out new skeletons to rattle. There was some good news for the company. Bill Gates put up a good court performance following his disastrous early videotaped evidence. Sales of XP reached an astonishing 32 million and first-quarter profits hit \$2.74b, 12 per cent up on last year.

But revenues fell just short of expectations and Microsoft said earnings were likely to flag in the next two quarters.

Gates and his henchmen spent much of their court time defending the bundling of Explorer and the Windows Media Player with XP. Lawyers claimed this was squeezing out rival products; Microsoft said they were too tightly coupled to the operating system to be unbundled.

Gates was forced to concede that a decoupled version exists in XP Embedded, but he argued that this worked differently from the mainstream version.

Sun's chief strategy officer Jonathan Swartz revived the old claim that Microsoft does not fully disclose application programming



Via is the latest company to design a machine around the imminent XP for the Tablet PC operating system, which is tailored for a pen interface.

Via's Tablet PC, a reference design for manufacturers using its products, boasts a 10.4in screen, USB2 and Firewire ports, and optional Wifi. It uses the company's C3 processor.

interfaces (APIs) to rivals – and said this was still going on.

He said Microsoft saw web services as a threat because they were server based and could be accessed by non-Microsoft devices. Its answer was the .Net strategy for delivering services but part of the API was being kept quiet to limit access by rival software.

Microsoft group vice-president James Allchin denied another Sun claim that the company continues to thwart distribution of Java.

Earlier, lawyers had produced an email from a Microsoft employee, Fraser Mocke, that advocated using the 'embrace and extend campaigns we have used in the past' to counter

competition from media players such as Real Player and Quicktime.

The idea was to adopt the rival technology and then 'extend' it with technology that would only work with Windows. This is very similar to what Microsoft is said to have done with Sun's Java.

Microsoft lawyers denied knowledge of Mocke and a long-serving manager told the court that she had never heard the term 'embrace and extend'.

Nine states were calling for sanctions on Microsoft to ensure that it opens Windows to rival applications. The trial was expected to run into May.

For updates visit [www.pcw.co.uk](http://www.pcw.co.uk).

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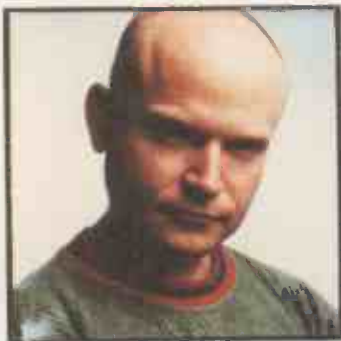
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## Enlightenment looms

Gordon Laing reaches nirvana as he finds a way to share his ADSL connection

[gordoni@pcw.co.uk](mailto:gordoni@pcw.co.uk)

**E**very so often, things all seem to come together. After months or years of hype, you finally experience a group of technologies that actually seem to deliver the goods. I'm sure I'm inevitably in for a fall, but right now I've become quite evangelical about the combination of shared ADSL, wireless networking and a humble PDA.

This couldn't have happened at a better time. After the disappointments of Bluetooth, Wap and GPRS, I was prepared to be let down by every new technology.

Appropriately enough, research giant Gartner Group developed a chart in 1995 perfectly documenting these experiences. Gartner's hype cycle begins with the Peak of Inflated Expectations, followed by The Trough of Disillusionment. I then made my way up the Slope of Enlightenment and reached the technological nirvana that is the Plateau of Productivity. Cringing aside, these terms really do describe my experiences with ADSL. My initial high hopes were dashed by quality of service during the trial period, and the process of swapping providers which could see you losing broadband for several weeks.

My slope of enlightenment began when I realised how easy it was to share my ADSL connection between my main PC and a secondary system. The ISPs may insist that expensive ADSL services are required to connect more than one PC, but that doesn't stop Windows' Internet Connection Sharing (ICS) from pumping IP around your network. ICS is certainly neat, but you need to leave your 'gateway' PC switched on. I also had to disable my software firewall for ICS to work, or buy a more capable version. I also wasn't happy with the tedious dial-up networking process employed by my Alcatel USB modem. Then again, nowhere near as unhappy as my new PC – imagine

my surprise when I discovered USB ADSL modems are incompatible with dual-processor machines. Clearly I had a number of problems that needed fixing.

Everything came together when I realised I could use any ADSL modem. I first believed the supplied Alcatel USB 'Stingray' was part of my ADSL service that I could not change. In terms of official support, it was, but I decided to try plugging in a different model instead. In the end I bought a single box containing an ADSL modem, router and four-port 10/100 Ethernet switch. The modem automatically connects to the broadband service, which the router and switch then share between up to four devices, while also allowing them to communicate over a 100Mbit network – no drivers need installing, no PC needs to be left on and it's got a built-in firewall too. I went for a D-Link DSL-504, but many similar products are also available.

For me the shock was that I'd solved all my networking and sharing issues with a single box costing just £145 ex VAT, and that it just plugged in and worked. Sure, I had to configure it using a browser but this one-off process simply involved changing the connection type to PPPoA, setting the VPI and VCI to 0 and 38 respectively, then entering my user name and password. After this, the unit automatically connects on demand, and it's the only thing that needs to be left switched on.

I have three PCs connected to it, and a cheap wireless access point. The latter allows me to enjoy my ADSL connection anywhere in my home, and right now my preferred mobile device is an HP Jornada 720 handheld fitted with a Wifi card. I've always been a great believer in PDAs, but once you've combined that with a wireless broadband connection, you're

**I worry about how the cheapest ISPs can cope with increased demand**

hooked. There's also something very eerie about the device being silent, when you're used to the background whirr of a PC or notebook.

It's important to note that the router is also happy to share ADSL with non-PC devices. I could happily connect a games console, set-top box or anything else with an Ethernet port and sufficient intelligence to request a dynamic IP address. It's only after you've fully digested this level of flexibility that you ask yourself why anyone would bother with a USB ADSL modem, apart from to save fitting a £10 Ethernet card. Don't get me wrong – the Alcatel Stingray is a fine device supported by all the ISPs, but no-one is forcing you to use it. Sure, my Stingray was automatically rented as part of the cheapest ADSL service available at the time, but it was a doddle to replace it.

Today's self-install ADSL services require you to buy your own modem. Again, the Stingray is heavily endorsed for around £70 ex VAT, but I think you'd be mad not to spend another £70 for something superior. If you're a new self-install customer buying a different modem, though, remember to buy micro-filters for your phone sockets (see our DIY broadband feature page 89).

With monthly subscriptions starting from just £23, ADSL is also fast-becoming a no-brainer – at least for the 66 per cent of the population it currently reaches. On a darker note, I worry about how the cheapest ISPs can cope with increased demand, but as with all providers, it's a case of wait and see.

Regardless of ISP, though, if you have any intentions of sharing your ADSL connection, then buy a router from day one. Add a wireless access point, and the plateau of productivity could be yours for the taking.

**PCW**

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Apr. 2002, German



GA-7VRX  
"PC Hardware Award"  
"Tech" Team Hardware  
Apr. 2002, Australia



GA-8IRXP  
"Editor's Choice"  
CHIP  
Mar. 2002, Spain



GA-8IRXP  
"Hardwareinfo"  
Gold Award  
Mar. 2002, Netherlands



GA-8IRXP  
"PC Game Hardware Award"  
Gold Award  
Mar. 2002, Germany



GA-8IRXP  
"Hardware Zone"  
Mar. 2002, Singapore



GA-7VRX  
"Gold Award 2002"  
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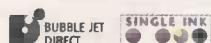
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## My favourite things

It's not all bad... there are some things Barry Fox actually does like...

barryf@pcw.co.uk

Is there anything in the computer world that you actually like? A reader asked me last month (Letters, June 2002). That got me thinking, especially when he later admitted he has 'a fat pipe to the Internet (courtesy of my employer), a fairly reliable Hotmail account (courtesy of Mr Gates) and a bunch of system managers to sort out all my software problems.'

What I do like is hardware, software and systems that work, and companies that show interest when I find a problem. I have bought my last three PCs from Dell, because that way I am not paying for the help of often-ignorant shop staff.

I like Dos because it's like an old car engine you can get your hands on, not one with an electronic ignition. Dos programs run lightning fast on a modern PC because there are no fancy graphics to process. Batch-copying files with a \*.\* command is a darn sight easier than Control-clicking and ending up with copies of copies where I don't want them. And loads of businesses, which don't want their staff to play Windows games or hunt for porn on the net, like Dos too.

I still use the old Q&A Dos database because Symantec stopped further development before there was a halfway to usable Windows version. Every so often I export my data to a modern Windows program just to reassure myself that I am not missing anything.

I also like a printer with Dos drivers. After dropping Dos drivers, HP brought them back for some laser printers. The last I heard, Samsung was providing them too. But it doesn't like to admit it.

I most definitely like laser printers, especially HP's. Epson has just confirmed that there is nothing wrong with the Photo Stylus 790, which I bought to print colour when I really need to. It is quite normal for

the ink to dry and clog the heads if the printer is not used for a couple of weeks. It then has to gobble ink to clean the heads. I sometimes think it would be cheaper to support a drug habit than use a colour inkjet occasionally.

I like serial modems and ISDN terminal adaptors because the PC is less likely to 'lose' them than USB devices. I liked dealing with Elsa because its German head office seemed genuinely concerned when I pointed out that it was fitting faulty ISDN jack sockets. Most companies just wish I would drop dead when I tell them about a fault their quality control people should have spotted.

I like buying from stores. If the goods are faulty I can take them back, rather than wait on hold until Jungle's customer service line gives me authorisation to return an obviously dud hard drive.

I used to like buying from Tandy because it had a good range of little components and connectors. I now like Maplin for the same reason.

I liked Compuserve Classic and made the mistake of upgrading to CS 2000. Now I am where I have wanted to be ever since, on AOL with the same user name (barryphox@aol.com). I like AOL because it is bulletproof and you can usually get affordable help by phone. I used to like Freeserve until I tried to cancel my Anytime account. Has the company been taking lessons from Sky?

I love software that does a simple job well. Screenprint does what Windows should do, and prints a screen image from the Print Screen key. Likewise CloneCD is far easier to use than Roxio and Nero. Both Screenprint and CloneCD can be bought for peanuts at [www.softwarelabs.com/tsl4/3-screenprint.htm](http://www.softwarelabs.com/tsl4/3-screenprint.htm) and [www.elby.org/CloneCD/english](http://www.elby.org/CloneCD/english).

**Most companies just wish I would drop dead when I tell them about a fault they should have spotted**

I liked the Cardscan scanner so much I bought it after reviewing. It takes business cards, and scans and OCRs them, magically putting the names and phone numbers in the right fields. But you may have to hunt for one in the UK. At £200 the price is high, too. But it's worth the cost and effort.

I like the Imation Flash Go US connector that reads all the current data card formats, without the need to connect a camera, data device or audio player.

Powerquest's Partition Magic is the only way to split a big hard disk into smaller partitions, for keeping a backup image file well clear of the operating system, for example. And version 7 works with XP. It makes FDisk look like a megaton bomb with a hair trigger.

I think I will like Powerquest's new and XP-compatible Driveimage 2002, as long as it copes with the EZ Bios overlay which Maxtor's hard disk installation software (Maxblast) just loves to put on disks, like fungus. Until Driveimage 2002 is available I will have to stick with Norton Ghost as the only bombproof backup – provided you are prepared to learn Dos and master Norton's user-hostile interface.

Although Ghost is a classic example of how to cripple excellent software with appalling get-up and documentation, Systemworks 2002, with Norton Utilities, and One Button Checkup, is an easy-to-use life-saver. Norton Anti-Virus will be good too, when Symantec makes it easier to pay for continued updates. Panda is good, but undersold. If I were a larger company I would choose Sophos.

Finally, I think I like XP. Despite refusing to recognise some of my older kit and making Dos programs a bit harder to use, it does feel like the most robust and stable Windows since 3.11. And that I really did like.

PCW





nik\_rawlinson@vnu.co.uk

## Copyright or copy wrong?

As webcasters face the music they are in for a bleak future, says Nik Rawlinson

**A**re you listening to music? Through your PC? Switch it off for five minutes, would you? Just until you've finished this page. Thanks.

For three hours on 1 May the police and television crews buzzed their helicopters above our offices. They hung there like portents of doom, filming and observing the May Day protesters as they rolled steadily towards us.

Physical demonstrations took place around the world, but perhaps the most unusual protest of all occurred on the Internet. It was a peaceful protest – across the US the net went silent as online music stations from coast to coast either cut their output or opted into the Emergency Webcast Broadcasting System, a 24-hour talk show that ran for one day only. The focus of their protest was two-pronged: the US Copyright Office and the Digital Millennium Copyright Act (DMCA), which was passed by Congress in October 1998.

Traditional broadcasters in the US – the FM and AM stations – have only ever had to pay royalties to the composer of each track they play. For the digital broadcasters, though – those using satellite or the Internet rather than the airwaves – things look set to change.

In 1998, when the Bill was passed, Congress was concerned that the quality of many Internet streams would soon become so good that they could dent CD sales. A payment should therefore be made to compensate artists and record companies. Fair enough, said the stations. How about three per cent of the revenues we pay composers? The record companies shook their heads and asked for 15.

Neither party, it seemed, was going to compromise, so the US Copyright Office, charged with collecting the revenues, set up Carp, the Copyright Arbitration Royalty Panel. After six months of hearings, the

panel made its recommendation – Internet-only webcasting stations would have to pay 14 cents per track played for each listener and, because the Bill was passed in October 1998, the royalties would be backdated. The example on [www.saveInternetradio.org](http://www.saveInternetradio.org) puts things into context: a station broadcasting one hour of music (15 tracks) to 1,000 listeners would be required to pay royalties of \$21 (approx £15).

If you consider that webcasting is an as-yet unproven broadcast model, with few companies willing to pay to advertise on the medium, you start to see why online music stations are concerned that their future may be bleak. To make their point, they declared 1 May a 'Day of Silence'.

As always when a technology is still relatively young, the arguments for and against these new royalties are far from clear cut. You could argue that the recording artists should be compensated for their work and any losses that unregulated broadcasting could inflict upon their incomes. To counter this, many cite the fact that online broadcasting is pushing forward the adoption of broadband on a global scale.

Perhaps the most valid complaint, though, is that by imposing an arbitrary fee of 14 cents per track per listener the Copyright Office is not taking into account the size or income of each broadcaster – something both webcasters and record companies suggested in the first place.

The real worry, though, is that this law has not kept up with technology. When the DMCA was passed in 1998 webcasting was in its infancy and nobody really knew the implications of Internet radio stations, just as we didn't understand the effect of peer-to-peer networks.

But where peer-to-peer networking enabled potentially financially damaging

**Online gambling sites moved to friendly shores, why should radio not do the same?**

file-swapping, the reality is that online stations rarely rival the quality even of AM broadcasts, never mind FM. We are not tempted to rip their output as an MP3 to share with our friends or burn to disc in preference to paying for a new album. Artists are not being significantly harmed by having their work played online, indeed, some would say that the truth is precisely the opposite. Webcasting is the only chance some minority musicians have of any public recognition.

The Carp has passed its recommendation back to the Copyright Office, which will have made its ruling by the time you read this column. If it accepts the proposal then your favourite online station will probably still be on air. If it's American, though, within 45 days, the deadline for handing over its backdated royalties, it could disappear for good. Now you see why I asked you to switch off the music.

So, what does this mean for the UK? Well, apart from the fact that it could see a reduction in the choice of stations it could be good news. The ratio of European to US stations would grow, and a greater proportion of the global advertising spend could come our way. A knockback effect could also be that we see more stations hosted in Britain and other non-US territories. Online gambling sites moved to friendly shores, why should radio not do the same?

Many say that with the World Service Britain leads the way in global broadcasting. Perhaps the future lies in being home not only to a respected worldwide broadcaster, but also to the smaller stations of our planet. Whichever way, it can only be good news... unless and until a similar law is passed here.

That's fodder for a future column, though. For the moment, switch back on and listen while the music lasts. **PCW**

LOOK FORWARD



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## LETTER OF THE MONTH

### **OfTel off-track on broadband >**

BT's poor record in securing a take-up rate for ADSL comparable to that of, say, Germany or the US, has been the subject of much correspondence and editorial. May I contribute by discussing OfTel's failure to regulate the industry satisfactorily?

When I drew OfTel's attention to the fact that pricing for Internet access using ISDN is, for all but light usage, significantly higher than it would be for ADSL, it referred the matter back to BT. After some correspondence, the final statement from BT was 'unable to charge you a lower rental until ADSL becomes available in your area'. On telephoning OfTel the response was to the effect that BT is not obliged to submit pricing for 'add-on' services, such as ISDN or ADSL, to OfTel, and that OfTel would only deem to look at such pricing if it felt it was 'anti-competitive'.

This is a stunning admission and raises the question of who regulates the regulator? It is indisputable that there is a problem with the ADSL rollout and ISDN pricing for all

but light Internet usage is a matter of public record. It is also public knowledge that those of us in rural areas rely on BT for our copper connections for upstream connection to the Internet.

It is difficult to blame BT in this matter as it has a statutory duty to its shareholders to make as much money as it can get away with. But I do feel that, as consumers, we should start to hold OfTel and its parliamentary masters more accountable for the failure of the broadband market so far.

BT is very fond of quoting 60 per cent household availability. If a product is so available then the low take-up rate can only mean that BT either has a perverse definition of availability, or that the pricing is wrong (unless you are completely barmy and suggest that the British do not want broadband access when other markets do). If the pricing is so wrong or BT is so disingenuous, why won't OfTel and/or parliament do anything about it?

*Bob Andersson*

**Leo lessons >** The comments about the 'End for ICL' in the May issue (News, page 28) are not quite correct. ICL was formed by the merging of English Electric Leo Computers and ICT. English Electric (not English Electronics) was a large group, mainly involved with heavy electrical plant. ICT was formed by the merger of Powers Samas and British Tabulating Machines, both being manufacturers of punched card machines. Leo Computers was in a class by itself.

As early as 1947, J Lyons & Co. of teashop fame decided to install a computer in its head office for commercial applications. It had to build it in-house as the work at Ferranti and Manchester University

was on scientific machines. The world's first commercial machine, christened Lyons Electronic Office, was installed in 1951. The company Leo Computers was formed in 1954 and produced a series of very successful machines that ran throughout the 1950s and 1960s. Leo was acquired by the English Electric Company in 1963.

*Justin Underwood*

**Dylan Armbrust replies >** Thanks for the background history (and correction too). It just goes to show how fascinating the history and business of computers can be.



# WIN!

Each month we are giving away a set of Creative Inspire 5300 speakers to the author of the Letter of the Month.

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**Mac attack >** I was very disappointed that you gave the new Imac to a Windows XP user to review (PCW May 2002). He obviously wanted to give as negative an impression of the system as possible. For example: 'It is sadly let down by a lack of decent third-party software to deal with other aspects of productivity'. Examples please? For a start, users are not limited to Appleworks (which is bundled 'free' with the Imac). Microsoft offers Office X for Mac OS X (by its own admission, the best version of Office on any platform) and Office 2001 for Mac OS 9 or Classic mode.

OK, Access isn't available, but Filemaker is, and for very heavy duty use, 4D (plus the open-source MySQL and PostgreSQL). Omni Group make a pretty good outliner, Omni Outliner. There's some very nifty freeware and shareware out there for enhancing OS X as well, such as ASM, Tinkertool, Launchbar, Defaultfolder, and Fruitmenu.

Perhaps you should also tot up the value of some other things supplied free with the Imac, like Apple's full C/C++/Objective-C/Java/Applescript development suite, including an IDE and interface builder (install it using /Applications/Installers/Developer/Tools/Developer.mpkg, or from the Developer Tools CD if Mac OS X is bought separately). This is like Microsoft bundling Visual Studio with Windows. Networking is more sophisticated than Windows, and under OS X, users can now directly access Windows file sharing. Firewall software is also an intrinsic part of Apple's Unix-based networking code, not an add-on bundle.



# LETTERS

Please give the next Mac you review to someone who understands them. You don't do your reputation any good (except in the Wintel community) by printing biased articles.

Alun Carr

Andy Stewart replies > As someone who spends the majority of my working life using a Mac, I would consider myself an ideal candidate to review the latest iMac. However, I was conscious that the review could descend into Mac evangelism and so tried to remain as objective as possible.

I stand by the comments made about the lack of third-party software: there isn't any bundled with the iMac and, while there are Mac-flavoured versions of most leading software packages, these are invariably more expensive than their PC equivalents. Appleworks is adequate but Microsoft Office is better.

You're right to mention the iMac's added functionality, but Mac OS X's strength is surely its simple and intuitive interface – something that may not necessarily appeal to many PCW readers who are more concerned with tweaking their back ends and getting their hands dirty in the guts of a PC.

It is also for this reason that we compared the OS with Windows XP. These two operating systems have evolved to a point where they closely resemble each other. Microsoft's imitation is a glowing endorsement of Apple's hard work and indicative of the demand for multimedia functionality.

At the end of the day, if you are a Mac owner, then by all means consider upgrading to the iMac 2, but if you're a PC user there is little on offer that an upgrade to XP couldn't remedy.



Pieces of eight: Do 17th Century pirates hold the key to bits and bytes?

**Spanish bits and bytes** > I do not believe Mark McIntyre is entirely correct (Letters, Binary Bugs, May 2002). I believe the origin of the term 'byte' comes from the gold coin used in Spain in the 17th Century. These coins were often bitten into eight roughly equal segments, or 'bits' hence the term 'Pieces of eight'.

I'm uncertain why the word byte is spelled incorrectly, probably to make it less confusing in relation to the regular spelling, but I remember that because there were eight bits to one of these coins, the engineer who coined the phrase noticed the connection between eight binary units, and eight gold bits in the coin you would 'bite'.

The story may be completely untrue (and I can't find my original source) but it seems to be plausible enough. I believe any non-8bit unit in computing is more properly referred to as a 'word' – I know words are normally 16bit values, but I believe the length is variable.

John Cheseldine

Dylan Armbrust replies > Whatever the veracity of your story John, it certainly makes for a great tale and it also seems to fit the situation well.

**You say data...** > Unless my sources are wrong, the Norman invasion of England took place in 1066 and the original Domesday Book was compiled around 1086. This is 900 years earlier than the 1986 BBC Domesday Project, not 1,000 as your article 'Data that lasts' states (June issue, News, page 18, ). The title of this piece is also a grammatical howler. 'Data' is a plural form, so it should have been 'Data that last'.

Sam Edge

Clive Akass replies > You've got me banged to rights on the anniversary – all that talk of the Millennium got me confused. But your second point is arguable. I refer you to *Chambers 21st Century Dictionary* which defines data as 'one or more pieces of information'. It adds: 'Originally plural but now generally treated as singular.'

I am all for precision in language, but I guarantee that just about every reader would have done a double take on either 'Datum that lasts' or 'Data that last', whereas our heading was immediately comprehensible. So I'm with *Chambers* on this one.

**Speed and size matter** > In Gordon Laing's Inside Information column (June, page 28), he concludes that remote control of PCs and mobile Internet access are both required. I agree, and for home access there are two other important factors to consider. Without cable or ADSL options being available to me, speedy Internet access is impossible (with satellite access being too costly at present). Then there is size.

Nobody seems to have quite got to grips with the ideal size for a convenient, home-access device. I for one would not be keen to lug around an LCD monitor, and PDAs are just too small for comfort. What home users require is an A4-sized device, probably set up in the landscape position, which can be used from an armchair. Perhaps some form of the Tablet PC will fill this need.

Ian Powell

Clarifications: June's brainteaser suffered from a glitch. The first clue should have read  $A1234 = 13$ . We apologise to readers who were stumped. We have repeated the brainteaser this month, so you have another chance to enter.

The Actiontec wireless-ready home gateway (June p53) has two Type II PC Card slots, not two Type I slots as published. Apologies for any confusion.

## Send your letters to:

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or email [letters@pcw.co.uk](mailto:letters@pcw.co.uk)

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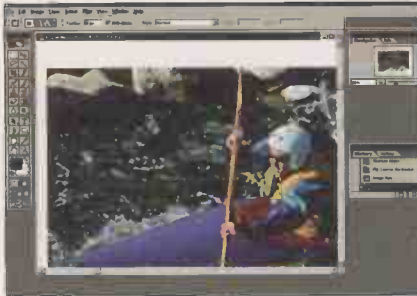
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# HOW WE TEST

## RESULTS EXPLAINED

When we're testing PCs, notebooks and components, we run benchmarks, which are explained below



Adobe Photoshop 6.0.1 is part of Sysmark 2002



3Dmark 2001 tests DirectX performance



Quake III: Team Arena tests OpenGL

### Sysmark 2002

Sysmark 2002 is made up of 14 applications that are divided into two categories: office productivity and Internet content creation. A predefined script, with data, is run on each application at an execution speed that includes one-second pauses between operations to simulate human activity. Applications are run concurrently to reflect the way most people use PCs today.

The time taken for each application to complete an operation (ignoring keystrokes and mouse clicks) is recorded. Sysmark then calculates the geometric mean of the application times for each category, and converts these into a score for each of the two categories.

These scores are based on a comparison between the test system and a reference PC featuring a 1GHz Pentium III processor, an Intel 815EEA chipset motherboard, 256MB of PC133 SD-Ram, a 64MB Creative Geforce Annihilator 2 graphics card, a 30GB UltraDMA100 IBM hard disk and Windows XP. A score of 100 indicates that the test system has a performance equal to the reference PC, 200 indicates twice the performance and so on. An overall Sysmark score, the weighted geometric mean of the two category scores, is then calculated.

We run the benchmark at a resolution of 1,024 x 768 in 16bit colour. It loops three times, rebooting between each category. The applications are as follows:

### Office productivity

Microsoft Word 2002  
Microsoft Excel 2002  
Microsoft Powerpoint 2002  
Microsoft Outlook 2002

Microsoft Access 2002  
Netscape Communicator 6.0  
Dragon NaturallySpeaking Preferred v.5  
Winzip 8.0  
McAfee Virus Scan 5.13

### Internet content creation

Adobe Photoshop 6.01  
Adobe Premiere 6.0  
Microsoft Windows Media Encoder 7.1  
Macromedia Dreamweaver 4  
Macromedia Flash 5

Sysmark 2002 is a commercial benchmark, available from Bapco at around £130 ([www.bapco.com](http://www.bapco.com)).

### Quake III: Team Arena

We test OpenGL performance with Quake III: Team Arena (v.1.27g). The settings are:  
video mode: 1,280 x 1,024,  
colour depth: 32bit, full screen,  
highest texture detail,  
texture quality: 32bit,  
texture filter: trilinear, lighting and lightmap.  
Compressed textures: no  
At the command prompt we type:  
`timedemo 1`  
`demo mpdemo1`  
This runs demo 1 and records the frames per second.

### 3Dmark 2001

This DirectX test runs three specially coded games at low and high detail. A fourth test only runs on cards that are fully compliant with DirectX 8. This results in higher scores being given to these cards than to others. The benchmark is also run at 1,280 x 1,024 in 32bit colour and textures, set to loop three times.

The result is calculated by adding together the average frame rate for

the first three games in low detail and multiplying by 10. The average frame rate for the fourth game, and the first three games in high detail are added together and multiplied by 20. Finally, the two scores are added together to produce the final result. The scores below, provided as a reference, should give you an idea how two different graphics chips perform under this test.

### 3Dmark 2001

6,467  
0 1,000 3,000 5,000 7,000  
ATI Radeon 8500

6,260  
0 1,000 3,000 5,000 7,000  
Asus V8200 Deluxe  
(Geforce3 TI500)

Tested using 2GHz Pentium 4 (256KB of Level 2 cache), 256MB of PC800 RD-Ram, Windows XP

PCW

### Seti@home

We occasionally use this test to give us a feel for the performance of a system. The test is very CPU intensive. We time how long it takes the Seti@home program to process the same one per

cent of the same work unit. As a reference, a PC with a 1GHz Pentium III and 512MB of PC133 memory takes nine minutes 40 seconds to complete the test. Another PC with two 933MHz Pentium IIIs, 256MB of PC800 Rambus takes four minutes.

### 3D Studio Max2

Some of the higher-end systems seem appropriate for 3D modelling. We have written a specific scene and time how long it takes for the system to render this.

### Battery test

To get a feel for the length of time a battery will last on a notebook, we have a specific test. Based on a looping Excel Visual Basic application, it opens worksheets, generates random numbers and pivot tables, then zooms, and adjusts the brightness and contrast of an image. The application also includes 2D animation and periodically halts to simulate natural human pauses. The process is self-timing, with the running time recorded to disk every 30 seconds until the battery power diminishes.

### PERFORMANCE RESULTS

200  
0 100 200 300  
Sysmark 2002

60  
0 20 40 60 80 100  
Quake III: Team Arena (fps)\*  
\* Tested at 1,280 x 1,024 32bit colour  
PCW

The result: a score of 200 indicates that the system is twice as fast as the reference PC

The reference PC (PIII 1GHz, 256MB memory) scores 100

The result: a score of 60fps or higher is most desirable

A result of 30fps (frames per second) or above means the machine can produce playable frame rates at the tested resolution

PCW

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Mark Walsh Reviews Editor

# Reviews

## Difficult decisions ahead for 'the new HP'

**J**ust as we were going to press, HP announced details of its long, drawn-out merger with Compaq. The news was pre-empted by the tearing down of Compaq's websites, in favour of links to HP's. At the briefing the merged company was referred to as the 'new HP' – the word Compaq seemed to be taboo.

The main focus of the announcement was to emphasise the intent to 'lead change rather than be swallowed by it', and outline the fusion of products and brands to slim down the respective ranges into one byzantine bunch. The loss of the Jornada range, in favour of the more popular Ipaq, was the most prominent consumer product adjustment, and it was also stated that the company would be split into four sections to deal with distinct market areas.

In the past, Compaq has leant towards AMD chips over Intel, whereas the 'old HP' was strictly Intel only. So the question is: where will the 'new HP' get its chips from? Well, Intel has been making quite a comeback in recent months, with its price cuts and latest chip revisions making it far more appealing than before. Specifically this month these changes have brought us affordable Mobile P4 systems and the highest of high-end P4 PCs (including a spanking new 533MHz front-side bus) for less than £1,500 ex VAT.

Intel also feels the time is now right for the Celeron range to undergo a Pentium 4-like makeover. About time, we mutter. But there's no denying it is, and always has been, a strong contender in the budget

chip market. Turn over the page and see what Hi-Grade has built around this Celeron for just £799.

Armari's Liquid Cool system (p48) offers a couple more reasons for HP to consider sticking with Intel. Always one to give us the latest in high-brow tweaking technology, Armari has delivered a P4 system that has been overclocked to nearly 3GHz. 'Isn't that dangerous?' I hear you ask. Couldn't the heat do some serious damage to house and home if the PC was left for too long? Well, no, because besides the safety-conscious measures Armari has taken, the P4 chip includes a number of measures to prevent such a disaster. Thermal protection is in-built, a feature AMD chips lack, and the P4's deep pipeline means it's more tolerant of overclocking. The Northwood core shuts down automatically if the heatsink falls off, and it can scale up to 3.5GHz – 4GHz at a push. Conversely, AMD's Palamino core has pretty much reached the end of the road in that respect.

But AMD is far from dying away. For starters, the Mesh-built Athlon XP system (page 52) costs only £699 ex VAT and is just as well equipped as the more expensive Hi-Grade. With regard to new processors and updates, current rumours about AMD's 64bit Hammer processor suggest Intel will have its work cut out to beat that chip. Also, an early sample of the Thoroughbred revision to AMD's Athlon XP chip has reached our desks. It is very much scalable, and the mobile chip we received looks promising (see page 51), with desktop chips on their way to us next month. Only then will we, and probably the new HP, be a bit closer to deciding which chip maker to back.

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### RATINGS

EXCELLENT ■■■■■ VERY GOOD ■■■■ GOOD ■■■ BELOW AVERAGE ■■ POOR ■

# REVIEWS



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EXCLUSIVE



The new case provides some interesting features, but the lack of separate sound card is disappointing



## Hi-Grade P4 Celeron desktop

The Ultis P4 C17 PW07 is feature packed but comes in at a budget price

**T**raditionally, Intel has taken quite a beating when it comes to value, as its P4 chips, while remaining the fastest on the market, are a couple of hundred pounds more expensive than AMD's only slightly slower Athlon processors. However, at the budget end, roles are reversed, as the Celeron has been outclassing its AMD rival, the Duron, pound for pound for many months. To do this, it has had to keep up with the times by, for example, breaking the Gigahertz barrier and adopting 0.13micron technology.

Inside this Hi-Grade Celeron system is the all new, singing and dancing Celeron chip, based on Pentium 4 architecture and clocking in at an impressive 1.7GHz – over 300MHz faster than its PIII-based Celeron predecessor. Costing just \$83 (£56), the modified Willamette chip retains its Socket 478 configuration, but has been 'dumbed down' to have a 100MHz system clock, and Level 2 cache has been slashed to just 128KB. Aside from this, there seem to be very few differences from the original 1.7GHz P4. Higher clock speeds will be released in the coming months.

The chip is wrapped up in a 533MHz MSI DDR motherboard and, coupled with 256MB of PC2100 DDR memory, it gave a perfectly decent Sysmark score of 138 overall, with some particularly impressive scores coming from the Internet content creation tests. While

these are not the highest scores we have seen from a sub-£800 system, this is the first time an Intel chip has offered such good value. This, coupled with price cuts for 'normal' Pentium 4 chips means Intel could easily win back the processor crown.

The system's innards have been neatly tied down, and there's plenty of space left to upgrade, including two spare Dimm memory slots, three PCI and two 5.25in bays. There are four USB ports, two at the front, two at the back, and the line-in and mic-out ports have been drafted over to the front as well.

The method by which this transfer has been achieved is sadly far from elegant: a large grey wire connects the external mini-jack ports of the motherboard to the rear, and blocks one of the PCI bays. However, the case does also allow you to do the same with a Firewire port, a real bonus for video-editing junkies.

ATI's 8500LE chip gives sufficient 3D performance for gamers. The card also offers DVI and S-Video outputs. 3Dmark 2001 performance on this occasion was 5,484, and Quake III tests gave us 73.8 frames per second (fps). The monitor is LG's 775FT. While its big brother the 795FT, is a superior model, with a better-looking fascia and a USB hub at the rear, the 775FT still offers excellent image quality and good looks.

Fitting into a £799 price bracket demands some sacrifices; this time it's the sound chip. The onboard chip provides a very respectable 5.1 output, which could easily do justice to games or the occasional DVD. But its quality just does not compare to that of a separate sound card. However, old favourites, Creative's DTT2200 speakers, adequately supply 5.1 sound.

Back on the positive side, the storage drives are of a high standard. A Maxtor 7,200rpm hard drive gives you 60GB of space; a size that is rapidly becoming the norm. The CD-RW drive whirs along at 24-speed, which is more than enough for most users.

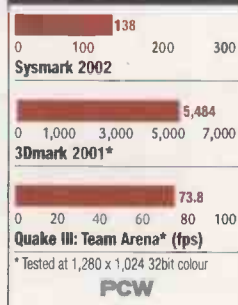
While this is a particularly solid system, and excellent value, when held up against the £100 cheaper AMD-based Mesh system (see page 52), it seems less palatable. Nevertheless, there are some pretty impressive components under this hood, and performance is excellent.

Mark Walsh

### DETAILS

**PRICE** £938.83 (£799 ex VAT)  
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### PERFORMANCE



### SPECS

1.7GHz Intel Celeron processor • MSI motherboard with 533MHz 845E chipset • 256MB of PC2100 DDR SD-Ram • 60GB Maxtor hard drive • ATI 8500LE graphics card • 24x CD-RW • 16x 40x DVD • 56KB V.90 fax/modem • Windows XP Home • Microsoft Works V.6 • Norton Antivirus • One-year on-site warranty



The Vaio has a CD-RW/DVD combo drive and excellent battery life – impressive considering the £2,000 price tag

## Sony Mobile Pentium 4 notebook

With its large screen and good battery life, this portable will do your desktop proud

If you believe that bigger is better, the new Pentium 4 Vaio from Sony will impress you. The PCG-GRX316MP has the biggest notebook screen in the business, measuring 16.1in, with a native UXGA resolution of 1,600 x 1,200, figures you typically associate with a 19in or 21in CRT monitor.

Backing up the display is a beefy 1.6GHz Mobile Pentium 4 processor and 256MB of DDR memory. There is a vacant memory slot under a large cover on the bottom of the Vaio, which can accept another 256MB module of DDR memory to give a total of 512MB.

This notebook is aimed squarely at the corporate market as a desktop replacement, so it could well end up running memory-intensive applications. It comes with Windows XP Professional, Norton Antivirus, WinDVD, Adobe Photoshop Elements and Adobe Premiere 6 LE, but no office suite. As this is designed for corporate desktop replacement use, we consider the choice of video rather than office software a poor one. However, it is far superior to nearly all other Mobile P4 systems we have seen.

That huge screen is driven by ATI Mobility Radeon 7500 graphics with 32MB of memory. Our graphics test results were perfectly acceptable with a 3Dmark 2001 score of 2,137, and a Quake III Team Arena frame rate of 32.5fps (frames per second). Hence, there's no reason not to use

this notebook for gaming in your idle moments.

The Sysmark 2002 score of 138 is also impressive, although we've seen higher scores from other Mobile Pentium 4 notebooks (see this month's group test). However, there was a distinct disparity between Internet and office scores, which were 195 and 98 respectively.

Battery life can make or break a notebook. We were pleased that the lithium-ion battery lasted for two hours nine minutes in our own PCW Excel-based test. That's nowhere near the three hours 34 minutes of the PIII-based Vaio PCG-SRX41P we reviewed last month, but it's the longest we've seen from a Mobile Pentium 4-based notebook and particularly impressive considering the huge screen.

Usability and ergonomics are of prime importance, of course, and the look of the screen and feel of the keyboard are good. If you type heavily the keyboard flexes slightly, but in regular use it's absolutely fine. Travel and response are perfectly adequate. The touchpad and mouse buttons are up to Sony's usual standard. They are the same as every other Vaio, and as such better than most of the competition. Beneath the mouse buttons there's also a jog dial and Internet Back button.

A variety of ports litter the notebook's sides. There are three USB ports in total (one on the left, one on the

right and one on the back), as well as a headphone jack, a microphone jack, one iLink/Firewire, Lan, modem, VGA out, TV-out, parallel port and S/PDIF (Sony/Philips Digital Interface). The ports are tidily tucked away behind plastic flaps. There are two Type II PC Card slots (which can take a single Type III card) and, inevitably, there's a Memory Stick slot.

Should you feel that's not enough, you can plug in a PCGA-PRGX1 port replicator to add a serial port and two more USB ports, but this will set you back £119 ex VAT.

Rounding off the hardware spec there's a Sony CRX810E combo drive rated at eight-speed DVD-Rom, 16x 10x 24x CD-RW and a 30GB hard drive.

The PCG-GRX316MP isn't really portable enough for those on the road all the time. It also lacks wireless Lan and infra-red which could be a problem for some users. It is a good desktop replacement notebook, particularly for its large screen and long battery life.

Leo Waldoock

### SPECS

1.6GHz Mobile Pentium 4 processor • 256MB of DDR Ram • Intel 845 chipset • 16.1in UXGA monitor • 1,600 x 1,200 resolution • 30GB UltraDMA100 hard drive • ATI Mobility Radeon 7500 graphics chip • Yamaha AC-XG WDM sound chip • 16x CD-RW/DVD combo drive • Windows XP Professional • Weight 3.8kg

### DETAILS

**PRICE** £2,002 (£1,704 ex VAT)

**CONTACT** Sony 08705 424 424  
www.vaio.sony-europe.com

**PROS** Enormous screen; excellent performance; good battery life

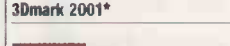
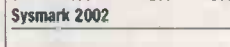
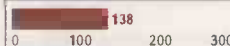
**CONS** No office suite; big and heavy; no wireless Lan

**OVERALL** While the Vaio is physically large and quite heavy, it's still pretty good looking and delivers excellent battery life.

For just over £2,000, it's a very good all-round package and the screen is impressive

**SCORE** ■■■■

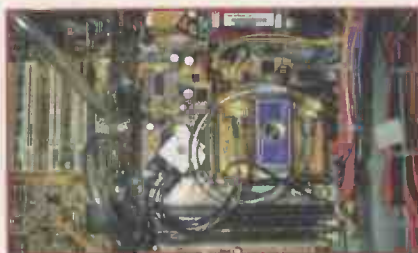
### PERFORMANCE



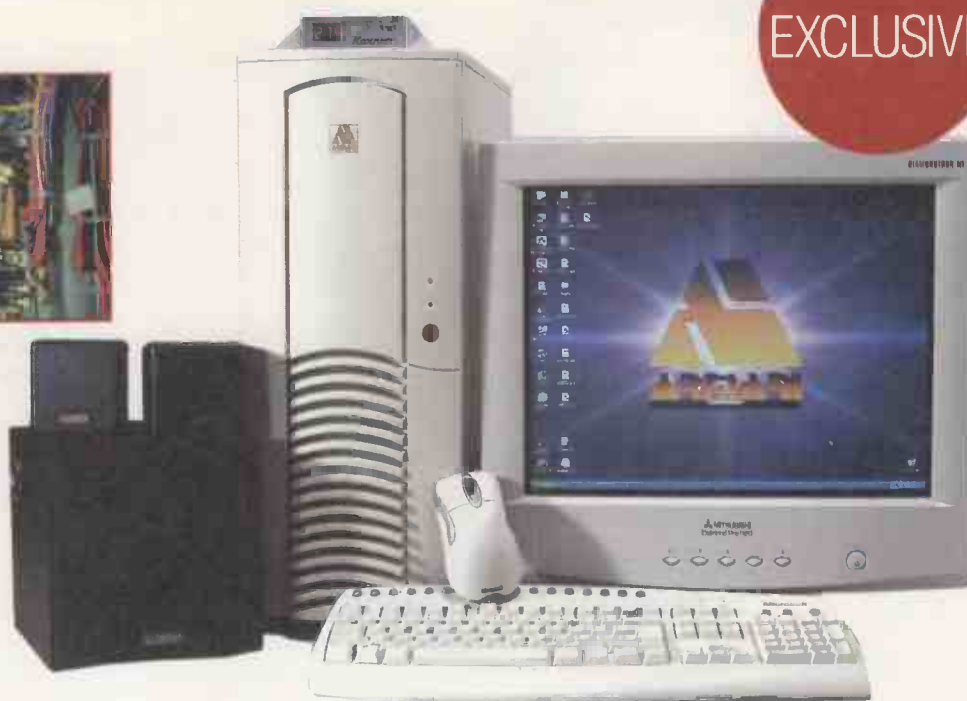
\* Tested at 1,280 x 1,024 32bit colour

PCW





The Armari has a series of tubes through which liquid is pumped to cool the processor, graphics chip and northbridge



## Armari Liquid Cool system

Overclocked to nearly 3GHz, the innards of this R833 LFC24 still keep their cool

### DETAILS

**PRICE** £2,696.63 (£2,295 ex VAT)

**CONTACT** Armari 020 8993 4111

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

**PROS** Very, very fast

**CONS** Pricey; poor sound

**OVERALL** With sky-high performance scores but a price to match, this is a stable and well thought out overclocker's dream. And, as a rather bizarre added bonus, the Koolance system, and particularly the flow of liquid around the case, somehow manages to make your PC look interesting

**SCORE** ■■■■■

### PERFORMANCE

0 100 200 300 **274**  
Sysmark 2002

0 3,000 6,000 9,000 12,000 **9,480**  
3Dmark 2001\*

0 30 60 90 120 150 **132.2**  
Quake III: Team Arena\* (fps)

\* Tested at 1,280 x 1,024 32bit colour

PCW

**Y**ou may have seen pictures of processor overclocking disasters – using liquid nitrogen to cool it down, or frying an egg on it are our current favourites. But in place of this tomfoolery, Armari's R833 LFC24 takes a more sensible and practical approach, and still manages to overclock its processor to nearly 3GHz.

To cope with the extreme heat given off by the overclocked chip, Armari has installed a series of plastic tubes through which liquid is pumped over the processor, chipset and graphics chip to cool them. The apparatus used is made by Koolance, and is available separately from [www.overclockingstore.co.uk](http://www.overclockingstore.co.uk).

Inside the tubes used in the R833 is an inert Hydro-Carbon Fluorinet electrical cooling fluid. Armari doesn't sell the cooling device separately, however off the shelf the device uses water as its coolant. Water easily collects ions, which make it conductive, heating it up – not ideal when it's acting as a coolant.

The pumping action takes a few moments to start up once the PC has been turned on, but failsafes are in place to prevent the system overheating and melting the components or even catching fire. Internal temperature can be easily monitored from the LED display on top of the system box.

On average the system runs at a remarkably cool 35 degrees Celsius,

which, incidentally, is significantly less than that of your average system. The bog-standard 2.4GHz Pentium 4 processor has been overclocked to 2.95GHz. This was done by adjusting the Bios FSB (front-side bus) settings; the amount it is overclocked is left up to the user. Our hope was to tweak it so it broke the 3GHz barrier, but Armari says this would require modifications to the motherboard and processor's voltage supplies that would have voided their warranties. You are welcome to perform such actions yourself, though, as long as you are aware that the component warranties will be voided.

Asus's P4S533 motherboard is one of the first capable of supporting DDR400 memory, but has been fitted with 512MB of PC2700 DDR SDRAM. While this is a slight disappointment, as faster memory would have boosted performance, the option is at least there for upgrade at a later date.

Sysmark performance is quite phenomenal. Clocking in at a whopping 274 overall, Internet content scores were quite startling at 380. This is the highest score ever produced in our labs, beating the previous record holder, a dual-processor, Hyper-threaded Armari system, at 259.

As the graphics chip is also being cooled it too has been overclocked, although only lightly. The Visiontek Geforce4 4600 card has been boosted to just five per cent over the factory norm,

as time would not permit further testing. Nevertheless, it broke our labs 3Dmark record too, giving us 9,480. Quake III was high, but slightly less impressive, at 132.2 frames per second (fps).

The surrounding components are of excellent quality too. The stunning graphics are piped through to a good-quality NEC-Mitsubishi 19in monitor, and the 120GB Western Digital hard drive and optical drives are ultra-fast SCSI affairs – a fact that doubtless aided Sysmark performance. However, there is no separate sound card, only a six-channel C-media chip from the motherboard, and Creative SW320 speakers. With its £2,500-plus asking price, we did expect top-notch components across the board, but as this is not a multimedia-orientated system, the lack of quality audio components is more excusable.

Not only is this PC a technical marvel, it is also a stable, incredibly fast overclocked system. It's a shame this performance comes at such a high price.

Mark Walsh

### SPECS

Intel P4 2.4GHz • Asus P4S533 motherboard (with onboard C-media sound chip) • 512MB of PC2700 DDR SDRAM • Visiontek Xtasy Geforce4 4600 graphics card • NEC-Mitsubishi Diamond Pro 920 19in monitor • 120GB hard disk • 40x CD-RW drive • 16x DVD drive • Creative SW320 speakers • Windows XP Professional

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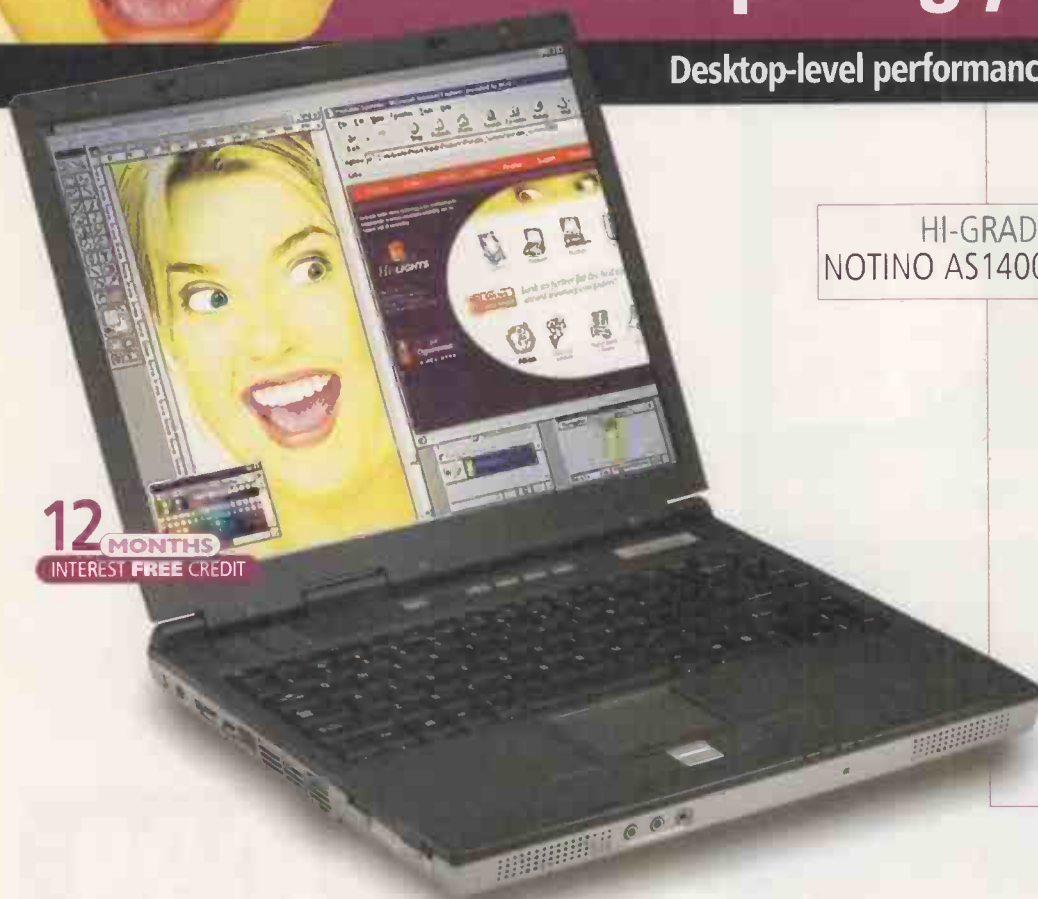
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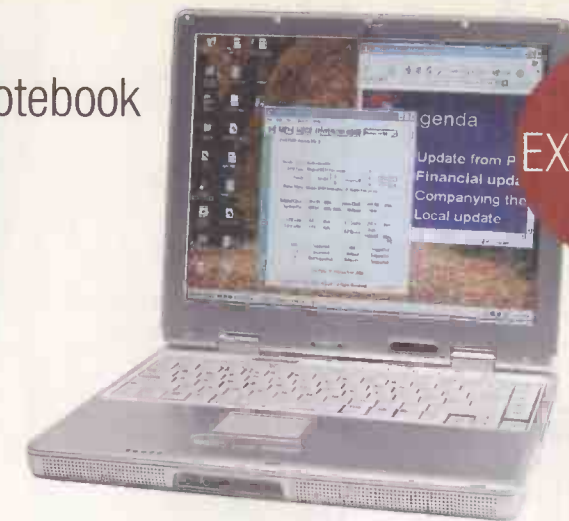
**NEC** Athlon Thoroughbred notebook

The Versa C180 houses AMD's latest processor

**C**odenamed Thoroughbred, AMD's latest revamp to its Athlon XP range makes its first appearance on these shores as a 1600+ mobile chip that clocks in at 1.4GHz. With a 200MHz clock and 256KB of Level 2 cache to its name, this chip also uses 0.13micron technology, something Intel adopted late last year.

NEC is the first company to get its hands on AMD's latest chip. This pre-production notebook comes with a new chassis, called the Mangusta. Its 14in TFT screen is pretty impressive to look at, but can only handle resolutions of up to 1,024 x 768. Graphics are onboard and fed by 32MB of the 256MB of system memory, and so are nothing to write home about.

The hard drive is adequate at 30GB, and the eight-speed CD-RW/DVD combo drive is an excellent inclusion considering the overall cost. The rather odd absence of floppy drive is made up for by four USB ports and a Firewire



connection. Modem, network and Type II PC Card slots are also supplied.

Even despite the hindrance of SD-Ram over the more often favoured DDR SD-Ram, we expected this chip to fly. But initial indications showed it would be a little slower than a 1.6GHz Mobile Pentium 4 chip – a little disappointing but more than adequate. However, this model is almost as well equipped as Dell's P4 system (see page 52) and around £500 cheaper, and as such is a real bargain.

Our main concern here though was the battery life. AMD's Powernow

power management software was missing so the scores obtained were appalling. This omission will be rectified by the time the notebook is released, and we can only hope that it can make enough of a difference to make this a practical, portable option.

Mark Walsh

**DETAILS****PRICE** £1,056.33 (£899 ex VAT)**CONTACT** NEC 0870 0106 322

www.nec.co.uk

**PROS** Excellent value**CONS** Battery life is currently horrendous**OVERALL** Fitting AMD's latest mobile processor into a £900 notebook is very impressive, but battery life is our major concern**SCORE** ■■■■**SPECS**

AMD mobile Athlon XP 1.6GHz processor  
• Via Twister-K KN133 chipset • 128MB of PC133 SD-Ram • 30GB hard drive • CD-RW/DVD combo drive • S3 Savage4 graphics • 14in TFT XGA screen • 3.4kg

**Task-IT** 2.4GHz PC

An impressive machine for the power-hungry user

**T**he Predator 2.4 is by far the most impressive machine we've seen from Task-IT, and the first computer on test to contain a Pentium 4 with a 533MHz front-side bus (FSB). The previous version's FSB was set at 400MHz, so in theory this new chip can be up to a third faster.

Aside from bus size, though, there have been no real changes to the chip. It's still based on the Northwood core, with 512KB of Level 2 cache. And like its predecessor, it clocks in at 2.4GHz, but the supporting chipset is the i850E. This is an improved version of the i850 that supports the new bus speed.

If you're familiar with the i850 chipset you'll know it uses dual-channel RD-Ram. This has not changed and neither has the speed of the memory, as it comes fitted with two sticks of 128MB PC800 RD-Ram in two of the four Dimm slots. The Intel motherboard comes with onboard Ethernet and



is fitted with an NEC USB2 controller chip with two USB2 ports around the back, with another two at the front. A host of other quality components has also been fitted. A 7,200rpm Maxtor hard disk is the main storage drive and is well proportioned at 60GB, but far from huge by today's standard.

The Predator 2.4 is an incredibly fast PC, scoring 243 in our Sysmark 2002 tests. It's also a very capable gaming system managing 8,484 in 3Dmark 2001 as well as 117.4fps (frames per

second) in Quake III Team Arena. At £1,499 ex VAT, the Predator 2.4 isn't cheap, but it has a lot to offer the power-hungry user.

Lars-Goran Nilsson

**DETAILS****PRICE** £1,761.33 (£1,499 ex VAT)**CONTACT** Task-IT 01442 233 573

www.task-it.co.uk

**PROS** Very fast; USB2-equipped**CONS** The case feels cheap for this price point**OVERALL** A great machine if you have cash to spare, but it would've looked better in a different case**SCORE** ■■■■**PERFORMANCE**

243  
0 100 200 300  
Sysmark 2002

8,484  
0 2,500 5,000 7,500 10,000  
3Dmark 2001\*

117.4  
0 30 60 90 120 150  
Quake III: Team Arena\* (fps)

\* Tested at 1,280 x 1,024 32bit colour

PCW

**SPECS**

Intel 2.4GHz processor • 256MB of PC800 RD-Ram • 60GB hard disk • 16x 40x DVD-Rom • 24x CD-RW • Creative Geforce4 Ti 4400 • LG 915FT+ monitor • Creative Audigy sound card • Creative Inspire 5300 surround speakers • Windows XP Home • Lotus SmartSuite • 56K fax/modem • Firewire



## Dell P4 notebook

The Mobile P4 has become more affordable



### DETAILS

**PRICE** £1,643.83 (£1,399 ex VAT)

**CONTACT** Dell 0870 907 5664

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

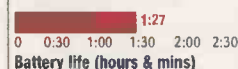
**PROS** Reasonable price for a mobile Pentium 4 notebook

**CONS** Poor battery life; lacks a few basic features

**OVERALL** Not bad for a basic Mobile Pentium 4 notebook, but battery life needs improvement

**SCORE** ■■■■

### PERFORMANCE



PCW

Two months ago we took a look at the first notebooks to contain Intel's Mobile Pentium 4 chip. The two problems that stood out were the price and poor battery life. Dell has managed to rectify the first of these issues with the Inspiron 2650, as it's more than £700 cheaper than the model we looked at in the May issue.

Packed with a 1.6GHz P4-M processor and 256MB of PC2100 memory, Sysmark performance is reasonable, if slightly lower than we would expect, coming in at 145.

A 16MB Geforce2 Go graphics card caters for those who need portable 3D performance. However, the display is a 15in TFT unit capable of resolutions up to 1,024 x 768 and so could not run our graphics tests. However, it is good quality with bold and sharp colours.

The chassis has been redesigned; it's still a three-spindle design so you get everything you'll need as standard. Dell has even managed to squeeze in a DVD CD-RW combo drive at this

price, as well as a 30GB hard drive. Other standard features include built-in modem, 10/100Mbit Ethernet, two USB ports, a single PS/2 port, parallel port, and a Dsub for connecting to an external monitor as well as a single Type II PC Card slot.

The keyboard is well laid out, although the Windows key has been relocated to the top right-hand corner, the touchpad is unresponsive and the buttons are a bit stiff.

The problem of the poor battery life has not been resolved. In our tests the review unit lasted one hour and 27

minutes, but this is still disappointing and makes it a poor choice if you're looking for a notebook to use on the move. But for those prepared to trade performance scores for portability, it is quite a bargain.

Lars-Goran Nilsson

### SPECS

1.6GHz Mobile Pentium 4 processor • 256MB of PC2100 DDR SD-Ram • Intel 845MHz chipset • 30GB IBM hard disk • 16x CD-RW/DVD • Geforce2 Go 16MB graphics • Intel AC97 sound chip • Windows XP Home Edition • Microsoft Office XP • Actiontec V.92 56K modem • 3.3kg

## Mesh value PC

A high-quality system at a good price



### DETAILS

**PRICE** £821.33 (£699 ex VAT)

**CONTACT** Mesh 020 8208 4744

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

**PROS** Price; good upgrade path

**CONS** Below average monitor

**OVERALL** A very impressive showing for £699, despite slight cost cutting in some areas

**SCORE** ■■■■

### PERFORMANCE



\* Tested at 1,280 x 1,024 32bit colour

PCW

The Mesh Matrix XP 1800+SB is a gem, as it's a high-quality computer at a bargain price. The processor is an AMD Athlon 1800+, which, together with 256MB of PC2100 DDR SD-Ram, is fitted to an Asus A7V333 motherboard. The choice of motherboard makes this system reasonably future proof as it is compatible with PC2700 memory. Sysmark performance is impressive, giving an overall score of 167.

The motherboard features four standard USB1 ports, two USB2 ports, and an optional bracket for another two USB2 ports is also available.

The motherboard's C-media chip delivers six-channel audio as standard. Sound tends to be the first thing to lose out to a price point, although sound quality is better than expected. It is channelled through Creative FPS1600 speakers. These may not be the optimal choice considering the 5.1 sound chip, but they are still

reasonable. All storage and optical drives are high quality, particularly the Teac 40-speed CD-RW. The only fault with the Matrix XP 1800+SB is the monitor. The 17in NEC Multisync 75F is limited to a maximum resolution of 1,152 x 864 at 75Hz and could not run our graphics tests at the desired resolution. Picture quality is poor too, but it could have been worse.

Graphics comes from a Leadtek card, based on the Nvidia Geforce4 MX440 chipset and performance is reasonable, despite the attached

monitor. Overall, this is a good buy if you want a bargain upgradeable PC, and Mesh's three-year warranty makes it a more secure purchase.

Lars-Goran Nilsson

### SPECS

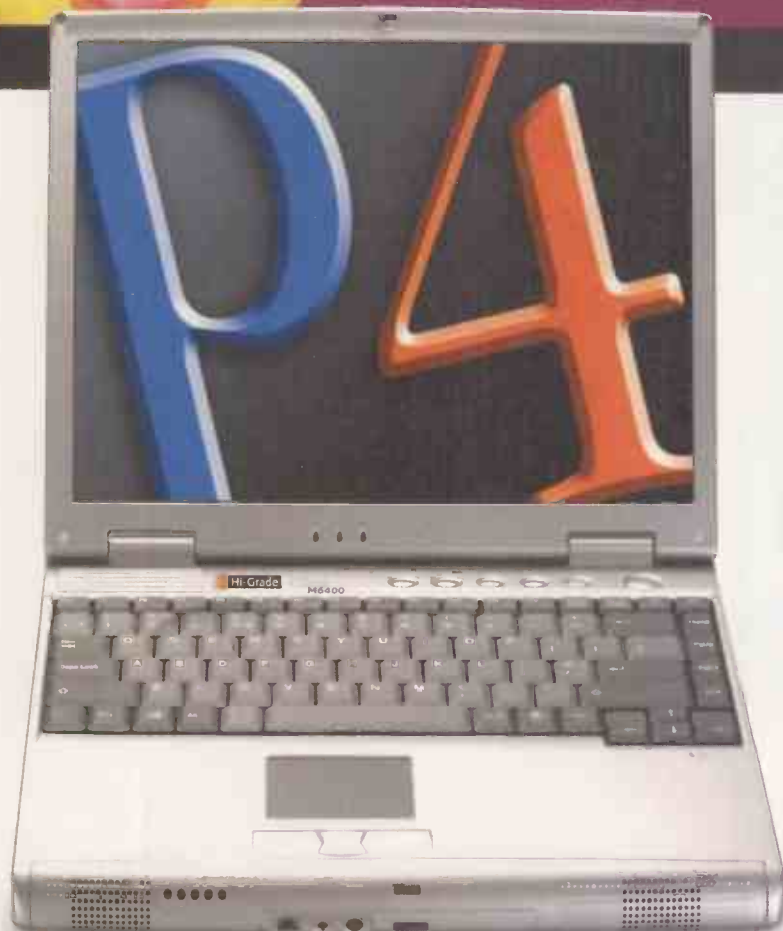
AMD Athlon 1800+ • 256MB of PC2100 DDR SD-Ram • Asus A7V333 motherboard (C-media sound chip onboard) • 40GB hard drive • 40x 12x 48x CD-RW • 16x DVD-Rom • Leadtek Geforce4 MX440 graphics card • 17in NEC Multisync 75F monitor • Creative FPS1600 speakers • 56K V.90 modem

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## STANDARD ULTINOTE M6400 FEATURES

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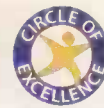
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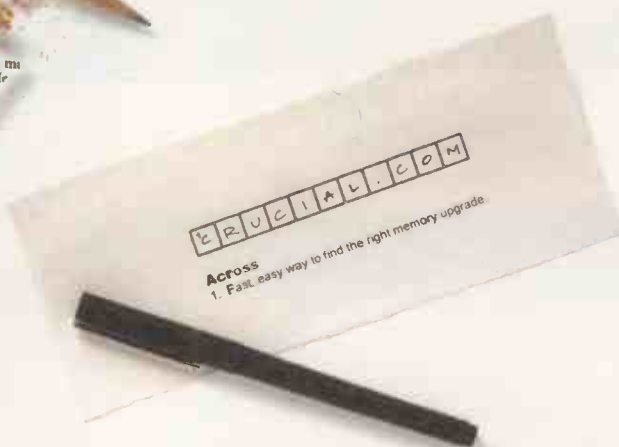


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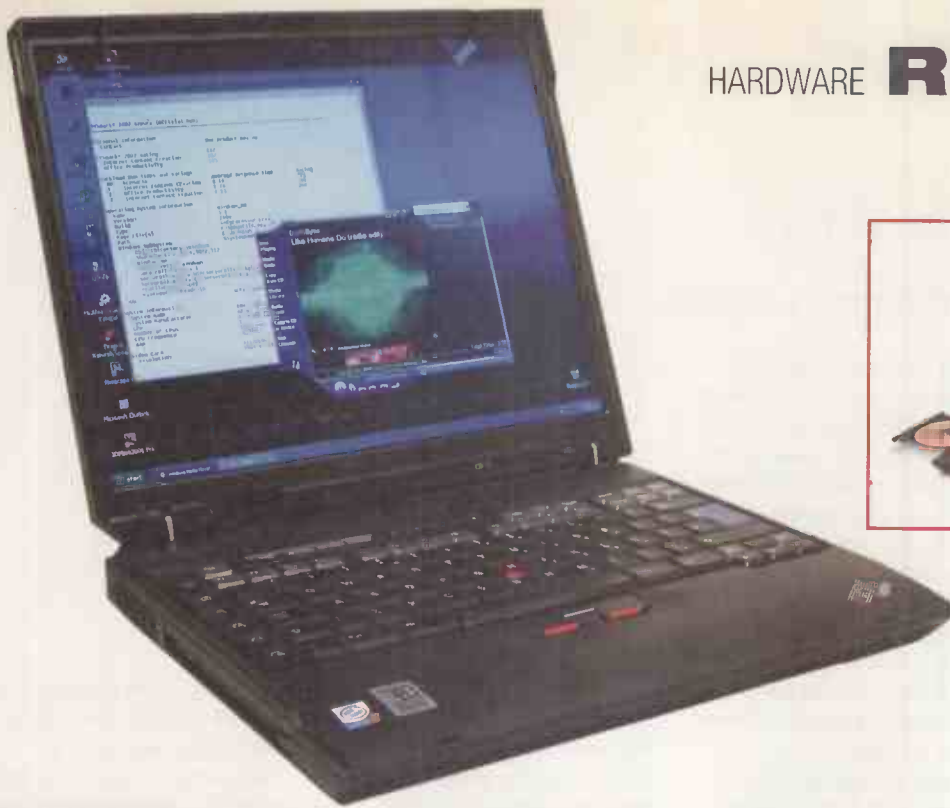
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## IBM Mobile Pentium 4 notebook

Beneath its chunky exterior the Thinkpad A31 hides some neat features

One of IBM's first ventures into the Mobile Pentium 4 market is a chunky number, weighing in at over 3kg. Its remarkably sturdy exterior, makes it ideal for the road warrior who fancies a spot of weight training while on the move.

Packed with a 1.6GHz Mobile Pentium 4 and 256MB of PC2100 DDR SD-Ram, performance is more than we could ask for from a notebook, or even need. Running under Windows XP Professional, the overall Sysmark score of 147 is one of the highest we have seen from a notebook. But performance is not the be all and end all, and at just under £2,500, this notebook has a lot more to prove.

Scouring the exterior, the first thing you notice is the plethora of ports and features. The most impressive inclusion is that of a spare 5.25in bay. With one on either side of the chassis, you could have both the included eight-speed CD-RW/DVD combo drive and a numerical keypad extension installed at the same time; quite a rarity, even for a notebook of this size. Sound is surprisingly well catered for; the Soundmax chip is better quality than we had expected, as are the stereo speakers, and the three audio-in/out ports are clearly labelled to the side. Two Type II PC Card slots sit alongside the left-hand 5.25in bay, and at the rear of the Thinkpad are the usual array of I/O ports: two USBs, one serial port, one parallel, a PS/2, Ethernet and modem.

But if we were shelling out £2,500, a few more options, such as Firewire and a couple more USB ports, even USB2, would have been appreciated.

The 15in LCD screen is superb, filling the whole side of the chassis, and has a native resolution of 1,400 x 1,050. However, other resolutions do look pretty horrendous. The anti-glare covering on the screen is what really sets it apart from the crowd – everything is very clear and crisp. Graphics from an ATI Radeon Mobility 7500 chip are surprisingly good. A 3Dmark score of 2,558 is more than enough to let you run Quake III, and indeed most of the games on the market today. The Thinkpad A31 also comes with a 40GB hard drive. While this may seem huge, almost excessive, considering what you can actually do with this behemoth, the extra storage space could easily come in handy.

The keyboard is, on the whole, excellent. Buttons are large and feel good to the touch, but we did have a few problems on our review model. First of all, the Internet and email shortcut keys are arranged down the left-hand side of the keyboard, rather than on top where you would normally expect them. This led to many a slip-up on our part, for instance when we mistook the Compose Email key for the Escape key.

But most disappointing of all is the lack of a Windows key. This is unforgivable these days, considering

how much most people use it, and particularly odd considering the enormity of the typically adjacent Control and Alt keys. On the plus side, the trackpoint is truly excellent, though we expect nothing less from IBM. The centre of the three mouse buttons acts as a scroll wheel and is a particularly handy function.

Battery life has often disappointed when it comes to Mobile P4 notebooks, this month's Sony being the only real exception (see p47). Sadly, the IBM gives us a measly one hour 42 minutes; a particular surprise considering the size of the battery that could have been fitted into the Thinkpad's mammoth chassis.

With all the features you could expect from a high-end notebook, and the system performance to match, there's no faulting IBM's intentions. But considering its heftiness, both physically and financially, when you hold this up against other P4 notebooks currently on the market (see the Dell p52 and Sony p47 reviews, and our notebook group test on page 107), this one pales a little.

Mark Walsh

### SPECS

1.6GHz Mobile Pentium 4 processor • 256MB of PC2100 DDR SD-Ram • Intel 845 chipset • ATI Mobility Radeon 7500 graphics chip • 15in LCD screen • 1,400 x 1,050 max resolution • 40GB hard drive • 8x CD-RW/DVD combo drive • Windows XP Professional • Weight: 3.5kg

### DETAILS

**PRICE** £2,469.85 (£2,102 ex VAT)  
**CONTACT** IBM 0800 169 1458

[www.pc.ibm.com/uk](http://www.pc.ibm.com/uk)

**PROS** Featured packed

**CONS** Heavy; expensive

**OVERALL** There's no denying this is high-quality notebook with great performance and an even better screen. But at nearly £2,500, regardless of its extra features, it just doesn't measure up against the competition

**SCORE** ■■■

### PERFORMANCE

**Sysmark 2002** 147  
0 100 200 300

**3Dmark 2001\*** 2,558  
0 1,000 3,000 5,000 7,000

**Battery life (hours & mins)** 1:42  
0 0:30 1:00 1:30 2:00 2:30

\* Tested at 1,280 x 1,024 32bit colour

PCW



## Toshiba Pocket PC

Looks aren't everything when it comes to this PDA



### DETAILS

**PRICE** £369 (£314 ex VAT)  
**CONTACT** Toshiba 0870 444 8944  
[www.toshiba.co.uk/computers](http://www.toshiba.co.uk/computers)  
**PROS** Slim; light; SD expansion slot  
**CONS** Eccentric power management; unresponsive screen  
**OVERALL** A slim, lightweight PDA that certainly looks the part – if you can live with the Pocket PC interface. The screen doesn't have a very good viewing angle, and isn't as responsive to the stylus as it should be. The power management will also become a nuisance if you use net connections on the move

**SCORE** ■■■■

**T**here's little doubt that PDAs based on Microsoft's Pocket PC operating system have made quite an impact in the market – especially the Compaq Ipaq. Toshiba's latest offering, the e310, is a slim silver unit, packing a 206MHz Strongarm chip, 32MB of memory and the usual complement of Pocket PC applications into a 12mm thick, 140g chassis. Expansion is by means of a Secure Digital (SD) slot on the top of the unit, giving you the ability to add more memory, Bluetooth and other accessories.

The supplied cradle provides connection to the PC and power for charging. The bottom two and a half inches of the e310 slip in via plastic guides, so you can't just grab it and go. In fact, so snug was the fit that just lifting the top of our unit was sufficient to raise the cradle from the desktop.

The colour screen is oft touted as one of the benefits of PocketPC over Palm, but the one on this Tosh just doesn't cut the mustard. It lacks

contrast, and doesn't have a great viewing angle either. It also didn't seem that responsive to the stylus. Playing Solitaire was fiddly and handwriting recognition seemed worse than it should have been.

Mobile data users will be unimpressed too; sure, the e310 will talk to your Irda-equipped phone. But if you have the battery-saving auto-shut-off feature enabled, it'll switch off in the middle of a lengthy download – so forget fetching a new spreadsheet with Explorer, or the papers with Avant Go, unless you either turn off the power

management before you connect, or keep fiddling with buttons or stylus while the download's going on.

Thin and shiny it may be but, just like dating, a little while spent in the company of this PDA will convince you that looks aren't everything.

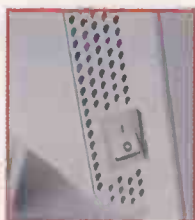
Nigel Whitfield

### SPECS

206MHz Intel Strongarm processor • 32MB of memory • Pocket PC operating system • Smart Digital card slot • 3.5in screen • Resolution: 320 x 240 • Dimensions: 123 x 78 x 12mm (h x w x d) • Weight: 140g

## NEC 15in LCD monitor

A flat-panel screen with no pretensions



A rear 'vacation' switch is concealed and unnecessary

### DETAILS

**PRICE** £410.08 (£349 ex VAT)  
**CONTACT** NEC-Mitsubishi 08701 201 160  
[www.nec-mitsubishi.com](http://www.nec-mitsubishi.com)  
**PROS** A bright display with a wide viewing angle  
**CONS** Slightly garish colour control; one power switch too many; the price is a little steep  
**OVERALL** A decent display with no unique features, and no pretensions. The 1550VM is aimed at a specific market and it serves it very well. If only it was £20 or £30 cheaper

**SCORE** ■■■■

**T**he LCD1550VM is a 15in VGA-only TFT panel, and is one of four in NEC's new range. Other members of this new clan include DVI inputs and USB hubs, though each addition comes at an extra cost.

The mains power cable has no power brick and both this and the VGA cable are hidden behind a pop-off plastic cover at the rear of the panel. There is also an audio connection for the integrated speakers. Rated at one watt each, they are suitable for nothing more than Windows tweets and bleeps. There is no height adjustment, but you get enough back and forth tilt to make up for that. The viewing angles are quoted as 75 degrees left and right, 50 degrees up and 60 degrees down. This is impressively wide and makes the display very easy to use. However, it can't twist from side to side.

While not the prettiest flat panel going, the 1550VM is very neat and



tidy. All the controls are on the front including a headphone socket, or at least that is what we thought. In addition to the front power button there is also a frankly unnecessary 'vacation' switch on the rear of the display, which shipped in the Off position.

Maximum resolution is 1,024 x 768, which is adequate for a display of this size. The screen is surprisingly bright and the geometry is near perfect.

Greyscales are imprecise at the dark and bright extremes and

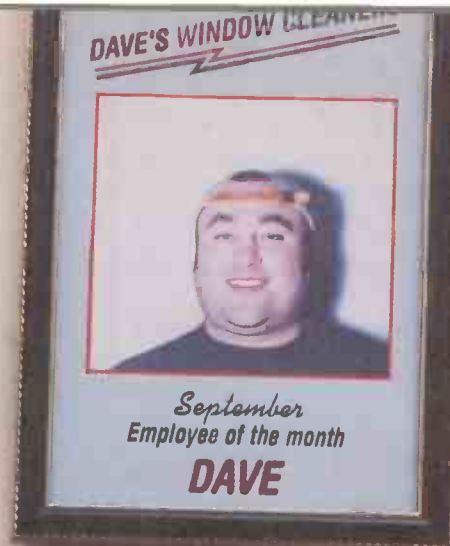
colour graduations also get rather garish towards the brighter end of the scale. There are no interference patterns and text is very clear in all colour combinations.

All in all, the 1550VM is very good for office applications and Internet browsing, which is exactly what NEC-Mitsubishi intended.

Leo Waldoock

### SPECS

1,024 x 768 native resolution • VGA and mini-jack audio inputs • Two 1w speakers



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## Creative Nomad Jukebox 3

A 20GB hard drive provides loads of room for MP3s



**D**espite a 30 per cent reduction in size since its last incarnation, Creative's Jukebox is still by far the chunkiest MP3 player on the market, coming in at roughly the size of 10 CDs piled on top of each other. However, portability seems to be more coincidence than design, as many of its features, particularly the inclusion of a remote control, imply that it is more of desktop accessory.

Capable of wav, MP3 and WMA playback, the Nomad now includes a Firewire port for faster data transfer. The analogue and optical line input to the side allows for wav recording and direct MP3 encoding. Rates of between 64 and 320Kbits/sec can be selected.

Its hard drive clocks in at 20GB; this will easily store the average music lover's complete CD collection. Transferring 300MB of MP3 files via the USB cable took just under six and a half minutes, and around a third of that using the Firewire port. Battery life is impressive to say the least, offering in

the region of the stated 11 hours of playback. There's also an option to install a second lithium-ion battery, though this comes at an extra cost.

The LCD screen may be large, but from time to time the interface was confusing. Our real complaint, though, was with Creative's supplied software. Once installed, splash screens and toolbars littered our desktop.

The quality of playback is very impressive, but the included EAX functions add various atmospheres that are ineffective and therefore pointless. The supplied headphones

are reasonably comfortable, but sound quality through them is quite poor. The remote is small, with few controls to get to grips with. But this, just like the device itself, serves its purpose.

Mark Walsh

### DETAILS

**PRICE** £349.99 (£297.36 ex VAT)

**CONTACT** Creative 0800 973 069  
<http://europe.creative.com>

**PROS** Fast data transfer; huge capacity

**CONS** Occasionally annoying interface

**OVERALL** Part MP3 storage device, part portable player, this doesn't quite suit either function perfectly. Nevertheless, it is fast and feature packed and has the largest hard drive in the field

**SCORE** ■■■■

### SPECS

20GB of storage space • USB and Firewire connections • Headphone output • Two line outs • Optical input • Weight: 293.8g without batteries • Dimensions: 123 x 130 x 35mm • Battery life: 11 hours per Li-ion battery • Creative Playcentre, Creative file Manager and Audiosync software

## Logitech THX speakers

The cinema experience comes to your desktop

**T**he Z-560s are the first speakers to emerge from Logitech since its acquisition of Labtec, and are the first multimedia speakers to be officially THX certified. THX is essentially a list of manufacturing standards – more information on this Lucasfilm-owned branding can be found at [www.thx.com](http://www.thx.com).

Good-looking and sturdy, this five-piece connects to your PC via mini-jack cables and bare wire from subwoofer to satellites. The intention behind this is to reduce interference that can often come from poorly constructed connectors. The slightly less pretty remote has a headphone socket, along with power, fade (front-to-back output ratio), bass, overall volume and M3D controls. M3D aims to create surround sound from a stereo source; the effect is reasonable, but there's slightly too much reverb for our liking.

Positional information is accurate and sounds are crisp and clean. The lack of a fifth satellite seems bizarre at



first. As all audio is fed solely via two mini-jack cables, there isn't a distinct subwoofer feed and we found that speech could occasionally be crowded out by sound effects. The very chunky subwoofer inevitably produces brutally loud bass levels. These are clearly speakers designed for film, as even on its lowest setting the bass is too high for decent music playback.

All in all, this is a very good set of speakers, managing to produce a

cinematic feel even in the less-than-ideal conditions of our labs. But £200 could get you a better rounded set of home entertainment speakers.

Mark Walsh

### DETAILS

**PRICE** £199.99 (£170.20 ex VAT)

**CONTACT** Logitech  
[www.logitech.co.uk](http://www.logitech.co.uk)

**PROS** Excellent film playback

**CONS** Overly heavy bass; expensive

**OVERALL** Sitting in the middle of both price and quality scales, these are an excellent purchase if you watch DVDs on your PC. However, music lovers should steer clear

**SCORE** ■■■■

### SPECS

400w RMS total: 188w subwoofer • 53w per satellite • 35Hz-20KHz frequency response • >100dB Signal to Noise Ratio • Mini-jack connectors to PC; bare wire between woofer and satellites





The advanced 950 driver keeps you informed of job progress, ink supply and more



## Epson inkjet printer

The Stylus Photo 950 delivers decent picture quality but at a hefty price

Epson debuted Print Image Matching (Pim) in 2001. In partnership with 13 digital camera manufacturers, it had developed a new way to record camera settings and feed them to an inkjet printer. The printer consulted this adjustment data to produce more realistic looking prints.

However, while Pim knew all about colour balance and sharpness, Exif, an already established standard, did some other things that Pim did not, such as recording exposure times and white balance settings.

Since 2001, though, a lot has happened, with Exif2.2 arriving on the scene, and a fresh release of Pim, PimII, appearing in Epson printers. PimII now incorporates Exif2.2, closely aligning Epson to the more established standard. One of the payoffs, in theory, is Image noise reduction, which should be of particular interest to those camera manufacturers looking to squeeze high resolutions out of small sensor chips, resulting in cheaper and smaller hardware. There are no PimII cameras yet, but there is one compliant printer – the Stylus Photo 950. It is a hefty beast with a price to match: £322 ex VAT. But before that price sees you turning the page, check out what it can do.

Epson uses Piezo technology where a vibrating crystal ejects ink from the head. This, combined with tension on the surface of the liquid, allows it to vary the size of each drop. However, variable size droplets

have been cast aside in the 950 in favour of a faster engine. The crystal's vibration cycle has been halved, allowing it to produce a physically smaller droplet of just 2pl (picolitres) and a top resolution of 2,880 x 1,440dpi (dots per inch). Being twice as fast, you can print at double the resolution without slowing down.

It certainly flew through our four key tests, too, and beat every printer in our November issue printer group test by a comfortable margin. Our 50-page plain-text file completed its run in just eight minutes 16 seconds. The 50-page pdf was ready for collection after just eight minutes four seconds, and it only took an impressive seven minutes 54 seconds to process a 50-page mixture of text and screenshots. These results are most likely the fruit of extra nozzles in the head and a second black ink well.

Speed isn't everything, though, so we were relieved to see that the 950 lives up to Epson's boast of quality. Even on photocopy paper, large black characters were dense, and feathering – a risk when using cheaper paper – was barely discernible. Text was easily legible in all point sizes down to 2pt.

Switching to photo paper for our standard test photo, we saw speed results in line with those from the group test: two minutes 11 seconds compared to the group test fastest of two minutes 28 seconds. Quality was excellent. Similar colours could be distinguished one from another, and

areas of tonal variation showed smooth gradations. Traditionally tricky skin tones were realistic. However, the 950 really impressed when printing landscapes and nature, with complex forestry, subtle hillside fog and vivid sunny skies well reproduced.

For the photo enthusiast, it takes Epson paper rolls, as did the 895 (November 2001, p216), and has the added bonus of an integrated cutter and hammock-like device for catching the completed prints.

Beneath the hood is a dial that raises the workings slightly to accept a CD caddy. Several manufacturers are now producing printer-compatible blank CD media and Epson has thrown in design software to simplify the process. While the results were nowhere near as vivid as either its photo output or shop-bought CDs it was certainly easier – and tidier – than using CD labels.

With individually replaceable ink wells, you should save money on refills, but whether this is reason enough for the initial investment is up to you.

Nik Rawlinson

### DETAILS

**PRICE** £378.99 (£322.55 ex VAT)

**CONTACT** Epson 0800 220 546  
www.epson.co.uk

**PROS** Versatile; very fast; integrated paper cutter

**CONS** Pricey

**OVERALL** With first-class drivers, impressive output and a lightning-fast print engine this printer sits at the top of the semi-professional stack. It would be a five-star product were it not for the price, but a bit of shopping around online should find you a better deal

**SCORE**

### SPECS

Piezo inkjet technology • Max resolution: 2,880 x 1,440dpi • USB and parallel interfaces • Five colour, two black cartridges • Cartridge life: 440 pages from colour cartridges with five per cent coverage, 628 from black • Operating system support: Windows 95, 98, ME, NT4, 2000, XP • Weight: 7.4kg • Dimensions: 515 x 663 x 299mm (w x d x h)



The high-resolution Z65 has two paper trays, one of which uses an automatic paper sensor

## Lexmark high-resolution inkjet printer

Its simplicity of use and automatic cartridge alignment make the Z65 attractive

**L**exmark's Z65 A4 inkjet printer has the highest resolution currently on the market, coming in at 4,800 x 1,200dpi (dots per inch), and proclaims a print speed of up to 21ppm (pages per minute).

Apart from its speed and resolution, Lexmark is particularly proud of the printer's automatic cartridge alignment feature. This eliminates the need for manual alignment, helping to increase ease of use and minimise user intervention. Once you've placed the tri-colour and black cartridges into their respective slots by lifting the front cover, the LED and optical sensors read the alignment page, then automatically adjust the printhead and printer driver settings. The space between the colour and black cartridges can vary slightly, so this technology can help reduce misalignment of the print cartridges and ensure the best print quality. It's also a real boon not having to print a special alignment page and manually change the software driver settings.

The Z65 automatically recognises different paper types and adjusts the printer settings to achieve optimal print quality. Print drivers adjust the way they format print jobs depending on the type of media used, so failing to select the correct print option in the driver software can lead to poor results or no visible gain in quality.

Automatic paper type sensing eliminates this potential for human error. A paper type sensor in the printer's

paper tray constantly monitors the type of paper loaded. Working with the basic physical principle that different types of paper reflect light in different ways, the paper sensor is made of a light emitter and two light captors. Depending on which captor receives light, and in which quantity, the printer's driver determines which type of media is loaded from a choice of plain, photo or coated paper, and transparency, and makes any configuration changes accordingly.

The Z65 has dual paper trays. The nearest of the two trays at the front of the printer has a plain paper capacity of 100 A4 sheets, and the rear one can hold 150 A4 sheets. Both trays use Lexmark's Accu-Feed paper handling system, but only tray one uses the automatic paper sensor. Either tray can be selected by pressing the corresponding button on the printer or via the printer driver software.

Although Lexmark has made several printhead design improvements on its colour and black cartridges, the quality of the Z65's photographic output isn't on a par with offerings from Epson or HP. At times acceptable, occasionally horrendous, close scrutiny reveals pixels that are not noticeable on continuous tone prints, slight over-saturation of colours that frequently requires manual software correction, and images that generally appear 'flat'.

Print speed is also disappointing, being nowhere near Lexmark's claims of up to 21ppm (mono; five per cent

saturation) and 15ppm (colour; five per cent saturation). We achieved 7ppm and 2ppm respectively. Lexmark has been able to improve on its print speed by increasing the size of its printhead swath from a third to a half an inch (the size of printhead, plus the area covered in one pass of the cartridge). It has also introduced a redundant nozzle design. Two nozzles are responsible for each line of print, allowing them to fire alternately, resulting in a faster carrier. Also, if one of the nozzles fails, the other can continue printing, lapping over the areas missed by the faulty nozzle.

Back on the down side, Lexmark, like most other printer makers, doesn't supply a USB cable – an irritating omission. It's a shame the three-colour cartridge design is so expensive to maintain at over £20 a cartridge, and that the print quality is only mediocre, because the Z65 is quick and easy to use. While the Z65 may be one of the simplest printers to use, many may find the quality and speed of its output too offputting.

**Rob Christian**

### SPECS

Max resolution 4,800 x 1,200dpi • USB 1.1 • Tri-colour, single black cartridge types • Cartridge life: 450 colour pages at 15 per cent coverage; 600 black pages at five per cent coverage • Maximum paper weight 270gsm • Operating system support: Windows 98, ME, 2000, XP, Mac OS 8.6-9.1, Mac OS X • Weight 4.9kg • Dimensions: 445 x 305 x 216mm (w x d x h; paper support and exit tray retracted)

### DETAILS

**PRICE** £129.95 (£109.95 ex VAT)

**CONTACT** Lexmark

08704 440 044

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

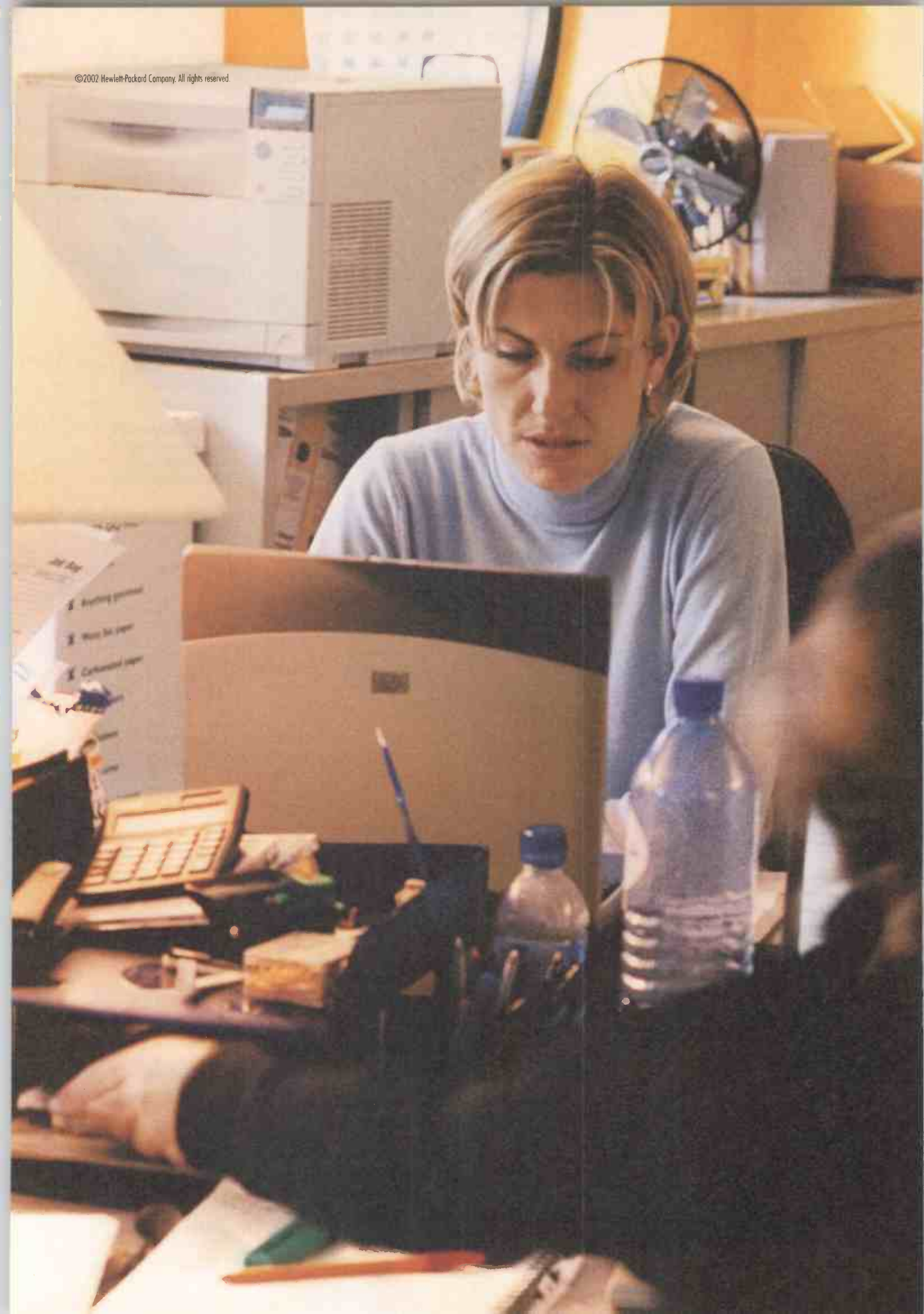
**PROS** Fast; intuitive to use; reasonable price

**CONS** Expensive to run; poor photographic print quality

**OVERALL** A new graphical user interface, automatic cartridge alignment and paper type sensing make using this inkjet printer a breeze, but print quality is mediocre and its three-colour cartridge is expensive for large print runs

**SCORE**







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## Brother multifunction device

A convenient and versatile all-in-one unit



**B**y combining an inkjet printer, scanner, colour copier and plain-paper fax machine into one unit, Brother's MFC-590 saves you desk space. It's also a versatile alternative to peripherals, letting you operate fax and copier functions directly without switching on your PC.

Up to 100 sheets of paper are loaded into a lean-back feeder, with printouts emerging onto an extending output tray at the front. There is an automatic document feeder on top of the machine which operates for multipage faxes and copies alike. This lifts up to reveal a conventional A4 glass scanning plate for thicker originals such as books, magazines and bulky objects.

The printer hardware is built around a 1,200dpi (dots per inch) Piezo printhead, using four ink cartridges. Having separate cartridges, as opposed to one black and one tri-colour, is less wasteful over time, but replacing all the inks at once is expensive at over £40. Print quality is average but by

no means poor, while real-world throughput is slow at around 2-3ppm (pages per minute) for ordinary colour office documents at normal quality. It is capable of near-photo quality, but with our A4 photo test on glossy paper taking more than 19 minutes, we can't imagine anyone wanting to bother.

The scanner uses a 36bit CCD array capable of capturing images at up to 600 x 2,400dpi optical sampling rate. Scan quality is not sophisticated, but is acceptable for general office scanning, colour copying and faxing. Fax performance is equally competent, enhanced by a clear button layout.

Our biggest concern was the incomplete support for Windows XP. Drivers are available from <http://solutions.brother.com>, but were absent from our test sample. Most buyers though will be perfectly happy with the average quality and performance.

Alistair Dabbs

### DETAILS

**PRICE** £445.32 (£379 ex VAT)

**CONTACT** Brother UK  
0161 931 2354

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

**PROS** Convenient and straightforward to use

**CONS** Slow and noisy; doesn't fully support Windows XP

**OVERALL** In classic multifunction style, this machine is a jack of all trades but a master of none. Speed and quality for each function is never better than average

**SCORE** ■■■■

### SPECS

Print speed: 10ppm mono, 8ppm colour  
• Parallel and USB interfaces • Inkjet cartridge • Cartridge life: black 950 pages, cyan/magenta/yellow 450 pages • Weight: 11kg • Dimensions: 468 x 467 x 368mm

## Panasonic 3-in-1 gadget

Audio and video playback – and a digital camera to boot



**P**anasonic's SV-AV10 is a digital camera, audio player, voice recorder and mpeg-4 camcorder squeezed into a tiny box.

The maximum resolution for pictures is 640 x 480. Despite the flash, which has to be manually enabled, you'll get the best results in daylight and, sadly, there is no zoom function. Framing the picture is easy – the image appears on the 2in LCD screen, which neatly folds out (see picture).

Mpeg-4 movies are small in size and jerky, but adequate if you just want short, emailable clips. Our 20-second movie took up 620KB of space on the supplied 8MB SD (Secure Digital) card, so the most you'll be able to store is six minutes. There is a small microphone at the front, along with the camera lens.

As a voice recorder, it's hard to fault, but then it's quite difficult to get this feature wrong. You can fit up to 25 minutes of speech onto the card.

Transferring files from SD card to a PC is straightforward with the included

USB reader/writer, which appears as a drive in Windows Explorer.

The SV-AV10 scores well on digital audio. Real Jukebox lets you rip music from CD onto the PC hard drive and transfer it onto the SD card. We found it tricky to use. The device can play back MP3 or AAC files – Panasonic recommends the latter as they take up less space.

Storage space is the main problem with this product – the 8MB card just isn't large enough to store audio. We

could only fit six AAC tracks on the card, and that was at the very low-quality rate of 32Kbits/sec. To use this feature properly, you'll need to invest in a 64MB card, costing around £65.

John Collins

### DETAILS

**PRICE** £260 (£221.28 ex VAT)

**CONTACT** 08705 357 357

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

**PROS** Compact; lots of features; a fun gadget

**CONS** Small amount of storage supplied

**OVERALL** It's best to think of this as a decent digital audio player with some handy extras. Make sure you get your hands on a larger memory card though

**SCORE** ■■■■

### SPECS

640 x 480 resolution images • 2in LCD • MP3, mpeg-4 and AAC support • 8MB SD card • USB SD card reader/writer supplied • Real Jukebox and SD movie stage (mpeg-4 video editing) software • Weight: 98g



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A USB cradle allows the F601 to transfer files to your PC – and it recharges the batteries too



## Fujifilm slimline digital camera

The Finepix F601 Zoom has a unique vertical aspect

**F**ujifilm's F601 digital camera is compact, sleek and weighs 220g. Its aluminium-magnesium alloy body looks stunning, and the camera is petite enough to slip in your pocket. However, its size prevents full use of the features it offers, and the vertical-aspect also makes it hard to manage.

The F601 looks more modern than the previous model, the 6900, which had a more professional look. It boasts a high resolution of 2,832 x 2,128 with a 3x optical zoom and a 4.4x digital zoom. The lens is rated as being equivalent to 38-108mm on a standard 35mm camera.

Fujifilm uses its own Super CCD technology. This processes the data from the 3.1 megapixel Super CCD chip in the F601 Zoom to deliver a 6 megapixel file. However, as a 6 megapixel file is more than twice the size of the original, Fujifilm is forced to apply a higher level of compression in order to fit the same number of images onto the memory card. Image quality is therefore no better than that of a typical 3.1 megapixel camera.

Full manual control is available, as you would expect given the cost. However, the Menu button is a real nuisance, as it is also used to operate the zoom. Fumbling between the two is tricky and, despite crowding the dashboard, these would have worked better as separate functions.

The photography mode has a

separate dial, but it's a bit fiddly.

The different modes on the rotary dial include auto photography, scene position, manual shots, movie and audio recording. When selected, these light up with a matching icon above the TFT – useful for night-time shooting. There are seven white balance settings, and the macro focus range is from 20cm. The focus options also allow switching between manual, auto and AF (area focus).

Exposure options come in four flavours: programmed auto exposure (AE), aperture-priority AE, shutter-priority AE and manual exposure, with aperture ranging from f2.8 to a decent f8 at full zoom. For increased sensitivity, the camera features ISO settings up to 1,600, surpassing the specs of its predecessors. The higher settings of 800/1,600 can only be taken at 1,280 x 960 pixels, but are good for sports enthusiasts after an action shot. Alternatively, the pop-up flash has five modes and is effective up to 15feet.

The 1.5in LCD screen provides clear, crisp vision. Scene position has five options – portrait, landscape, sports, night scene and 40-frame continuous shooting. The latter can be set for 5fps (frames per second) for up to four frames, with a maximum of 1.8fps for up to 40 frames, although the latter can only be achieved at 1,280 x 960 pixels.

Movie mode allows video footage in jpeg format with sound. With two different quality settings, the VGA offers

recording at 640 x 480 pixels at 15fps. twice the resolution of other cameras at this frame rate. You can also record at 320 x 240 pixels, allowing you to fit more onto the 16MB Smart Media card.

Audio recording via the microphone allows you to store 34 minutes onto the 16MB card, which is not really impressive. Also watch out for fingers accidentally blocking the poorly placed mic while recording. A voice memo option allows up to 30 seconds for each image.

The F601 works with a lithium-ion battery charged via the AC adaptor or through the picture cradle. Connecting to the PC via USB, the camera rests in the matching cradle and can send pictures to a PC. Bundled software includes Finepix Viewer, Video Impression and Adobe Photo Deluxe HE 4.0 for Windows.

The F601 has impressive specs for a slimline pocket number. But in aiming for such a design, ease of use has unfortunately been sacrificed.

Jananie Nadarajah

### DETAILS

**PRICE** £599.99 (£510.63 ex VAT)


**CONTACT** Fujifilm 020 7586 1477

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

**PROS** Impressive image quality in a compact package

**CONS** Audio recording not amazingly crisp

**OVERALL** The F601 combines functionality with style. Zooming options have room for improvement but good configuration options permit good-quality images. Before forking out the £600, it may be worth thinking about whether such a miniature camera with its vertical aspect is too small and fiddly to really get to grips with

**SCORE** 

### SPECS

Megapixel rating: 3.1 Super CCD • Max resolution: 2,832 x 2,128 • 3x max optical zoom • 4.4x max digital zoom • 36-108mm focal length (35mm equiv) • f2.8/4/5.6/8 aperture • 60cm/2ft to infinity focus range • 20-80cm/0.7ft-2.6ft macro focus range • Five flash modes • 1.5in LCD colour screen • ISO ratings up to 1,600 • 16MB Smart Media card • Dimensions 72 x 93 x 34mm • Weight: 220g



## DAB digital radio PCI card

Modular Technology's card offers crystal-clear sound and data services too

If the Government is to be believed, the future of radio is digital and your existing tuner will soon be about as much use as feathers on an space shuttle. So, while we wonder how much it's going to cost us to replace our existing kit, advocates are citing a number of benefits to Digital Audio Broadcasting (DAB), including crystal-clear sound with no fade or hiss, a greater choice of stations and, perhaps most importantly, data services.

It's not quite that simple, though. While stations may not fade, they do gobble like a turkey with the slightest interference and, although you can already receive some digital-only stations such as Core (pop) or Oneworld (speech), the technology could mean you end up with access to fewer stations than you're picking up now. As the networks slowly roll out, you can probably hear any services from neighbouring counties that are already up and running. When your local multiplex goes on line, though, you can wave them goodbye.

Stations are organised into one of seven multiplexes (or groups) on the 217.5 to 230MHz band. They are compressed using the internationally adopted Eureka-147 standard for digital radio, with sound quality requirements built into each station's licence. Stereo music services, for example, must encode to a minimum of 128Kbits/sec, matching the quality of your average MP3.

The core of this card is the same Radioscape chip that was inside the Psion Wavefinder, so it's perhaps no surprise that the software shares some common elements. That said, while the Wavefinder software scattered the available stations in a loose multiplex arrangement across a single pane, Modular's design displays each multiplex individually, so is far easier to navigate.

The data services are currently fairly rudimentary. Most stations broadcast SMS-like messages that scroll across the screen of a regular digital receiver. On the Modular Technology interface, these scroll below the station name as you hover your mouse above its icon. Doing this also brings up a signal-strength indicator and supplementary buttons for playing or recording the station's output.

Only the BBC is running a full data service so far. BBC Vision Radio delivers simple web pages, but the download through the aerial, is painfully slow, in spite of the fact that there are no images apart from simple headers. The technology has the capacity to transmit photos alongside the audio stream, but current receivers can do nothing with them so nobody bothers.

The electronic programme guide, meanwhile, facilitates timed recording. Like the data services, this is currently only being broadcast by the BBC National multiplex, but once

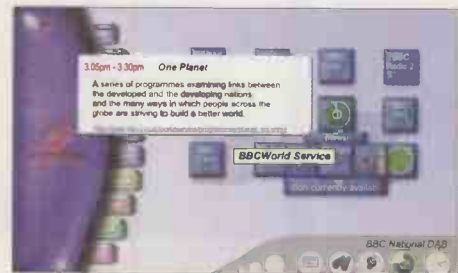
downloaded it brings the interface to life. Moving your pointer across a station icon calls up details of the current programme, while simultaneously producing a dedicated guide on its own page within the interface. Each entry is accompanied by relevant email and web addresses, along with a Record button which, when clicked, programs the software to record the relevant programme to your hard drive in either mpeg-2 or mpeg-3 format.

It's far easier than programming your video, and the simple interface allows you to set margins either side, automatically recording a set number of minutes of extra output on either end in case the station is running slightly off schedule.

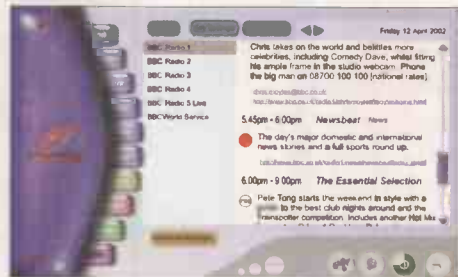
Digital radio certainly isn't quite up to scratch yet. For a start, the infrastructure is not yet in place for truly national coverage and, while it doesn't fade or hiss, the signal is far from perfect in many covered areas – even central London.

If you live in a region where you can receive digital radio, though, and want to see what all the hype is about, this card and software combo is the best way to do it. It's cheap, the software is built with real people in mind (not amateur radio enthusiasts) and the programme guide and data services make it far more versatile than a conventional tuner.

Nik Rawlinson



Moving your pointer across a station icon calls up details of the current programme



It's far easier than programming your video

### DETAILS

**PRICE** £99 (£84.26 ex VAT)

**CONTACT** Modular Technology  
01869 321 323

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

**PROS** Simple software; hardware more discrete than Psion Wavefinder

**CONS** The digital radio network is not yet national

**OVERALL** Far cheaper and more versatile than a conventional digital tuner, if you want to upgrade your home or office listening experience, this is the way to do it. Just make sure you have coverage first (check [www.ukdigitalradio.com](http://www.ukdigitalradio.com))

**SCORE** ■■■■■



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The Finepix 6900 Zoom is Fujifilm's latest high-end digital camera for the consumer market and uses a combination of Fujinon optics and a 3.3Megapixel Super CCD. Aesthetically interesting, it offers powerful manual control and thoughtful features, but with some design oversights to buy one. Full review

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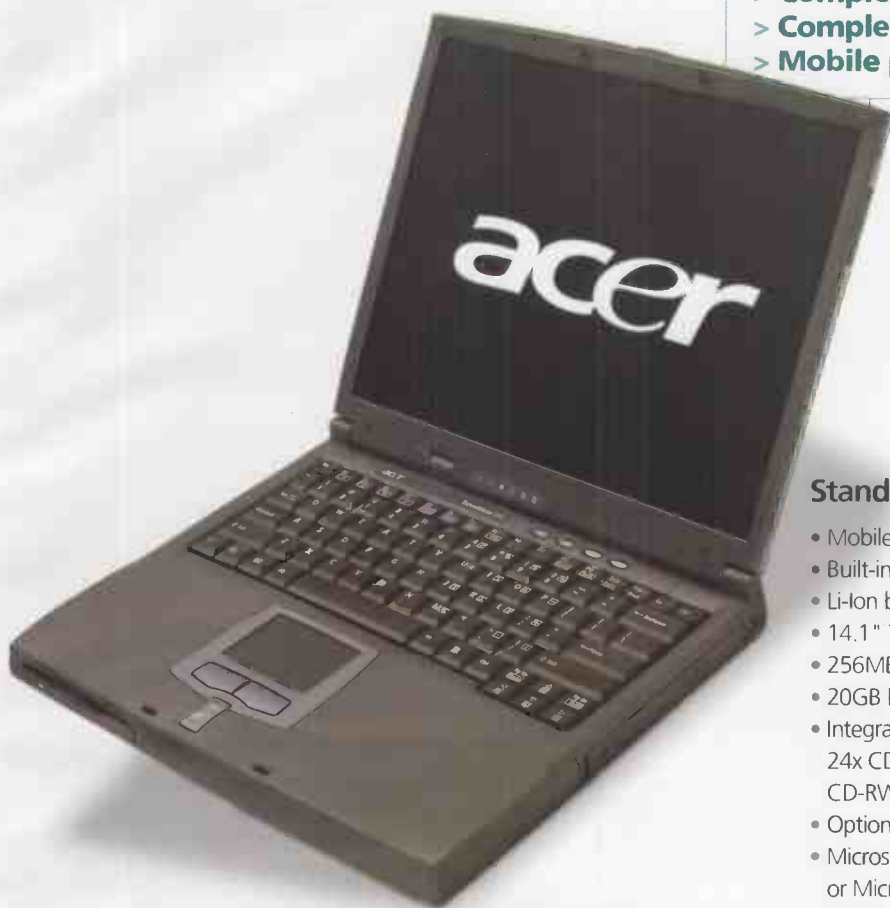


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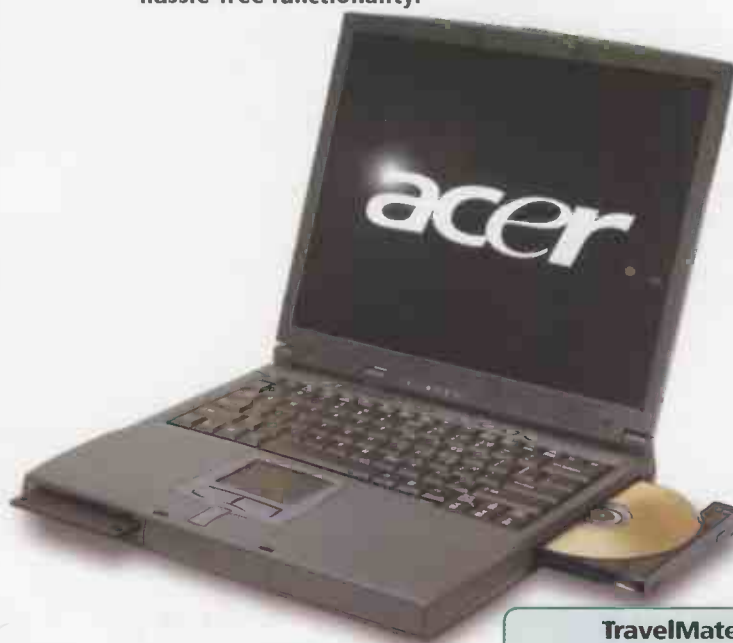
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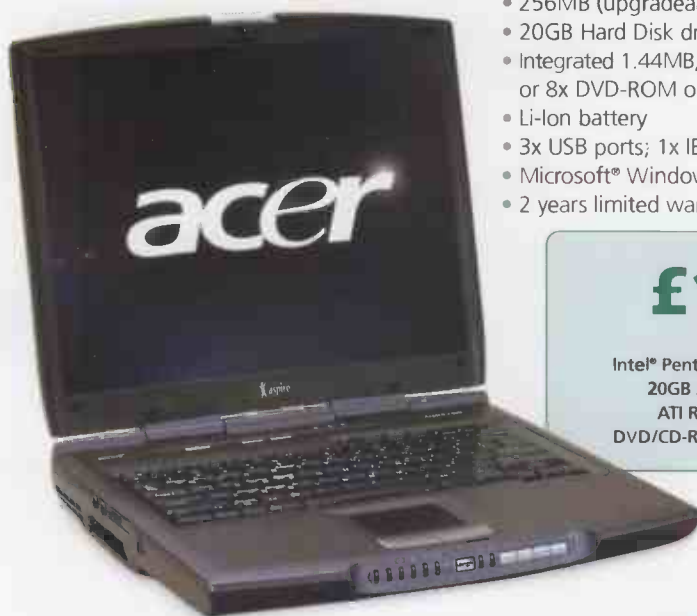
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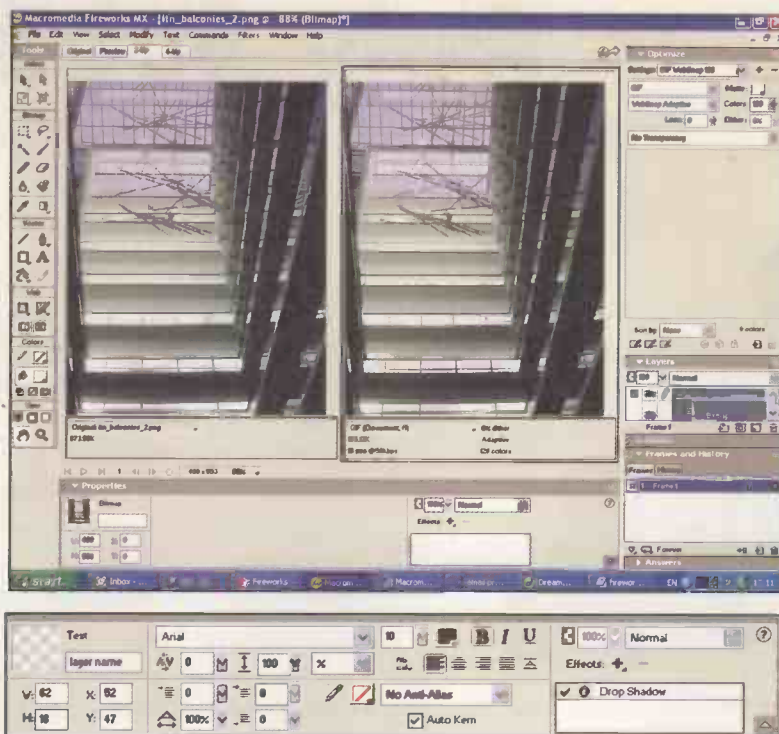
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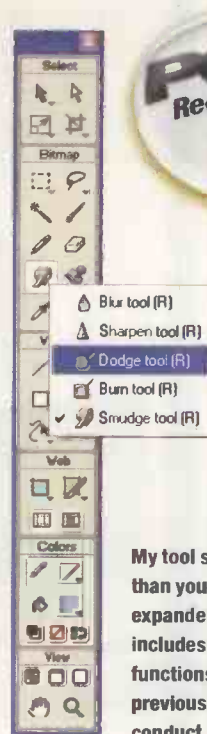
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Right: Fireworks MX's interface includes various expandable panels



Below right: The new Property Inspector puts all of an object's attributes in one place



My tool strip's bigger than yours. The expanded tool strip includes a range of functions you'd previously have to conduct in Photoshop

## Macromedia Fireworks MX

Manipulating photos for the web has become even easier with this upgrade

**W**e have a soft spot for Photoshop. Not only is it the best photo-editing software on the market, but it's also an essential weapon in the armoury of any serious web developer. Or at least it was, but now Fireworks MX from Macromedia is set to seriously dent its appeal to the semi-professional user. Photoshop will remain the tool of choice for print and high-end photo editing, but the recent growth in several key areas of Macromedia's image-optimisation tool makes you wonder how Photoshop will compete in the web arena.

First up, there's the MX interface consisting of expandable panels, including a Property Inspector (pictured above). A mass of common functions have been included in this context-sensitive strip, cutting down the time it takes to develop graphics for a site.

Take text editing, for instance, which in Fireworks 4 was a laborious process using the canvas and up to three palettes. MX's Property Inspector, though, puts every tool in the same place so you can edit text, change its attributes and position and apply effects from one palette. Text is also now edited on the canvas.

You also have the freedom to use obscure fonts, safe in the knowledge that an image of the text will be saved with your work and rendered on

systems without access to the font itself. Resizing the font-replacement image makes the text editable in a default font rather than rescaling it, which may or may not be a good thing — if you want to treat it as a vector graphic or imported image and resize it, you can't, but if you're simply proofing the document it allows you to make changes for reworking by the original developer. They will have to replace the original font, though, when they reload the document on the original machine.

The tool strip has grown (pictured above right), and its fly-out menus now include blur, burn, dodge, sharpen and smooth tools, giving you more than just level control over how images look. The paint bucket has been joined by a new gradients tool, but the menus for this are not as clear as in Photoshop.

The pop-up menu tool now provides a clearer interface and supplementary options. Menu items and related entries are stored in a directly editable table. Menus can be vertical or horizontal and you can specify the width.

We thought one tool was a bit too ambitious. The reconstitute table function should in theory be able to rebuild a page from an existing table-based layout if you lose the original files. In practice we had difficulties, as it refused to reconstitute pages from any of the sites we tried,

citing invalid HTML as the problem. Fortunately, it seems happy to rebuild pages produced in Dreamweaver MX.

We were impressed by the symbol and library functionality when compared to version 4. Hitting F8 saves your symbol to the library from which it can be duplicated as necessary, and each copy tweaked independently.

Like Dreamweaver, Fireworks is an extensible product, and with an installed base of over 1.3 million users there's a chance that if a function doesn't exist, someone will produce it — free. One of the best recent examples of this is shipped with Fireworks MX. This extension will read the data from an XML document, and combine it with a directory of images and a master document to produce new files. Each will contain the textual data from the XML document, an image drawn from the directory, and the effects applied to the master document inside Fireworks. It's an easy way to produce a banner campaign written entirely in Flash.

The added functionality, improved user interface and new photo-editing tools make this a serious threat to Photoshop. Macromedia's figures show that around 50 per cent of Dreamweaver customers also buy Fireworks. We wouldn't be surprised to see that climb with the release of Fireworks MX.

Nik Rawlinson



### DETAILS

**PRICE** £219 (£186.38 ex VAT); upgrade £109 (£92.77 ex VAT)  
**CONTACT** Macromedia  
01344 458 600

[www.macromedia.com/uk](http://www.macromedia.com/uk)

### SYSTEM REQUIREMENTS

300MHz or faster processor, Windows 98SE, ME, NT4 (service pack 6), 2000, XP, 64MB of free Ram (128MB recommended), 800 x 600 (256-colour) display, 80MB of available hard drive space

**PROS** Intuitive interface; improved menu builder; photo-editing tools

**CONS** Reconstitute table function is a little over-ambitious

**OVERALL** The new photo-editing tools and bargain upgrade price should tempt even Fireworks 4 users to put their hands in their pockets. If yours is a first-time purchase or you intend to make a few Javascript menus, then the proposition is even more compelling. Keenly priced for the semi- to fully professional web developer, this represents a major advance in an established and respected product line

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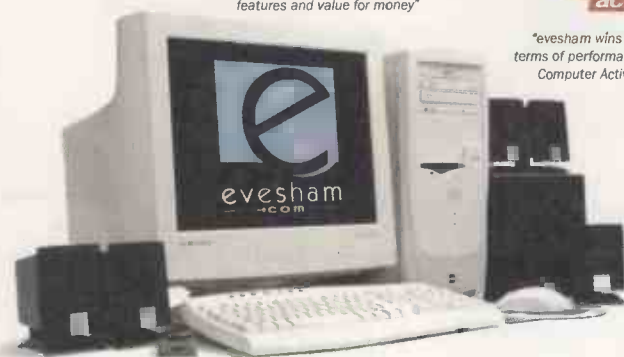
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- CD-RW drive (32x10x40) with Justlink BURN proof technology
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# No. 1 Power PC

At the top of PC Advisor's Power PC chart for the second month running, it's hard to fault the awe-inspiring Axis 2100+GF4. Now featuring a free upgrade to AMD's fastest ever Athlon XP 2100+ processor, this well-priced PC in the words of PC Advisor is "close to being the perfect Power PC."



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- **AMD Athlon XP 2100+ (1.73GHz) Processor**
- Asus A7V333 motherboard with Via KT333 chipset and USB 2.0
- 512MB DDR RAM (PC2100) (2x256MB)
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As pictured with  
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- Midi-tower case (420x198x465)

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- 128MB nVIDIA GeForce4 Ti4600 Ultra graphics with TV-out & DVI
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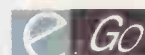
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from: 17" evesham EZ Flat	£54 (£63.45)	£91 (£106.93)	£144 (£175.08)	£210 (£246.75)	£206 (£242.05)	£408 (£479.40)	£657 (£771.98)
from: 17" LG Flatron 795FT		£38 (£44.65)	£90 (£105.75)	£158 (£185.65)	£152 (£178.60)	£355 (£417.13)	£603 (£708.53)
from: 19" Samsung SM957 DF			£53 (£62.28)	£121 (£142.18)	£115 (£135.13)	£318 (£373.65)	£566 (£665.05)
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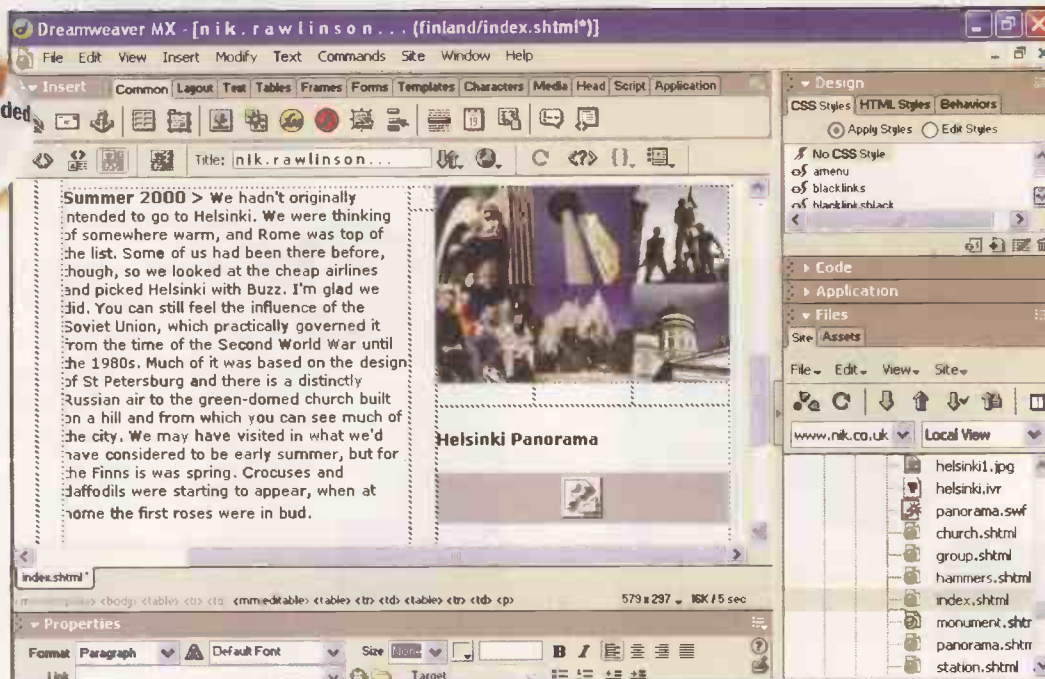
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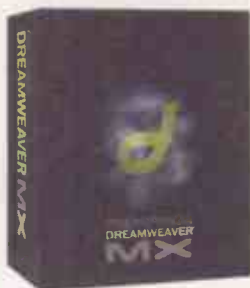
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Perhaps unfamiliar at first, you'll soon be working faster than ever with the new Dreamweaver



## Macromedia Dreamweaver MX

Power and ease of use combine to make this web design tool a market leader

**H**appy birthday! Dreamweaver is five years old. In software years, that makes it middle aged. But Dreamweaver is far from going through a mid-life crisis, it has been reborn; fitter, faster and much, much stronger. Users of Dreamweaver 4, the web design tool that has captured 87 per cent of the North American market for professional web development, will hardly believe that possible, but we speak the truth.

You'll probably be as surprised as we were to discover that the most common Dreamweaver-related tech-support query relates to the site definition dialogue box. This is the screen used to define how and where your files are saved and uploaded. It seems only logical, then, that

Dreamweaver MX now features a site wizard, particularly as this release includes the full functionality of the previously separate Ultradev. This is no longer simply a page layout tool; it is also an online application builder, with support for PHP, ASP, ASP.Net and Web Services, JSP and, of course, Coldfusion.

Now for the technical bits. Although there is no assumption that you already know what any of these technologies are, the standalone developer should be prepared to perform some server-type tweaking on their PC. There is no bundled web server so if you are running Windows ME or XP Home you'll have to go out and download one, while Windows 98, 2000 and XP Professional users can opt for IIS or PWS. Likewise, depending on

your technology of choice you may find yourself hunting down PHP, MySQL or Jrun. It is a shame Macromedia didn't include these as part of the default install, but then you could argue that with PHP and MySQL being open source it would have ended up shipping outdated code sooner rather than later.

We were also disappointed that there is still no easier way to define which files should be transferred to the remote server in Ascii mode than to manually edit a configuration file. However, as you'll probably only ever need to add one or two extensions to the already impressive default list, it's not too great a chore.

The 'new file' dialogue box has been expanded to include a templates

### DETAILS

**PRICE** £299 (£254.47 ex VAT); upgrade £149 (£126.81 ex VAT)

**CONTACT** Macromedia

[www.macromedia.com/uk](http://www.macromedia.com/uk)

#### SYSTEM REQUIREMENTS

300MHz or faster processor, Windows 98, 2000, NT, ME, XP, Netscape Navigator 4 and above or Internet Explorer 4 and above, 96MB of Ram (128MB recommended), 275MB of free hard drive space, 256-colour monitor capable of 800 x 600 (1,024 x 768 recommended)

**PROS** Easy database manipulation; powerful interface

**CONS** Not all functions (for example some template features) are backwards compatible

**OVERALL** Adobe was closing in on Macromedia in terms of functionality and ease of use with the launch of Go Live 6, but Dreamweaver MX sees Macromedia streaking ahead once again. Power, ease of use and speed finally come together at the bargain price of £299

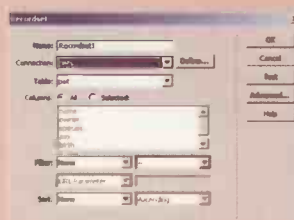
**SCORE**

### SEVEN STEPS TO A DATABASE-DRIVEN WEBSITE USING MYSQL AND PHP

**1** Connect to the database by opening a new page, clicking the bindings tab and completing the dialogue box.



**2** Select the database in the connection box, and the relevant table, then click OK.



**3** Click the dynamic table button to define the area that will display the database contents.



page, which draws together the templates from every defined site, making it easier to base a new site or page on existing work.

### Nested templates

Of even greater benefit, though, is a brand new feature, nested templates. Macromedia has recognised that while many sites have a unified skin, some subsections would benefit from slight differentiation – for example, a unique menu. Nested templates allow you to lay out an overall design that permeates the whole site, while containing further sub-templates. Redesigning one of these sub-templates will only change those pages that specifically make use of it, while amending the site-wide template will affect every page in the site.

'Optional' regions take this flexibility to a third level. Anything set as an optional region within a template will be displayed by default on all dependent pages. It can, however, be simply switched off on an individual page. The most common use for this would be in a templated menu bar, where you might want to make the link to the current page 'disappear' to maximise screen space and avoid confusion.

Optional regions and nesting reduce the number of templates you'll need to produce when developing large sites, and will likely prove a godsend for developers of small sites with hosting packages that don't offer SSI (server side includes). It's not an efficient replacement – it will, after all, mean uploading every affected page – but it is the only viable alternative if you want to avoid considerable manual recoding.

Sadly, Macromedia has rewritten the template engine to make these functions possible and, as a result, editable regions within Dreamweaver MX templates are not recognised by Dreamweaver 4. Nor is there any way to

export version 4-compliant versions of an MX template, which could be a problem for an organisation considering a staggered switch from 4 to MX.

It is in designing templates that you come to appreciate the speed and flexibility afforded through the integration of the MX interface. MX is more than just Dreamweaver, it is a Macromedia strategy, one part of which is a flexible, customisable interface. This includes Dreamweaver's Insert toolstrip, which is organised into context-sensitive tabbed pages; developing with PHP, for example, adds a PHP tab featuring the relevant tools.

The template tab of this toolstrip gives you one-click operations for defining editable regions, optional regions and nested-template placement. Previously you had to trawl through a series of menus, and even then achieve only half as much as you can here.

By reducing the amount of code used to define a table, Dreamweaver MX considerably reduces the size and complexity of a page. It now specifies cell widths only on top-row cells, and heights only in the first column rather than on every <tr> and <td> tag. Not only will this make your pages download slightly quicker, it also makes rewriting the page in code rather than design-view far easier.

### Help for first-timers

Code hinting may finally tempt first-time coders to join the majority of Dreamweaver developers who at some point dump the mouse and hit the keyboard. The Dreamweaver MX code-editing view has fully context-sensitive Word-like autocomplete functions. Type '<a h', for example, and it will suggest that you mean '<a href'. Expand this to '<a href="index.htm" class=' and it will display a list of styles drawn from the style sheet attached to or defined within the current page.

Right-clicking on a link gives access to the tag editor, a dialogue of entry boxes for defining attributes relevant to the tag. Each is accompanied by an icon to indicate the browsers with which it is compatible, and is linked to Dreamweaver's integrated reference works, to save you switching between the dialogue and reference panel.

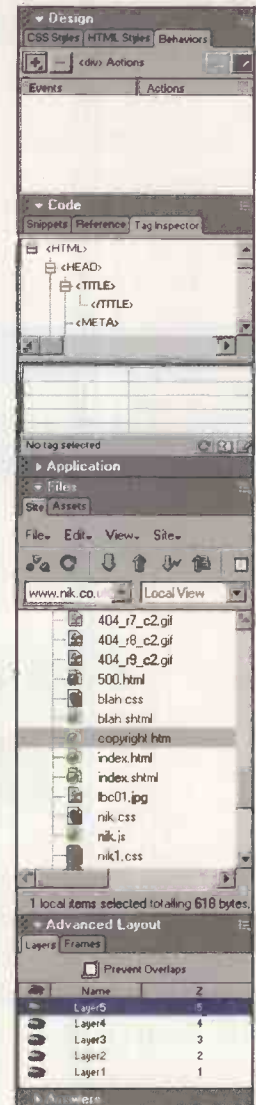
However they were developed, your pages will benefit from a reworking with Dreamweaver MX, but its real power is in developing dynamic sites.

We used PHP and MySQL, running IIS under Windows 2000 Professional, to produce a web-based contacts database. Connecting to the database, which need be no more than an empty table at this stage, is a simple matter of binding it to the page. Once bound, a range of application-specific tools practically negate any requirement to understand SQL commands. Single-click operations add navigation elements for moving forwards and backwards through records, or jumping to the beginning or end of the results list.

Anyone with a rudimentary understanding of visual page design should be able to pass attributes from one page to another. Once you have defined a standard form, the form action can be pointed at your results page, which in turn will pick up the content of the input field for use as a search term, pulling all matching results out of the database. Our step-by-step guide (below) shows how quickly a database-driven site can be established.

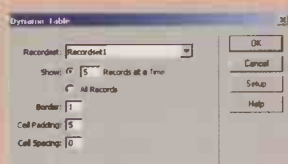
With equivalent functionality for the most common web development platforms, professional developers should be worried. When the general public discovers how easy it is to build database-driven sites with an application that costs about the same as four hours of a developer's time, they could be out of a job.

Nik Rawlinson

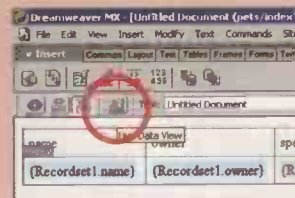


The MX Interface maximises screen use with collapsible panels

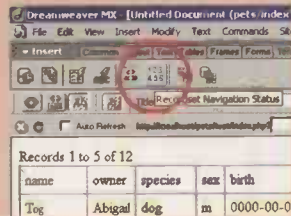
**4** The dynamic table dialogue appears. All you need do is tell it how many records you would like to display at a time.



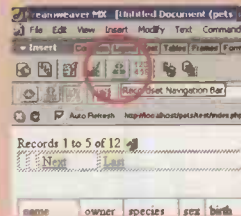
**5** Now that the table is on your page, click the Live Data View button to populate it using your database.



**6** Click Recordset Navigation Status to add a line indicating the record numbers on view.



**7** Add control buttons by clicking Recordset Navigation Bar and the necessary links will appear.





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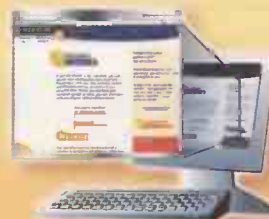


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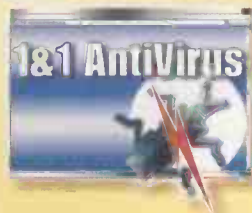
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Vertical Sync: 58 to 75 Hz  
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Regulations: TCO 99  
Multimedia: YES  
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## Powerquest Drive Image 2002

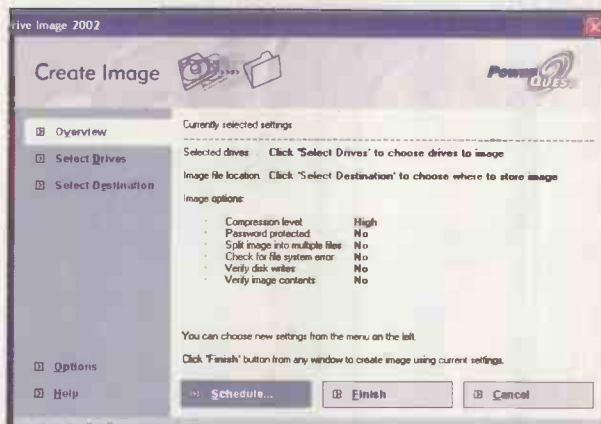
Backing up your hard drive couldn't be easier

**P**rotecting your data has become easier with the new release of Powerquest's Drive Image 2002. This adds features from the company's hard drive partitioning software, Partition Magic, and comes with an updated look and feel.

Drive Image makes an image of your data or hard drive for recovery or backup purposes. This release enables you to work within Windows until you hit the button to do the desired tasks, then the PC reboots into Dos and gets on with the job.

The main new feature strikes you as soon as you open the application. A wizard invites you to make an initial backup of your PC. This wizard checks your drive, then checks for a destination partition for the image you are about to create. Ordinarily you would use Partition Magic to create this partition, unless you had the foresight to do it when you installed Windows.

Drive Image 2002, however, includes some Partition Magic features and will



Drive Image 2002's wizard does all the work for you

create a partition for images that is hidden by default. It can also reallocate free space and delete a backup partition. If you want to convert or resize a partition you will still need Partition Magic, but many users will find that Drive Image has all they require.

The other new features are less exciting for home users. Lan support has been added, to allow image creation and restoration across a network. You also get limited imaging within Windows,

without booting to Dos. This does not include the Windows or System partition, so you'll require a minimum of three partitions (Windows, data and backup) to make use of this feature.

Drive Image 2002 is well worth while if you do not own any other Powerquest software. However, it's less essential if you currently use Partition Magic and Drive Image as individual packages and are looking to upgrade.

Leo Waldoock

### DETAILS

**PRICE** £39.95 (£34 ex VAT)

**CONTACT** Powerquest  
0118 945 0200

www.powerquest.com

### SYSTEM REQUIREMENTS

Pentium-compatible processor,  
20MB of hard drive space, Windows  
9x, ME, NT4, 2000, XP

**PROS** An excellent Windows  
interface and you get some Partition  
Magic tools included

**CONS** Very few new features for  
the home user

**OVERALL** While there's no real  
reason to upgrade, some interesting  
new features make this software  
very good value

**SCORE** ■■■■■

## Pure Motion Edit Studio 3

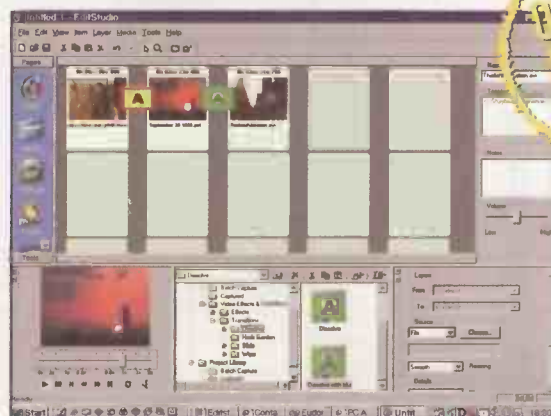
A reasonably priced video-editing package

**V**ideo-editing software has helped to reduce some of the panic induced when you're invited to watch a friend's holiday video. Even the most cack-handed videographers can now easily tart up their holiday footage into something vaguely entertaining. Edit Studio is aimed at the amateur and offers many professional features at an entry-level price.

Getting video clips into Edit Studio is straightforward as the software can capture from both analogue and DV devices. It even has a scene detection mode to automatically break up footage into manageable chunks for editing.

The main addition to version 3 is the storyboard edit mode. You can quickly and easily create a movie by dragging and dropping clips into separate boxes on the storyboard grid and then selecting a transition effect for each edit. If you've got a short attention span this is all the editing you'll need to do.

However, if you're more ambitious you'll want to delve into the timeline edit



Editing in  
storyboard  
mode is  
very easy

mode. This takes a more traditional approach with the video clips laid out in horizontal strips across the screen. You can also stack an unlimited number of layers on top of each other containing media such as video effects, still images and soundtracks and raw video clips.

Unfortunately, the storyboard mode's ease of use hasn't been carried over into timeline editing. Some basic functions are overly complicated. For example, creating transition effects is a real chore and, because the end result effectively becomes a self-contained

video clip, it's not always easy to differentiate between the original footage and the transition clip.

Another downside is cost; a boxed copy is £30 more expensive than Ulead's Video Studio 6 and, while this has more editing features, you have to shell out an extra £20 to purchase the mpeg XS plug-in to export finished footage in a format suitable for Video CDs or DVDs. Even with the mpeg plug-in you can't burn VCDs or DVDs directly from within the package.

Niall Magennis

### DETAILS

**PRICE** £59 (£50.21 ex VAT) for  
download, £79 (£67.23 ex VAT) boxed

**CONTACT** Pure Motion  
07092 265 529 (premium rate)  
www.puremotion.com

### SYSTEM REQUIREMENTS

Windows 98 SE and later, 350MHz PII,  
64MB of Ram, 4GB of hard disk  
space, analogue or DV capture device

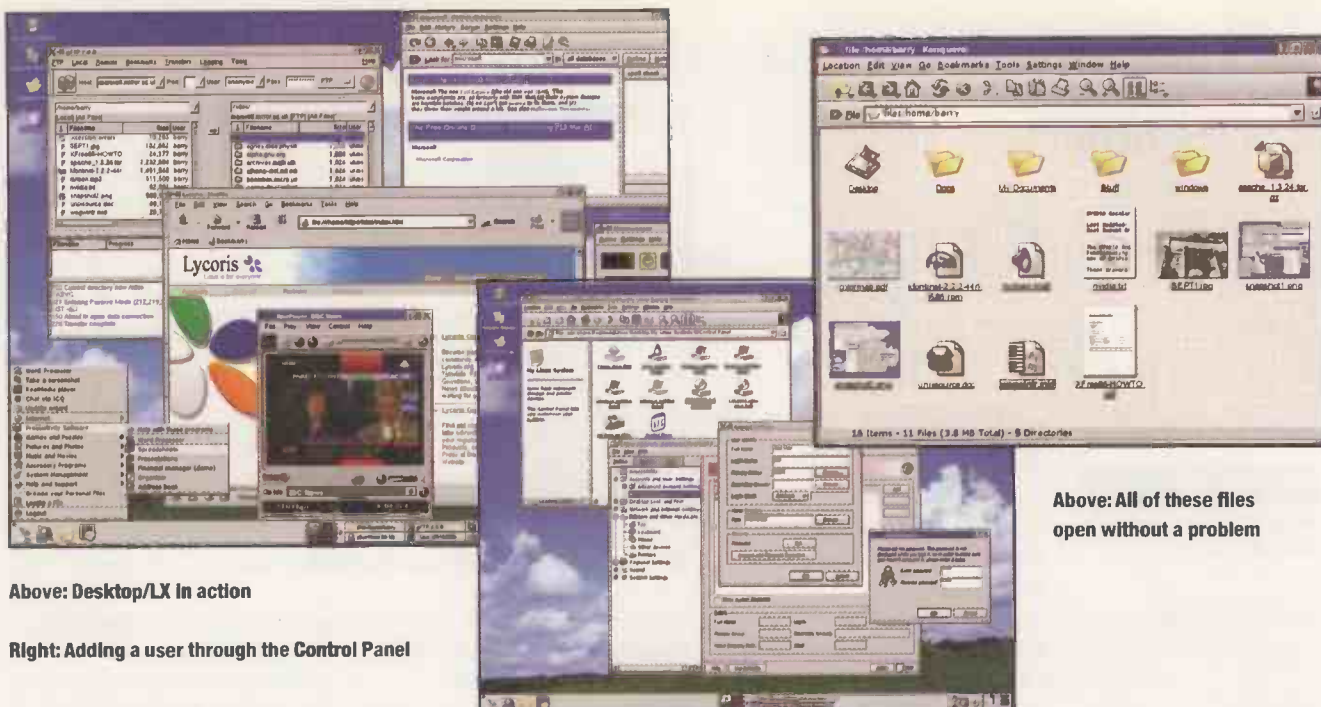
**PROS** Storyboard mode; features  
mpeg-2 export support; timeline  
editing can be awkward

**CONS** Need mpeg-Xs plug-in for  
mpeg-2 export support; timeline  
editing can be awkward

**OVERALL** Edit Studio 3 has a  
wealth of features and an excellent  
storyboard edit mode. However, it is  
more expensive than many rivals and  
the timeline editing can be awkward

**SCORE** ■■■■■





Above: Desktop/LX in action

Right: Adding a user through the Control Panel

Above: All of these files open without a problem

## Lycoris Desktop/LX

If you want to use Linux but want the look and feel of Windows, take a look at this

**W**inning over the home desktop market is something many Linux distributors are aiming to do and usability is one way of achieving this. Following this line of thinking, Redmond, Washington-based Lycoris has launched Desktop/LX.

This provides a look and feel familiar to Windows users, and the screenshots above show a similarity to XP, but that is where the similarity ends. Desktop/LX is still a Linux system based on the KDE desktop, with a collection of some of the most popular KDE applications. The first version, Amethyst, has received praise from the Linux community for its easy installation and configuration. It is due a new release, Update 2, and we review the release candidate here.

Desktop/LX is based on Caldera's Open Linux and uses a modified version of the 'Lizard' installation program: Lyzard. The first surprise is how easy and fast the installation is, taking around 15 minutes.

Lyzard successfully detected and configured all of the installation PC's components: the wheel mouse, Soundblaster Live card, CD-RW, Ethernet card and modem, and even the USB-connected HP 950C printer. Our Nvidia Geforce3 Ti200 and monitor were identified and resolutions were listed and could be tested. This way the graphical setup is confirmed and working before

the hard disk is touched. Many technical questions are also avoided. For example, Linux distributions usually ask for the keyboard type to be set with lines such as 'generic 104-key keyboard'. Desktop/LX instead uses the 'standard keyboard with Windows keys'.

The disk configuration section is a concern when you're installing onto a system with an existing Windows installation. Desktop/LX makes this as easy as a dual-booting Windows-only system. Like most distributions, it will detect existing Linux partitions and use those, or allow you to create new partitions in free space. Unusually, the choice of filesystem is taken away, and the standard journaled ext3 filesystem is automatically used instead.

After configuration on network, printer and timezone settings, the bootloader is installed – automatically detecting Windows. The KDE login screen then appears. Hardware is configured, with the drivers working, the operating system installed and running, all without a single reboot.

Desktop/LX doesn't offer any choice of installed applications. An impressive number are available, though, including Mozilla (web browsing), Koffice (office suite) and Xmms (media player). These are laid out in the menus and work as expected; a point overlooked by many Linux distributors.

Lycoris has provided the KDE filemanager, Konqueror. Clicking on a text file launches a text editor, and other common 'Mime' types, including MP3s, MPGs and images, launch their applications. Also provided is a 'Network Neighbourhood' style browser for Windows shares.

Every option to make KDE more attractive is switched on by default. Many files are previewed in the file browser; menus fade in, and animations use up any spare processor cycles. All of these can be switched off through the Control Panel. The KDE Control Panel has been modified substantially, making many administrative tasks, such as adding a user or setting up a remote Windows printer, logical and straightforward.

As this system is aimed at the desktop user, many utilities found on other distributions are not present. Compatibility with Microsoft Office is relatively good, and Koffice's word processor and spreadsheet will open simple Word and Excel documents and display them adequately. If Microsoft Office compatibility is paramount, though, you should look towards Sun Microsystems' Star Office, which claims 100 per cent compatibility.

Barry Shilliday

### DETAILS

**PRICE** \$29.95 (\$25.49 ex VAT) (approx £20) for official standard version (includes 60 days' email support), free downloadable version

**CONTACT** [www.lycoris.com](http://www.lycoris.com)  
[www.linuxfactory.ie](http://www.linuxfactory.ie)

### SYSTEM REQUIREMENTS

**Required:** Pentium processor, 64MB of Ram, 1GB of hard disk space

**Recommended:** 300MHz Pentium II, 128MB of Ram

**PROS** User friendly; easy to install

**CONS** Comparatively few applications; still a very young distribution

**OVERALL** Desktop/LX gives you cutting-edge applications with some unique features, and is great if you're new to Linux. A lot of time has been spent making the system as user-friendly as possible, but experienced Unix users will notice the missing common utilities

**SCORE** 



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530804	Pentium <sup>®</sup> 4 1.7GHz	£164.99	£140.42
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519003	Maxtor 40Gb	£66.99	£59.57
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PART CODE		Memory prices subject to change to reflect market price movements - check in-store, on-line or by phone for our latest prices
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354734	256Mb PC100	
354742	64Mb PC133	
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PART CODE		INC. VAT	EX. VAT
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539017	SCSI III Single Cable*	£24.99	£21.27
539025	IDE Fast Cable*	£14.99	£12.76
539068	Round IDE Cable*	£14.99	£12.76
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539466	Internal Sound Cable*	£5.99	£5.10
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539146	3 Way Ratchet Set*	£7.99	£6.80
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539170	Heatsink Compound*	£3.49	£2.97
539208	Premium Compound*	£5.99	£5.10
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541653	Asst Screw Pack*	£7.99	£6.80

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### Mesh **Matrix XP1800+SB**

**REVIEW** July 2002, p52 **PRICE** £821.83  
(£699 ex VAT) **CONTACT** Mesh 020 8208 4744  
[www.meshcomputers.com](http://www.meshcomputers.com)

**new**



One of the best value systems we have seen in months, the Matrix 1800+ is powered by AMD's super-fast Athlon XP 1800+ and, with 256MB of PC2100 DDR SD-Ram, it's up there with the best of them in terms of performance.

Graphics are excellent too, coming from a Geforce4 MX 440. There's plenty of room inside for expansion and it comes with a 17in NEC monitor.

**ENTRY-LEVEL PC**

### Hi-Grade **Ultis P4 C17 PW07**

**REVIEW** July 2002, p46 **PRICE** £938.83  
(£799 ex VAT) **CONTACT** Hi-Grade 020 8532 6111  
[www.higrade.com](http://www.higrade.com)

**new**



Although it suffers from the curse of onboard sound, this P4-based 1.7GHz Celeron system is a cut above the rest. With decent benchmark scores and an upgraded architecture, the Celeron is the best budget processor money can buy.

ATI's Radeon 8500LE chip is an ideal option at this price point, as is LG's excellent 775FT monitor. The new Hi-Grade case is a feature-packed delight too.

**MID-RANGE PC**

### Task IT **Predator 2.4**

**REVIEW** July 2002, p51 **PRICE** £1,761.33  
(£1,499 ex VAT) **CONTACT** Task IT 01442 233 573  
[www.task-it.co.uk](http://www.task-it.co.uk)

**new**



This system may not be cheap, but it packs a tremendous punch. Inside is a 2.4GHz P4 processor, featuring the all-new 533MHz front-side bus, and a Geforce4 TI 4400 graphics card. Also included is a 60GB hard drive and a superb 19in LG CRT screen, as well as Windows XP Home and Lotus SmartSuite. If you can afford the Predator 2.4, you'll have one of the fastest machines on the market.

**HIGH-END PC**

### Sony **PCG-GRX316MP**

**REVIEW** July 2002, p47 **PRICE** £2,002  
(£1,704 ex VAT) **CONTACT** Sony 08705 424 424  
[www.vaio.sony-europe.com](http://www.vaio.sony-europe.com)

**new**



This notebook is both feature-packed and stylish. Its whopping 16in UXGA screen could easily make you forget the fact that there's a 1.6GHz Mobile P4 processor inside this large yet slender desktop replacement. While excellent performance is always a bonus, what really impressed us here was the battery life; well over two hours far outdoes the Mobile P4 competition.

**FULLY FEATURED NOTEBOOK**

### Sony **Valo PCG-SRX41P**

**REVIEW** June 2002, p41 **PRICE** £1,849  
(£1,573.61 ex VAT) **CONTACT** Sony 0870 240 2408  
[www.vaio.sony-europe.com](http://www.vaio.sony-europe.com)



Sony notebooks have always been commended for their style, and this latest ultra-portable is no exception. Literally the best compact notebook we've seen, it maintains many of the Vaio design features that have made the range so successful, and includes both wireless and Bluetooth technologies. The icing on the cake is the battery life – a stunning three hours and 34 minutes.

**ULTRA-PORTABLE NOTEBOOK**

### Toshiba **Satellite 3000**

**REVIEW** July 2002, p108 **PRICE** £999  
(£850 ex VAT) **CONTACT** Toshiba 01932 828 828  
[www.toshiba.co.uk](http://www.toshiba.co.uk)

**new**



Seldom do budget notebooks come as fully featured as this at a cost of less than £1,000. Performance is surprisingly good considering its meagre asking price, and battery life is up there with the best of them. The Satellite is also the only notebook in its class capable of completing our graphics tests. While there are areas where costs have been cut, such as the lack of ports at the rear, the rest is near perfect.

**BUDGET NOTEBOOK**



# BEST BUYS YOUR GUIDE TO TODAY'S TOP PRODUCTS

## Sony Clie PCEG-T625

**REVIEW** June 2002, p42 **PRICE** £329  
(£280 ex VAT) **CONTACT** Sony 0990 111 999  
[www.sony.com](http://www.sony.com)



Stylish and functional, this latest Clie is more than just a pretty face. While its use of Palm OS means it has fewer features than its Pocket PC-based rivals, its build quality is exceptional.

**POCKET PC**

## Philips Webcam Pro 3D

**REVIEW** March 2002, p139 **PRICE** £76.99  
(£65.52 ex VAT) **CONTACT** Philips 0800 169 8430  
[www.philips.co.uk](http://www.philips.co.uk)



This is a brilliant webcam that can be used for high-res still snaps or 60fps video at 640 x 480. It is even capable of text recognition with the help of Xerox's Pagecam technology.

**WEBCAM**

## Hewlett-Packard PSC 950

**REVIEW** June 2002, p56 **PRICE** £299  
(£254.47 ex VAT) **CONTACT** HP 08705 474 747  
[www.hp.com](http://www.hp.com)



The PSC 950 may be more expensive than some, but it squeezes ahead of the competition with superb-quality printing and scanning, and the added bonus of three memory card slots.

**MULTI-FUNCTION DEVICE**

## Canon D1250U2

**REVIEW** April 2002, p75 **PRICE** £119  
(£101.28 ex VAT) **CONTACT** Canon 0121 680 8062  
[www.canon.co.uk](http://www.canon.co.uk)



This first USB2 scanner is also one of the best. Lightning fast and excellent quality, and with plenty of extra features as standard, the only thing that could turn you off is the price.

**SCANNER**

## Minolta Pagepro 1100L

**REVIEW** May 2002, p122 **PRICE** £131  
(£111.49 ex VAT) **CONTACT** Minolta 01784 442 255  
[www.minolta-qms.co.uk](http://www.minolta-qms.co.uk)



The Pagepro 1100L may not be pretty, or the best quality, but at the asking price, what you get is truly astounding. Easy to use and compact, this is the best value laser printer on the market.

**BUDGET LASER PRINTER**

## Epson Stylus Photo 895

**REVIEW** November 2001, p216 **PRICE** £155.99  
(£132.76 ex VAT) **CONTACT** Jungle 0870 727 1771  
[www.jungle.com](http://www.jungle.com)



Featuring a PC Card slot, an attachment for 100 x 8m rolls of photo paper, a top resolution of 2,880 x 720dpi and PIM technology, this is a versatile printer at an excellent price.

**BUDGET INKJET PRINTER**

## Creative Inspire 5300

**REVIEW** April 2002, p132 **PRICE** £88.71  
(£75.50 ex VAT) **CONTACT** Creative 0800 973 069  
[www.europe.creative.com](http://www.europe.creative.com)



A decent set of 5.1 speakers boasting excellent sound quality at a reasonable price. They're a bit basic and lack a separate decoder, but if you own a 5.1 sound card these are ideal speakers.

**LOW-END SPEAKERS**

## Acoustic Energy Aego2

**REVIEW** April 2002, p138 **PRICE** £299.95  
(£255.28 ex VAT) **CONTACT** Acoustic Energy  
[www.aegoproject.com](http://www.aegoproject.com)



Dressed in stylish plastic, the Aego2s are the best looking 2.1 speakers we've seen. Sound quality is almost infallible too, but a setup of this quality comes with a hefty price tag.

**HIGH-END SPEAKERS**

## Creative Audigy Platinum EX

**REVIEW** December 2001, p95 **PRICE** £157.45  
(£134 ex VAT) **CONTACT** Watford 0870 220 0700  
[www.europe.creative.com](http://www.europe.creative.com)



Aimed at musicians, gamers and DVD fans the Audigy has 24bit, 96KHz-capable Dacs and handles audio streams in 16bit at 48KHz. Software connects two PCs via Firewire.

**SOUND CARD**

## Ericsson T68

**REVIEW** April 2002, p66 **PRICE** £149.99  
(£127.65 ex VAT) **CONTACT** Ericsson 0990 237 237  
[www.sonyericssonmobile.com/uk](http://www.sonyericssonmobile.com/uk)



One of the first colour mobile phones that comes in an incredibly compact size. It's loaded with all the latest features such as GPRS, HSCD, Bluetooth and Tri-band, making it an excellent mobile phone.

**MOBILE PHONE**

## IBM Deskstar 120GXP

**REVIEW** April 2002, p69 **PRICE** £238.52  
(£203 ex VAT) **CONTACT** Dabs 0870 429 3120  
[www.dabs.com](http://www.dabs.com)



The performance of the new range of Deskstar drives from IBM surpasses every EIDE drive we've previously seen. If you're after a large and fast hard drive, which makes very little noise, then look no further.

**EIDE HARD DRIVE**

## Fujitsu MAN3735MP

**REVIEW** February 2002, p152 **PRICE** £602.77  
(£513 ex VAT) **CONTACT** Fujitsu 020 88573 4444  
[www.fujitsu-europe.com](http://www.fujitsu-europe.com)

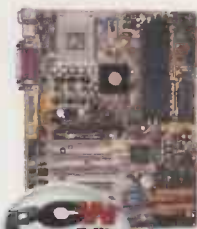


One of the fastest SCSI hard drives on the market that offers 73.5GB of storage space and a spindle speed of 10,000rpm. An excellent choice for high-end workstations and servers, but it comes at a cost.

**SCSI HARD DRIVE**

## Abit KG7-Raid

**REVIEW** December 2001, p190 **PRICE** £113.98  
(£97 ex VAT) **CONTACT** Dabs 0870 429 3120  
[www.dabs.com](http://www.dabs.com)

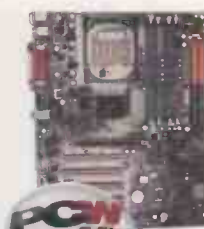


**SOCKET A MOTHERBOARD**

One of the first DDR boards to support four memory slots. It is based on the AMD 761 northbridge and the Via 686B southbridge and contains six PCI slots. The ultimate AMD board for enthusiasts.

## Abit TH7II-Raid

**REVIEW** December 2001, p180 **PRICE** £164.50  
(£140 ex VAT) **CONTACT** Dabs 0870 429 3120  
[www.dabs.com](http://www.dabs.com)



**P4 MOTHERBOARD**

With an Intel 850 chipset and RD-Ram support, this is a fast board. The micro-LEDs, onboard alphanumeric LCD for diagnostics and micro-buttons for power and reset make configuration easy.

## Samsung SM151B

**REVIEW** February 2002, p69 **PRICE** £370.12  
(£315 ex VAT) **CONTACT** Samsung 0800 521 652  
[www.samsungelectronics.co.uk](http://www.samsungelectronics.co.uk)



This high-quality 15in flat panel features integrated speakers and comes with pivot software as standard. Boasting excellent image and text quality, the SM151B is well worth its price.

## NEC-Mitsubishi Diamond Pro 740SB

**REVIEW** April 2002, p56 **PRICE** £210.32 (£179 ex VAT)  
**CONTACT** NEC-Mitsubishi 08701 201 160  
[www.nec-mitsubishi.com](http://www.nec-mitsubishi.com)



An attractively priced 17in Diamondtron monitor featuring Superbright, which improves the brightness during game play and DVD playback without decreasing the image quality.

**17IN MONITOR**

## Iiyama Vision Master Pro 453

**REVIEW** October 2001, p167 **PRICE** £440.63  
(£375 ex VAT) **CONTACT** Iiyama 01438 314 417  
[www.iiyama.co.uk](http://www.iiyama.co.uk)



The first CRT in the UK to feature a DVI connection, the Vision Master Pro 453 offers excellent colour purity. It also boasts a four-port USB hub, speakers and has a grey finish.

**19IN MONITOR**

## Mitsubishi Diamond Pro 2060U

**REVIEW** October 2001, p80 **PRICE** £652.12 (£555 ex VAT)  
**CONTACT** Mitsubishi 08701 201 160  
[www.mitsubishi-monitors.com](http://www.mitsubishi-monitors.com)



Fitted with two standard D-Sub connectors and three downstream USB ports, this 21in monitor is capable of running a resolution of 2,048 x 1,536, though 1,600 x 1,200 is best.

**21IN MONITOR**

## Sony DCR-PC110E

**REVIEW** June 2001, p107 **PRICE** £1,126.82  
(£959 ex VAT) **CONTACT** Sony 0990 111 999  
[www.sony.co.uk](http://www.sony.co.uk)



The DCR-PC110E is a small, solid camera, with a 4MB Memory Stick and a top resolution of 1,152 x 864. A dual-function button enables you to switch between manual and auto-focus mode.

**DIGITAL VIDEO CAMERA**

## MSI G4MX440-T

**REVIEW** April 2002, p60 **PRICE** £92.82  
(£79 ex VAT) **CONTACT** Scan 0870 755 4747  
[www.msi.com.tw](http://www.msi.com.tw)



Based on Nvidia's new Geforce4 MX440 chipset, this card has 64MB of fast DDR memory, running at 550MHz. Also featuring an S-Video TV-out, it easily outperforms the competition.

**GRAPHICS CARD**

## ATI All-in-Wonder Radeon 8500

**REVIEW** March 2002, p69 **PRICE** £316.08  
(£269 ex VAT) **CONTACT** ATI 01628 480 200  
[www.ati.com](http://www.ati.com)



When it comes to performance and features, this superb, if pricey, graphics card keeps ATI ahead of the pack. Truly universal, it's ideal for gamers, video editing and TV/DVD playback.

**VIDEO-EDITING CARD**

## Olympus C4040 Zoom

**REVIEW** January 2002, p172 **PRICE** £675.02  
(£575.50 ex VAT) **CONTACT** Olympus 0800 072 0070  
[www.olympus.co.uk](http://www.olympus.co.uk)



If a 3megapixel camera is just not enough for you, the C4040 is the one to buy. Featuring a 4.13megapixel CCD, 3x optical zoom, and a 64MB Smartmedia card, it's sturdy, light and very comfortable to use.

**DIGITAL CAMERA**

## Panasonic LF-D311

**REVIEW** November 2001, p103 **PRICE** £468.82  
(£399 ex VAT) **CONTACT** Panasonic Industrial  
0845 600 3535 [www.panasonic-industrial.com](http://www.panasonic-industrial.com)



With an EIDE interface and the ability to burn DVD-R discs, this Panasonic drive is a tantalising device. It's also bundled with Sonic DVD It software, Prassi Primo DVD, Cyberlink's Power DVD and Power VCR II.

**REMOVABLE STORAGE**

## LG GCE-8320B

**REVIEW** April 2002, p71 **PRICE** £82.25 (£70 ex VAT)  
**CONTACT** LG Electronics 0870 607 5544  
[www.lge.co.uk](http://www.lge.co.uk)



If you're after a fast drive at an amazing price you can't go wrong with this LG. It's one of the fastest CD writers we've tested to date, and with both buffer underrun protection and an 8MB buffer it's a great buy.

**CD-RW**



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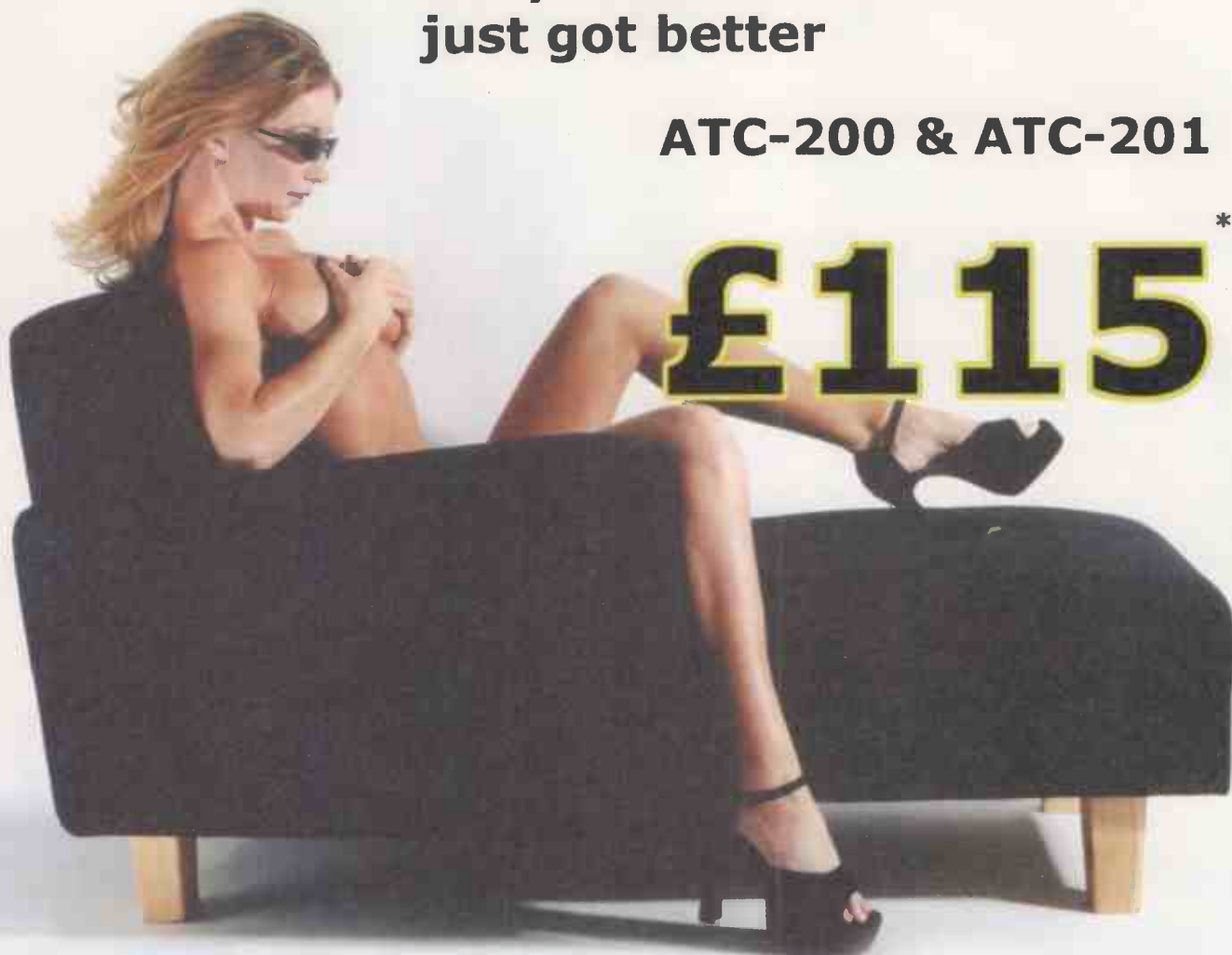


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# DIY BROADBAND

Why wait for an engineer to install your ADSL connection when you can do it yourself? We investigate the different types of self-install services available

**B**roadband can truly revolutionise the life of any Internet user, whether you run a business or browse for fun. A flat monthly fee brings you unlimited access at speeds up to 10 times faster than a traditional 56K modem.

High speed means web pages load in an instant and you'll never worry about huge downloads again. Also, since it's always on you can stream high-quality audio and video, leave instant messengers running and check for email as often as you like.

Broadband roughly describes a set of technologies that deliver multiple services down a single pipe, one of which is normally high-speed, always-on Internet access. In the UK, we have the choice of ADSL, cable modem and satellite, and each has its pros and cons. Until recently, broadband was plagued by high charges and low availability, but all of that is beginning to change, thanks to recent price cuts and steadily increasing coverage. Today ADSL is available to 66 per cent of the population from as little as £23 per month, and new DIY options mean you don't even have to wait for an engineer appointment.

Over the following pages we'll compare the various broadband options in the UK, detail the DIY process, reveal what the ISPs won't tell you, and explain why fast, always-on Internet access could change your life.

## What is ADSL?

Digital Subscriber Line (DSL) is a technology allowing data to be sent at high speed over analogue telephone lines between a residence and local exchange. The data occupies previously unused frequencies that are much higher than conventional voice





# FEATURE DIY BROADBAND

traffic. This means you can use the same line for high-speed, always-on Internet access, while still chatting or faxing.

Since the vast majority of people download more data than they send, most telecom providers offer an asymmetric service, where incoming speeds are higher than outgoing ones – hence asymmetric DSL or ADSL. Symmetrical DSL services offer identical upload and download speeds, but are less commonly implemented.

In the UK the main players are BT and Kingston Communications, the latter offering ADSL to all its customers in Hull, under the name Karoo Rapidtime – see [www.kcftd.co.uk](http://www.kcftd.co.uk) for more information.

BT's wholesale division offers a number of ADSL packages that are sold onto ISPs which then repackage them for retail.

All have upload speeds of 250Kbits/sec, and download speeds of either 500, 1,000 or 2,000Kbits/sec.

ADSL is known as a contention service, which means you share the connection to your ISP with other subscribers. BT Wholesale operates two different contention ratios: 50:1 for the cheapest services and 20:1 for the expensive ones. A contention ratio of 50:1 means up to 49 other users could be sharing your bandwidth at any time. BT doesn't consider this a problem, though, as most people use their connections in short bursts to load new web pages, send emails or download files.

## ADSL requirements

To get ADSL, you need a standard analogue BT telephone line that's within 5.5km of a local exchange, which has been upgraded for ADSL operation. By June 2002, BT will have upgraded over 1,000 local exchanges, which will bring the total ADSL coverage to two-thirds of the population. Right now it has 60 per cent coverage, but by upgrading another 100 or so exchanges, BT will reach another six per cent. To find out if ADSL is available on your line, enter your postcode and phone number into the broadband availability section of the BT Openworld website ([www.btopenworld.co.uk](http://www.btopenworld.co.uk)). Potential subscribers to Freeserve's ADSL service can alternatively check their line in branches of Dixons.

Line activation takes up to 15 working days, after which you'll need an ADSL modem and a filter to separate the conventional voice traffic from high data frequencies. In the past, you had to rent the modem from your ISP and book an appointment with a BT engineer to fit the filter. The engineer installation is still available, but now you can alternatively choose a DIY option, buying your own modem and fitting the filter yourself. This process is quicker and cheaper, and you also have a choice of modem – more of which later.

## ADSL prices

The cheapest ADSL packages deliver 500Kbits/sec download and 250Kbits/sec upload, with a contention ratio of 50:1. Larger ISPs, such as BT Openworld, Freeserve, Demon and Netscalibur, typically sell this for £29 or £30 per month, while smaller ISPs, such as Plusnet, offer it as low as £23.44 per month – all inclusive of VAT. While all resell the same BT Wholesale consumer package, each ISP may offer slightly different levels of service, performance, contract lengths and extras, so check the small print. The monthly rental is the same for DIY or engineer-install, and most ISPs offer either.

BT Wholesale recently announced a future ADSL package which connects users directly to the Internet, bypassing traditional ISP hardware. This could allow ISPs to offer ADSL services without an investment in server and routing hardware, although end-user prices are unlikely to be much cheaper than today's lowest subscriptions.

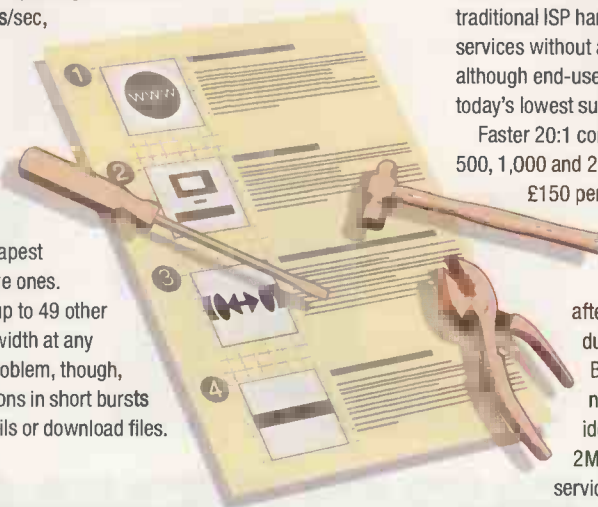
Faster 20:1 contention services offering download speeds of 500, 1,000 and 2,000Kbits/sec typically cost around £80, £120 and £150 per month, although you'll need to be located less than 3km from your exchange. These are also classed as business services and normally exclude VAT.

Easynet offers higher-speed ADSL services, after installing its own hardware in selected exchanges during the unbundling of BT's local loop. Along with BT Wholesale's standard ADSL packages, Easynet now also offers its own symmetrical services with identical upload and download speeds (up to 2Mbits/sec), and very high-speed asymmetrical services with 768Kbits/sec uploads and 4 or 8Mbits/sec downloads. The 2Mbits/sec symmetrical and 768/8,000Kbits/sec asymmetrical services both cost £250 per month, but you'll need to be near one of Easynet's unbundled exchanges and stump up a £995 installation fee, which puts this in the realm of the business user.

ADSL requires your line to be activated for a one-off fee. The engineer-install cost of £200 to £250 includes this activation fee and rental of a suitable modem for the contract period. The DIY option charges around £65 for activation, although ISPs sometimes waive or reduce this fee. DIY ADSL also requires that you buy your own modem and line filters. Most ISPs offer a DIY starter pack including modem and filters for £85, although there are other options. ADSL may offer unlimited Internet access for a flat fee, but you'll still need to pay for your normal phone calls and BT line rental.

## Cable modem

Cable modem services offer high-speed, always-on Internet access through conventional cable TV lines. Like ADSL, most cable services are asymmetric, with higher download rates than upload. The two operators offering cable modem services in the UK are NTL and



## BROADBAND PROVIDERS COMPARED

ISP	BT Openworld	BT Openworld	Freeserve	Pipex
Service	Home 500 Engineer assisted	Home 500 Plug & Go	Broadband	Xtreme Solo
Broadband technology	ADSL	ADSL	ADSL	ADSL
Max download/upload speed (Kbits/sec)	500/250	500/250	500/250	500/250
Installation/activation fee	£250	£65	£65	Free for first 40,000 subscribers
Monthly rental fee	£29.99 inc VAT	£29.99 inc VAT	£29.99 inc VAT	£23.44 inc VAT
Equipment included/DIY	✓/x	x/✓	x/✓	x/✓
Availability	66% of UK population	66% of UK population	66% of UK population	66% of UK population
Website	<a href="http://www.btopenworld.com">www.btopenworld.com</a>	<a href="http://www.btopenworld.com">www.btopenworld.com</a>	<a href="http://www.freeserve.com">www.freeserve.com</a>	<a href="http://www.pipex.net">www.pipex.net</a>

Note: all quoted speeds are theoretical maximums. Bandwidth is shared between users and performance may decrease during busy times

Telewest, but a TV or telephone subscription with either does not necessarily mean broadband Internet access is offered in your area. As with ADSL you'll need to check availability on their respective websites, but the service is not limited by distance.

Cable modems also operate a contended service, although this could involve more people than ADSL. A single cable TV channel devoted to Internet data may deliver over 30Mbps/sec, but it's shared throughout an entire neighbourhood that could have up to 1,000 users. Even if you were the only one using the service, you wouldn't enjoy 30Mbps/sec, as the operators cap each user's maximum speed.

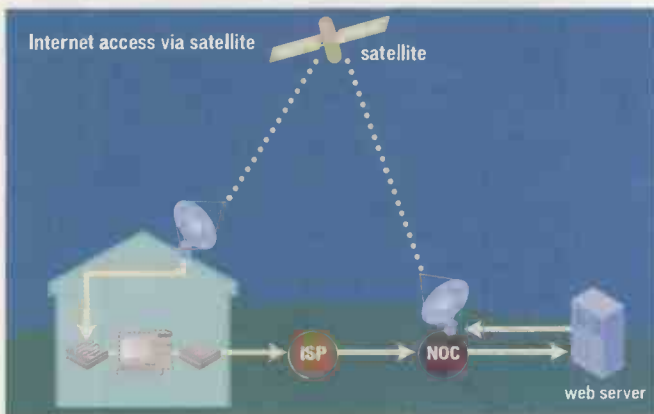
NTL offers three speeds with the following download and upload speeds: 128/64Kbits/sec, 512/128Kbits/sec and 1,024/256Kbits/sec. The cheapest 128/64Kbits/sec service costs either £24.98 per month including an NTL telephone subscription, or £42.98 per month including an NTL telephone and digital TV subscription. The 512/128Kbits/sec service costs either £34.98 or £52.98 per month with the same subscription conditions as above. Similarly, the 1,024/256Kbits/sec service weighs in at £59.98 or £77.98, depending on whether you take digital TV or the phone subscription. Installation fees are £50 for the cheapest and £75 for the faster options, and subscription includes rental of the cable modem from NTL.

Telewest's Blueyonder broadband service offers 512Kbits/sec download and 128Kbits/sec upload, and costs either £29.99 per month or £25 per month if you also subscribe to Telewest's digital TV and telephone services; both prices include rental of the cable modem. The installation fee is £50, or £25 if you also subscribe to the TV and phone services.

## Satellite

The third type of broadband access is by satellite. More expensive services employ a single dish to send and receive high-speed data, while cheaper services use the dish for downloading only, and a conventional 56K landline modem for the uplink. It's worth noting

**Satellite ADSL is not cheap, but is the only service available everywhere in the UK**



## IS YOUR PC READY FOR BROADBAND?

If you're looking to move into the broadband world, make sure your PC has, or can cope with, the following:

- Minimum specification: 200MHz Pentium, 32MB of memory, 150MB of free hard disk space
- USB ADSL modems require a free USB port and Windows 98 or later; incompatible with dual-CPU systems, which must use Ethernet modem instead
- Ethernet ADSL modems require a 10BaseT Ethernet port and an operating system that supports TCP/IP networking and DHCP – typically Windows 95 or later
- Most cable modems require a 10BaseT Ethernet port, but some feature USB ports too
- Satellite modems require either USB or 10BaseT Ethernet port – check with the supplier

that 56K modems only upload at 33Kbits/sec. The main players in this market are Aramiska, Bridge Broadband, Tiscali and BT. Bridge Broadband offers a two-way satellite service with 128Kbits/sec uploads and three download speeds of 512, 640 or 768Kbits/sec for £159, £199 and £249 per month respectively (installation fee included). BT Openworld offers a two-way business satellite service offering up to 500Kbits/sec download and 150Kbits/sec upload for £60 per month, and an £899 setup/equipment fee.

BT Wholesale recently announced a new satellite package using a dish to download data at 256Kbits/sec and a landline modem for uploads; higher 4Mbps/sec download speeds would be available on a pay-per-use basis. BT Wholesale intends to sell this service to ISPs including BT Openworld for around £15 per month (same as basic ADSL), but with a £400 installation fee – check this month's News pages for end-user pricing and news of a rival satellite service.

Satellite is unlikely to offer the cheapest prices, especially for high-speed two-way communications, but it is the only broadband service available everywhere in the UK. Perfect whether you're just beyond the reach of cable and ADSL, or located in rural areas.

## DIY ADSL

From mid-January, BT Wholesale finally offered a self-install ADSL option, which eliminates the cost of an engineer appointment, not to mention the wait. Self-install ADSL has been available in Germany for over two years, but BT Wholesale claims the delay was finding suitable filters for its network that the public can fit themselves.

Self-install in the UK typically costs £65 for line activation, plus around £85 for an ADSL modem and the required micro-filters. The monthly rental price is now the same as an engineer-install, so the only real difference is an initial saving of around £50 and the chance

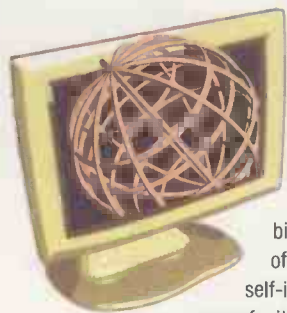
Easynet	NTL	Telewest	BT Openworld	Bridge Broadband
Business Broadband LLU	NTL: Home broadband	Blueyonder	Business Satellite 500/1	Bronze
ADSL	Cable modem	Cable modem	Satellite	Satellite
8,000/750	128/64	512/128	500/150	512/128
£995	£50	£50 or £25 for Telewest subscribers	£899	Free
£250 ex VAT	£24.98 with NTL phone or £42.98 with NTL phone and TV (inc VAT)	£29.99 or £25 for existing Telewest subscribers inc VAT	£59.99 ex VAT	£159 ex VAT
✓/x	✓/x	✓/x	✓/x	✓/x
Must be near one of Easynet's unbundled exchanges	In selected NTL areas	In selected Telewest areas	Anywhere in UK	Anywhere in UK
www.uk.easynet.net	www.ntlworld.com	www.blueyonder.co.uk	www.btopenworld.com	www.bridgebroadband.co.uk



# FEATURE DIY BROADBAND

to be up and running sooner. More importantly, though, it also lets you choose your own ADSL modem, which we'll come to in a moment.

The DIY installation process is a doddle. The key is the micro-filter, which looks just like a conventional line splitter. Connect your normal telephone and the ADSL modem to their respective sockets on the filter, then plug it into your wall socket. You then need to install any modem software before connecting it to your PC. Since a line activated for self-install ADSL will have high data frequencies coming out of every phone socket in your home, you'll need to fit a micro-filter onto all of them; BT says this includes non-voice devices like fax machines or set-top boxes. Most self-install ADSL kits come with two micro-filters, but if you've bought your modem independently, or require additional ones, they cost around £12 each.



Clearly DIY has proved to be a big hit, as already 75 to 80 per cent of all new ADSL connections are self-install, and BT Wholesale sees no reason for it not to settle at the same 90 per cent mark as in Germany. Self-install ADSL is only available on the cheapest 500Kbits/sec packages – the faster 1 and 2Mbits services still require an engineer appointment and normally also include rental of a more appropriate Ethernet-based modem or router.

## ADSL modems

The vast majority of ISPs delivering self-install ADSL also offer a broadband starter kit, including the standard Alcatel USB modem and a pair of micro-filters for around £70 ex VAT. Indeed, while many encourage the adoption of this Alcatel 'Stingray', you're normally free to choose any ADSL modem.

Many users prefer Ethernet modems which don't require drivers and work with any OS that supports TCP/IP networking – models with built-in router facilities start at around £100 ex VAT, and basic 10/100 Ethernet PCI cards can cost as little as £10. But if you're after the cheapest solution, check out internal PCI ADSL modems. Dabs' own model costs just £44 ex VAT, but remember if you buy your own modem, you also need your own micro filters at around £12 each (see [www.btopenworld.dslshop.co.uk](http://www.btopenworld.dslshop.co.uk)).

**The Alcatel 'Stingray' (right) is frequently offered in broadband starter kits**



To work with BT's ADSL network, you'll need a modem that offers PPP (point-to-point protocol) over ATM (asynchronous transfer mode), also known as PPPoA. If you buy your own Ethernet modem or router, you'll also need to configure its Virtual Path Identifier (VPI) and Virtual Channel Identifier (VCI) settings to 0 and 38 respectively. Existing ADSL users can also technically swap their modem, although they're unlikely to be supported by their ISP. If your installation was performed by an engineer, you won't need any micro-filters.

## Sharing broadband

Broadband suppliers clearly state their cheapest services are designed to connect one PC only. More expensive versions are available for those who want to connect multiple PCs. The reality, though, is that any Internet connection, broadband or otherwise can be shared between multiple devices. Your ISP may not approve as it messes up its contention ratios and may go against your contract, but technically it is simple.

Internet Connection Sharing (ICS) software in Windows 98SE onwards lets you share any Internet connection between connected PCs. The downside is that you need to leave the first PC switched on. A neater solution is to buy a router that connects to your ISP using the modem, then deliver the Internet data to any connected device – only the router needs to be left switched on. Connect a hub or switch to the router, and you could be sharing your broadband connection between multiple devices, regardless of operating system.

Many networking companies offer boxes that do the whole job.

**D-Link's DSL-504 has an ADSL modem, router and four-port Ethernet switch**



D-Link's DSL-504 (left) contains an ADSL modem, router and four-port 10/100 Ethernet switch for £145 ex VAT – not much more than the bog-standard Alcatel USB ADSL modem alone.

For wireless access to a broadband connection throughout your home or office, fit a wireless access point (Wap) to your router from just £120 ex VAT. Alternatively, broadband gateway devices are available from £150 ex VAT which include a Wap, hub and router, although the modem isn't normally built-in. It's truly liberating to then fit a Wifi card to a notebook or PDA and enjoy broadband Internet access without any cables. It's important to know that many cable modem users have reported problems when trying to share their broadband link using ICS or routers. One solution is to fit two network adaptors to the main PC, and connect the modem to one and the second PC to the other.

## In the end

Broadband promises a world of always-on high-speed data that's ready to deliver an unparalleled Internet experience. In reality, though, the contention ratios often slow access during peak times and there's still a lack of unique broadband content out there.

At worst, broadband remains faster than 56K dial-ups, and at best, it's vastly superior. Unique content is also a bit of a red herring after you've enjoyed swift web browsing, omnipresent messaging and a blasé attitude to huge downloads. Unlimited dial-up accounts may cost as little as £13 per month, but any enthusiast will easily justify the extra tenner for broadband, and it's a no-brainer for business.

Recent price drops and DIY options have seen ADSL take the lead in terms of cost, performance and flexibility. Now that broadband is truly affordable, we can only hope that coverage continues to expand outside highly populated areas and that capacity is increased to cope with demand.

## READ THE SMALL PRINT

Before you do anything else, check the terms and conditions of the service. Some broadband ISPs offer one or three-month contracts, but most ask you to commit to 12 months.

Changing broadband providers isn't as easy as swapping dial-up accounts. You may have to disconnect with one ISP before re-applying to another, which could leave you without broadband for several weeks.

Some broadband services employ network address translation (NAT), which could prevent you from using certain online applications, such as video-conferencing software. If you need support for H323 video-conferencing or static IP addresses, check with the ISP first.

An always-on connection presents a potential security risk, so run some kind of firewall for protection. Many routers offer firewall facilities, or you could install a software option such as Zone Alarm ([www.zonelabs.com](http://www.zonelabs.com)).

Finally, don't throw out that 56K dial-up account yet. You'll still need it for mobile access using a notebook or PDA, or for backup if your broadband fails.

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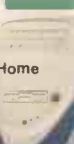
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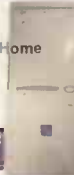
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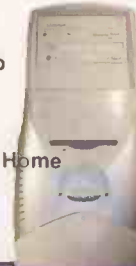
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# Break the PC *SPEED LIMIT*

**Stop! Don't** spend your hard-earned cash on upgrades just yet, because we've got some great power-boosting tips for your PC that will cost you little or nothing

**S**ooner or later you'll wish your PC was going faster, but there's no need for expensive upgrades yet. Whether you own the latest Pentium 4, or even an aging 486, you'll be surprised at what you can do to improve your system with the minimum of cost.

Over the following pages we'll show you how to make the most of existing hardware and detail modest upgrades that give the biggest bang for your buck. Better still, our top 10 power-boosting tips (see page 102) cost little or even nothing to implement. A little nip and a tuck could have your PC running faster and smoother than ever.

From tweaking the Bios or overclocking your processor, to making the most of driver updates and utilities, we'll show you how to bring your PC up to speed and reveal previously untapped performance.



## Increase your PC's memory

One of the cheapest, easiest and most effective ways to boost a PC's performance is to increase its memory, also known as Ram (random access memory).

In tests and everyday use, the difference that doubling your memory makes can be nothing short of monumental. Whether it's going from 8MB to 16MB or 128MB to 256MB, you'll immediately spot a big difference in overall performance.

If you're into handling large files, such as photos, videos or databases, then you'll really benefit from 512MB or even more still. To illustrate this, we timed how long it took Windows to prepare several files for printing on a 1GHz Pentium III system. A modest 3.3megapixel image printed from Photoshop took 25 seconds to spool with 128MB of Ram, compared to 10 seconds with 256MB. A 133MB Quark Xpress file took 13 minutes to spool with 128MB, five minutes with 256MB and just a minute and a half with 512MB of Ram.

Even with recent price increases, you can buy 256MB of DDR 2100 or PC133 Dimm for less than £75, so there are no excuses for skimping.

Watch out, though, as some motherboard chipsets, such as Intel's 810 and 815, will only take a maximum of 512MB of memory.

The higher cost of older types of memory may be uneconomical – see the Great expectations box below. We consequently only recommend significant memory upgrades on systems that employ 168pin SD-Ram or 184pin DDR Dimms. New Dimms are supposed to be backwards compatible, but existing memory can be fussy about new company. If you're having problems, you may have to remove old Dimms so that a new one can work properly. Before you get too upset, though, remember that 64MB of SD-Ram is only worth about £20.

Finally, if you're buying DDR memory, be aware that it comes in many flavours which may or may not work with your particular motherboard. Always check online databases such as those at [www.crucial.com](http://www.crucial.com) to ensure you're buying the right type. Also note that premium grade CAS2 memory will only operate at its best if you adjust certain Advanced Chipset settings – see the section on Bios for more details.

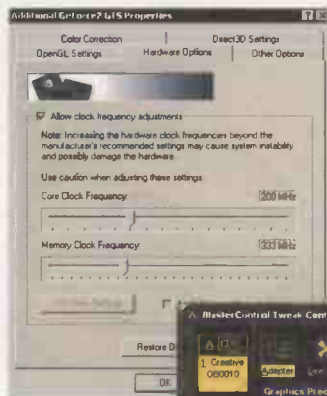
## Improve graphics performance

The key to super-speedy gaming performance is simply to invest in the best 3D graphics card you can afford. Fortunately, though, in this fast-evolving 3D market, there are some things you can do to increase your existing graphics performance without buying a new card. We've measured huge performance increases of between five and 20 per cent by simply installing newer drivers.

Graphics drivers are frequently updated, so regularly check the relevant website for the latest versions. If your card is based on an Nvidia chipset, head over to [www.nvidia.com](http://www.nvidia.com). Similarly, ATI users should visit [www.ati.com](http://www.ati.com) and so on. Latest versions of DirectX may also need to be installed from [www.microsoft.com/directx](http://www.microsoft.com/directx). True graphics tweekers should definitely download the Powerstrip utility, which offers all manner of display adjustments, at [www.entechtaiwan.com/ps.htm](http://www.entechtaiwan.com/ps.htm). We've also included the utility on this month's cover disc for your convenience.

If you're still not satisfied, then you may be able to overclock the memory or chipset on your graphics card and enjoy a slight performance increase (see screenshot top). As with overclocking your central processing unit (CPU), this can generate more heat and introduce instabilities, so take precautions and proceed at your own risk.

Surprisingly, many graphics cards come with utilities that allow you to overclock them from Windows – look for a tab in their Display Properties labelled Advanced or Performance. Interestingly this facility is hidden on Nvidia's ubiquitous Detonator drivers, but can be revealed with a quick Registry edit as follows. Start Regedit and open the HKEY\_LOCAL\_MACHINE. Scroll down through Software until you reach NVIDIA Corporation, then open the Global section. To access the additional controls, you'll need to modify a new Registry Key called NVTweak;



**You may gain a slight performance increase by overclocking the memory or chipset on your graphics card**



if this doesn't exist in the Global key, go to the Edit menu and Add a new Key, naming it NVTweak.

With NVTweak selected in the left-hand pane of the Registry Editor, you must go to the Edit menu and Add a new DWORD value, with the name 'CoolBits'. Once added, double-click on the CoolBits in the right-hand pane, and set the Value to 3, with a hexadecimal base. After rebooting your system, you'll notice that when you go to the Additional Properties of your Geforce Advanced Display Properties, you'll find an additional tab offering clock frequency adjustments.

But how can you tell if a tweak or update has made any difference? We use Quake III Arena, which features a built-in benchmarking facility. Simply type `timedemo 1`, followed by `demo demo001` at Quake's command prompt to automatically run a quick demo. Bringing up the command prompt afterwards will reveal the frame rate, and is a great way of comparing drivers, settings or graphics modes.

## GREAT EXPECTATIONS

The PC industry revolves around backwards compatibility, but that doesn't mean the latest chip, card or memory can be slotted inside your aging PC. It'll probably be the wrong shape and voltage.

Even if you could place a Ferrari engine in a Mini chassis, you still won't make a sports car, so ensure the components around it are of a similar grade for the best results. For example, owners of older systems will find their processor, memory and motherboard may prevent a brand new graphics card from performing at its best.

Economies also play a big role. A 128MB memory upgrade could breathe new life into an old PC, but if it takes old 72pin Simms, their high cost could buy you 128MB of faster SD-Ram memory, plus a 1GHz processor and a new motherboard to house them all. Indeed a motherboard upgrade will support all the latest chips, memory and cards, but it really boils down to whether you have the time, effort and ability to rebuild your PC, or if you just want a quick, easy fix.

They may be pricey and you're unlikely to get the best out of them, but a dedicated processor upgrade or increase in old memory will always enhance an aging PC. For significant upgrades, though, their price outweighs the convenience. If your processor and memory upgrade costs more than £300, you'd be better off buying a new motherboard with modern components, or a new PC.

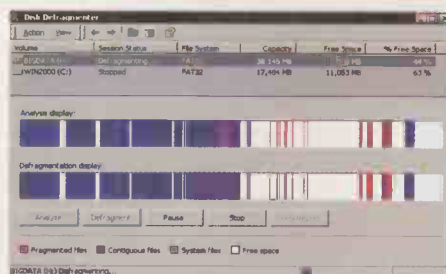
## Get the most out of your hard disks

Housing the operating system (OS), applications and files, the performance of a hard disk is crucial to the overall speed of a PC. The key thing to remember is that your OS and applications need space to breathe. The ideal amount of space varies with disk size, OS and Ram, but try to keep at least several hundred megabytes or five per cent free.

If your PC is grinding to a halt due to lack of disk space, it's time for a spring clean. Use the Add/Remove Programs Control Panel to remove redundant applications, check your Temp folder for large files that haven't been deleted, and get rid of a few emails, especially those with big attachments.

Afterwards, run the defragmenting tool to consolidate your free space (see screenshot right); shut down all applications, utilities and background tasks while doing this. Freeing up space and defragmenting costs nothing and can really improve performance.

There are times when deleting files is not an option and more capacity is required. Second-hand disks are

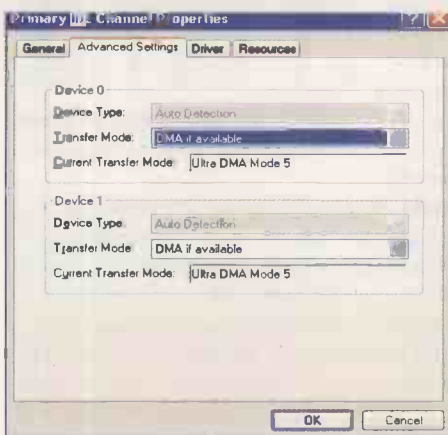


The disk defrag tool will enhance performance

cheap and easy to install as the slave of your primary IDE channel. A new model may also be so much faster that you should consider making it your master boot drive, reinstalling Windows and your applications onto it, and using your older drive as extra storage.

The main rule when it comes to IDE hard disks is to ensure they're not connected to the same IDE channel as anything other than another hard disk. The results vary between controllers, but you could suffer from reduced performance if you connect, say, a Rom drive as a slave to a hard disk. If you have no spare connectors for a second hard disk, or have to fit a CD writer as a slave to an existing disk, then buy a PCI IDE controller card and enjoy support for four more drives – see Connectivity section below.

Finally, ensure that DMA is enabled for your hard disks. In Windows 9x, check that DMA is ticked in the Properties of the disk. In Windows 2000 and XP, open the IDE ATA/ATAPI Controllers section, double-click on the Primary IDE Channel and select Advanced Settings. Here you should have Transfer Mode set to 'DMA if available', and below this, the actual mode you're operating in (see screenshot left). If you can't enable DMA modes, try updating the driver for your motherboard chipset.



Ensure DMA is enabled for your hard disk

## Software sense

It's worth mentioning software briefly. It goes without saying that updated drivers can make all the difference to the performance of a PC, so keep an eye out for new versions. Top of your list should be graphics drivers, followed rapidly by the 4-in-1 driver for motherboards with Via chipsets.

Checking for regular Windows updates and new service packs will also ensure your OS and applications are running safe and well, while a Bios update could be just the trick for solving incompatibility issues with upgraded disks or processors.

A truly super-charged PC will also employ utilities to monitor what's going on under the hood. Most motherboards these days come with software that sits in your system tray and essentially relays the information from the PC Health section of your Bios – handy for checking temperatures and setting alerts in case they get too high.



Motherboard software gathers essential information about a PC's health

## Improve PC connectivity

It doesn't matter whether you've got an aging 486 or the latest Pentium, as the very latest connectivity is only a PCI card away. If you've got a spare PCI slot, you can cheaply and easily add support for Firewire, USB2, Ethernet (wireless or wired), not to mention the latest hard disks. To be safe with drivers, you should be running Windows 98 or later.

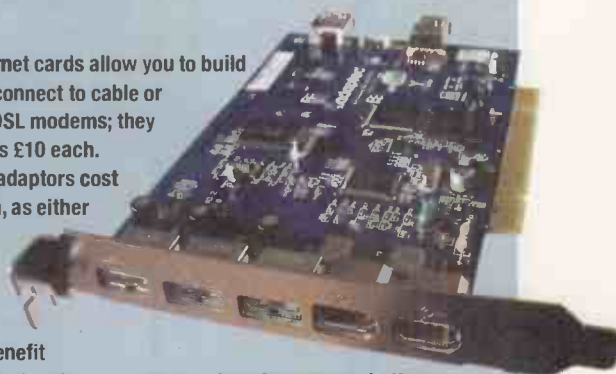
Firewire cards cost around £50 and normally come with basic software allowing you to capture and edit footage from DV camcorders – remember you'll need a camcorder with DV-in facilities to record the footage back to tape, though.

USB2 is appearing on more peripherals and while any USB2 device can be plugged into a standard USB 1.1 port, it will be limited to speeds of 12Mbps/sec. Connect a USB2 device to a USB2 port and you can enjoy speeds up to 480Mbps/sec, which is 40 times faster than standard USB 1.1.

Certainly a mouse or keyboard won't exploit the speed of USB2, but it revolutionises external hard disks and scanners. A four-port USB2 card costs around £30. If you've only got one spare PCI slot, consider Adaptec's Duo-Connect card (pictured), which offers both Firewire and USB2 ports for £80.

Wired Ethernet cards allow you to build a network or connect to cable or higher-end ADSL modems; they cost as little as £10 each. Wireless Wifi adaptors cost from £60 each, as either PCI cards or USB dongles.

Finally, if you want to enjoy the benefit of today's fastest and largest hard disks, but your current controller either won't support them, or has run out of spare connectors, then simply buy a new controller card. PCI cards, such as the Promise Ultra133 TX2, cost £50 and give you two UltraDMA133 channels along with support for drives larger than 137GB. Spend a little more and you could be enjoying Raid (redundant array of inexpensive disks) facilities, too.



Adaptec's Duo-Connect card offers both Firewire and USB2 ports



## Change Bios settings

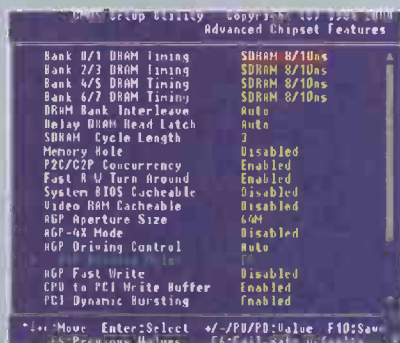
The Bios is an old-fashioned chunky chip on your motherboard, providing the means by which the PC can wake up and get started.

At its most basic, the Bios contains information on the date, time and installed drives, along with their booting order. Beyond this the Bios rapidly becomes quite complex, but a handful of options can be used to enhance the performance of your PC. Note that changing a setting in your Bios could make your PC unstable, or even prevent it from working properly, so always proceed with caution.

The page labelled Advanced Chipset Features is where you can adjust memory performance and, like comedy, it's all in the timing. Latency defines the delay between memory receiving data and actually reading it. The lower the latency, the faster the memory will perform. Most standard SD-Ram and DDR memory modules have latencies of 3 and 2.5 respectively, but faster versions of both types of memory are available with latencies of 2.

If you're using high-quality CAS2 or CL2 memory, then ensure the latency is set to 2 for the best performance. You should also try speeding up your timings from the standard 8/10ns settings to a Fast (6/8ns) or Turbo (5/6ns) option (see screenshot). We've measured between five and 10 per cent performance increases in Sysmark and Quake when switching from CAS3 to CAS2 memory.

If you have normal CAS3 or 2.5 memory, you could try adjusting its latency and timing to see if it'll handle the faster settings. If your system



Try speeding up timings to Fast or Turbo

becomes unstable, go into the Bios and change the settings back. Experiment, and be prepared for regular crashing if your memory isn't quick enough.

Performance enthusiasts should use CAS2 memory to build or upgrade a system. It's more expensive but more flexible, and available from [www.overclockers.co.uk](http://www.overclockers.co.uk) and [www.theoverclockingstore.co.uk](http://www.theoverclockingstore.co.uk).

## Protect your Bios

If you make any changes to your Bios which prevent your PC from starting up properly, it's normally possible to reset its data by shorting a jumper on the motherboard or removing the nearby battery for a few minutes. Your PC should then restart, although you'll need to re-enter any custom settings into the Bios.

There are unusual times when a Bios problem won't respond to resetting, thereby preventing your PC from restarting at all. Although such situations are rare, it's worth protecting yourself from the prospect of a dead PC. The most obvious protection is a Bios backup. Recent Gigabyte motherboards feature two Bioses and the option to switch between them. If one Bios fails, simply reboot, switch to the other, then repair the one that's gone wrong.

A similar facility is available to other motherboards using a Bios saviour. This is a chip that fits between the existing Bios and its socket, and backs up a working version of the Bios ready for when things go wrong.

Models such as those made by loss

([www.loss.com.tw](http://www.loss.com.tw)), come with a switch mounted on a blanking plate to select which Bios is used for booting. You can buy the loss Bios saviour from [www.theoverclockingstore.co.uk](http://www.theoverclockingstore.co.uk) for around £30.

Alternatively you could replace the entire Bios chip with one that has working settings. Companies such as Flashbios ([www.flashbios.com](http://www.flashbios.com)) supply new Bios chips programmed with whatever software you require for around £20, or will reprogram your existing one for £5. See this month's Hands On Hardware for more details.



If you get into trouble, short the Jumper on the motherboard to reset the Bios

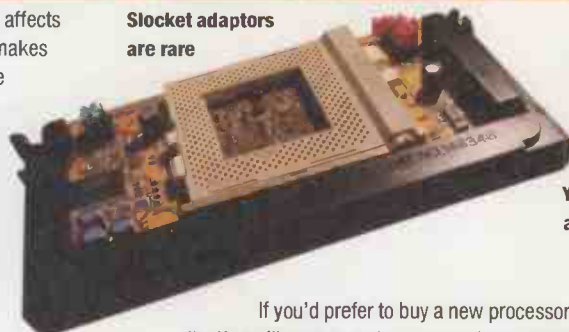
## Make that processor perform

Every major component in a PC affects performance, but the one that makes the biggest overall impact is the processor (CPU). A faster CPU means quicker games, nippier applications, less waiting time and overall a more responsive PC.

We explain on the following page how overclocking could increase your processing power for free, but what about actual processor upgrades?

Your upgrading choices boil down to what kind of motherboard you have, and how much effort you're willing to put in. If you simply want to slot in a new chip without changing any settings, check out dedicated upgrade packages from Evergreen ([www.everttech.com](http://www.everttech.com)), Powerleap ([www.powerleap.com](http://www.powerleap.com)) and Hypertec ([www.hypertec.co.uk](http://www.hypertec.co.uk)). They're pricier than buying a naked processor, but you're paying for ease of use and less disruption.

Socket adaptors are rare



You can upgrade a Pentium Pro to a Celeron chip



If you'd prefer to buy a new processor by itself, you'll have to make sure you know exactly what models and speeds your motherboard can take, but be realistic, as our earlier Great expectations box explains.

Owners of Slot 1 Pentium II or Pentium III systems based on BX chipsets have a good upgrade path using certain FC-PGA Intel CPUs, in combination with Slot-1-to-socket converters. Suitable FC-PGA 'socket' adaptors are, sadly, becoming increasingly rare, but suppliers such as [www.overclockers.co.uk](http://www.overclockers.co.uk) were still selling Asus models for £15 at the time of writing.

For the least disruption, you should upgrade to an FC-PGA CPU which uses the same FSB (front-side bus) frequency as your existing chip – this will either be 100, or 133MHz for later PIII models. Most Slot 1 motherboards will also only support FSB multipliers up to eight-times, which generally limits you to sub-1GHz processors; these are only now available on the second-hand market.

The most impressive processor upgrade on sale today for old Slot 1 or Socket 370 systems are made by Powerleap. It sells converters from £150 fitted with Intel's latest Tualatin FC-PGA2 processors, including the 1.26GHz Pentium III.

## Overclock your processors

Overclocking is the process of forcing a component to work faster than it was designed to. It normally refers to the main processor, but can be applied to pushing the frequency of any component.

If all goes well, your processor could enjoy a few hundred extra megahertz for free, but remember this is done entirely at your own risk. Overclocking could permanently harm your components and will certainly put them out of warranty, and as such we cannot officially support it. It's also far from guaranteed to actually work.

With that warning out of the way, we can explain the two keys to overclocking. On the theoretical side, the processor's speed is calculated by multiplying the front-side bus (FSB) by the processor's clock multiplier. On the practical side, you've got to ensure the processor and any related components are physically capable of handling the new, higher speed.

The theory is simple, so long as you know which numbers to use in your calculations. AMD's Duron and Athlon processors may boast system buses of 200 and 266MHz, but do so by applying double-data rate (DDR) technology to a 100 or 133MHz FSB. Similarly the Pentium 4's impressive 400MHz system bus is achieved by applying quadruple-data rate to a 100MHz FSB. New 533MHz system bus P4s have a 133MHz FSB.

The main figure overclockers need is the plain FSB, which for current Intel and AMD processors is either 100 or 133MHz. This is multiplied by a fixed number to calculate the core clock speed.

A 2GHz Pentium 4 has a 100MHz FSB, and a 20-times clock multiplier. A 1.2GHz AMD Duron also has a 100MHz FSB, and therefore a 12-times clock multiplier. An Athlon XP 1800+ has a core speed of 1,533MHz and a 133MHz FSB, which means it has an 11.5-times clock multiplier.

## THE UPGRADER'S BIBLE

The motherboard manual is your bible during the tweaking or upgrading process, as it details the slots and sockets in your system, along with the fastest or largest components it can handle. Check the motherboard manufacturer's website for updated support information too.

If you've lost the manual, head to the motherboard manufacturer's website and download an electronic version. If you don't know the manufacturer, an ID code displayed at startup can identify the brand and model – see [www.motherboards.org/moboidtools.html](http://www.motherboards.org/moboidtools.html).



Refer to the manual before tweaking your motherboard

## OVERCOME OVERCLOCKING PROBLEMS

To overclock the processor, all you need to do is gradually increase the FSB (front-side bus) and/or the clock multiplier to achieve the desired speed, but sadly this isn't always possible in practice. Intel and AMD immediately put a spanner in the works by locking the clock multipliers on their processors. So this leaves little option but to increase the FSB, but this in turn impacts other components. The AGP, PCI and memory buses are all driven by a fraction or multiple of the FSB, and therefore increasing it could push any or all of them into instability.

The PCI bus should run at 33MHz, but is normally calculated as one-third or one-quarter of the FSB. If the PCI is set at one-third of the FSB and the latter is increased to, say, 110MHz, then the PCI bus will be pushed to 36MHz. Some PCI devices will put up with this, but others may not.

The AGP bus should run at 66MHz, and is normally calculated as two-thirds or one-half of the FSB. Again, an interim FSB of 110MHz will use the lower two-thirds multiple, and hence drive the AGP bus to 73MHz – this could push some graphics cards over the edge.

Memory is also only rated up to certain speeds, and will make your system extremely unstable if pushed beyond its limits. One solution is to swap existing memory for faster rated modules, such as DDR2100 being replaced with DDR2700. Alternatively, your Bios may allow you to reduce the memory clock either by using a lower multiple of the FSB or selecting the 'host clock minus 33MHz' setting.

The processor itself is also unlikely to achieve overclocked speeds unless its core voltage is increased, which in turn generates more heat, with the potential for instability or damage. Additional cooling is

therefore an essential requirement for overclocking, and significant increases will demand exotic liquid-cooled solutions – see Cooling section later. Don't neglect to cool other components too – the chipset northbridge can get hot, especially in an overclocked system.

Finally, processors are produced using manufacturing processes that have a ceiling on possible core clock speeds. If you want to overclock your processor, you need to know its limits and ensure the desired speed is nowhere near that ceiling. Even if it's overclocked within the limits, there's no guarantee it'll work – some chips are

simply more overclockable than others.

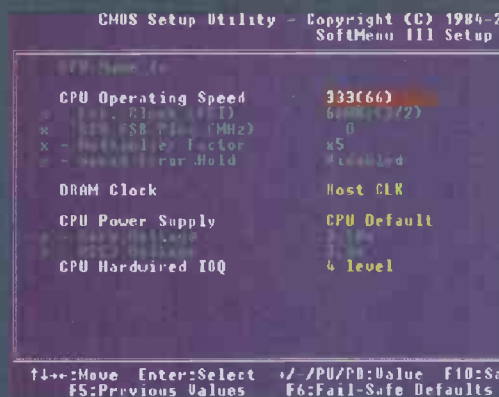
Just when you thought that was all, remember you won't be able to overclock unless your motherboard has manually adjustable settings for the FSB or clock multiplier, not to mention some way of increasing the core voltage. Before you consider any overclocking projects, ensure your motherboard offers the required control.

The trick with overclocking is also to take it one small step at a time. Sure, it's tempting to go for a 33 per cent increase on your first attempt, but try to resist that temptation and start with the smallest increments first.

If this is successful, try increasing by

another small step, and so on until your system can take no more.

At this point, go back to the last successful setting. If you overclock too far, your PC will act strangely, crash regularly, or not start up at all. If you were using the Bios to make adjustments, then a non-starting PC presents a Catch-22 situation – see Protecting your Bios section. This is why overclockers prefer motherboards with physical switches or jumpers as they are easy to return to a proven configuration.



Don't rush it... take overclocking one step at a time



## Overclocking the Pentium 4

Intel locks the clock multiplier on its Pentium 4 processors, forcing overclockers to increase to the FSB (front-side bus) and take care that the other components can cope.

In terms of the manufacturing limits, the original 0.18micron Willamette core used on the first Pentium 4s is unlikely to work beyond 2GHz. The latest 0.13micron Northwood core, however, has the potential to work at 3GHz and beyond.

Northwood is employed on Pentium 4s labelled with an A, or any running at 2.2GHz or above. Be aware that Pentium 4s between 1.6GHz and 2GHz are available with both cores, but the Northwood versions are clearly the best bet for overclockers – they even run faster than the old ones at the same clock speeds.

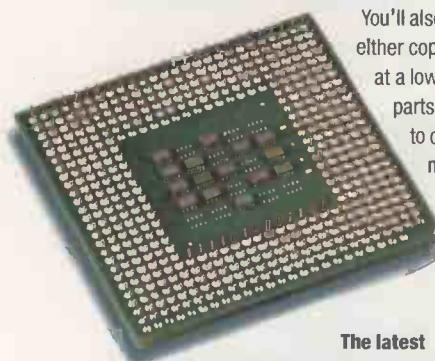
Let's consider the 2.4A model which runs at 2.4GHz with a 24-times multiplier on a 100MHz FSB. If the FSB was increased to, say, 125MHz, then the processor would attempt to be driven at 24 times 125, or 3,000MHz. Even a 110MHz FSB setting would give you a respectable 2,640MHz clock speed that might even work with normal air cooling.

Sadly these interim FSB settings between 100 and 133MHz will normally clock both the PCI and AGP buses beyond specification, which could cause problems. A 133MHz FSB would be ideal, as it normally allows an official one-quarter and one-half PCI and AGP setting, but this could prove too much of an overclock for a processor designed to run externally at 100MHz.

You'll also need to ensure your memory can either cope with the higher speeds, be clocked at a lower rate, or swapped for faster rated parts. Many RD-Ram systems allow you to clock their memory at different multiples of the FSB. Normally it would be set at four-times to achieve 400MHz with a 100MHz FSB, but a lower three-times setting could keep memory within spec despite increasing the FSB.

Finally, you'll need to feed your processor some extra juice for stability or to even start at all.

The Northwood Pentium 4s are designed to run with a core voltage of 1.5v, but most motherboards won't allow you to pump more than 1.65v into them. Heavy Northwood overclocking requires nearer 2v, forcing the truly dedicated to take a soldering iron to their motherboards, or at least buy models that support more than 1.65v. Note that such extreme overclocking demands exotic liquid-cooled solutions – see Cooling section.



**The latest 0.13micron Pentium 4s could overclock to 3GHz and beyond**

## Overclocking the AMD Athlon

Like Intel, AMD locks the clock multiplier on its Athlons, but there are ways to unlock the chip. These involve reconnecting tiny electrical bridges (labelled L1) on the surface of the chip itself, which were previously broken by AMD. On pre-XP Athlons running up to 1.4GHz, this was possible by drawing a tiny line between the bridges using a graphite-rich pencil (see picture), as explained in December 2001's Hands On Hardware.

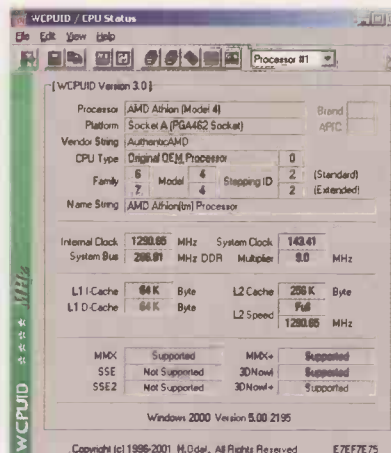
Athlon XPs are trickier, as they use a different base material for which a pencil mark has insufficient electrical conductivity. The solution here is to fill in the breaks with an insulator such as glue, then apply conductive silver lacquer to electrically rejoin each bridge. This is an extremely fiddly process which we'll leave to the extreme websites, and concentrate here on increasing the FSB instead.

Current Athlons should handle at least a 10 per cent increase, with a little extra core voltage. The XP Athlons are designed to run at 1.75v, so consider increasing this to 1.85v, with the help of extra cooling. The highest overclocks will demand voltages above 1.9v, which are only offered on some motherboards.

Modern Athlons run on a 133MHz external FSB, and normally drive their memory at the same external speed. Raising the FSB above 133MHz could push existing memory over the edge, so fit faster parts or use the Bios to reduce the memory clock where possible. Remember, too, that FSBs above 133MHz will normally be pushing the PCI and AGP buses into potential instability.



**Reconnect the electrical bridges with a graphite-rich pencil line**



**Keep a check on the overclocking status**

## Overclocking other processors

To date, all of AMD's Duron processors have been made with the same 0.18micron process that allows Athlon XPs to run at genuine clock speeds up to 1.8GHz. While you're unlikely to be able to overclock a modest Duron to such heady heights, it still has great potential.

Sadly, the Duron seems to be impervious to being unlocked, which once again forces you to increase the FSB. Since Durons are designed for a 100MHz external FSB, there are many increases that can be made without fitting anything more exotic than 133MHz or PC2100 DDR memory.

Again, you're unlikely to have success by increasing the FSB all the way to 133MHz, but interim settings up to 110MHz should work, and still deliver 10 per cent extra performance with traditional air cooling. As always, be aware that your PCI and AGP buses may subsequently be running beyond specification. Similar theories apply to the Intel Celeron, which has been running on a 100MHz FSB from the 800MHz version upwards.

The Pentium III has good overclocking potential, especially if you have a model running between 600 and 1,000MHz.

These were made with a 0.18micron process, which maxes out around 1.1GHz. The lower speeds should certainly be able to squeeze at least 10 per cent extra with modest core voltage increases of 0.05 or 0.1v.

Once again you're looking at increasing the FSB. If your Pentium III is running on a 100MHz FSB, then you'll need to fit 133MHz memory to cope with the increases, and as always you should take care not to push your PCI and AGP clocks too far. If your Pentium III is already running on a 133MHz FSB, you'll probably need to fit faster PC150 memory, which you can buy at [www.overclockers.co.uk](http://www.overclockers.co.uk).

## Intelligent Power Stepping



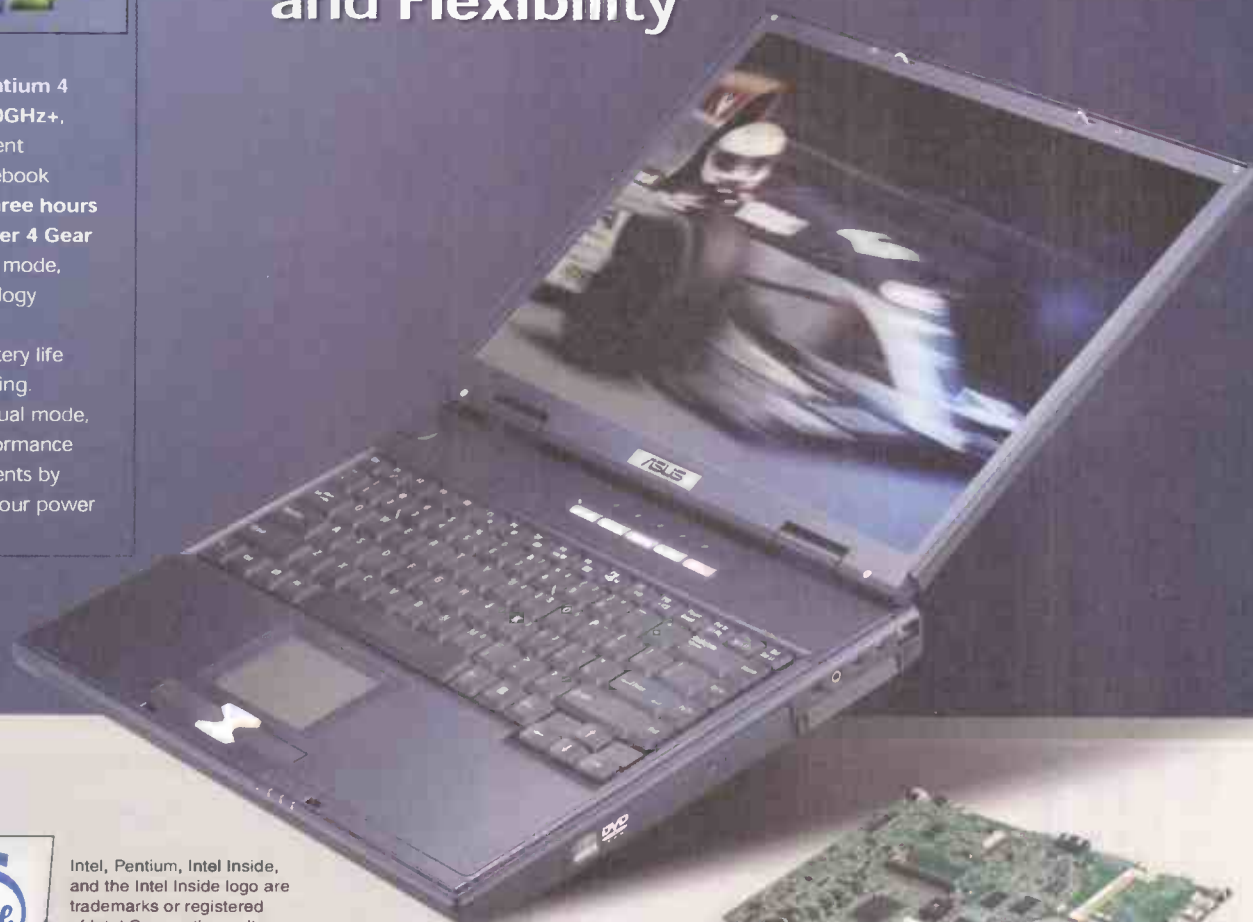
While supporting Pentium 4 processors up to 2.0GHz+, the ASUS L3C's efficient design enhances notebook battery life up to three hours thanks to ASUS Power 4 Gear technology. In Auto mode, Power 4 Gear Technology intelligently optimizes performance and battery life based on system loading. Power 4 Gear in Manual mode, users can define performance and battery requirements by choosing one of four power optimizing modes.

## ASUS L3 All-In-One Notebook PC

# Revolutionary Performance and Flexibility

# L3

Series



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Mobil Intel® Pentium® 4 Processor-M

The ASUS L3C introduces a new era in notebook computing by bringing Pentium 4 performance to the road. Its compact all-in-one design delivers a notebook that's robust in features, incredible in performance, and perfect for any situation. Leading-edge features such as 15" LCD display, 2.0GHz+ Pentium 4 processor, DDR memory support, and 32MB dedicated ATI M7 graphics, make the L3C one of the most powerful notebooks on the market.

**ASUS notebook PCs recommend Windows XP Professional for business.**

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### Revolutionary Notebook Performance

The ASUS L3C leverages the advanced Pentium 4 processor to bring desktop power to the road. 32MB ATI M7 graphics deliver compelling performance in 3D games and graphical intensive programs, while up to 1024MB of DDR memory provides the necessary bandwidth for today's most demanding applications. For those who still want to go faster, the ASUS L3C also lets you turbo boost performance thanks to its unique thermal design.

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### Cool down your components

As PC components go faster, they get hotter. Since this applies to processors, graphics cards and hard disks, the inside of an enhanced PC will begin to resemble an oven, which could in turn harm your components. Higher voltages required by overclocking further accentuate this problem, which is why cooling is, quite literally, a hot topic.

The one cooler that is absolutely compulsory is the one on top of your processor, as without this or thermal protection, it would literally fry within seconds. That's not to say the one that came as standard with your PC is adequate. Use monitoring utilities or the PC Health section in your Bios to check the temperature of your processor after long periods of use.

There's no set rule, but if it's above 60°C, then you should consider fitting a more substantial cooler to your CPU.

Traditional CPU heatsinks employ air cooling with fans, but these won't cut the mustard for truly heavy overclocking. Instead you're looking at liquid cooling which consists of pipes pumping coolant over the processor while removing heat with tiny

radiators; some even go as far as employing active refrigeration fluids. Complete water cooling systems cost over £100, or the squeamish can buy them already fitted to speciality cases, complete with temperature gauges from £150. (See also our review of a liquid-cooled PC p48.)

Processor coolers may be fashionable, but there's no need for your other components to become hot under the circuit boards.

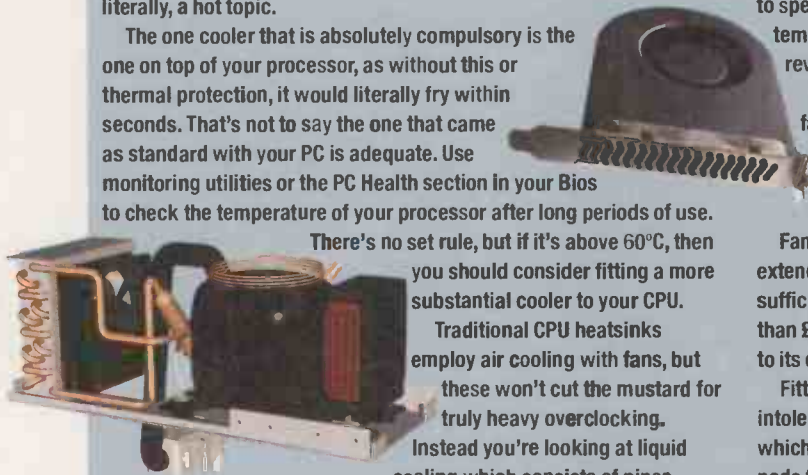
Fans attached to hard disks and even over memory cards can extend the life of overheating components, while case fans will ensure sufficient airflow is maintained inside your PC. Such fans can cost less than £10 – we'd recommend any self-enhanced PC has a couple fitted to its case.

Fitting coolers is all very well, but the resulting noise levels can be intolerable. Sensitive users could use larger, but slower rotating fans, which deliver the same airflow with lower noise. Vibration-absorbing pads fitted around the case also reduce noise levels.

A variety of cooling accessories are available from websites such as [www.theoverclockingstore.co.uk](http://www.theoverclockingstore.co.uk) and [www.overclockers.co.uk](http://www.overclockers.co.uk).



Case fans (above) and slot fans (centre) can extend the life of overheating components



Liquid coolers pump coolant over the CPU

### Get the right cases and power supplies

Cases and power supplies are probably the least exciting PC components, but they're an essential part of a boosted system. As you add increasingly power-hungry processors, graphics cards and a multitude of internal drives, greater stress is placed on the power supply.

If you're building or upgrading a high-spec machine, ensure the power supply can cope. The bare minimum these days is 300 watts, with most enthusiasts selecting 400w models or higher; if you have a Pentium 4 or high-end Athlon motherboard, you'll also need an ATX supply with supplemental power plugs, so check the manual to make sure you choose the right one. Decent power supplies cost £50 to £100 and can easily be fitted into a standard ATX case.

Speaking of which, you may want to go for a bigger case to accommodate plenty

of internal drives or unusually large motherboards and heatsinks. The extra space also allows superior airflow and cooling possibilities. We're not suggesting you buy a faceless beige box though.

If you're proud of the insides of your enhanced PC, why not show them off by fitting a coloured neon light inside the case and cutting a window in the side?

Check out [www.coolcasemods.com](http://www.coolcasemods.com) for inspiration and tools.

Check the power supply can cope with whatever upgrades you're planning



Don't hide it all away – show off and light up your PC's internals



### 10 PC POWER BOOSTING TIPS

You should have a good idea, now, of how to get more performance out of your PC, but here's a handy reminder – our top 10 power-enhancing tips.

- Try overclocking your processor for free extra performance. Remember to keep it cool though.
- You can never have too much Ram, especially if you're into audio visual applications. 256MB costs just £75.
- New graphics drivers can increase your 3D performance by up to 20 per cent – free of charge.
- Ensure you have several hundred megabytes free on your hard disk, or your PC will grind to a halt.
- Defragment your hard disk every few months to get maximum performance.
- The latest connectivity such as Firewire or USB2 is only a PCI card away – from £30 per card.
- Protect your PC from potential death by backing up your Bios with a £30 saviour chip.
- Stay cool. Fast PCs get hot, so install fans in the case and onto overheating components.
- High-quality memory may handle faster speeds – try adjusting memory timings in the Bios.
- Don't run out of power – enhanced PCs need at least 300w supplies, which cost from £50.

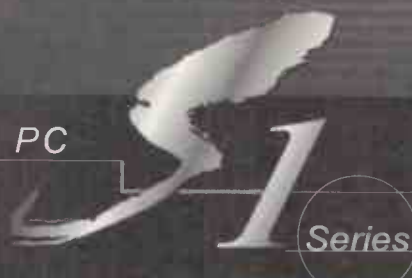
### And finally...

So there you have it. Plenty of ways to enhance your PC and keep it running happily without spending a fortune. If this feature has whetted your appetite for tweaks and upgrades, then check out our regular Hands On column dedicated to hardware every month.

We'd love to hear how you've got on power boosting your PC, so email us at [letters@pcw.co.uk](mailto:letters@pcw.co.uk).

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ASUS NOTEBOOK PC



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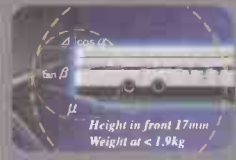
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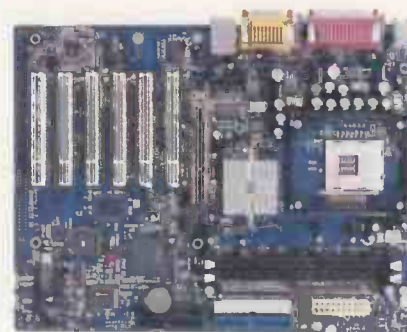
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WORDS & TESTING: LEO WALDOCK PHOTOGRAPHY: BRUCE MACKIE

# Laptops for less

Do you want to buy a notebook without spending a fortune? We've tested 15 affordable portables to help make your choice easier

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**N**otebooks are slender objects of desire that free you from your desk. They let you send email to your friends and family while you're on holiday, and make long journeys more fun, giving you the chance to watch DVDs when you're stuck in the passenger seat of a jam-bound car.

The snag is that a notebook is invariably more expensive than a comparable PC. This is partly due to the battery that a notebook must have, as well as the extra engineering involved in power saving and cooling that most PCs just don't need. Then, of course, there's the display panel.

As a result it is quite easy to spend £2,000 on a notebook, which is a substantial sum of money. However, recent research from Romtec-GfK showed that 45 per cent of notebooks sold in the UK had a price ticket of under £999 and another 45 per cent were priced below £1,299.

So, with a £1,299 price limit, we set out to discover what you could get for your money, and were pleasantly surprised at the results. We ran our suite of benchmarks and tests on 15 notebooks to see what's on the market – with our help you can avoid the lemons and buy yourself a peach. ➤



# GROUP TEST NOTEBOOKS

## Toshiba Satellite 3000

NOTEBOOKS UNDER £999



**PRICE** £999 (£850.23 ex VAT) **CONTACT** Toshiba 01932 828 828 [www.toshiba.co.uk](http://www.toshiba.co.uk)

**PROS** Good performance; good value; excellent battery life **CONS** No Firewire or infra-red

**OVERALL** The Satellite 3000 scores in all the right places

**FEATURES** ■■■■ **PERFORMANCE** ■■■■ **VALUE FOR MONEY** ■■■■

**BATTERY LIFE** ■■■■ **OVERALL** ■■■■

Our Editor's Choice in the £999 bracket is the understated dark blue and silver Toshiba Satellite 3000. Styling isn't a crucial issue, but let's not forget that a notebook is frequently on show, and the 3000 looks good.

It is really a notebook for the home user, rather than the full-on road warrior, as it includes Windows XP Home and minimal connectivity. There is nothing too critical missing from the specification, but if you happen to need Firewire, Lan or infra-red, this isn't the notebook for you. Connectivity is the 3000's weakest point and it receives only two out of five for features as a result. But the rest of the notebook more than makes up for this.

Performance is excellent – in fact the Toshiba wipes the floor with the

other notebooks using the same processor, and highlights the poor performance of the HP zt1151.

The IBM R31 has a very similar specification, but the Satellite 3000 is speedier than that notebook as well. If the substantial performance boost is down to the chipset alone we are impressed and amazed.

In addition to decent performance you get plenty of memory and the Satellite's battery life is the best of the group. Graphics performance is competent by notebook standards – in fact the Satellite 3000 was the only £999 notebook in the group to complete the graphics tests.

Toshiba gives you a lot of notebook for £999 and we feel the cost cutting on the specification is entirely justified.

It's a winner, and rightly so.



The Toshiba Satellite 3000 offers stunning performance

NOTEBOOKS UNDER £999

## Iridium Starbook 510

**PRICE** £938.83 (£799 ex VAT) **CONTACT** Iridium 0870 0660 222 [www.iridium-uk.com](http://www.iridium-uk.com)

**PROS** Fully featured; fair battery life **CONS** Poor performance **OVERALL** A decent notebook, but there are better in this group

**FEATURES** ■■■■ **PERFORMANCE** ■■■■

**VALUE FOR MONEY** ■■■■ **BATTERY LIFE** ■■■■ **OVERALL** ■■■■

In most respects the Iridium 510 fails to shine in this group. It has very few really bad points per se, although performance is a concern. This is puzzling as the specification is very similar to the Hi-Grade Notino 2200. But the figures speak for themselves.

On the positive side, the construction feels solid, and the keyboard is good to type on. Granted this is a little flexible, but it is significantly better than the Rock Sigma SI. The best part of the Iridium is its specification. The only plausible ways to improve it would be a DVD/CD-RW combo drive and a serial

port. It could also do with better design as the ports are all on the back. One of the strengths of the HP zt1151 is the headphone socket and USB port that are as close to hand as possible. That type of careful design is a sure way to win friends.

When you type on the Iridium your hands lie on the speakers and sound quality is muffled as a result. It is also a little disappointing that the Iridium includes the bare minimum of software. This is not a bad notebook, though, and it looks quite good on paper. It just doesn't perform well enough in reality.

## Mesh Pegasus 1500+ 14.1in Pro

NOTEBOOKS UNDER £999

**PRICE** £999 (£850.21 ex VAT) **CONTACT** Mesh 020 8208 4706 [www.meshcomputers.com](http://www.meshcomputers.com)

**PROS** Good performance **CONS** Terrible battery life **OVERALL** Strictly for use on mains power

**FEATURES** ■■■■ **PERFORMANCE** ■■■■

**VALUE FOR MONEY** ■■■■ **BATTERY LIFE** ■■■■ **OVERALL** ■■■■

The Mesh should be a real contender in this group, but with an appalling 44-minute battery life it has no chance. If you plan on your notebook spending most of its life plugged into the mains power supply, though, it is worth considering the Pegasus.

It is physically similar to a number of the notebooks tested here and has a decent screen and solid keyboard. The layout is uninspired, but then so is much of the competition, and all the ports are lined up on the back, along with the processor cooling exhaust.

Performance is decent enough, although we were surprised that the Toshiba Satellite 3000 managed to beat it in Sysmark tests. We were fairly impressed by the specification of the Mesh. The only glaring omission is its lack of Firewire, but we can't imagine using the S3 Twister graphics for video editing.

Connectivity is a positive strength here. Firewire apart, the Pegasus has the full set, and it would make a perfectly adequate portable workstation – just make sure there's a power point close to hand.



## Hi-Grade Notino 2200

**PRICE** £999 (£850.21 ex VAT) **CONTACT** Hi-Grade 020 8532 6113 [www.higrade.com](http://www.higrade.com)

**PROS** Excellent design; good performance **CONS** None to speak of

**OVERALL** A decent, small notebook

**FEATURES** ■■■■ **PERFORMANCE** ■■■■ **VALUE FOR MONEY** ■■■■

**BATTERY LIFE** ■■■■ **OVERALL** ■■■■

The Hi-Grade Notino 2200 stands out in this group with its 12.1in screen and tiny physical form. It's a lovely piece of design and steers clear of the faults we picked with the Rock, Mesh and Iridium. All the ports and sockets are on the sides and there is nothing on the back at all. Granted, the Notino is missing infra-red and serial ports, but those are rarely used at home. The only significant missing feature is the lack of a PS/2 port for a mouse – we are being forced down the USB route, whether we like it or not.

For such a slender notebook the performance is excellent. The SIS chipset and 1.06GHz Celeron combine to score well in Sysmark, and yet the notebook seems to generate no heat. As a result you get decent battery life and should just about be able to watch a whole movie

on one battery charge. The limiting factor is the SIS graphics, although they are certainly adequate for the job. Although the screen is smaller than the much more common 14.1in, it still has the same 1,024 x 768 resolution and is comfortable to use.

Hi-Grade feels confident about the Notino as it offers a two-year return to base warranty and free insurance against accidental damage.

You may have spotted that it scores three out of five in every category and wondered why it sneaks ahead of the opposition to win our Highly Commended award. Its main strength is intangible and doesn't appear on the features table, although it is shared with the HP zt1151. It's the way the Notino has been designed and the attention to detail that makes all the difference.

NOTEBOOKS UNDER £999



Performance and design make the Hi-Grade Notino 2200 a winner

NOTEBOOKS UNDER £999

## Rock Sigma SI

**PRICE** £997.58 (£849 ex VAT) **CONTACT** Rock Direct 0870 9909 090 [www.rockdirect.com](http://www.rockdirect.com)

**PROS** Plenty of memory; good connectivity **CONS** Poor performance; battery life **OVERALL** We can't recommend the Sigma SI

**FEATURES** ■■■■ **PERFORMANCE** ■■■■

**VALUE FOR MONEY** ■■■■ **BATTERY LIFE** ■■■■ **OVERALL** ■■■■



Where on earth did all the performance go? The Sigma SI has a Pentium III and plenty of memory, yet its Sysmark score ended up between the Iridium Starbook 510 and Hi-Grade Notino, both of which use a Celeron processor. This just goes to show that a decent notebook is more than the sum of its parts.

The specification is fair, although a CD-Rom, rather than a DVD-Rom is a touch mean as one of the uses for a notebook is to watch movies. We also didn't like the keyboard, which flexes and bounces quite alarmingly.

Battery life is shorter than we would like to see, and would barely be adequate for an hour's commute. Perhaps it's as well you don't get a DVD-Rom, as this battery life will never allow you to watch a whole movie in one sitting.

Those are the bad points out of the way, but sadly that leaves very little else. The main strength of the Rock is its connectivity. You get modem, Lan, infra-red, USB and Firewire. If you require all those features that's all well and good, but if you don't, we suggest you look at another option.

## ACI Powerlite

**PRICE** £1,287 (£1,095.32 ex VAT) **CONTACT** ACI 020 8357 1116 [www.aciplc.com](http://www.aciplc.com)

**PROS** Design; good battery life **CONS** Performance isn't good enough **OVERALL** A decent notebook, but the Notino is better

**FEATURES** ■■■■ **PERFORMANCE** ■■■■

**VALUE FOR MONEY** ■■■■ **BATTERY LIFE** ■■■■ **OVERALL** ■■■■

The first of the sub-£1,299 notebooks, ACI's Powerlite, has a very sleek design. It's not as small as the Hi-Grade Notino 2200, but it is one of the smallest and lightest notebooks on test. The touchpad is sensitive and the keyboard is a good size and fairly solid when typing, although the one on our review unit was prone to occasional mis-keying.

The SIS chipset gives good performance, but on the 3D graphics front things are quite abysmal. This is no problem for day-to-day tasks such as email and office use, and the screen is a decent size and

bright and clear, but don't expect to play games. Similarly, the speakers are barely up to the job of music playback, but are fine for Windows sounds. ACI includes Lotus Smartsuite rather than the more expensive Microsoft Office, but it is good to see a full office suite included in the price.

The power connector sticks out of the right-hand side of the chassis and could be knocked while the ACI is on charge. But overall, this is exactly the sort of budget notebook you should consider as a backup to your desktop PC for use on the move.

£1,000-£1,299 NOTEBOOKS





# GROUP TEST NOTEBOOKS

## Evesham Voyager 5600

**PRICE** £1,291.33 (£1,099 ex VAT) **CONTACT** Evesham 0870 160 9500 [www.evesham.com](http://www.evesham.com)

**PROS** Impressive Sysmark score; very good battery life **CONS** The features list is rather spartan

**OVERALL** A very good notebook for less than £1,299

**FEATURES** ■■■■ **PERFORMANCE** ■■■■ **VALUE FOR MONEY** ■■■■

**BATTERY LIFE** ■■■■ **OVERALL** ■■■■

With its 1.8GHz Pentium 4 processor the Evesham 5600 storms to the top of the charts in this group. It completed its benchmarks well and has a decent battery life.

The Voyager's graphics performance is less spectacular, but the ATI Mobility Radeon inside is a good chip and is only beaten here by the AJP 5600P with the Mobility Radeon 7500.

You can use this notebook, which sports a 20GB hard drive, for gaming, and it takes DVD playback and Powerpoint in its stride.

Mesh produces a near-identical notebook, the Discovery J800 14.1in Pro (not reviewed here), which is housed in the same chassis as the Evesham Voyager and uses the same processor, chipset and memory. The Mesh, however, has a 30GB hard drive.

We can find few flaws in the Voyager 5600. Perhaps the greatest is that it has no floppy drive, and Evesham charges £39 ex VAT for an accessory USB drive. That's a little mean, but the rest of the hardware is decent enough, and we feel the value for money is fair. To its credit, Evesham gives a two-year warranty and throws in two years' accidental damage insurance.

The Evesham 5600 weighs in at 3.25kg, and is a full kilogram lighter than the AJP 5600P. Despite the similar model names, they have very different chassis. We would be happy to use the Evesham as a desktop replacement, despite its slightly flexible keyboard.

The overall package is impressive and so wins our Editor's Choice award in the high-end category.

£1,000-£1,299 NOTEBOOKS



Evesham's Voyager 5600 lacks a floppy drive, but performance is good

£1,000-£1,299 NOTEBOOKS

## Hi-Grade Ultinote M6400 C1700

**PRICE** £1,291.33 (£1,099 ex VAT) **CONTACT** Hi-Grade 020 8532 6113 [www.higrade.com](http://www.higrade.com)

**PROS** Good software; USB floppy drive **CONS** Sacrifices performance for spec **OVERALL** The Evesham is better

**FEATURES** ■■■■ **PERFORMANCE** ■■■■

**VALUE FOR MONEY** ■■■■ **BATTERY LIFE** ■■■■ **OVERALL** ■■■■



This Hi-Grade is similar to Evesham's Voyager (above). Same chassis, different processor. Two large UK PC assemblers using the same chassis? It must be good.

Hi-Grade has opted for a 1.7GHz Celeron processor, rather than a full-on Pentium 4, but the technical differences are few and far between. The result is that the Hi-Grade demonstrated poorer performance than the Evesham, and graphics performance suffers too. If the lower performance resulted in longer battery life, we would have taken

that into consideration, but the Evesham wins on that score too. Hi-Grade offers free accidental damage insurance, but so too does Evesham.

The Ultinote includes a USB floppy drive, which would otherwise cost nearly £50 inc VAT. Hi-Grade also offers a 1.8GHz Pentium 4 model in the same chassis, but no floppy, and the price difference is also £50. Which do you value more – a floppy drive or a faster processor?

The software package should appeal to many, as it includes Microsoft Works Suite 2002.

## HP zt1151

**PRICE** £1,299 (£1,105.53 ex VAT) **CONTACT** HP 08705 474 747 [www.hp.com/uk](http://www.hp.com/uk)

**PROS** Well-designed chassis **CONS** Poor performance and 3D graphics **OVERALL** Style may outweigh performance for some

**FEATURES** ■■■■ **PERFORMANCE** ■■■■

**VALUE FOR MONEY** ■■■■ **BATTERY LIFE** ■■■■ **OVERALL** ■■■■

We reviewed the zt1151 in our May issue and raved about its wonderful chassis. But we were less enamoured by the performance of its Celeron processor, and this month are not surprised to see that in the £1,299 group it comes last in the Sysmark test. To its credit, though, it did manage to complete all of the tests without any problems.

There is more to a notebook than its outright performance, though, and we stand by all the positive remarks we previously made. The HP package is incredibly slick and professional and

there is a small bonus in the shape of a voucher that entitles you to buy a USB floppy drive for the discounted price of £14.99 inc VAT. We would have liked to see the floppy included as standard, but £14.99 is hardly going to break the bank.

The look and feel of the HP is very good. The CD buttons, volume control, headphone socket and one USB port are in exactly the right place. The DVD/CD-RW combo drive is on the side so it can be used even when the HP is plugged into a port replicator and the touchpad is the best in the business.

£1,000-£1,299 NOTEBOOKS



## Tiny Mediabook Extra 1200 CD-R

**PRICE** £1,299 (£1,105.53 ex VAT) **CONTACT** Tiny 0870 8303 162 [www.tiny.com](http://www.tiny.com)

**PROS** Chock full of ports and connectors **CONS** Sysmark and graphics performance are weak

**OVERALL** A good combination of features lift this Tiny above the competition

**FEATURES** ■■■■■ **PERFORMANCE** ■■■ **VALUE FOR MONEY** ■■■■

**BATTERY LIFE** ■■■■ **OVERALL** ■■■■

Tiny has managed to squeeze a fair part of this notebook's specification into its rather unwieldy model name.

Mediabook covers the DVD part of the DVD/CD-RW combo drive well. Despite the poor 3D performance of the S3 Savage4 graphics chip, DVD playback is fine. The latter part of its name, 1200 CD-R, speaks volumes about the 1.2GHz Celeron processor and the CD writing capabilities of the combo drive. If it makes life easier, think of the Tiny as a 1200 combo.

The Tiny Mediabook wins a Highly Commended award almost entirely on the strength of its feature list. Its design and performance are relatively uninspired. The colour and shape are inoffensive, and construction is more passable than rugged. If we were feeling generous we would say understated and leave it at that.

That sounds picky and negative, but the worst thing we can say is that the keyboard is slightly flexible when you are typing. The 1.2GHz Celeron is comprehensively beaten in Sysmark by the Toshiba Satellite 3000's 1.06GHz Celeron. Combine that system performance with the S3 Savage 4 graphics scores and you'll appreciate that gaming isn't really an option here.

The Mediabook is a weighty 3.3kg, but you do get the full set of features inside. Clearly the combo drive adds little or no extra weight over a more basic drive, and its inclusion along with a floppy drive is very good to see. Connectivity is a very strong point indeed with this notebook, although the physical layout isn't a patch on, say, the HP zt1151.

£1,000-£1,299 NOTEBOOKS



The Tiny Mediabook stands out for its great features list

£1,000-£1,299 NOTEBOOKS

## IBM R31

**PRICE** £1,209.08 (£1,029 ex VAT) **CONTACT** IBM 0800 015 3378 [www.ibm.com/uk](http://www.ibm.com/uk)

**PROS** Ergonomics; construction **CONS** Mediocre performance and graphics **OVERALL** The poor man's entry to Thinkpad land

**FEATURES** ■■■ **PERFORMANCE** ■■■

**VALUE FOR MONEY** ■■■ **BATTERY LIFE** ■■■■ **OVERALL** ■■■■



Road warriors use a T or X series IBM Thinkpad and that's all there is to it. Nothing else will do, particularly if your employer is picking up the bill for the privilege, and enhancing your street credibility in the process. The R series is substantially cheaper, but you get the same look and feel, albeit with a much lower specification.

You get the usual IBM trackpoint and positive mouse buttons. More importantly, though, you get the killer matt black chassis with the usual IBM pair of catches to secure the clamshell lid.

From a short distance it looks far more expensive than it is. The R31 case may be made from ABS plastic, but it looks the part. The spec is skewed to the professional user, so you don't get Firewire or PS/2 ports, or a DVD-Rom. Gamers should look elsewhere as 3D graphics scores are also weak.

IBM loads the R31 with Windows XP Professional and a number of its own utilities, including Thinkpad configuration. If you want a floppy drive, it will set you back £46 ex VAT as an extra. In short, you get very little for your cash, but it looks great.

## NEC Versa Premium

**PRICE** £1,251.38 (£1,065 ex VAT) **CONTACT** NEC 0870 0106 322 [www.nec-online.co.uk](http://www.nec-online.co.uk)

**PROS** Good connectivity **CONS** Poor performance and sound quality **OVERALL** The NEC has little to recommend it

**FEATURES** ■■■■■ **PERFORMANCE** ■■■

**VALUE FOR MONEY** ■■■ **BATTERY LIFE** ■■■■ **OVERALL** ■■■■

The NEC Versa Premium is a notebook that is more for the business than home user, but it is worth consideration for home office use.

There are a number of reasons for this, as a quick look at the specification will reveal. It has modem, infra-red and Lan but no Firewire. It is also one of the few notebooks in the group to have Windows XP Professional installed, rather than XP Home edition.

Battery life is at the lower end of the acceptable scale and the NEC weighs 2.45kg which is heavier than we would like. All in all it is not very portable.

It has a basic shape and is an unpleasant silver colour. Styling can work for or against a product, and here the NEC misses the mark.

The keyboard is good, but when you type on it your hands rest on the speakers. This is poor as the speakers are quiet anyway, even at full volume. The hard drive is also rather noisy and combines with the speaker position to make them almost useless. Beyond its connectivity options, the NEC has few outstanding features and is bettered in almost all areas by other notebooks in this group.

£1,000-£1,299 NOTEBOOKS





# "Best Notebook of the Year 2002"

PC Advisor - M722 - Jan 02

## AJP 7321 - Mid Range Notebook

- 14.1/15.1" TFT XGA (1024x768)
- AMD Athlon 4 Mobile 1600+ Processor with QuantiSpeed Technology\* & PowerNow! Technology
- 128MB SDRAM (upgradeable to 384MB)
- 20GB HDD ATA-100 EIDE
- 8x DVD (CD-RW4 Read/Writer or Combo DVD/CD-RW4 Drive)
- Built in 56K fax/modem
- Built in 10/100 Ethernet Adapter
- Shared Video Memory 8/16/32/64MB
- Ports: 2xUSB, IrDA, TV-Out, Parallel, Serial, Monitor, PS/2
- 310(W)x266(D)x40mm(H) / Weight: 3.2Kg
- Carry Case, 24 months RTB Warranty\*

Standard Features: Built in 3.5" FDD, Built in 3D Sound & Speakers, 1x PC Card Slot, Smart Li-Ion Battery\*\*, 5 Hot Keys (one button access to any application), Windows ME/XP Home\*\*\* with CD & Manual, Accessible World Wide Email Address

14.1/15.1" TFT

AMD Athlon 4 1600+

128MB RAM

20GB HDD

DVD

14.1" £875 +VAT

15.1" £949 +VAT



## AJP Neo-PC 4 - 15.1" TFT Desktop with a Difference

- 15.1" TFT XGA (1024x768)
- 1.6GHz Intel® Pentium 4 with 512K Cache (Optional 1.8GHz/2.0GHz/2.2GHz/2.4GHz)
- 256MB DDR (upgradeable to 1GB)
- 40GB HDD ATA-100 EIDE (7200 RPM)
- 24x CD ROM (Optional 8x DVD, CD-RW4 Read/Writer or Combo DVD/CD-RW4 Drive)
- Built in 56K fax/modem
- Built in 10/100 Ethernet Adapter
- ATI M7-P Radeon Integrated AGP 4x
- 64MB external DDR Video
- IEEE 1394 Firewire 400Mbps (for digital video)
- Ports: 4xUSB, Parallel, Serial, Monitor, 2xPS/2
- Logitech Cordless Keyboard & Optical Mouse
- 369(W)x384(D)x188mm(H) / Weight: 8.8Kg
- 24 months RTB Warranty\*

Standard Features: Built in 3.5" FDD, Built in 3D Sound & Speakers, 2x PC Card Slot, Windows ME/XP Home\*\*\* with CD & Manual, Accessible World Wide Email Address

15.1" TFT

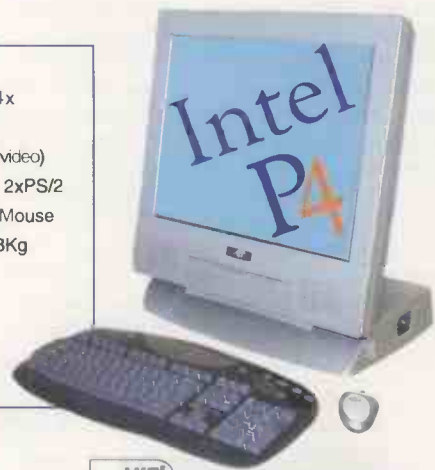
P4 1.6GHz

256MB RAM

40GB HDD

CD ROM

£1099 +VAT



## AJP Neo-PC 4 - 17.1" TFT - Desktop with a Difference

- 17.1" TFT SXGA (1280x1024)
- 2.0GHz Intel® Pentium 4 with 512K Cache (Optional 2.2GHz/2.4GHz)
- 512MB RAMBUS (upgradeable to 2GB)
- 60GB HDD ATA-100 EIDE (7200 RPM)
- 8x DVD Drive (Bay 1)
- CDRW Read/Writer (Bay 2)
- Built in 56K fax/modem
- Built in 10/100 Ethernet Adapter
- ATI M6-P with Integrated AGP 4x
- 64MB external DDR Video
- IEEE 1394 Firewire 400Mbps (for digital video)
- Ports: 4xUSB, IrDA, TV-Out, Video In, Parallel, Monitor, S/P DIF output
- Logitech Cordless Keyboard & Optical Mouse
- 460(W)x448(D)x220mm(H) / Weight: 13.9Kg
- 24 months RTB Warranty\*

Standard Features: Built in 3.5" FDD, Built in 3D Sound & Speakers, 2x PC Card Slot, Windows ME/XP Home\*\*\* with CD & Manual, Accessible World Wide Email Address

17.1" TFT

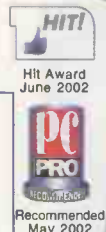
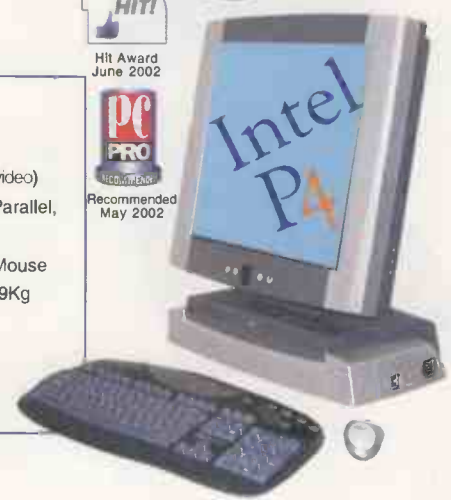
P4 2.0GHz

512MB RAMBUS

60GB HDD

Bay 1 DVD Bay 2 CDRW

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### AJP Business Achievements

- 2002 - The Best SubNotebook of the Year, PC Advisor
- 2000 - Ranked in the top 10% of Computer Companies, Dunn & Bradstreet
- 1999 - One of the Fastest Fifty growing IT Companies in London, Deloitte & Touche
- 1999 - The Best Notebook of the Year, PC Advisor
- 1997 - The Special Achievement Award for Business, PC Direct

Recommended April 2002



Recommended March 2002



Recommended Feb 2002



Hit Award Feb 2002



Gold Xmas 2001



Best Buy Dec 2001



Best Buy Dec 2001



Business Award 1997



ISO 9002



Buy IT Oct 2001



Commended Nov 2001



Best Buy Dec 2001



Best Buy Nov 2001



Silver Dec 2001



Silver Dec 2001



# "Fastest Laptop Yet, Performance 6/6"

PC Pro - 5600P - June 02

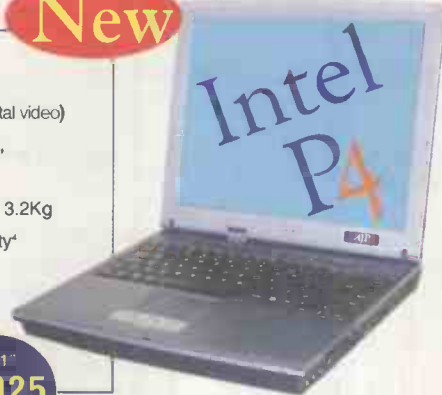
## AJP 620S - Mid Range Notebook

- 14.1/15.1" TFT XGA (1024x768)
- 1.6GHz Intel® Pentium 4 with 512K Cache (Optional 1.8GHz/2.0GHz/2.2GHz/2.4GHz)
- 128MB DDR (upgradeable to 1GB)
- 40GB HDD ATA-100 EIDE
- 24x CD ROM (Optional 8x DVD, CD-RW4 ReadWriter or Combo DVD/CD-RW4 Drive)
- Built in 56K fax/modem
- Built in 10/100 Ethernet Adapter
- Shared Video Memory 8/16/32/64MB
- IEEE 1394 Firewire 400Mbps (for digital video)
- Ports: 3xUSB, IrDA, TV-Out, Parallel, Monitor, S/P DIF output
- 331(W)x280(D)x44.5mm(H) / Weight: 3.2Kg
- Carry Case, 24 months RTB Warranty\*

Standard Features: Built in 3D Sound & Speakers, 1x PC Card Slot, Smart Li-Ion Battery\*\*, 3 Hot Keys (one button access to any application), (Optional) External USB 3.5" FDD, Windows ME/XP Home\*\*\* with CD & Manual, Accessible World Wide Email Address \*External USB FDD Add £49+VAT

14.1/15.1" TFT P4 1.6GHz 128MB RAM 40GB HDD CD ROM £949 +VAT £1025 +VAT

New



## AJP 8170 - High End Notebook

- 14.1/15.1" TFT XGA (1024x768)
- 1.8GHz Intel® Pentium 4 with 512K Cache (Optional 2.0GHz/2.2GHz/2.4GHz)
- 256MB SDRAM (upgradeable to 1GB)
- 20GB HDD ATA-100 EIDE
- 8x DVD (Optional CD-RW4 ReadWriter or Combo DVD/CD-RW4 Drive)
- External USB 3.5" FDD
- Built in 56K fax/modem
- Built in 10/100 Ethernet Adapter
- ATI M6-P Integrated AGP 4x
- 16MB external DDR Video SGRAM
- IEEE 1394 Firewire 400Mbps (for digital video)
- Ports: 2xUSB, IrDA, TV-Out, Parallel, Monitor, S/P DIF output
- 313(W)x263(D)x36mm(H) / Weight: 2.95Kg
- Carry Case, 24 months RTB Warranty\*

Standard Features: Built in 3D Sound & Speakers, 1x PC Card Slot, Smart Li-Ion Battery\*\*, 3 Hot Keys (one button access to any application), Windows ME/XP Home\*\*\* with CD & Manual, Accessible World Wide Email Address

14.1/15.1" TFT P4 1.8GHz 256MB RAM 20GB HDD DVD £1099 +VAT £1175 +VAT



Silver Award May 02



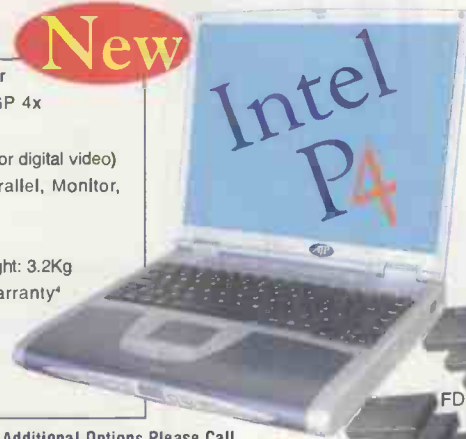
## AJP 5600P - Ultra High End Notebook

- 15.1" TFT SXGA+ (1400x1050)
- 1.8GHz Intel® Pentium 4 with 512K Cache (Optional 2.0GHz/2.2GHz/2.4GHz)
- 256MB DDR RAM (upgradeable to 1GB)
- 30GB HDD ATA-100 EIDE (Removable)
- 8x DVD (Swappable with CD ROM/CDRW/Combo)
- 3.5" FDD (Swappable with 2nd Battery/DVD/CD ROM/CDRW/Combo)
- Built in 56K fax/modem
- Built in 10/100 Ethernet Adapter
- ATI M7-P Radeon Integrated AGP 4x
- 64MB external DDR Video
- IEEE 1394 Firewire 400Mbps (for digital video)
- Ports: 4xUSB, IrDA, TV-Out, Parallel, Monitor, PS/2, S/P DIF output
- Audio DJ onboard
- 329(W)x290(D)x44mm(H) / Weight: 3.2Kg
- Carry Case, 24 months RTB Warranty\*

Standard Features: Built in 3.5" FDD, Built in 3D Sound & Speakers, 1x PC Card Slot, Smart Li-Ion Battery\*\*, 3 Hot Keys (one button access to any application), Windows ME/XP Home\*\*\* with CD & Manual, Accessible World Wide Email Address

15.1" TFT P4 1.8GHz 256MB RAM 30GB HDD DVD £1249 +VAT

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# GROUP TEST NOTEBOOKS

## AJP 5600P

**PRICE** £1,299 (£1,105.53 ex VAT) **CONTACT** AJP 020 8208 9777 [www.ajp.co.uk](http://www.ajp.co.uk)

**PROS** Massive system and graphics performance **CONS** Battery life; weight

**OVERALL** A desktop replacement that is more luggable than truly mobile

**FEATURES** ■■■■ **PERFORMANCE** ■■■■ **VALUE FOR MONEY** ■■■■

**BATTERY LIFE** ■■■ **OVERALL** ■■■■

The paper specification could easily fool you into thinking that the 5600P is a full desktop PC, with its 1.7GHz Pentium 4, 512MB of Ram, ATI graphics, DVD/CD-RW combo drive and so on.

Pick up the notebook and your prejudices will be reinforced. The AJP weighs a hefty 4.25kg with an extra 0.75kg for the power supply unit.

The fundamental question was whether we were looking for a portable PC or a mobile solution. We feel a notebook should be able to fulfil both roles. Unfortunately, the AJP is likely to spend the bulk of its life on a desk, as it just isn't mobile enough.

Performance aside, battery life was quite poor, and the underside gets quite warm in use. Neither is very desirable when you're using the notebook as a laptop, but these

problems don't matter very much when you're connected to the mains power and sat at a desk.

We would class this as a desktop replacement notebook with plenty of connectivity. You would be happy using the 5600P for graphics work, gaming and DVD playback. The only limitation to video editing is the relatively small hard drive.

The AJP scored four out of five for features. A serial port and a 30GB hard drive would certainly have gained it the same five out of five awarded to the Tiny.

In many respects the AJP takes precisely the opposite approach to our Editor's Choice, the Evesham Voyager 5600. But the real surprise is that two notebooks which have so little in common were so hard to separate.

**£1,000-£1,299 NOTEBOOKS**



ALSO  
CONSIDER

Heavy though it is, the AJP 5600P has some great features

**£1,000-£1,299 NOTEBOOKS**

## Rock Xeno

**PRICE** £1,291.33 (£1,099 ex VAT) **CONTACT** Rock Direct 08709 909 090 [www.rockdirect.com](http://www.rockdirect.com)

**PROS** Good performance; excellent warranty **CONS** Poor battery life **OVERALL** A good value package

**FEATURES** ■■■■ **PERFORMANCE** ■■■■

**VALUE FOR MONEY** ■■■■ **BATTERY LIFE** ■■■ **OVERALL** ■■■■



OK, we admit it. This notebook is in the same chassis as the Evesham Voyager 5600, but inside Rock's Xeno there are some different specs.

The main difference is the 1.7GHz Pentium 4 processor rather than a 1.8GHz Pentium 4 or 1.7GHz Celeron. Our performance graphs show that this seemingly minor change in specification actually has a significant impact on the laptop's performance. The Xeno has near identical graphics performance to the Evesham, so the processor has little effect here.

In terms of battery rundown time, the Rock produced much worse performance than we achieved from the Evesham.

Rock has supplied a 30GB hard drive, and in the world of notebooks this is very generous. The chassis has no internal floppy drive and is moving towards being legacy free. As with the Evesham, a USB floppy drive is an optional extra, and Rock charges a rather steep £49 ex VAT if you want one. Its three-year warranty is also very good – we wish more manufacturers would offer the same.

## Toshiba Satellite Pro 6000

**PRICE** £1,291.33 (£1,099 ex VAT) **CONTACT** Toshiba 01932 828 828 [www.toshiba.co.uk](http://www.toshiba.co.uk)

**PROS** A very well integrated product **CONS** Performance is a little weak **OVERALL** Well worth considering for road warriors

**FEATURES** ■■■■ **PERFORMANCE** ■■■■

**VALUE FOR MONEY** ■■■■ **BATTERY LIFE** ■■■■ **OVERALL** ■■■■

Toshiba has managed to create a notebook that is very similar to the IBM R31. There are differences of course, but the net result is similar. The Pro 6000 uses a 1GHz Pentium III where the IBM has a 1.06GHz Celeron. Both have Windows XP Professional and neither has office software. In addition to the trackpoint, Toshiba uses crescent-shaped mouse buttons, which work well and give you a huge target area to click on.

The management software is effective, and the Toshiba console takes over a number of Windows

functions. When running on battery the notebook drops to standby after a short period of inactivity and awakens instantly. The software setup is detailed and well thought out. We liked the design too, the speakers are neatly located and the chassis feels solid.

Toshiba includes a USB floppy drive and only lets the side down by omitting Firewire. Perhaps specifying a CD-Rom is a little stingy, though. It also has a carrying case containing software CDs and modem adaptors.

**£1,000-£1,299 NOTEBOOKS**



# "The professional's choice"

PC Pro, June 2002  
Recommended

Over the last 6 months Systemax has been impressing the IT magazines again and again. Choose from our range of systems with Intel® Pentium®4 processors and you'll benefit from increased performance and get the most from your applications. To find out why our PCs win awards order your own Systemax PC today... you won't be disappointed!

## VENTURE™ 5065

If you need a reliable PC that won't let you down then look no further. Network ready, a respectable 30GB hard drive and Microsoft Windows 2000 Professional will ensure you get your new business off to a flying start. Don't forget all PCs are backed by a 3 year warranty as standard.

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- Gainward NVIDIA Vanta LT 16MB VGA Card
- On-Board Sound
- Systemax 10/100 Fast Ethernet Card
- Microsoft® Windows® 2000 Professional
- Systemax Wheel Mouse
- Systemax PS/2 Keyboard with Web Hotkeys
- 3.5" 1.44MB Floppy Drive
- McAfee Virus Scan V6
- Systemax 1 year On-site Warranty, 2 years RTB

### Intel® Pentium®4 2.0GHz Processor



CODE: 54777

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INC VAT



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## AWARD WINNING PCS

Computer Shopper – June 2002  
Best Buy – PC Extremes – Inspire A2100CS

"Data can be read or written concurrently on two IDE channels offering significant benefits. The Inspire is one of only two systems to include a DVD-RAM/R-drive, which allows 4.7GB of removable storage. An Ethernet adaptor, Firewire, 56K modem and CD-RW complete the feature-rich configuration."

PC Pro – June 2002  
Recommended – Reliance P2400CP

"The professional's choice of Pentium 4 machine. This PC offers incredibly fast performance, buckets of hard disk space and a respectable all-round feature set."

PC Pro – June 2002  
Recommended Entry Level Servers – Mission P1000CP

"The Mission P1000CP delivers a fine specification for the price and packs it all into a sleek black chassis with tons of expansion potential. The SuperMicro P3TDL3 motherboard looks a fine choice, as its server-specific and comes with the ubiquitous ServerWorks chipset."

PCW – June 2002  
Editors Choice – Inspire A1900CX

"Systemax has gone the extra mile here, supplying the extra connectors for six-channel sound, as well as digital output, which is handy if you feel like upgrading the Systemax a later stage."

## FUSION 5000



- Intel® Pentium®4 1.8GHz Processor
- 256MB PC2100 266DDR RAM
- 40GB Ultra DMA 100 7200rpm
- Gainward NVIDIA GeForce4 MX420 64MB DDR VGA Card with TV-Out
- Videologic ZXR-500 5.1 Surround Sound Speakers
- Hauppauge WinTV-GO TV-Tuner Card
- Systemax 16x DVD-ROM Drive
- Systemax 32x10x40 Burnproof CD-RW
- Please call for full specification



CODE: 54775

**£999**

EX VAT

**£1173.<sup>83</sup>**

INC VAT

## TRAVELBOOK 4000V



- Intel® Pentium®4 1.6GHz Processor
- 256MB PC133 RAM
- 30GB Ultra DMA 100 5400rpm Hard Drive
- Systemax DVD-ROM Drive
- 14.1" XGA TFT Display
- 16MB ATI Mobility M6-D 16MB VGA
- Built-in 10/100 LAN and 56K Modem
- Approximate battery life of 3 hours
- Please call for full specification



CODE: 54603

**£1049**

EX VAT

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INC VAT

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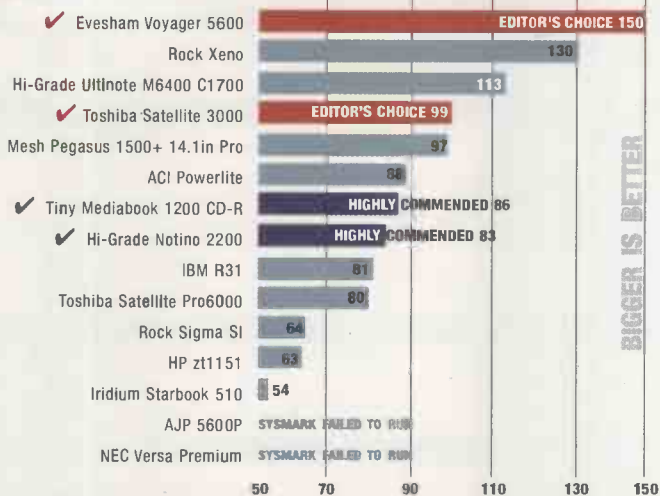


# me2uweb

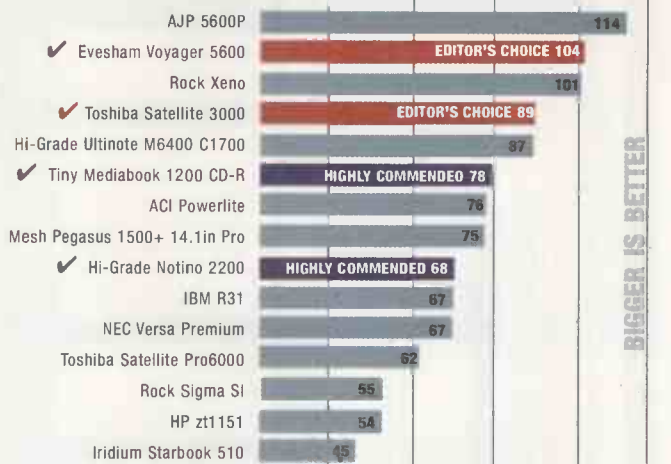
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## LAB RESULTS

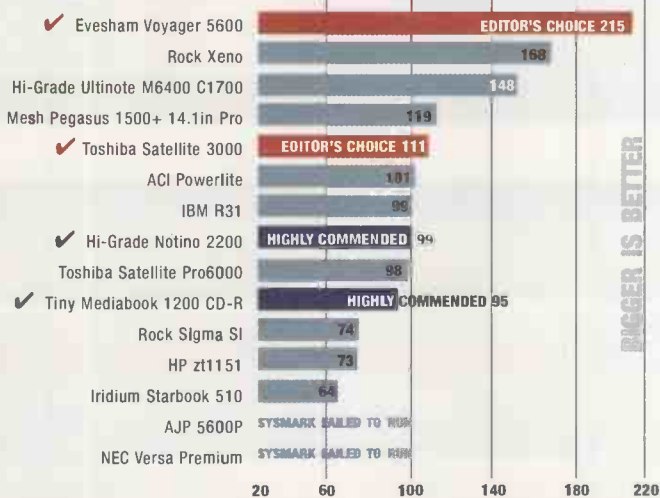
### Sysmark 2001 overall



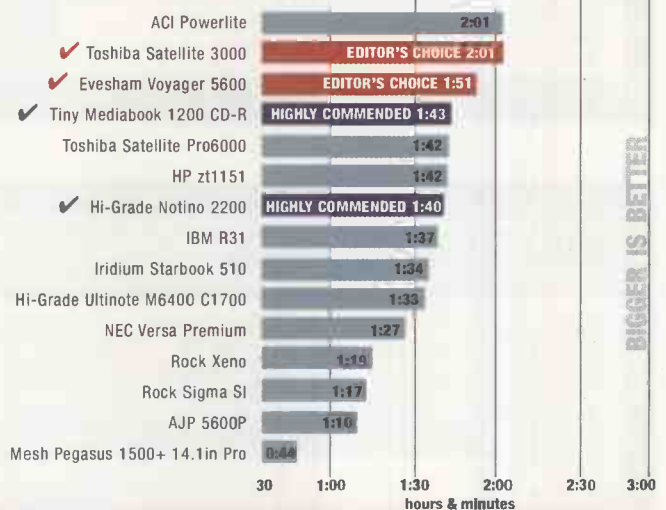
### Sysmark 2001 office productivity



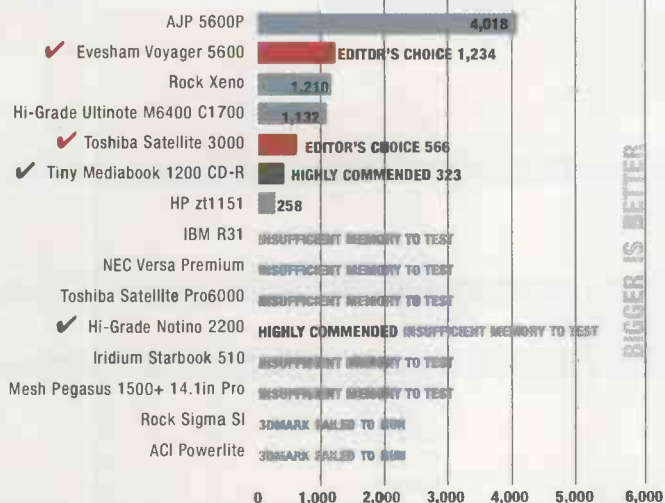
### Sysmark 2001 Internet content creation



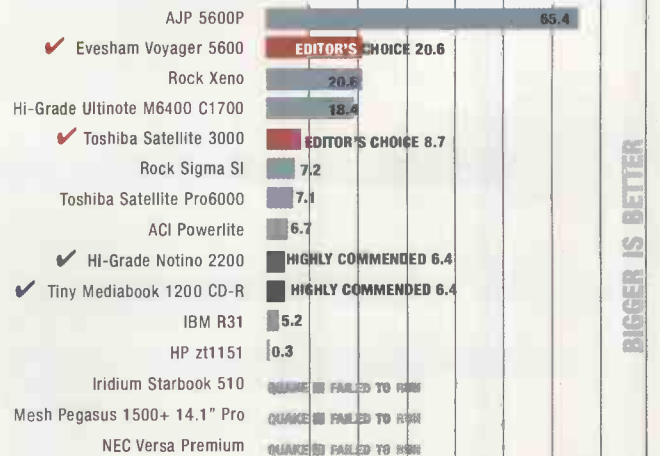
### Battery life



### 3Dmark 2001 (1,280 x 1,024 at 32bit)



### Quake III Team Arena (fps) (1,280 x 1,024 at 32bit)



Please see page 42 for an explanation of how we tested the notebooks



### TABLE OF FEATURES



#### NOTEBOOKS UNDER £999

MANUFACTURER	HI-GRADE	IRIDIUM	MESH
MODEL NAME	NOTINO 2200	STARBOOK 510	PEGASUS 1500+ 14.1IN PRO
Price inc VAT (ex VAT)	£999 (£850.21)	£938.83 (£799)	£999 (£850.21)
Sales telephone	020 8532 6113	0870 0660 222	020 8208 4706
URL	<a href="http://www.higrade.com">www.higrade.com</a>	<a href="http://www.iridium-uk.com">www.iridium-uk.com</a>	<a href="http://www.meshcomputers.com">www.meshcomputers.com</a>
HARDWARE SPECS			
Processor	Intel 1.06GHz Celeron	Intel 1GHz Celeron	AMD Athlon 4 1500+
Chipset	SIS630	SIS 630	Via
Memory	112MB	120MB	120MB
Max memory in this configuration	368MB	632MB	256MB
Hard disk size/transfer rate (UltraDMA66/100)	20GB UltraDMA100	20GB UltraDMA100	20GB UltraDMA100
Touchpad or trackpoint	Touchpad	Touchpad	Touchpad
No of USB/Firewire/serial/parallel/PS/2	3/1/0/1/0	2/1/0/1/1	2/0/1/1/1
Modem/Lan/intra-red/PC Card slots	✓/✓/✓/1	✓/✓/✓/1	✓/✓/✓/2
MULTIMEDIA			
Optical drive/floppy drive	DVD-Rom/USB	DVD-Rom/Internal	DVD-Rom/Internal
Sound chip	SIS 7018	SIS 7018	Crystal WDM
Graphics chip/memory	SIS 630/16MB	SIS 630/8MB	S3 Savage4/8MB
Screen size/maximum resolution	12.1in/1,024 x 768	14.1in/1,024 x 768	14.1in/1,024 x 768
OTHER INFORMATION			
Bundled software	Microsoft Works 6, Norton Antivirus	WinDVD, McAfee Virus Scan	WinDVD, Lotus SmartSuite 9.7
Standard warranty (RTB = return to base, C&R = collect and return)	2yrs RTB	1yr C&R	2yrs RTB
SCORES			
Features			
Performance			
Value for money			
Battery life			
Overall			

### TABLE OF FEATURES

#### £1,000-£1,299 NOTEBOOKS

MANUFACTURER	HI-GRADE	HP	IBM
MODEL NAME	ULTINOTE M6400 C1700	ZT1151	R31
Price inc VAT (ex VAT)	£1,291.33 (£1,099)	£1,299 (£1,105.53)	£1,209.08 (£1,029)
Sales telephone	020 8532 6113	08705 474 747	0800 015 3378
URL	<a href="http://www.higrade.com">www.higrade.com</a>	<a href="http://www.hp.com/uk">www.hp.com/uk</a>	<a href="http://www.ibm.com/uk">www.ibm.com/uk</a>
HARDWARE SPECS			
Processor	Intel Celeron 1.7GHz	Intel 1.06GHz Celeron	Intel 1.06GHz Celeron
Chipset	Intel 845	Via	Intel 830M
Memory	256MB	240MB	120MB
Max memory in this configuration	512MB	496MB	632MB
Hard disk size/transfer rate (UltraDMA66/100)	20GB UltraDMA100	20GB UltraDMA100	20GB UltraDMA100
Touchpad or trackpoint	Touchpad	Touchpad	Trackpoint
No of USB/Firewire/serial/parallel/PS/2	2/1/0/1/0	3/1/0/1/0	2/0/0/1/0
Modem/Lan/intra-red/PC Card slots	✓/✓/✓/1	✓/✓/✓/2	✓/✓/✓/1
MULTIMEDIA			
Optical drive/floppy drive	DVD-Rom/USB	DVD/CD-RW combo/X (see review)	CD-Rom/X (see review)
Sound chip	Avance AC97	Via AC97	Soundmax
Graphics chip/memory	ATI Mobility Radeon/16MB	S3 Savage4/16MB	Intel 830M/8MB
Screen size/maximum resolution	14.1in/1,024 x 768	15in/1,024 x 768	14.1in/1,024 x 768
OTHER INFORMATION			
Bundled software	PowerDVD, MS Works Suite 2002, McAfee Antivirus	Microsoft Works Suite 2002	Norton Antivirus, PC Doctor
Standard warranty (RTB = return to base, C&R = collect and return)	2yrs RTB	1yr RTB	1yr RTB
SCORES			
Features			
Performance			
Value for money			
Battery life			
Overall			

# NOTEBOOKS GROUP TEST



## £1,000-£1,299 NOTEBOOKS

### ROCK SIGMA SI

£997.58 (£849)  
0870 9909 090  
www.rockdirect.com

### TOSHIBA SATELLITE 3000

£999 (£850.23)  
01932 828 828  
www.toshiba.co.uk

### ACI POWERLITE

£1,287 (£1,095.32)  
020 8357 1116  
www.aciplc.com

### AJP 5600P

£1,299 (£1,105.53)  
020 8208 9777  
www.ajp.co.uk

### EVESHAM VOYAGER 5600

£1,291.33 (£1,099)  
0870 160 9500  
www.evesham.com

Intel 1GHz Pentium III  
SIS 630S  
240MB  
752MB  
20GB UltraDMA100  
Touchpad  
2/1/0/1/1  
✓✓✓✓✓

Intel 1.06GHz Celeron  
Intel 830M  
248MB  
504MB  
20GB UltraDMA66  
Touchpad  
3/0/0/1/0  
✓✓✓✓✓

Intel 1GHz Pentium III mobile  
SIS 630S  
184MB  
640MB  
20GB UltraDMA100  
Touchpad  
2/0/1/1/0  
✓✓✓✓✓

Intel 1.7GHz Pentium 4  
Intel 845  
512MB  
512MB  
20GB UltraDMA100  
Touchpad  
4/1/0/1/1  
✓✓✓✓✓

Intel 1.8GHz Pentium 4  
Intel 845  
256MB  
512MB  
20GB UltraDMA100  
Touchpad  
2/1/0/1/0  
✓✓✓✓✓

CD-Rom/Internal  
SIS 7018  
SIS 630/16MB  
14.1in/1,024 x 768

DVD-Rom/X  
Crystal WDM  
Intel 830M/8MB  
14.1in/1,024 x 768

CD-Rom/USB  
SIS 7018  
SIS 630  
13.3in/1,024 x 768

DVD/CD-RW combo/internal  
Avance AC97  
Mobility Radeon 7500/64MB  
15in/1,400 x 1,050

DVD-Rom/X (see review)  
Avance AC97  
ATI Mobility Radeon/16MB DDR  
14.1in/1,024x768

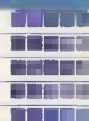
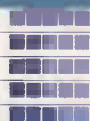
McAfee Virus Scan  
1yr C&R

WinDVD, Microsoft Works 6  
1yr RTB

Lotus SmartSuite Millennium  
1yr C&R, lifetime labour & tech support

WinDVD  
1yr RTB

Power DVD, Big Fox, Sun Star Office  
2yrs RTB, 2yrs accidental damage insurance



### NEC VERSA PREMIUM

£1,251.38 (£1,065)  
0870 0106 322  
www.nec-online.co.uk

### ROCK XENO

£1,291.33 (£1,099)  
08709 909 090  
www.rockdirect.com

### TINY MEDIABOOK EXTRA 1200 CD-R

£1,299 (£1,105.53)  
0870 8303 162  
www.tiny.com

### TOSHIBA SATELLITE PRO 6000

£1,291.33 (£1,099)  
01932 828 828  
www.toshiba.co.uk

Intel 1.2GHz Pentium III  
iSIS  
112MB  
384MB  
20GB UltraDMA100  
Touchpad  
2/0/1/1/1  
✓✓✓✓✓

Intel 1.7GHz Pentium 4  
Intel 845  
256MB  
768MB  
30GB UltraDMA100  
Touchpad  
2/1/0/1/0  
✓✓✓✓✓

Intel 1.2GHz Celeron  
Via Twister  
224MB  
480MB  
30GB UltraDMA100  
Touchpad  
2/1/1/1/1  
✓✓✓✓✓

Intel 1.0GHz Pentium III mobile  
Ali Nappa 2  
112MB  
624MB  
20GB UltraDMA100  
Trackpoint  
2/0/1/1/1  
✓✓✓✓✓

DVD/CD-RW combo/internal  
SIS 7018  
SIS 630/16MB  
14.1in/1,024 x 768

DVD-Rom/X (see review)  
Intel AC97  
ATI Mobility Radeon/16MB  
14.1in/1,024 x 768

DVD/CD-RW combo/internal  
Soundmax  
S3 Savage4/32MB  
14.1in/1,024 x 768

CD-Rom/USB  
Ali  
Trident Cyberblade XP/16MB  
14.1in/1,024 x 768

Norton Antivirus, Prassi PmoDVD  
1yr C&R

WinDVD, McAfee Virus Scan  
3yrs C&R

PowerDVD  
1yr C&R

Sophos Antivirus, Toshiba Utilities  
1yr RTB





# GROUP TEST NOTEBOOKS

## Editor's Choice

**W**hen we sent out the invitation for this group test, we were very liberal with the specification. We required an optical drive so we could load testing software, and Windows XP – either Home or Professional version. We set two price points; up to £999 and £1,000-£1,299 including VAT to attract a representative sample of the market.

A glance at the features table shows that we got a fair variety of hardware, although there are some common components. Most of the screens are 14.1in with a resolution of 1,024 x 768 and hard drives were all 20GB with the sole exception of the 30GB in the Rock, Tiny and Mesh entrants at the upper end of the scale. We saw a variety of processors including Pentium 4, Pentium III, Celeron and Athlon 4. On the graphics side of things we received notebooks that included chips from SIS, Intel, ATI and S3, but none from Nvidia.

We tested the notebooks with our regular benchmarks, namely Sysmark 2002, 3Dmark 2001, Quake III Team Arena and our own battery test. We ran the graphics tests at a resolution of 1,024 x 768 rather than the usual 1,280 x 1,024 to ensure a common testing platform.

We had problems running Sysmark on a few of the notebooks, particularly in the intensive Internet content creation multimedia arena. We suspect that the issue was one of heat generation and dispersal in the cramped confines of the chassis.

There is often a direct trade-off between battery life and the speed and graphics performance of a notebook. However, the days are gone when a full-power desktop replacement notebook had a short battery life and the only way to get a decent battery life was to get a low-speed processor and a small amount of memory. It is possible now to get high performance and a long battery life for a reasonable price.

### The winners

In the £999 price bracket we gave our **Editor's Choice** award to the **Toshiba Satellite 3000**. Clearly Toshiba has done something special with this notebook, as the performance is significantly better than we would expect, going on the specification alone. We can only think that the Intel 830M

chipset boosts the Celeron 1.06GHz processor to unnatural heights, and frankly we love it.

The rest of the Toshiba package is less spectacular, but it's still good stuff. Battery life sneaks past two hours and the software package is respectable. What you don't see in the features table is all the little bits and pieces that come with every Toshiba, like a quality carrying bag. The only other notebook with a similar level of completeness is the IBM R31. The Toshiba 3000 outperforms that same IBM and costs £200 less – a worthy winner.

Our **Highly Commended** award goes to **Hi-Grade** for the **Notino 2200**. It's a cute little beast with a small form factor and 12.1in screen. You probably wouldn't replace your desktop PC with the Notino, but you'd be happy using it on the move.

Performance is good, as is everything else, but not outstanding: the Notino scored three out of five in each category. Its strength is its look and feel – Hi-Grade has packaged a very slick consumer product.

In the up-to-£1,299 group our **Editor's Choice** is the **Evesham 5600**. It features a 1.8GHz Pentium 4 to provide a huge amount of raw power. It has very few weak areas and outperforms relatively young PCs. We were impressed by the balance of system performance, graphics and battery life. It's not quite as polished as the Toshiba or IBM, but you get a lot of hardware for your money.

The **Tiny Mediabook** was the only notebook here to score five out of five, which was awarded for features, and so we gave it the **Highly Commended** award in the high-end category. It's got everything. You get all the connectivity you are likely to need, as well as a 30GB hard drive and a combo CD-RW/DVD drive. Although the performance isn't breathtaking, the Mediabook Extra 1200 CD-R finished all the tests without problem and battery life is just good enough to allow you to watch most DVD movies.

We did some soul searching over the **Also Consider** award which we gave to the **AJP 5600P**. It wouldn't complete Sysmark, which is a bit of a concern. It uses a desktop processor which means it runs relatively hot. It is a desktop replacement with monstrous processing power and gaming-quality graphics. It even has 512MB of memory.

### NOTEBOOKS UNDER £999

#### Toshiba Satellite 3000



#### Hi-Grade Notino 2200



### £1,000-£1,299 NOTEBOOKS

#### Evesham 5600



#### Tiny Mediabook Extra 1200 CD-R



## The Evesham 5600 provides a huge amount of raw power

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WORDS: NIK RAWLINSON PICTURES: BRUCE MACKIE & NIK RAWLINSON

# Digicam delights

It's now possible to get top-quality pictures from pocket-sized digital cameras without breaking the bank. We've put eight leading snappers through their paces

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**W**ith summer well and truly upon us – as far as the calendar is concerned – it's time to get out and take pictures of the family, the countryside and the dog. It was once true that this meant a trip to the chemist to buy film and, depending on the age of your camera, a fresh set

of flash bulbs, but with the price of digital cameras dropping about as quickly as everything else computer related that's no longer necessary.

*PCW* has gathered together eight key players in the digital camera market, taking one budget model from each. With resolutions of between 2 and 3.3 megapixels, they are more than up to the job of replacing your existing film camera, and with online photo printing services now rivalling conventional silver-halide processes there is no reason for your film-favouring friends to know you've bitten the binary bullet. You'll also find that each camera easily connects to your PC, so you'll be able to download, upload and edit your pics to your heart's content.

We tested each camera in a range of environments and in various lighting conditions, reproducing an image from each beside the relevant review. As ever, be aware that the magazine printing process may alter the colour balance in each photo, so these should be used to examine resolution and compression only.

As each of these cameras is about half the price you would have paid for a model of this quality a few years ago, we also wanted to know if lower prices equated to lower quality. There was only one way to find out...





# GROUP TEST DIGITAL CAMERAS

## Canon Powershot A40

**PRICE** £299 (£254.47 ex VAT) **CONTACT** Canon 0800 616 417 [www.canon.co.uk](http://www.canon.co.uk)

**PROS** Versatile **CONS** A little pricey

**OVERALL** Would suit beginners and experts alike – you get what you pay for

**OVERALL SCORE** ■■■■■

Well-balanced and comfortable to hold, the Powershot A40 is Canon's entry-level 2megapixel offering. Its styling and operation is very similar to the rest of Canon's range, but lacks the superior feel of the higher-end products. It is powered by four AA batteries and features both an optical viewfinder and a 1.5in LCD. The flash can be set to on, off, auto, fill-in or red-eye reduction mode. The lens, meanwhile, has an impressive focal length equivalent to 35-105mm on a regular 35mm camera, making it roughly equivalent to the HP, yet in a far smaller body.

The 3x optical zoom is supplemented by a 2.5x digital function, for a total zoom of 7.5x, while the macro mode will take you as close as 16-76cm, which is one of the best in the group test.

The A40 has three resolution settings: 1,600 x 1,200, 1,024 x 768 and 640 x 480 and stores images on a bundled 8MB Type I Compact Flash (CF) card. Additional shooting modes

record movies, with sound, at 320 x 240 and 160 x 120 pixels, or panoramic images that can be stitched together using the software included in the box.

A button on the front of the body allows a front-mounted ring to be unscrewed, making room for supplementary lenses, which, combined with the fact that either nothing or practically everything can be set to manual, makes this one of the most versatile cameras on test.

The Canon produced some of the most realistic reds in our flower bed test. There was also good focus across the whole image, giving a very pleasing overall effect. Like the Kodak, it also performed very well in our interior detail shot. Under strip lighting, white pages in our dictionary were rendered white, and details in the corners of the image were captured cleanly. Clear plastic objects picked up both light and colour reflected from other objects. Very impressive indeed.



## Epson PhotoPC 2100Z

**PRICE** £305.53 (£260.05 ex VAT) **CONTACT** Epson 0800 220 546 [www.epson.co.uk](http://www.epson.co.uk)

**PROS** Quiet; good detail capture **CONS** Pricey; charger is optional extra

**OVERALL** Easy to use; great for the beginner

**OVERALL SCORE** ■■■■

Very much the plain-Jane entrant, the 2.3megapixel (3.1megapixel with hardware interpolation) 2100Z feels rather over-sized in proportion to its external functionality. Like the Kodak, it is switched on by flipping the lens cover to one side. The lens is equivalent to a 35-70mm component on a regular 35mm camera, which is a little disappointing as the difference between telephoto and wide-angle photos is weaker than others in the test. However, it is very quiet. The macro is a little weak, closing in to only 30-50cm. Sensitivity is set automatically to either 100 or 200 ISO, and focus is handled by the 2100Z.

The 1.6in LCD is supplemented by an optical viewfinder, without manual adjustment. The on-screen menu is small and fiddly, and not up to the standard of Epson's high-end cameras – a shame considering that porting a subset of the OS should not add to the cost. A neat feature is the border around the LCD image, which turns yellow to warn when you stray

into digital zoom territory (the limits are 2x optical, 2.5x digital).

The three quality settings are: Hypic (2,160 x 1,440), Print (1,800 x 1,200) and email (720 x 480), giving this camera a friendly face. Using the supplied 8MB Type I Compact Flash card, you'll be able to store 11, 16 and 117 photos respectively.

A bonus addition is the copy of MGI Photosuite III SE included in the box – branded software is less common at this end of the price scale.

The 2100Z produced fairly muted colours in our flower bed test. The red tulips lacked the vibrancy of those captured by the Canon and Olympus, and there was a touch of orange to the yellow flowers.

Like the HP, the 2100Z also erred slightly towards the shadows when used under strip lighting. However, it did produce sharp images and detail was good. Right into the corners of the picture, small words in a dictionary and fur on a child's toy were realistic and well captured.



**HP Photosmart 715****PRICE** £349 (£297.02 ex VAT) **CONTACT** HP 08705 474 747 [www.hp.com/uk](http://www.hp.com/uk)**PROS** Versatile; high resolution **CONS** Bulky; expensive**OVERALL** Will deliver the biggest prints in the group, but at a price**OVERALL SCORE** ■■■■■

Easily the biggest of the cameras, the 3.3megapixel Photosmart 715 also has the highest resolution. It is not only long and tall, it is also wide, courtesy of a deep lens arrangement. This gives it the benefit of one of the widest focal length ranges, equivalent to between 32mm and 102mm on a conventional 35mm camera, covering the ground between telephoto and wide-angle.

Like many budget cameras, it runs on four AA batteries (supplied) and has a power input point, while the 1.8in LCD is backed up by an optical viewfinder with dioptre so it can be tweaked to suit your eyes. Pictures are stored on Type I Compact Flash and you should squeeze around 10 2,048 x 1,536 pixel shots onto the supplied 16MB card. Upping the compression increases this to 20, while dropping the resolution to 640 x 480 should give you space for 162. This camera is the very essence of point and shoot, with automatic focus and exposure, and sensitivity fixed at

100 ISO. The flash can be set to on, off, red-eye reduction or automatic and there is a 10-second self timer.

A macro mode will focus on anything between 20 and 60cm away, which is fairly average. Looking further afield, the 715 benefits from a 3x optical zoom, supplemented by a 2x digital zoom. The simplistic menus, meanwhile, seem well-pitched for the first-time user.

The HP performed moderately well in use. In some instances, bright areas of a sunny flower bed appeared more exposed than the same image produced by other cameras, such as the Kodak and Olympus. However, some red tulips were also markedly more vibrant than those produced by other cameras in the test.

Under overhead strip lighting, used to simulate the environment in which many of these cameras will be used, its output was a little subdued. White surfaces came out slightly dirty in comparison to the competition, but on the whole the image was sharp.

**Kodak DX3600 Zoom****PRICE** £249 (£211.91 ex VAT) **CONTACT** Kodak 0870 243 0270 [www.kodak.co.uk](http://www.kodak.co.uk)**PROS** Great interior shots **CONS** Dock may not appeal to all**OVERALL** A competent and versatile submission**OVERALL SCORE** ■■■■■

The Kodak is unique here for connecting to the PC by means of a docking station, which simultaneously recharges the battery. Should you run out of juice while out and about, this battery pack can be replaced by two standard AA cells.

This 2.2megapixel device features a 2x optical zoom, 3x digital zoom and a lens rated at the equivalent of 35-70mm on a regular 35mm camera. This is the same as the Epson and is not particularly impressive, much like the uncomfortable and rather over-sensitive rocker that controls the zoom. There is a 30mm thread for optional extra lenses, though, so if you're willing to spend a bit more you can upgrade the device. The macro mode is a fairly ordinary 28-60cm.

The DX3600 is the only camera tested here to have 8MB of built-in memory, which can be supplemented through the insertion of a Type I Compact Flash card. To the rear, the 1.6in LCD supplements the optical

viewfinder and provides a home to the basic menu system. There are two resolution settings, offering 1,800 x 1,200 or 900 x 600 pixels. This is a 3:2 aspect ratio, which more closely resembles a traditional film-based photo. Movies can also be shot at 320 x 240 or 160 x 120, like many other movie-enabled cameras.

The DX3600 picked up yellows particularly well in our flower bed test. The red tulips were creeping slightly towards scarlet, though, and lacked the realism of those produced by the Olympus. The range of colour in the green spectrum, however, was impressive, with particularly good definition between light and shade.

The Kodak was the best of the bunch in our interior detail shot. Although we were using strip lighting, whites came out truly white and right into the corner small details were clearly captured. Indeed, it was so good that we even had to check the Exif picture data to ensure the flash had not fired during testing.



# GROUP TEST DIGITAL CAMERAS

## Nikon Coolpix 2500

**PRICE** £299.99 (£255.31 ex VAT) **CONTACT** Nikon 0800 230 220 [www.nikon.co.uk](http://www.nikon.co.uk)

**PROS** Small; good images **CONS** Poor body design

**OVERALL** Good internals let down by a poorly designed body

**OVERALL SCORE** ■■■■

The 2megapixel Coolpix 2500 is a smart looking device. It is small, blue, and has some of the simplest controls of the group. In common with other Nikon cameras the lens section of the body must be twisted, allowing you to take pictures over the top of a crowd, making it great for concerts. Unfortunately, in this instance your fingers get stuck inside the casing and you invariably end up pressing your thumb on the lens.

It has four resolution settings: 1,600 x 1,200, 1,280 x 1,024, 1,024 x 768 and 640 x 480, and three compression levels, giving you room for between eight and 113 images on the bundled 16MB Type I Compact Flash card. A handy 'small picture' button automatically copies smaller sizes of images for emailing. Exposure compensation can be set between +/-2EV in 0.3EV steps. It is also Print Image Matching (Pim) compliant, so has 12 image type settings to optimise images for printing on an Epson inkjet, while the flash

can be set to on, off, auto, slow sync or red-eye reduction modes. The lens is equivalent to 37-111mm on a conventional 35mm camera. This is one of the best ranges in the group. It has a 3x optical zoom (4x digital) and can take you to as close as 4cm for macro photography. The 2500 is powered by a slimline rechargeable battery.

Like the HP Photosmart, this Coolpix demonstrated slight higher exposure of the yellow flowers in our test. The red tulips, however, were very realistic. Edges were crisp and tonal variation within green foliage was well differentiated.

The Coolpix performed well in our interior detail test. Even without the flash, and under strip lighting, white pages of a dictionary were captured as white, and there was fair detail in the corners and edges of the image. Like the Kodak, it made the best of the available light and the resulting picture was almost as good as one taken using a flash, putting it on a par with the Canon.



## Olympus Camedia C-220 Zoom

**PRICE** £199.99 (£170.20 ex VAT) **CONTACT** Olympus 0800 072 0070 [www.olympus.co.uk](http://www.olympus.co.uk)

**PROS** Good Images; small; very affordable **CONS** Clumsy lens cover

**OVERALL** Looks good, as do its images, and is great value

**OVERALL SCORE** ■■■■



Slim and attractive, the 2megapixel C-220 will easily slip into any pocket or bag. Unfortunately, it's rather keen to get on with business and in our tests the lens cover frequently slipped open as it travelled around with us, exposing the lens and popping out the flash.

Shutting it down is a rather clumsy operation, requiring that you push the cover into the lens and leave it there until the unit retracts far enough for you to pass it across. It is, however, a well-balanced body and feels good in your hand.

To the rear, a 1.5in LCD screen supplements the regular optical viewfinder. This is bright and clear, and easy to use in most lighting conditions, but has a slow refresh and is not turned on by default. There is an almost unprecedented range of six flash settings.

The C-220 runs on two standard AA batteries and saves images to an 8MB Smart Media card. With resolution options of 1,600 x 1,200, 1,024 x

768 and 640 x 480 it can fit between five and 49 shots onto the media.

The lens is equivalent to a 35-114mm unit on a conventional 35mm camera. It features a 3x optical and 2.5x digital zoom, which equates to 7.5x in total.

The control for this sits on top of the body. It is small and unpleasant to use, but effective enough. The macro mode, meanwhile, takes you to between 20cm and 50cm.

The Olympus performed well in our flower bed test, producing a good range of colours, particularly among the yellow flowers. Red tulips were vivid and realistic, while tonal variation among the green foliage was well differentiated. Like the Sony, saturation was slightly higher than the rest of the group.

It produced some good detail in our interior shots. Under strip lighting, corners and edges of the image were clean, although the luminance was not quite up to the standard achieved by Kodak, Nikon or Canon.

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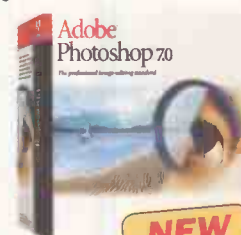
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MS Windows XP Home Upgrade Win	E356830	£68.07	(£79.98)
MS Windows XP Professional Win	E356820	£196.99	(£231.46)
MS Windows XP Pro Upg Win	E356821	£129.99	(£152.74)

## PUBLISHING / GRAPHICS SOFTWARE

New Adobe Photoshop 7.0	E410065	£442.99	(£520.51)
New Adobe Photoshop 7.0 UPG	E410067	£101.99	(£119.84)
Adobe Acrobat 5.0 Win32 CD	E317900	£159.99	(£187.99)
Adobe Acrobat 5.0 Upg Win32 CD	E318763	£64.99	(£76.36)
Adobe Illustrator 10 Upg	E376114	£106.99	(£125.71)
Adobe Illustrator 10 Full	E376108	£294.99	(£346.61)
New QuarkXPress 5.0 full	E407920	£893.99	(£1050.54)
Jasc Paintshop Pro 7 *Whilst Stocks last	E266863	£32.99	(£38.76)
Corel Draw 10 Full	E269472	£319.99	(£375.99)
Corel Draw 10 Upg	E269473	£147.99	(£173.89)
Adobe InDesign 2.0 Full	E394935	£538.99	(£633.31)
Adobe InDesign 2.0 Upg	E394942	£74.99	(£88.11)
*Jaws PDF Creator 2.1 * Whilst stocks lasts	E394413	£69.99	(£82.24)

## WEB / MULTIMEDIA SOFTWARE

MM Dreamweaver Full New MX			Please Call
MM Dreamweaver Upg New MX			Please Call
Fireworks Full New MX			Please Call
MM Fireworks Upg New MX			Please Call
MM Studio MX			please call
MM Director Shockwave 8.5 Studio	E329179	£894.99	(£1051.61)

DESCRIPTION	CODE	£ EX VAT	£ INC VAT
MM Flash MX Full	E244547	£364.99	(£428.86)
MM Flash MX UPG WIN	E410853	£144.99	(£170.36)
Adobe GoLive 6.0 Full	E399938	£279.99	(£328.99)
Adobe GoLive 6.0 Upg	E399942	£70.99	(£83.41)
Adobe LiveMotion 2.0 Full	E399935	£136.99	(£160.96)
New! Adobe Web Collection 5.0 Win	E420206	£829.99	(£975.24)
MS FrontPage 2002 WIN	E327937	£116.99	(£137.46)
MS FrontPage 2002 UPG WIN	E327938	£59.99	(£70.49)

## PROGRAMMING / SERVER SOFTWARE

Borland C++ Builder 2000 Cd 5 Clients	DCS7062	£679.99	(£798.99)
Ms Windows Advanced Server 2000 CD 25 Clients	DCS7061	£2700	(£3172.50)
Ms Windows Server 2000 Version Upgrade CD 5 Clients	DCS7063	£329.99	(£387.74)
MS VStudio .Net Pro Upg 2002 Win9X/NT/2000/XP CD	E391114	£214.99	(£252.61)
MS VStudio .Net Ent DE UPGRADE 2002 Win 9X/NT/XP CD	E391169	£729.99	(£857.78)
MS Visual C++ .Net Std 2002 Win 98/NT/2000 CD	E391084	£346.99	(£407.71)
MS Visual Basic .Net Std 2002 Win 9X/NT/2000 CD	E391105	£176.99	(£207.96)
MSDN Universal Full	E391101	£729.99	(£857.78)
Borland C++ Builder V6.0 Enterprise Full System	E402959	£1948.99	(£2288.90)
Borland Delphi V6.0 Personal Edition	E402867	£69.99	(£82.24)
Veritas Backup Exec 8.6 NT/2000	E342491	£299.99	(£352.49)
MS SQL Server 2000 Std SCAL	E389930	£1049	(£1232.57)
J Builder 5 Personal was Foundation	E402890	£519.99	(£610.99)
J Builder 5 Professional Scholar Win	E407238	£66.99	(£79.24)
Borland Delphi Pro 6.0 Scholar Win	E335125	£79.99	(£93.99)

## UTILITY SOFTWARE

Norton AntiVirus 2002 V8	E364591	£29.95	(£35.19)
Norton Utilities 2002 V6	E362344	£27.49	(£32.30)
Norton Internet Security 2002 V4	E364844	£37.99	(£44.64)
Norton Personal Firewall 2002 V4	E364808	£23.99	(£28.19)
Norton Systemworks 2002 V5	E364633	£45.99	(£54.04)
PC Anywhere 10.5 Host/Rem	E392114	£97.89	(£115.02)
PCAnywhere 10.5 H/R Upg	E392168	£75.99	(£89.29)

## EPSON PRINTER SUPPLIES

Tri Colour Ink Cartridge 740/670	PR1582	£13.69	(£16.09)
Black Ink Cartridge 740/760	PR1581	£13.99	(£16.44)
Black Ink Cartridge 680	E257213	£16.35	(£19.21)
Colour Cartridge Stylus 400/600/800/1520	PA0414	£13.45	(£15.80)
Glossy Photo Paper A3 20 Sheets	PA0417	£14.99	(£17.61)

DESCRIPTION	CODE	£ EX VAT	£ INC VAT
<b>HP PRINTER SUPPLIES</b>			
Black Ink Cartridge 750C/850C/820C/1600C	51645A	£18.49	(£21.73)
Tri Colour Ink Cartridge 970C/930C	C6578D	£21.79	(£25.60)
Tri Colour Ink Cartridge D3890C/895Cxi	C1823D	£19.99	(£22.49)
Ultra Precise Black Toner Cartridge LJ2100	C4096A	£63.99	(£75.18)
Bright White Paper A4 (200 Sheets)	C5977B	£3.95	(£4.64)
<b>CDR BLANK MEDIA</b>			
Sony CDR 74Min 650MB CD074CN	ME6399	£1.05	(£1.25)
TDK CDR 74Min 650MB	ME7271	£1.45	(£1.70)
Maxell 80min CD-R 700mb	E342536	£1.15	(£1.35)
<b>DLT IV TAPES</b>			
Maxell DLT IV TK88 20/40-35/70GB	ME7781	£50.99	(£59.91)
Sony DLT IV TK88	ME7923	£54.99	(£64.61)
Imation DLT IV	ME7469	£52.95	(£62.22)
HP DLT IV TK88 20/40-36/70GB	ME7021	£52.95	(£62.21)
Fuji DLT IV TK88	ME7080	£54.99	(£64.61)
Quantum DLT IV TK88	ME7823	£53.95	(£63.39)

## MODEMS

US Robotics V92 56K External Fax Modem	E393362	£51.99	(£61.09)
US Robotics 56K Message Modem Ext	DMD3588	£68	(£72.99)
US Robotics 56K PCI Voice FaxModem	E249274	£36.99	(£43.48)
Hayes Accura 56K Int PCI Modem	E108876	£37.99	(£44.64)
Elcon Diva ISDN USB T/A	DMD4778	£52.99	(£62.26)
Elcon Diva Speed 850 ISDN T/A	E304457	£64.99	(£76.36)
Elcon Diva 2430SE ADSL Modem	E337038	£154.99	(£182.11)

## PC CARDS

3Com OfficeConnect 10/100 56K Type 3 PC Card	E372365	£59.99	(£70.49)
3Com OfficeConnect 10/100 56K XJACK PC Card	E372315	£66.99	(£78.71)
USR 56K GSM PC Card	DMD4548	£74.99	(£88.11)
3COM 10/100 LAN PC card XJACK	E000152	£75.99	(£89.29)
3COM OfficeConnect 10/100 PC card	E000155	£34.99	(£41.11)

## NETWORKING SWITCHES

3Com OfficeConnect 8 port dual speed Switch	E331212	£78.99	(£92.81)
Netgear FS308 8 port Dual speed Switch	DEH4197	£99.99	(£117.49)
Netgear 16 port 10/100 R/M switch	DEH3596	£163.99	(£192.69)
Netgear 24 port 10/100 R/M switch	DEH4646	£177	(£209.98)
3Com OfficeConnect 5 Port 10/100 Switch	E331211	£56.99	(£66.96)
3Com OfficeConnect 8 Port 10/100 Switch	E331212	£78.99	(£92.81)

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# "The component quality is excellent"

Computer Shopper, Mar 2002

"NetHighStreet.Com has been bubbling under the PC Plus Awards for a while producing solid PCs"

PC Plus - April 2001

"it's built for top performance"

PC Advisor - Nov 2001

"The prize for best sound in the chart"

PC Advisor - Dec 2001

"Solid performance and excellent component quality throughout"

Computer Shopper - Mar 2002

"The build quality is high, while accessibility for upgrades is excellent"

Computer Shopper - June 2002

**PCPlus**

Verdict 8/10  
Feb 2002



APRIL 2002



Nov 2001



Dec 2001



	OFFICE	HOME	PRO	EVO	ELITE
Motherboard	PC Chips 810LMR	ASUS A7N266-VM	ASUS A7S333	ASUS P4S333	ASUS A7V333
Memory	128 MB PC133 SDRAM	256 MB DDR PC2100	256 MB DDR PC2100	256 MB DDR PC2100	256 MB DDR PC2100
Hard Drive	20 GB UDMA 100	40 GB UDMA 100	40 GB UDMA 100	40 GB UDMA 100	60 GB UDMA 100 7200 RPM
Graphics	AGP Graphics O/B	nVIDIA nFORCE	GeForce 4 MX420	GeForce 4 MX420	GeForce 4 Ti4200
Multimedia	52x CD-ROM Drive	52x CD-ROM Drive	16x DVD-ROM Drive	16x DVD-ROM Drive	16x DVD-ROM Drive
CD-RW	Option Available	Option Available	32x12x40 Buffer Underrun Proof	32x12x40 Buffer Underrun Proof	32x12x40 Buffer Underrun Proof
Sound	SIS Sound O/B	Dolby Digital Sound	6 Channel Audio	6 Channel Audio	6 Channel Audio
Modem	56K v.90 Modem & 10/100 Network Card	56K v.92 Modem & 10/100 Network Card	56K v.92 Modem	56K v.92 Modem	56K v.92 Modem
Monitor	15" Hansol 510A Colour Monitor	17" Hansol 720E Colour Monitor	17" Hansol 720E Colour Monitor	17" Hansol 720E Colour Monitor	19" Hansol 920P Colour Monitor
Speakers	200W PMPO Speakers	200W PMPO Speakers	Subwoofer & 2 Satellite Speakers	Subwoofer & 2 Satellite Speakers	Creative Inspire 5.1 Surround Sound Speakers
Extras	2 USB Ports 3.5" Floppy Disk Drive	4 USB Ports 3.5" Floppy Disk Drive	4 USB Ports 3.5" Floppy Disk Drive	4 USB Ports 3.5" Floppy Disk Drive	4 USB Ports, 2 USB 2 Ports 3.5" Floppy Disk Drive
Warranty	12 Months RTB Warranty	12 Months RTB Warranty	12 Months RTB Warranty	12 Months RTB Warranty	12 Months RTB Warranty
	<b>AMD Duron 1GHz</b> £300	<b>AMD Duron 1.2GHz</b> £398	<b>Athlon 1800 + XP</b> £563	<b>Pentium 4 1.6GHz</b> £590	<b>Athlon 1800 + XP</b> £732
	<b>AMD Duron 1.2GHz</b> £315 (£370.13 inc.VAT)	<b>Athlon 1800 + XP</b> £435 (£511.13 inc.VAT)	<b>Athlon 1900 + XP</b> £581 (£682.68 inc.VAT)	<b>Pentium 4 1.7GHz</b> £615 (£722.63 inc.VAT)	<b>Athlon 1900 + XP</b> £750 (£881.25 inc.VAT)
	<b>Athlon 1800+ XP</b> £347	<b>Athlon 1900 + XP</b> £453	<b>Athlon 2000 + XP</b> £611	<b>Pentium 4 1.8GHz</b> £630	<b>Athlon 2000 + XP</b> £780
	<b>Athlon 1900+ XP</b> £365 (£428.88 inc.VAT)	<b>Athlon 2000 + XP</b> £483 (£567.53 inc.VAT)	<b>Athlon 2100 + XP</b> £649 (£762.58 inc.VAT)	<b>Pentium 4 2GHz</b> £705 (£828.38 inc.VAT)	<b>Athlon 2100 + XP</b> £818 (£961.15 inc.VAT)

All systems come with Microsoft Internet Keyboard, Microsoft Wheel Mouse and no Operating System pre-loaded.

## POPULAR UPGRADES

Upgrade 15" Monitor to 17"	£15	£18	Upgd 128MB to 256MB SDRAM	£12	£14	Upgd GF4 MX420 to Ti 4200	£62	£73
Upgrade 17" Monitor to 19"	£40	£47	Upgd 256MB to 512MB DDR	£55	£65	Upgd GF4 MX420 to Ti 4400	£145	£171
Upgd 17" Monitor to 15" TFT	£169	£199	Upgd 20GB to 40GB 5400 RPM	£7	£9	Add Epson C20 Printer	£35	£41
Upgd 15" Monitor to 15" TFT	£182	£214	Upgr 40GB to 60GB 5400 RPM	£15	£18	Add Artec USB Scanner	£31	£37
Add Windows XP	£59	£70	Upgd 60GB to 80GB 7200 RPM	£18	£21	Add On-Site Warranty	£20	£23

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## Ricoh Caplio RR120

**PRICE** £199.99 (£170.20 ex VAT) **CONTACT** Ricoh 020 8261 4031 [www.ricoh.co.uk](http://www.ricoh.co.uk)

**PROS** Comfortable to use; great price **CONS** LCD difficult to see in sunlight

**OVERALL** The LCD lets it down – the Olympus entrant is a better choice

**OVERALL SCORE** ■■■■

The 2.2megapixel Caplio has two image size settings – the rather unconventional 1,792 x 1,200 and 896 x 600. It is supplied with a standard 8MB Smart Media card. Unfortunately, it is one of those love it or hate it designs – very retro, and with a tendency to pop off its lens cap if you carry it without the bundled case. It feels comfortable in your hand, though, and is well balanced.

The lens features a 3x optical zoom, backed up by 2x digital, and has a focal length equivalent to 38–114mm on a conventional 35mm camera – a range that stretches from wide angle to telephoto. The macro mode, meanwhile, will get you within 8cm and 40cm of your subject.

The optical viewfinder is backed up by a 1.5in LCD, which is also home to the functional but very basic menu. We found this screen very difficult to use in bright sunlight where we had been able to clearly see what was going on with the other models on test. Two shooting modes allow

for either fully automatic or semi-manual photography. The latter accommodates adjustments of  $\pm 1.5\text{EV}$  in 0.3EV steps, and one of five white balance settings including automatic. The self-timer can be set to 10 or two seconds.

The RR120 is powered by four regular AA batteries, and while there is a port for external power input, there is no adaptor in the box.

We were a little disappointed with the Ricoh's performance in the flower bed test. The image was a little darker than those produced by other cameras on test but it could be quickly brightened in any image-editing application.

However, it did very well when used inside, producing the brightest picture of the lot under strip lighting. It was perhaps a little too bright to be realistic, but impressive nonetheless. It produced a good clean white on the pages of our dictionary and picked up good detail in the edges and corners of our photos.



## Sony Cybershot DSC-P50

**PRICE** £300 (£255.32 ex VAT) **CONTACT** Sony 08705 111 999 [www.sony.co.uk](http://www.sony.co.uk)

**PROS** Extensive hardware functionality **CONS** Output a little disappointing

**OVERALL** Easy to use and great for the more adventurous beginner

**OVERALL SCORE** ■■■■



Sony came from nowhere and quickly established itself in the digital camera market thanks to superior lenses, ease of use and first-class power management using Info-lithium batteries. It is a little disappointing then, although not surprising in a budget model, to find that the 2megapixel P50 uses regular rechargeable AA cells.

Exposure can be set to  $\pm 2\text{EV}$  in 0.3EV steps, while focus can be set to multi-spot auto focus, centre auto focus, or a range of distances from 50cm to infinity. You'll probably want to leave the ISO setting on automatic, but if you're after a specific effect or believe you know better than the P50, then 100, 200 and 400 ISO options are available. The lens is rated as being the equivalent of 41–82mm on a regular 35mm camera.

The well-organised menu has an impressive range of functions that you would normally expect to apply through image-editing software. Sharpness and picture effects such as sepia, solarise or black and white

are included but will most likely be shunned by serious photographers.

The common image sizes of 1,600 x 1,200, 1,280 x 960 and 640 x 480, meanwhile, are supplemented by a 1,600 x 1,067 setting.

The camera is supplied with a 16MB Memory Stick, capable of holding 16 high-resolution shots, rising to 182 if you opt for a lower resolution and higher compression setting.

The Sony's performance in the flower bed test was good, although images were slightly more saturated than the rest of the group. We found it lacked the life and realism of images produced by its competitors. That said, luminosity was even across the image. Focus was also consistent across the shot, but not as sharp as seen in the Kodak's output.

Our interior test image, taken under strip lighting, was a little grey, but we still placed it just behind the Canon, our Editor's Choice camera. Again, the image lacked the vibrancy and life seen in Kodak's output.



### TABLE OF FEATURES



MANUFACTURER	CANON	EPSON	HP	KODAK
MODEL	POWERSHOT A40	PHOTOPC 2100Z	PHOTOSMART 715	OX3600 ZOOM
Price inc VAT (ex VAT)	£299 (£254.47)	£305.53 (£260.05)	£349 (£297.02)	£249 (£211.91)
Contact	0800 616 417	0800 220 546	08705 474 747	0870 243 0270
Website	<a href="http://www.canon.co.uk">www.canon.co.uk</a>	<a href="http://www.epson.co.uk">www.epson.co.uk</a>	<a href="http://www.hp.com/uk">www.hp.com/uk</a>	<a href="http://www.kodak.co.uk">www.kodak.co.uk</a>
Resolution (megapixels)	2	2.3	3.3	2.2
Image size options	1,600 x 1,200/ 1,024 x 768/640 x 480	2,160 x 1,440 (interpolated)/ 1,800 x 1,200/720 x 480	2,048 x 1,536/640 x 480	1,800 x 1,200/ 900 x 600
Bundled media size	8MB	8MB	16MB	8MB
Memory type	Compact Flash	Compact Flash	Compact Flash	Internal/Compact Flash
Flash modes	On/off/auto/fill-in/red-eye	Off/auto/red-eye	On/off/auto/red-eye	Off/auto/fill-in/red-eye
35mm lens equivalent	35-105	35-70	32-102	35-70
Aperture (f-stops)	f2.8-f4.8	f3.3-f4.5	f2-f8 (tele: f2.5-f10)	f3.3-f4.5
Optical/digital zoom	3x/2.5x	2x/2.5x	3x/2x	2x/3x
Macro mode range (cm)	16-76	30-50	20-60	28-60
Attachment for extra lens	✓	✗	✓	✓
Tripod mount point	✓	✓	✓	✓
Self-timer (seconds)	2/10	10	10	10
Power	4 x AA	4 x AA (rechargeables supplied)	4 x AA (supplied)	2 x AA/battery pack
Exposure rating (ISO)	50/100/200/400	100/200	100	100/200
Interface	USB cable	USB cable	USB cable	USB dock
LCD display size	1.5in	1.6in	1.8in	1.6in
Other extras	Image browsers and converters	MGI Photosuite SE	HP Photo Imaging Software	Kodak Picture Software
Overall score	■■■■■	■■■■■	■■■■■	■■■■■

### TABLE OF FEATURES



MANUFACTURER	NIKON	OLYMPUS	RICOH	SONY
MODEL	COOLPIX 2500	CAMEDIA C-220 ZOOM	CAPLIO RR120	CYBERSHOT DSC-P50
Price inc VAT (ex VAT)	£299.99 (£255.31)	£199.99 (£170.20)	£199.99 (£170.20)	£300 (£255.32)
Contact	0800 230 220	0800 072 0070	020 8261 4031	08705 111 999
Website	<a href="http://www.nikon.co.uk">www.nikon.co.uk</a>	<a href="http://www.olympus.co.uk">www.olympus.co.uk</a>	<a href="http://www.ricoh.co.uk">www.ricoh.co.uk</a>	<a href="http://www.sony.co.uk">www.sony.co.uk</a>
Resolution (megapixels)	2	2	2.2	2.1
Image size options	1,600 x 1,200/1,280 x 1,024/ 1,024 x 768/640 x 480	1,600 x 1,200/ 1,024 x 768/640 x 480	1,792 x 1,200/ 896 x 600	1,600 x 1,200/1,600 x 1,067/ 1,280 x 960/640 x 480
Bundled media size	16MB	8MB	8MB	16MB
Memory type	Compact Flash	Smart Media	Smart Media	Memory Stick
Flash modes	On/off/auto/red-eye/slow sync	On/off/auto/red-eye/slow sync	On/off/auto/red-eye/slow sync	On/off/auto/red-eye
35mm lens equivalent	37-111	35-114	38-114	41-82
Aperture (f-stops)	f2.7-f4.8	f2.8-f4.9	f2.9-f6.9	f3.8
Optical/digital zoom	3x/4x	3x/2.5x	3x/2x	2x/3x
Macro mode range (cm)	To 4	20-50	8-40	Automatic down to 8
Attachment for extra lens	✗	✗	✗	✗
Tripod mount point	✓	✓	✓	✓
Self-timer (seconds)	10	12	2/10	10
Power	Rechargeable Li-ion supplied	2 x AA batteries	4 x AA batteries	2 x AA rechargeable batteries
Exposure rating (ISO)	100	80-160 (automatic)	100/200/400	100/200/400
Interface	USB cable	USB cable	USB cable	USB cable
LCD display size	1.5in	1.5in	1.5in	1.6in
Other extras	Nikon View 5	Camedia Master	Caplio download software	MGI Photosuite SE
Overall score	■■■■■	■■■■■	■■■■■	■■■■■

# Editor's Choice

**T**he only way to test cameras is to use them, which is exactly what we did here. We chose two environments. The first was a sunny flower bed in full bloom, with bright red tulips, yellow flowers and a backdrop of green grass. Here, we looked for realistic colours that were neither overexposed nor too oversaturated. Slightly saturated images can look good, but take it too far and you start to lose detail.

Next, we took outdoor shots both in bright sunlight and under overcast skies. Again, we checked for realistic colours, sharp edges and an accurate rendition of the scene.

Finally, we grouped together a range of objects, chosen for their varied surfaces. Furry toys, shiny yo-yos, matt stress balls and the pages of a dictionary with very fine print were arranged in a photography studio where the lighting could be carefully controlled. We then used strip lighting to simulate average interior lighting and took a picture of the scene, using a tripod to ensure that each camera had the same view. This image was examined to see how well the colours had been rendered, whether transparent surfaces remained see-through, and how well each camera coped with detail in the edges and corners of the frame.

It must be stressed that while our tests threw up differences between the cameras submitted, none of the results were bad, *per se*. Each would be good enough to print and hang on a wall, and even if you are not initially happy with the results most of the cameras come with idiot-proof software to tweak the colours and contrast. The differences between each one were so small that most only lost marks on usability and design issues rather than performance, highlighting how important it is to hold a product before making your purchase.

## The winners

Each winner was chosen by comparing output, features, usability and build quality to that displayed by the rest of the group. It is the **Canon Powershot A40**, then, that walks away with this month's **Editor's Choice** award. Not only did it feel well balanced and pleasant to use, but it also produced a set of well rendered images.

Images were well balanced, with realistic colours in both our internal and external test shots. We were a little disappointed that it was bundled with only an 8MB media card, especially with memory prices falling, but this is a complaint common to many of the products reviewed here.

What finally swung it for the Canon, though, was its versatility. First-time users will cut their teeth with its automatic mode and make more use of the manual settings as their confidence grows.

The first of our **Highly Commended** awards is carried away by the **Kodak DX3600 Zoom**. This produced some of the best images of the group, but was neither as versatile as some others tested, nor as pleasant to use.

Like the Canon, it can take supplementary lenses, which will appeal to any user worried that they may be restricted by the rather average optics built into the camera itself. However, we did not take to the docking station. While this provided an easy way to upload images to the hard drive it takes up desk space. With Windows XP providing such good camera and scanner support, recognising most models as an external hard drive, the dock is an idea slightly after its time, but it's a good option if you're still using Windows 98 or ME.

The **Olympus Camedia C-220 Zoom** takes our final **Highly Commended** award. We weren't entirely enamoured with the zoom control and the LCD was a little slow to refresh, but those factors aside, it was well balanced and pleasant to use. Its output was clean and bright, and for a camera with few controls it was surprisingly versatile – a good thing in our view.

If you frequently find yourself in places where you would rather not take an expensive camera, it is the ideal choice. Not only is it an absolute bargain at less than £200, it is also small enough to slip discretely into a trouser or jacket pocket.

We would like to give an honourable mention to the **Nikon Coolpix 2500**, which produced some very impressive output and was small enough to carry around discretely. Were it in a more conventional body, or simply produced without the clumsy frame that runs around the edge of the lens unit it would have been an award winner.



Canon Powershot A40



Kodak DX3600 Zoom



Olympus Camedia C-220 Zoom

**Most only lost marks on design issues rather than performance**





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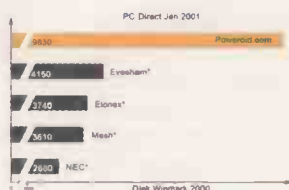
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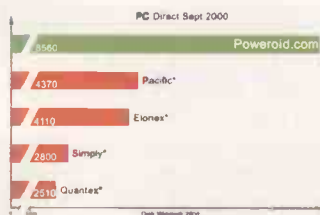
**Premium PCs:**  
(Model 9008)

AMD Athlon XP 2100+  
Coolermaster 101 "silver finish" case  
Asus A7V333 motherboard with USB 2.0  
80 - 120 GB 7200 rpm UDMA 133 hard disk  
512 MB DDR SDRAM PC2100 - PC2700  
16 x DVD, Plextor 40 x CDRW Burn Proof  
GeForce 4 Titanium Ti4600, 64 MB  
(Option of ATI Radeon All In Wonder 8500 DV)  
Creative Audigy soundcard, IEEE 1394  
Iiyama VM Pro 454 monitor  
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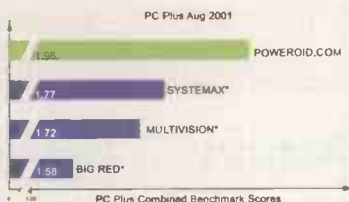
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# pcwexpert

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138 HISTORY  
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152 WORKSHOPS

Windows has become the world's most prevalent desktop operating system. This month in *pcwexpert* we investigate its beginnings, see how it has evolved and look towards the next upgrade. We also learn how to configure the XP firewall and how to back up and restore the Registry

ILLUSTRATION David Angel

## Windows

Written by Roger Gann and Tim Nott



# Windows on the world

From its early beginnings to the launch of XP, Windows has been through a variety of facelifts

**A**round 1964 Doug Engelbart of the Stanford Research Institute invented the 'X-Y Position Indicator for a Display System'.

It's not recorded which member of his team shortened this unwieldy title to 'mouse', but at the 1968 Joint Computer Conference in San Francisco, Engelbart demonstrated not just the mouse, but online collaboration, video-conferencing and hyperlinks.

His vision of a screen connected to a computer that 'was instantly responsive to every action' inspired everyone – except the manufacturers. It was not until 1973 that the Alto, the first computer with a Graphical User Interface (GUI), was built by Xerox.

In 1981 IBM launched its Personal Computer. Legend has it that IBM, looking for an operating system for its new baby, approached Gary Kildall of Intergalactic Digital Research. Kildall had developed an operating system for the Z80 processor, CP/M, and had facilitated its portability by separating it from the hardware-dependent Bios

(Basic Input/Output System). Gary, the story goes, was flying his plane when IBM called. Dorothy, his wife and business partner, was reluctant to sign IBM's non-disclosure agreement.

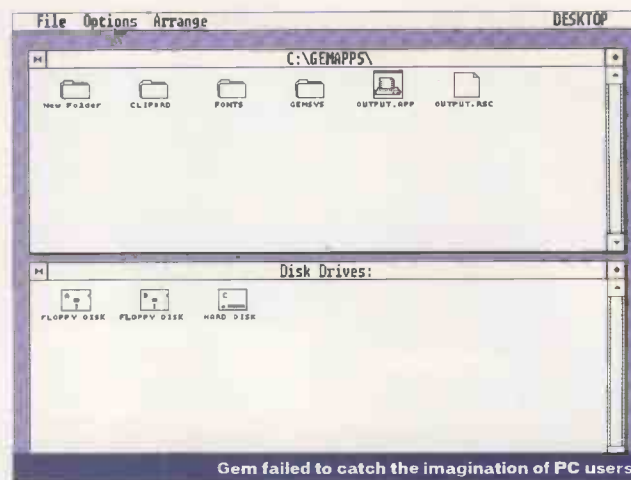
So IBM approached Microsoft. The only problem was that Microsoft hadn't developed an operating system; its business was in programming languages. But the problem was rapidly solved – Microsoft paid \$50,000 to Seattle Computer Products for the rights to their Quick and Dirty Dos (QDos), which it then licensed – non-exclusively – to IBM.

## Flying start

The combination of IBM's clout in the business world, and the fact that the PC clones could be built by other manufacturers, got the machine off to a flying start.

Two years later, Apple launched the Lisa – the first GUI personal computer – followed a year later by the Macintosh. The same year, Kildall, having come down to earth and dropped the 'Intergalactic' from the company name, released Gem – a PC GUI.

This failed to woo the hearts and minds of PC users, with the



notable exception of desktop publishers, where it lasted until the early 1990s as a front end for applications such as Ventura.

The release of the 80286 and 80386 chips brought new capabilities to the PC. The first removed the 640KB memory limit and the second brought multitasking.






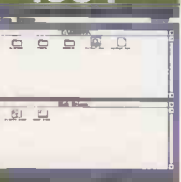
So, by the late 1980s, several problems were in search of a solution. The extra memory needed system-level software to access it, and the multitasking capabilities needed an environment in which to run. And as PCs entered the working

lives of more and more users, the demand grew for a friendlier interface.

The first version of Windows shipped in 1985, with now-familiar accessories such as Notepad, Paint and Write; non-overlapping windows; and – unlike the Macintosh – 16 glorious colours.

At that time it was not the multimegabyte application we run today. It shipped on floppy disks and could quite happily run with 640KB of memory on a PC with just a single floppy drive. Just as well, as hard drives were prohibitively expensive.

## pcwexpert timeline

1964	1973	1981	1983	1984	1984
					
X-Y Position Indicator for a Display System is invented. This is later renamed the mouse, much to the relief of us all.	Xerox develops the first Graphical User Interface (GUI) and finally the mouse has a use.	IBM develops the Personal Computer and ships it with QDos from Microsoft.	Apple debuts the Lisa, the first entirely GUI-based personal computer.	The now legendary Macintosh follows the Lisa, and establishes itself as a benchmark for GUI computing.	Digital Research introduces the world to Gem, its Mac OS-like windowed OS for PCs.

The following year saw the arrival of Windows 286, with Windows 386 coming in 1987, but this was still primarily a way of running multiple Dos applications.

What was needed were Windows 'killer' applications. And they came – not just from Microsoft with Excel and Word, but also from third parties such as Corel, Micrografx and Aldus.

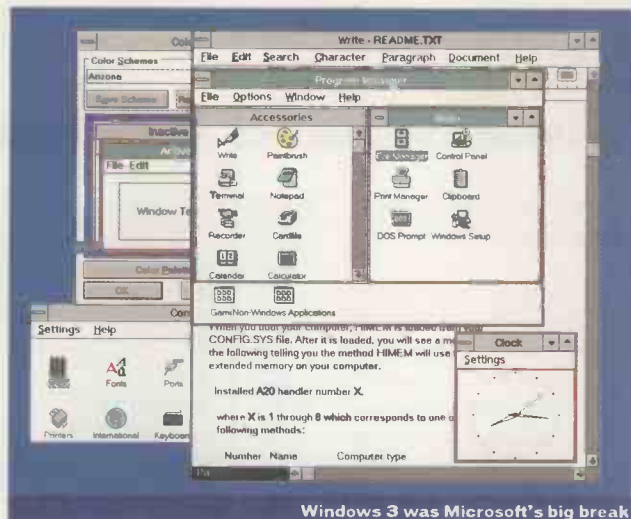
### Big break

The big break came in 1990, with the release of Windows 3, which, like its predecessors, ran on top of Dos. Bill Gates was in prophetic mood, foreseeing multimedia, pen and voice recognition and 'a PC on every office desk and in every home' – a vision, economic naivety aside, that seems less far-fetched in retrospect.

On another matter he was well adrift, seeing Windows 3 as a stepping-stone to OS/2, the 32bit OS being developed by Microsoft and IBM. 'People say that OS/2 is not an overnight success. So what? It's Microsoft versus Microsoft versus Microsoft,' said Gates. Shortly after, Microsoft pulled out of the OS/2 project.

### Windows 3.1

In April 1992 along came Windows 3.1. The modest point-one increment



encompassed 'over 1,000 enhancements' – notably the inclusion of multimedia and TrueType fonts.

It sold three million copies in the first two months. Eighteen months later Windows for Workgroups added peer-to-peer networking, and the following year saw the launch of Windows NT 3.1.

Although similar in looks to Windows 3.1 it was based on different (partly OS/2) code and intended for network servers and corporate workstations.

### Start me up

The summer of 1995 saw the most hyped event in the history of computing: TV ads featuring the Rolling Stones song *Start*

me up announcing the arrival of Windows 95. This was a 32bit operating system that, once loaded, no longer relied on Dos drivers. A complete new look got rid of the old File and Program Managers, introducing the Taskbar, Explorer and long file names. It sold a million copies in four days.

The Stones' song continued 'You make a grown man cry' – and Windows 95 was not entirely without its problems. The following year a 'Service Release' fixed some bugs and added support for the Fat 32 file system, but NT users had to wait until summer 1996 for their interface makeover in NT4.

Windows 98 integrated web browsing, with a slew of

features that were mostly useless to those with a pay-by-time Internet connection, including news and stock prices as part of the desktop.

More useful spin-offs included the Quick Launch toolbar, versatile folder views and Windows Update, which facilitated applying the numerous patches and fixes available online. Windows 98 also brought support for the Unicode character set, DVD, USB and Win TV.

### New versions

The turn of the millennium saw two new versions. Back in the corporate stream, Windows 2000 succeeded NT4, bringing 98-style Internet integration and much-improved support for mobile users.

Later in the year, Windows Millennium edition (ME) catered for home users. 'Real mode' MS-Dos finally disappeared and the self-maintaining aspect of Windows Update was joined by a System Restore feature that, in the event of problems, could undo changes made to the Registry and system files.

Finally, the two streams reconverged in 2001, with the launch of Windows XP. Although this, the current version of Windows, comes in both Professional and Home versions, the two are based on a common kernel.

1985	1990	1991	1992	1995	2001
Microsoft ships the first release of Windows, complete with Notepad, Paint and Write.	Bill Gates launches Windows 3, signalling the death of Gem. The new version of Windows enjoys widespread acceptance.	Windows 3.1 brings us multimedia, TrueType fonts and 'over 1,000 enhancements'. It sells three million copies in two months.	The business world finally gets a Windows release to itself - Windows NT 3.1. This is partly based on OS/2 code.	Windows 95 wipes the operating system floor and introduces the world to the now familiar Start button. It sells one million copies in four days.	Windows XP sees the business and consumer Windows product lines merge once more in a more colourful environment.



# Inside the operating room

We dissect Windows and explain how it has evolved into the fast, flexible and sophisticated product we use today

If you've read the history section you'll notice one of the new features in Windows 3.1 was TrueType. Prior to that, Windows came with versions of Times, Courier, Helvetica and Symbol fonts but these were bitmapped – each size of each letter needing a separate image.

Though these looked fine on the screen at the supplied sizes, larger or in-between sizes appeared 'blocky', as did any size when printed. One solution was to use the printer's built-in fonts for printing and substitute a Windows font for the screen, but what you saw bore little relation to what you got. More upmarket printers came with 'soft' fonts generating bitmapped screen fonts to match printer fonts.

A third solution was to buy a type management add-in such as Adobe Type Manager, Facelift or Superprint, which cost as much as – or more than – Windows 3.0, but offered scalable fonts that looked good at any size on screen or in print.

TrueType technology – initially developed by Apple – brought scalable font rendering to the core of the operating system. Rather than being stored as a bitmap, the outline of each letter is stored as a set of vector objects – mathematical entities that can be scaled to any size. The screen or printer driver then 'colours in' the outline. So, if your screen displays at 96 dots per inch (dpi) and your printer outputs at 300, the driver 'rasterises', accordingly, giving true Wysiwyg at the best resolution of either device.

TrueType stores font outlines as Quadratic B-Splines, which are similar to the Bezier curves used in drawing programs, with outline sections defined by control points that shape the curve between its endpoints. When an application requests, for example, a 24point Arial letter B, the outline is brought from the font file then scaled to the appropriate pixel size of the output device: this

calculation is performed to an accuracy of one-sixty-fourth of a pixel.

Pixels whose centres lie inside or on the outline are turned on. The larger the letter relative to the resolution of the output device in pixels per inch, the more pixels are turned on and the finer the character shape becomes.

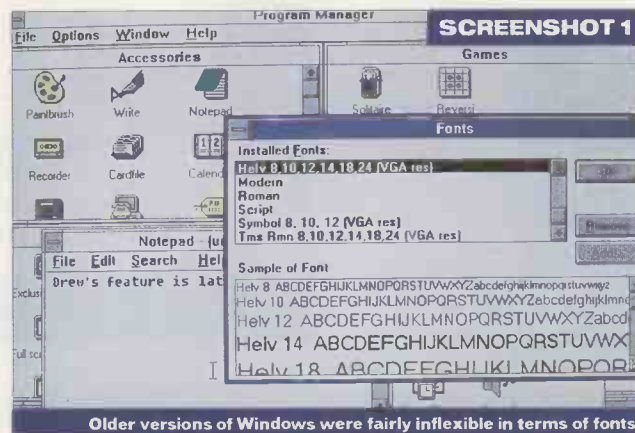
So far, so good, but there's a problem when pixel size approaches the stroke width. A stroke, for example, of just under a pixel width, will disappear if split equally across two adjacent pixels as it will fail to turn either on. So the font file must contain instructions that optimise the display of each letter at low resolutions by 'grid-fitting' it – distorting the shape to optimise the pixel coverage – a process also known as 'hinting'.

Greyscale rasterisation, or font smoothing, was added to TrueType shortly after the launch of Windows 95. Instead of just addressing the on/off state of a pixel in terms of black and white, this uses shades of grey on the curves and diagonals of letters. This smoothes out or 'anti-aliases' the staircase effect caused by rendering diagonals and curves in square pixels.

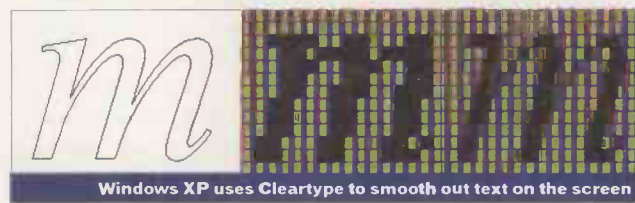
Windows XP takes this a step further with ClearType, designed for the LCD screens in laptops, handhelds and flat-panel monitors. On these screens, each pixel actually consists of red, blue and green sub-pixels. ClearType addresses each of these individually, resulting in smoother looking, more legible text (see picture above). It is claimed this can increase reading speed by 15 per cent.

## The Registry

Windows 3.0 stored its settings in a collection of plain-text files with the extension .ini. Typically, hardware settings such as the display and keyboard drivers were stored in system.ini, and software settings such as file associations



Older versions of Windows were fairly inflexible in terms of fonts



Windows XP uses ClearType to smooth out text on the screen

and screen colours were stored in win.ini. Applications would either store settings under a custom section in win.ini or in their own 'private' .ini file.

The consequences were that there was a size limit to .ini files, and applications whose installation bloated win.ini could bring the system to its knees. Also, the proliferation of .ini files in various locations made it a challenge to back up your settings.

Windows 3.1 saw the start of migrating file associations to a 'registration database' and Windows 95 introduced the Windows Registry as a central repository for both Windows and application settings. Win.ini and system.ini have continued to exist, rather like pensioned-off retainers, should a 16bit application need their services. A new category of .ini file surfaced, which we will return to later.

Under Windows 95 and 98, on a single-user system, the Registry consists of two files, system.dat and user.dat. On multi-user machines, each user has their personal user.dat that is read in when they log on. Windows ME adds a third file –

classes.dat. Unlike their .ini ancestors these are not editable text files, but they can all be accessed simultaneously with the Registry Editor, where they appear as a single hierarchical entity split into six main sections. Each section consists of keys and nested subkeys, any of which can contain values. Values can either be text, a variable-length hexadecimal number or a Dword – an eight-digit hexadecimal number.

The first, HKEY\_CLASSES\_ROOT, corresponds to classes.dat in Windows ME – in earlier versions the contents are part of system.dat. This contains information about various 'objects' in Windows, including OLE (object linking and embedding) links, Windows shortcuts and file associations.

File associations are stored in two parts. For example, the key for .jpg defines it as a 'jpegfile'. On a Windows ME system another subkey points at a separate hexadecimal key identifying the thumbnail viewer. Going down to the jpegfile entry the default value is 'Jpeg image': this is the description you see in Explorer for that file type.

Then there are three further subkeys. The CLSID key is a Class Identifier for an ActiveX module – in this case the one that displays .jpgs in HTML documents. The DefaultIcon key is self evident, and the Shell key contains the commands that you can access when you right-click on a .jpg file, including the application that launches with 'Open'.

HKEY\_CURRENT\_USER contains settings relevant to the user currently logged in, as stored in the user.dat file. If there is only one user, these will be the same as in HKEY\_USER\DEFAULT.

Here you'll find keys for display options, keyboard layout and other Control Panel settings. The Software key is where applications can store per-user settings. These can include, the toolbar arrangements in a program, recent file lists or high scores in games. Many more Windows settings, such as folder arrangements and programs run at start-up, are stored under Software\Microsoft\Windows\Currentversion.

HKEY\_LOCAL\_MACHINE contains configuration data that is applicable to all PC users, physically stored in system.dat. This includes information on hardware such as monitors, sound cards and USB devices; network settings; time zone information and so on. There is also a Software key here where applications can store non-varying data, such as the location of program files on the hard disk.

It also has a large section devoted to Windows, containing information such as shared network folders and printers, installed fonts and shell extensions, Internet security zones and when drives were last backed up or defragged. This section also contains a duplicate of HKEY\_CLASSES\_ROOT.

HKEY\_CURRENT\_CONFIG, the fifth section, is again part of system.dat and is only of interest if you have more than one hardware profile: you might, say, have a laptop that is sometimes plugged into a desktop monitor. This section contains pointers to one of the profiles stored in HKEY\_LOCAL\_MACHINE.

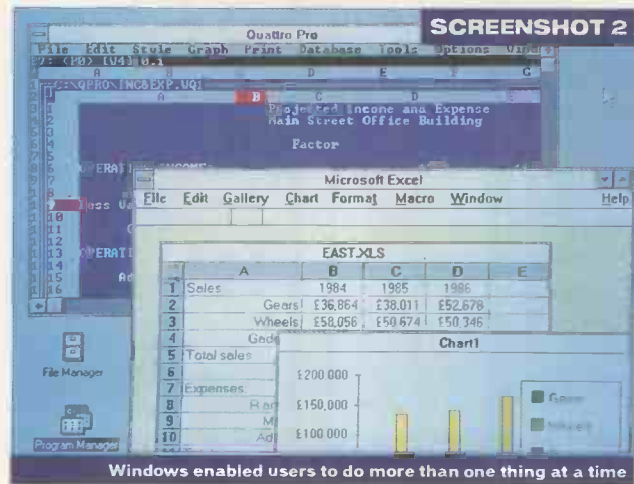
Finally, HKEY\_DYN\_DATA doesn't point to a file at all – it contains entries that are loaded into memory each time the PC is started for instant access.

## Multitasking

An early benefit of Windows was multitasking. Not only could you swap between programs, but the PC could also perform more than one task at a time. Typically, under Dos, if you wanted to print a document on a standalone PC, you couldn't do anything else until printing had finished, which didn't do much for productivity. So, what happens when you hit the Print button in a Windows application? Assuming you are not using a Postscript printer, which uses its own language and protocols, the first thing that happens is that the output is sent to the Graphics Device Interface (GDI) which generates an Enhanced Metafile (EMF). When this is done, control passes back to the application – as far as it's concerned, the printing is done and you can carry on working.

The EMF is a mixture of bitmapped and vector data: if the output, for example, contains a photograph and a green circle, the photo will be encoded as a stream of pixels, whereas the circle will be encoded as a set of instructions – 'draw circle, fill it in with green pixels'.

The EMF is stored as a temporary file which is then processed by the spooler, which interprets the file as a background thread. The output from the spooler is passed to the printer driver in stages: only when



Windows enabled users to do more than one thing at a time

the printer is ready to receive more data is another packet sent.

Printing is a prime example of multitasking, but it isn't the only one. Under Windows 3.x, multitasking was 'co-operative'. This was an honour system in which the operating system relied on the application to check the message queue regularly and give up control to other applications when required. Applications that did not check the queue could hog processor time and prevent the user from running other tasks or using other applications.

Windows 95 and NT introduced 'pre-emptive' multitasking, putting the OS in charge of assigning or taking away control from applications. Each process (a program or window, for example) also has one or more threads running, each thread being a unit of code that can be run concurrently with other threads.

For example, if you open two folders each runs as a separate

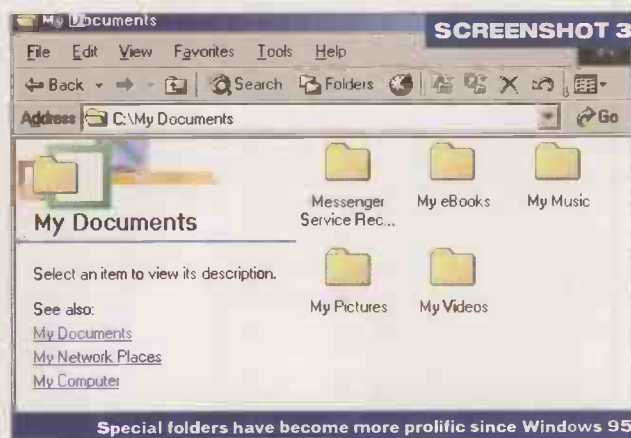
thread, although they are part of the same Windows Explorer process. If you copy files from one to the other the target window thread does the work, but you can still initiate other copies or navigate up or down from the source window.

## Special folders

With the launch of Windows 95, the word 'directory' was replaced by 'folder'. This was more than just clever marketing, as folders can do much more than just store files. Windows has several 'special' folders that perform various tasks, and some folder objects that look and behave like directories but aren't.

Take, for example, the Fonts folder. Although this corresponds to a directory that can be seen from a Dos prompt or from the 16bit File Manager, it has menu items and commands not seen in other folders, such as 'Install new font' on the File menu and customised view icons.

Taking another example, the Recycle Bin; though it looks like a folder, it doesn't exist as a visible directory under Dos at all. Instead its contents correspond to a directory or directories named 'Recycled' – one for each hard drive or partition. Opening one of these in Explorer shows the same contents as the Recycle Bin itself, apparently duplicating the entries over each drive. Examining the directories in Dos reveals that each contains renamed versions of the files and folders that have been binned from that drive only.





The answer to this mystery is that there are two hidden files in each Recycled directory. One contains a table of the original names and paths of the binned files or folders on that drive only. The other is the key to the enigma: the new generation of .ini files we mentioned in the Registry section. Special folders contain a file named desktop.ini. As with the Windows 3.x generation of .ini files, these are in plain text. They can be used to customise folders in all sorts of ways, but their powers go far beyond the cosmetic.

A Class Identifier, which appears as groups of hexadecimal numbers inside curly brackets, points to a Registry entry that defines how the folder will behave – in the case of the Fonts folder

linking it to the relevant code in fontext.dll, and in the case of the Recycled folders redirecting the view of their contents to the Recycle Bin object. Special folders have proliferated since their introduction in Windows 95 – in Windows ME you have My Music, My Pictures as well as My Documents, History and Favourites. Windows Media Player also uses desktop.ini files to enable album thumbnails and information for music files (see screenshot 3).

### Memory management

As we saw in the history section, the advent of the 80286 processor did away with the memory limit for PCs, but Dos could still only address 640KB of the total installed memory.

It was possible to use extra memory as a Ram disk, fooling the OS into seeing the extra memory as a very fast but temporary disk drive.

This had its uses, particularly on floppy-only systems, where programs from one or more floppies could be copied to the Ram disk at start-up. This technique is still used by the Startup Disk in Windows 98 and ME. However, it didn't solve the problem of making the memory available to run programs, so two workarounds evolved. Expanded memory used the physical memory between 768KB and 960KB as a 'Page Frame' for high memory: pages were loaded in and out of the window rather like slides in a projector. Extended memory

could be addressed directly by the processor.

Though rival advocacy was fierce, the Extended Memory Specification (XMS) standard developed by Lotus, Intel, Microsoft and AST, prevailed over the expanded Lim standard, curiously enough developed by Lotus, Intel and Microsoft.

It was still a kludge, though, as the XMS driver, himem.sys, had to be loaded from Dos before Windows was loaded. Windows 95 did away with the need to have an explicit himem.sys in the Dos config.sys file – in fact it didn't need the latter at all, as himem.sys was automatically loaded by Windows.

But having gained access to the memory, the problem remains as how best to use it.

## NTFS has more...

### Fault tolerance

NTFS repairs hard disk errors automatically without displaying an error message. When XP writes a file to an NTFS partition, it keeps a copy of the file in memory. It then checks to make sure this matches the copy stored. If the copies don't match, Windows marks that section of the hard disk as bad and won't use it again. This is known as Cluster Remapping. Windows then uses the copy stored in memory to rewrite the file to an alternate location on the hard disk. If the error occurred during a read, NTFS returns a read error to the calling program, and the data is lost.

### Reliability

NTFS is a 'journaling' file system. NTFS keeps a write-ahead log file of all changes made to the hard disk. If something bad happens to the system in the midst of a write to the disk, NTFS can resume the operation automatically as soon as the operating system is running again. Under the Fat file systems, this would result in file system or disk corruption. When a CHKDSK is performed on Fat 32, the consistency of pointers within

the directory, allocation, and file tables is checked. Under NTFS, a log of transactions against these components is maintained so CHKDSK need only roll back transactions to the last commit point to recover consistency within the file system, making NTFS more reliable.

### Security

NTFS is a highly secure file system – you can grant various permissions to directories and individual files. These permissions protect files and directories locally and remotely. Every file in NTFS has an Access Control List (ACL). That means you can create user-based security for every file on your computer. NTFS also includes the Encrypting File System (EFS), which uses 'public-key' security to encrypt files on an NTFS volume, preventing unauthorised users from accessing those files. Encryption is even preserved in backups – useful on notebooks and shared machines.

### Storage efficiency

NTFS is more efficient at storing files than Fat 32 – you'll use less space on the disk storing 1,000 typical files under NTFS – the larger your hard disk, the truer it is.

### Drive performance

As drive sizes and the sheer number of files on a partition increase, NTFS' performance doesn't degrade. There are also performance improvements on boot times. But on very large disks, the small cluster size results in millions of clusters, which means more time managing them.

### File compression

Although Drivespace may be dead and buried, NTFS does offer native support for file compression. The NTFS compression offers you the chance to compress individual files and folders.

### Disk quotas

Disk quotas allow administrators to manage the amount of disk space allotted to users, charging only for the files they own. This is transparent; the user simply sees the disk space available to them.

### Link tracking

With NTFS in XP, a shortcut link will not be broken if you move the target file, as it was in Windows 98. Thanks to its Distributed Link Tracking Client, file shortcuts can be updated by automatically searching for the new location of the target file.



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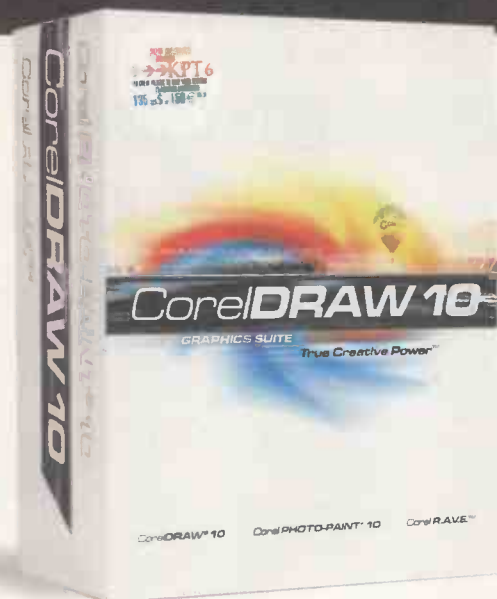
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One way of speeding up a PC is to use disk caching: setting aside part of memory as a temporary store for data read from – or waiting to be written to – the hard disk. If that data is needed again, the OS looks first in the cache – where it can be accessed more quickly. Windows 3.0 used another Dos driver – Smartdrive – to create a disk cache.

This began to be phased out in Windows 3.11 in favour of the native Windows 32bit Vcache, which replaced it in Windows 95. Vcache can dynamically change its size, grabbing hold of any spare memory and releasing this on demand. This answers the frequently asked question 'where's all my memory gone?' It's on loan to Vcache. If an application is cached, Vcache can also run that application straight from within the cache, without having to uncache it into the main memory – a technique known as cache mapping.

Having used memory as disk space, the next step is to use disk space as memory. Before we consider how this is done, it's worth considering why. The idea of using relatively cheap disk space as if it were expensive memory goes back beyond personal computing to the early days of mainframes.

Although the price of both memory and disk space has dropped dramatically, the latter is still cheaper by a factor of 20 or so. Virtual memory, as it is called, is still used in Windows, enabling the user to run more programs and load bigger files. When a program is being run, parts of the code are swapped out to the hard disk on a least-recently-used basis. If a call is made to program code that's no longer in physical Ram then a page fault occurs. Despite the name, this isn't a problem, but a signal to the virtual memory manager to pull the code off the hard disk, and swap some other code out. All this happens transparently, and the only thing you'll notice is hard disk activity.

Windows uses a swap file as virtual memory, and controls its size on the fly. Though it is possible for the user to specify

maximum and minimum sizes for the swap file, it is generally best to let Windows take care of this. One exception is that if you have multiple drives or partitions, it is worth specifying the fastest or least used to host the swap file.

One problem with Windows 3.x was that, no matter how much memory you had installed, your system could still grind to a halt with 'Out of memory' messages, slow screen refresh and disappearing buttons and icons. The cause lay in the User and GDI (graphics device interface) heaps. The former stores menus, buttons and controls for active windows and the latter stores cursors and icons. The problem was that these heaps were limited to 64KB, and when they became full, the PC ran out of 'resources' and exhibited the symptoms above, even with plenty of reported free memory. In theory you could regain resources by closing down programs, but this wasn't always effective, as some applications 'leaked' resources – that is, they didn't return them when closed.

The solution was to restart the OS. Windows 95 went a long way to alleviating the problem, with an unlimited GDI heap for 32bit programs, but leaked resources can still be a problem with badly behaved programs and those designed to run under 3.x.

## Windows XP

One of the biggest changes brought by Windows XP was a high-performance, file system – the New Technology File System (NTFS) (see boxes). Originally



introduced with NT, NTFS is a significant improvement over the Fat 32 file system. NTFS is more secure, efficient, as fast as Fat 32 on typical drives and is extensible, which could make it more useful in the future. One of the big problems with Fat 32, however, is that it doesn't scale well. The larger the volume size in Fat 32, the larger the cluster size. At 64GB, Fat 32 moves up to 16KB clusters. Even a 512byte file uses 16KB of space just to exist under Fat 32 on a 64GB volume. That means Fat 32 does not store data efficiently on larger volumes. By contrast, NTFS is able to keep to its 4KB cluster size default even on huge disk volumes. NTFS also stores files that are less than 700bytes in the Master File Table, where they displace 1KB instead of 4KB, improving storage efficiency. No other Windows file system stores files as efficiently, especially on large disk volumes.

NTFS supports very large hard disks, up to 2TB in practice but it

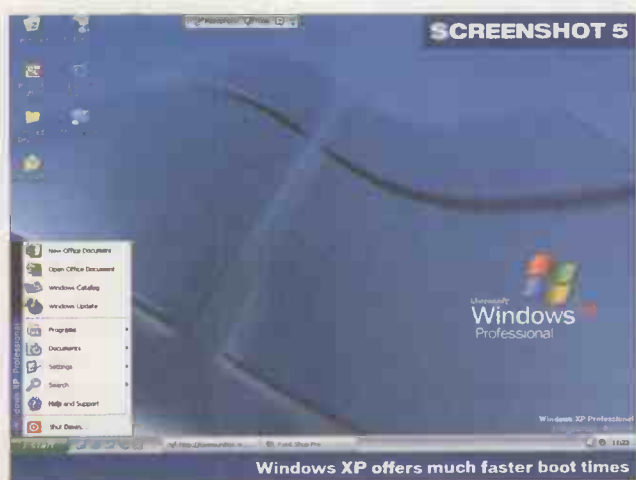
has a theoretical limit of 16 exabytes (one exabyte = one billion gigabytes). It also supports Unicode, and natively supports long file names. NTFS can be accessed by NT, 2000 and XP. Other OSs can access it using third-party device drivers, such as those available from Sysinternals (see screenshot 4) [www.sysinternals.com/ntw2k/utilities.shtml](http://www.sysinternals.com/ntw2k/utilities.shtml).

## XPerformance

Windows XP is faster at booting and loading applications than its predecessors. It uses innovative technology in three areas to achieve this: the Bios, prefetching and defragmentation.

Slow boot times or 'boot delays' are a frequent complaint. There are many factors that affect boot time such as memory checks, hardware discovery and driver loading, all of which add to 'the experience'. Over the past few versions of Windows, Microsoft has worked with Bios vendors to minimise boot delays by eliminating unnecessary processes. With XP, Microsoft has set boot time goals for PC manufacturers to achieve: cold boot to usable state: 30 seconds, resume from hibernate: 20 seconds and resume from standby: five seconds.

Changes in the kernel have made it easier for PC vendors to achieve these goals. The first time saver is support for the Simple Boot Flag (SBF) spec. This is a simple Cmos Bios register that is set after Windows boots for the first time, and can shorten subsequent boot times. XP isn't





the first OS to use SBF, as ME and 2000 both set the flag. The SBF holds three bits that identify the OS as Plug and Play (PnP), if the last boot was successful and if diagnostics need to be run.

The PnP bit is important in optimising boot time. When set, it tells the Bios to only configure the devices it needs to boot. So, it saves time by ignoring other resources. In fact, if the Bios does boot as a non-PnP legacy system it can limit the ability of Windows to reassign resources.

The booting bit is set by the Bios when it passes control to the OS. If the OS successfully boots, it clears this bit. If the OS boot fails, the bit is left set and the Bios assumes a failed boot and sets the Diagnostics Bit. This forces the Bios to run Post (power on self test) diagnostics on the next boot. But if the boot was good, this bit is cleared and the diagnostics skipped. The Bios will then transfer program execution to the boot sector.

Not only does this avoid Post, but it can avoid memory tests, start disk spin-up early, optional Rom initialisation, logo screens and the floppy disk check. On the second booting of XP, you will see the effect, even before Windows starts to boot. Depending on the speed of your PC, this can shave precious seconds off the boot time.

### Prefetching

The XP boot loader has been rewritten to incorporate parallel 'prefetching' of the code it needs. It gives a shopping list to the File I/O system, which in turn brings in large chunks of data from multiple files in overlapping requests. XP brings in boot and shell code, as well as device drivers and Registry settings.

Prefetching isn't confined to the boot process either: as individual programs are launched, Windows keeps track of when files and components are accessed. The next time the application is accessed, Windows prefetches the items to expedite the application's launch. The prefetch optimising code exists both within the XP kernel and the task scheduler service. The kernel

keeps track of pages that are referenced by a given process immediately after the process is created. The service transforms the recorded pages into prefetch instructions for that process. The next time the process is created, the kernel executes the prefetch instructions, speeding up the creation of the process.

Disk optimisation and application/boot prefetching work in tandem: when XP defragments the file system for faster program access, the data it recorded for the application and bootup prefetch processes is factored in to determine optimal file placement on the disks.

The Prefetcher is enabled by default, but you can tweak its performance. Simply navigate to HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Control\SessionManager\MemoryManagement\PrefetchParameters in the Registry and find the value EnablePrefetcher. Most likely, it will be set to 3, so you might like to increase the value to 4 or 5.

XP also prioritises driver loading to provide a usable desktop. Protocol binding for network devices is done in parallel and can improve boot time, especially if negotiating with hubs and routers, or if the cable is unplugged from the network card.

## Converting to NTFS

There are two ways to convert to NTFS. The first is during installation, where you'll be asked both what partition you want to install to and if you want to format that drive with NTFS or use the existing file system. The second option is then available - the command-line Convert utility. To access it, open the Command Prompt window. To get more information about this tool, type `Convert /?` To use it, close all applications, and it may also require a reboot. Click Start, Run, and then type `cmd` and press Enter. In the command windows, type `convert D: /FS:NTFS` and press Enter. If there are open files on the volume being converted, you'll have to reboot. And if this is a large drive with lots of files, the process could take a while.

While the Convert utility works well it's not a perfect solution. It can lead to a fragmented Master File Table (MFT) which is the rough equivalent of Fat 32's File Allocation Table, and slow down the system. Sadly the disk defragmenters supplied with XP (and 2000) don't defrag the MFT and so you'd need to invest in a third-party defragmentation utility. In cases such as this, Microsoft recommends performing the conversion at the outset, preferably on a blank partition.

When you first boot XP, it monitors the drivers, startup applications, Registry entries and shell code being loaded and saves information about prior logical disk read operations. On the second boot, Windows pre-loads drivers and code asynchronously in parallel into memory, ahead of them being requested or used, effectively caching them.

Windows keeps track of your last eight boots and applies heuristics on what to prefetch. In previous versions of Windows, boot files and drivers would load serially - one after another. Since much of the delay in boot time was the physical loading into memory, prefetching saves time.

### Defragmentation

Windows XP also dynamically rearranges the layout of files on the hard disk to accelerate loading. When XP prefetches a driver or application, it will try to load the whole file in one go. Saving disk seek time is critical as it's an expensive operation in terms of processor cycles.

When a file is fragmented, portions of program code and data that will ultimately be loaded into memory in 4KB chunks (aka memory pages) are stored in different locations on the drive. Each request for code or data absent from memory requires a physical disk access.

The disk I/O system looks in the file allocation tables to find the required code or data in a file on the hard drive, and then 'seeks' it on the right disk location.

If data is laid out contiguously on the hard drive, when the file is small enough it can be loaded in one operation. If it's bigger than the file buffer, then it's read in successive disk reads. By having the data in one contiguous file, only a single multitrack seek might occur, and successive reads only need to read other tracks on the same cylinder, or move a track at a time to get to the next set of data. The OS keeps a pointer into the file, which is reset to the next point in the file after each read, so explicit seeks are not needed.

One big difference between XP and earlier versions is that the defragmentation is automatically done during idle intervals. It uses heuristic analysis of the past eight times you started your PC to rearrange file layout dynamically into consecutive sectors. When the machine is idle for 10 minutes or you run `defrag c: -b`, XP will use that time to optimise the most used files. It will start optimising after your first boot, so your second boot will be faster.

Microsoft estimates that 90 per cent of optimisation is already done immediately after the first boot or run in XP and fine-tuned from there.

## Protection

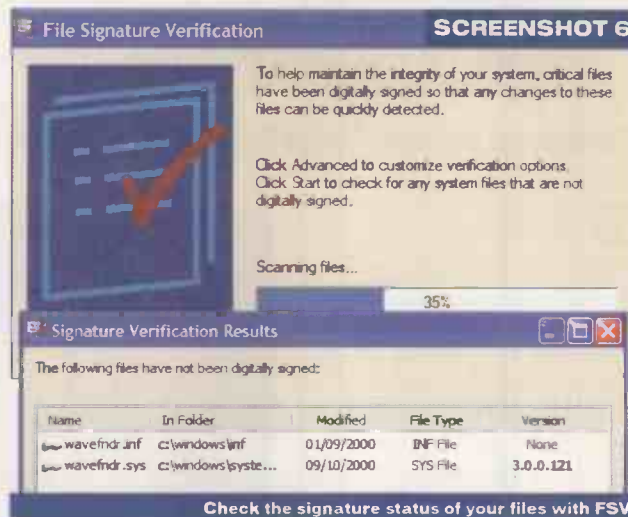
Good-quality device drivers are the key to a stable OS, but ensuring that users only employ good drivers has been a thorn in Microsoft's side for many years. People traditionally complained about the flakiness of Windows when the finger of blame ought to have been pointed at dodgy device drivers. Windows XP has several new technologies designed to protect it from unruly drivers.

In an attempt to improve the quality of driver software, ever since Windows 2000, Microsoft has imposed a stringent quality test on device drivers. Only those that pass rigorous testing earn a digital signature. A driver's digital signature also shows it has not been altered since testing. And if you install a driver that has been so approved, XP will be happy – but if you try and install an 'unsigned' driver then you'll be warned of this. In this way, Microsoft hopes to improve the robustness and reliability of its operating systems.

Driver testing is carried out at Microsoft's Windows Hardware Quality Lab. Third-party and Microsoft-supplied drivers go through the testing program to make sure that they meet the high standards. Once they pass testing, they are given a Microsoft digital signature. This signature is tied to the driver package that was tested (driver upgrades must be re-tested), and XP and 2000 will automatically recognise these digital signatures.

Driver signing, at this point, is merely informational: you can still install whatever drivers you can get, for better or worse. In some cases, Windows NT drivers, or even Windows 98 drivers, may work fine. When you try to install an unsigned driver, a warning dialogue pops up and you can still click on 'Install Anyway'.

This may be acceptable behaviour for an individual but not for a large network. Here, the driver signing system can be set to three levels of protection. Ignore allows any driver to be installed, regardless of its status, Warn is



the default setting, notifying the user if a driver does not have the Microsoft digital signature, and prompts for continuing or terminating the installation, and Block stops any drivers not bearing a digital signature.

It's possible to impose these settings on a standalone PC if you're an Administrator – simply double-click the System applet in the Control Panel. On the Hardware tab, click the 'Driver Signing...' button, choose the level and click OK. You can also make this choice the default for all users of the system.

Tucked away in the Windows folder is the File Signature Verification utility (see screenshot 6). This will report on installed drivers (actually all system files), giving the driver's filename and location, modification date, version, signature status and catalogue file. It will write this report to a text file, which can quickly be scanned for unsigned drivers. The utility can be run by clicking Start, Run, and then typing: Sigverif and clicking OK.

Regardless of this, there are some drivers that XP will refuse to install point-blank. Its Driver Protection database contains a list of drivers that are known to crash systems. When in user mode, the PnP Manager service blocks the installation of any driver listed in the database at \Windows\Drvmain.sdb and opens a web page at the Microsoft site that reports the reason the installation was blocked and where to find updates.

In the event that a duff driver is installed, all is not lost as XP makes it easy to put things back the way they were. The Hardware Installation Wizard (HIW) keeps backup copies of replaced drivers. When you update a driver, the HIW creates a 'system restore point' if the driver is unsigned and then saves the driver being replaced and its driver installation file (inf) in a unique directory.

If you update the same driver again, the HIW will create a new backup and delete the previous one, thus keeping only the most recent backup. A driver's property page in the Device Manager has a button that lets you roll back the driver to the previous version.

If things are so bad that the new device driver prevents your PC from booting, you need to resort to the 'Last Known Good' recovery option, which you access through the boot menu. This allows you to revert the system to the last copy of the HKEY\_LOCAL\_MACHINE\System\CurrentControlSet subkey with which the system successfully booted and a user logged on.

This has been integrated with the HIW to make recovery more likely. Under XP, when you update a driver the HIW saves the previous version used to boot successfully in \Windows\Last Known Good\System32\Drivers, and when you select the Last Known Good boot option the updated driver is replaced with the old version.

## Fat 32 or NTFS?

### You must use Fat 16/32 filing system to:

- Dual boot with an OS other than XP, 2000 or NT (NT can only read Fat 16 volumes)
- Access the volumes from a bootable floppy (Third-party solutions are available)
- Format a floppy disk
- Decide about the file system to use - conversion from Fat to NTFS is a one-way trip

### You must use the NTFS filing to:

- Encrypt files so only certain users have access
- Use fault-tolerant disk configurations such as Raid 5 or mirroring
- Assign permissions to files, specifying which users or groups have access
- Store files larger than 4GB
- Format partitions larger than 32GB
- Audit files for access by certain users or groups
- Stop files being accessed by bootable floppy disk
- Have a more robust filing system less prone to errors or corruption



# Extending the XPerience

With Microsoft already working on the upgrade of XP, the way we interface with our PCs is set to change

**W**indows XP is not the end of the line for Windows – Microsoft is currently well down the path to the next upgrade of its number one operating system.

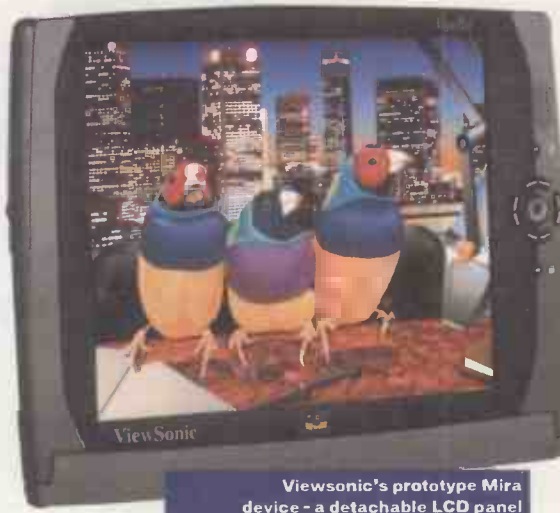
However, as far as Windows XP is concerned, its immediate future focuses on the release of Service Pack 1. Although Service Packs were made conceptually redundant by Windows XP's Automatic Updates, Microsoft has announced that there will be a Service Pack released, probably around September/October.

XP SP1 will roll up critical updates and contain enabling technologies for 'Mira' and new types of PCs such as the Tablet PC and the Freestyle-enabled PC. It will also include the changes required by the consent decree with the US Department of Justice.

Mira technology is designed to extend the Windows experience to a new generation of smart displays for use anywhere in the home. A Mira device will essentially be a large Pocket PC, capable of being carried around the house, allowing you to access your PC from anywhere.

Already Viewsonic has demonstrated a prototype Mira device – it looks like a typical LCD panel but it's detachable and can be picked up and carried around; the user interacts with the PC back in the home using wireless networking, Terminal Services technology and a stylus. It's perfect for web browsing, and other tasks that don't require heavy keyboard use. It's a lesser beast compared to the Tablet PC, which is a full-blown Windows PC, rather than an inflated PDA.

A complementary technology to Mira will be Freestyle. Users can connect a Freestyle-enabled PC to a TV set and hi-fi and use a remote control to view home videos, listen to music and flick through digital photos, watch DVDs and program Digital Video Recorder (DVR) capabilities through an onscreen program



Viewsonic's prototype Mira device - a detachable LCD panel

guide on the PC. The DVR also allows you to watch, pause, and record live TV like you would with, say, a Tivo. For Freestyle to work, however, a new generation of 'stereo component-like' PCs will need to be created.

Windows XP SP1 probably won't include Corona, the next generation of Windows Media Technologies. It'll include upgrades to all of Microsoft's digital media products, including Windows Media Server (which will ship with Windows .Net Server in late 2002), a new Windows Media Player, which will be available for all platforms, not just Windows XP.

Corona will feature new Windows Media Audio (WMA) and Video (WMV) formats. A new format, WMA Pro, will offer 24bit resolution and six channels (or more) of discrete sound for surround-sound capabilities.

With any luck, at about the same time as Windows XP SP1 is released, we'll also see the server version of Windows XP, Windows .Net Server 2002. Essentially a point upgrade of Windows 2000 Server, it'll comprise Standard Server, Enterprise Server, Datacenter Server versions as well as a new Web Server edition.

Windows .Net Server has been updated to include support for the .Net Framework and XML

Web Services. Windows .Net Server has also been tweaked for better performance and reliability: Microsoft says that it performs up to 50 per cent faster than equivalent Windows 2000 Server products.

Towards the end of 2003 we'll see the first updated release of Windows XP, code-named Longhorn. This won't represent a significant overhaul, but it will probably amount to a Windows XP Second Edition.

It's expected to offer a few .Net features, which means you will be able to use the Internet more efficiently and treat it as a continuation of your PC. Longhorn will also offer a slightly modified GUI, refining the task-based paradigm in Windows XP and adding support for more local services and web services in the shell-mounted task lists.

More importantly, reports indicate that it'll feature an SQL Server .Net-based file system, something originally meant for Longhorn's successor, Blackcomb. Dubbed Storage+, this file system will let Microsoft's search tools work across a wider range of storage devices, including the file system, Active Directory, SQL Server databases and Exchange Server data stores. Such a unified storage system will allow data

to be combined in a common database and accessed from a variety of devices, regardless of its format. Other Longhorn goodies include DVD burning and Windows Movie Maker 2, which will be a significant improvement over the existing version.

It has also been reported that Windows Update will be the first step in Microsoft's transition to a subscription model, allowing you to purchase Microsoft software and online services. In 2005 or so, we'll see the first major upgrade to Windows XP – Blackcomb.

Originally slated to be its first fully fledged .Net Windows release, Microsoft has now retreated from this goal, which is just as well because the widespread take-up of broadband, upon which .Net is predicated, hasn't happened yet.

Unsurprisingly, with such a distant release date, nothing concrete is known about Blackcomb, but it probably represents the last release of Windows in a recognisable form – thereafter Windows will embrace Microsoft's much vaunted .Net technology.

Announced back in 2000, Microsoft .Net consists of an Internet-based programming infrastructure as well as a user environment and services that support multiple devices, all built around the new extensible markup language (XML).

It includes server and client software, as well as services built around familiar faces, such as Windows, Office and MSN and that will be linked by the Internet. Neither a new operating system nor a new software suite, Microsoft .Net will rely on XML and a series of building blocks that Microsoft will host and sell as subscription services.

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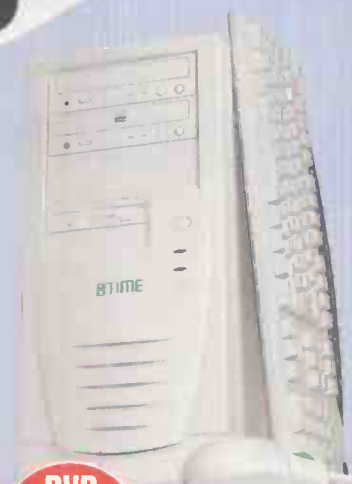
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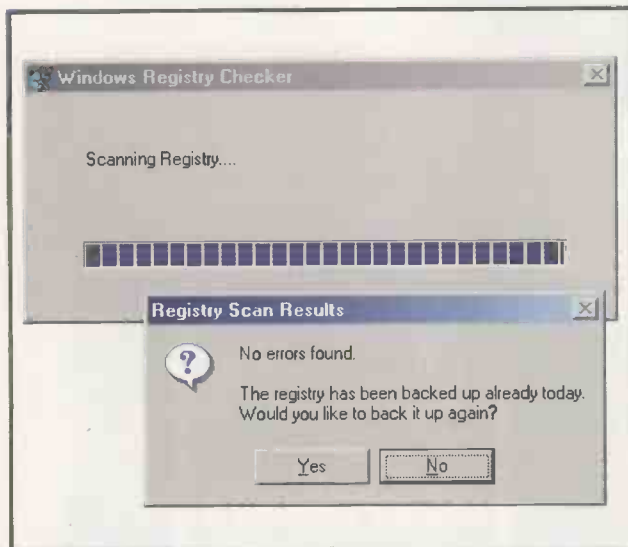
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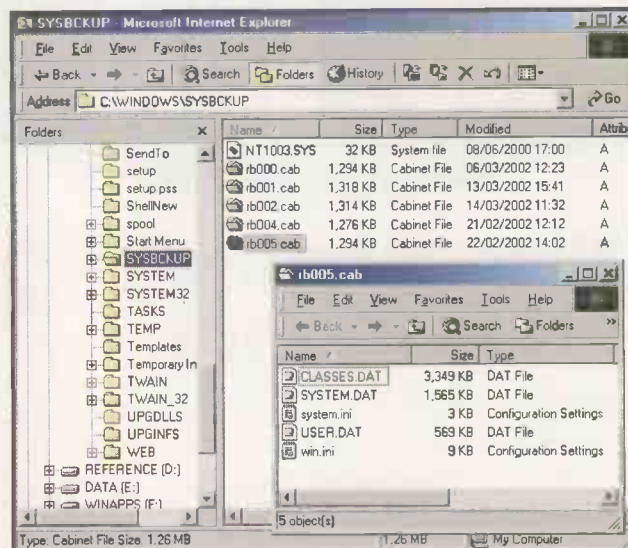


# How to back up and restore the Registry

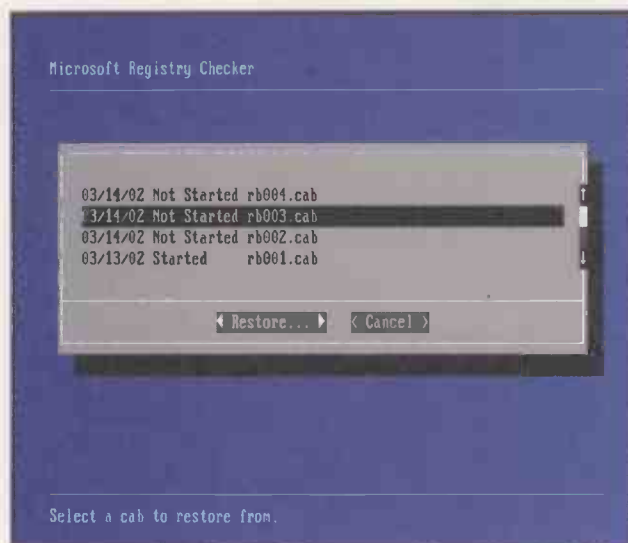
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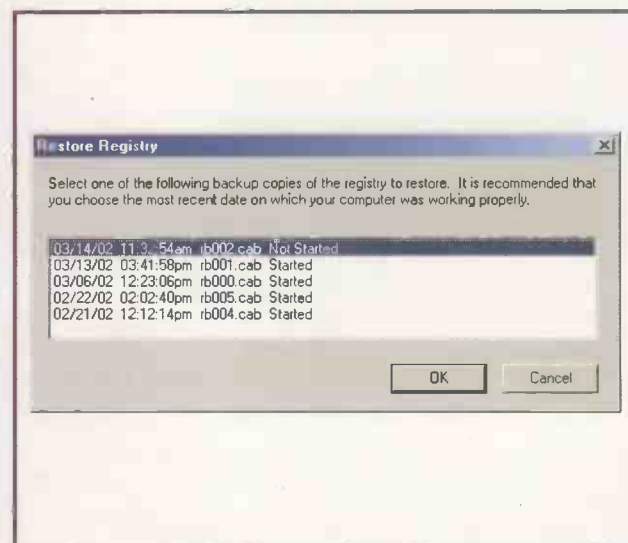
**1** Windows ME and XP users have a System Restore feature that backs up not just the Registry, but also other essential system files. However, the Windows 98 method described here works equally well for ME users who don't want to make a complete system restore point. The Registry Checker is hidden in the Tools menu of the System Information utility, or you can click **Start**, **Run**, then type `scanregw`. This will check the Registry for errors, and ask if you want to make a backup. It's a good idea to do so before installing new software or using the Registry editor.



**2** By default, Windows 98 and ME create Registry backups each day when the computer is restarted. Backups are stored in the Windows\Sysbckup folder. This is a hidden folder so you will need to turn on View hidden files from Explorer's Folder Options, View dialogue. Backups are stored as .cab files: open one and you will see it contains the User, System and, in Windows ME, classes.dat files plus win.ini and system.ini. Five generations are kept, but you can change this number by editing the MaxBackupCopies entry in the file Windows\Scanreg.ini.



**3** When Windows starts, it automatically checks the Registry. If any errors are found, it will replace the Registry with the most recent backup. You can 'roll back' the Registry to an earlier version manually. In Windows 98, first you need to close down Windows. Restart the computer and hold down the Control key to display the boot menu, then choose 'Safe mode command prompt only'. At the command prompt type `scanreg /restore` - the Registry checker will run, then the screen above will appear and you can choose which backup to restore.



**4** Windows ME users don't have the option to start in command prompt mode, but they can still do so by booting from a floppy startup disk. There is, however, an undocumented trick available. If you type `scanreg/restore` into the Start, Run, box, or a windowed MS-Dos box, then you'll get a warning that Windows needs to be restarted and that you should close all programs. Follow these instructions, OK the warning and you will see the dialogue above: choose the backup you want, click OK and your PC will restart with the chosen backup restored.

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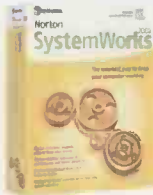
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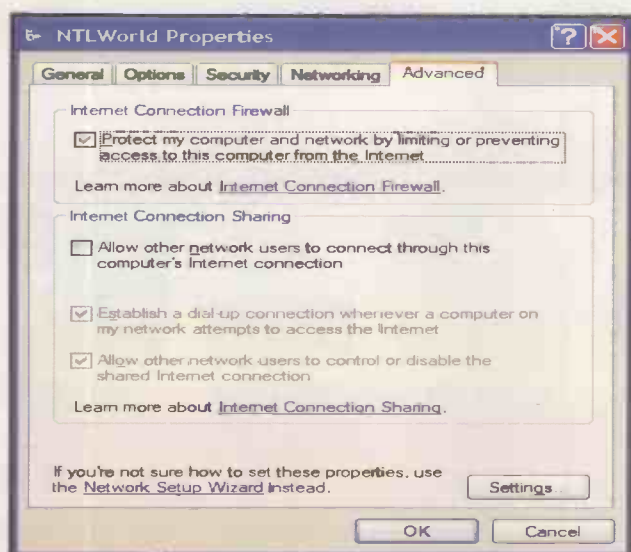
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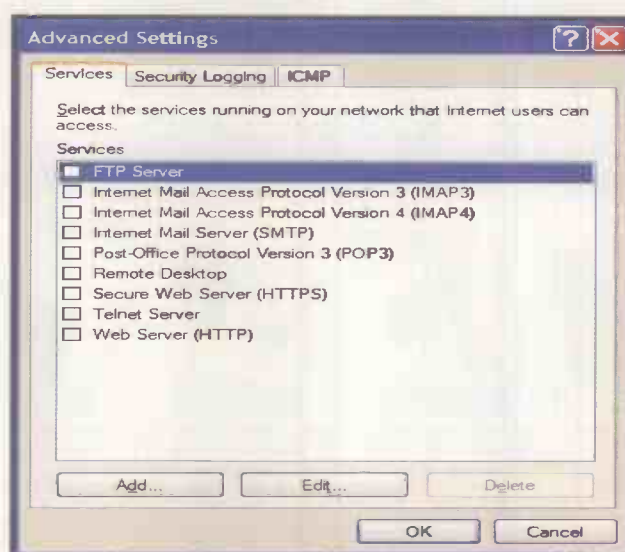
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# Configuring the XP firewall

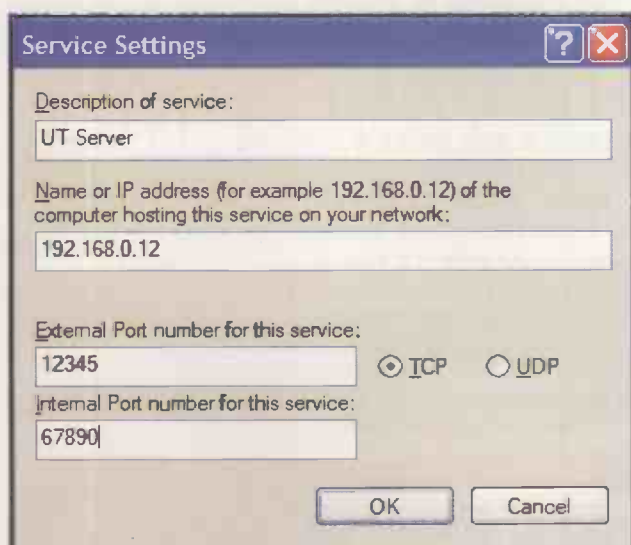
XP users can protect themselves from the bad guys with the Internet Connection Firewall - here's how



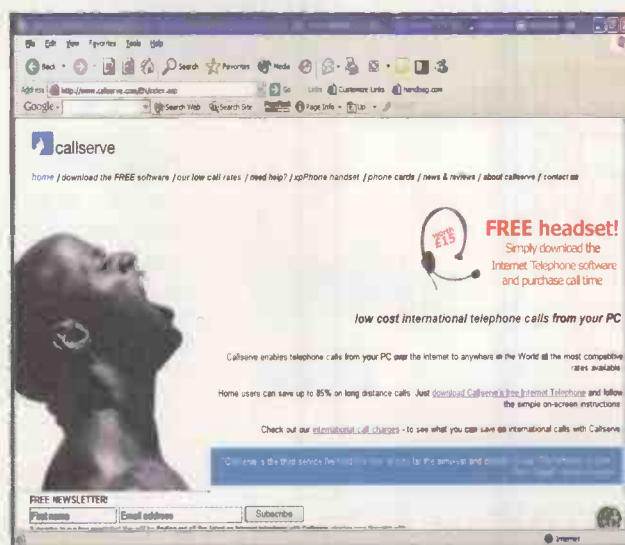
**1** As we now spend more time online it is essential to use a firewall to protect us from the bad guys haunting the Internet. There are several good utilities available, including Zone Alarm, which is free for personal use, but Windows XP comes with a competent firewall as standard – the Internet Connection Firewall (ICF). Activation is simple: right-click on My Network Places and choose Properties. Right-click on the Internet connection icon and choose Properties again. Click on the Advanced tab and you'll see an ICF checkbox. Tick it to enable ICF.



**2** ICF is a powerful packet firewall, but it doesn't have all the features of a full-blown firewall. ICF is either on or off; you can't selectively protect specific ports or protocols. However you do have the ability to allow a few protocols to pass, such as HTTP, FTP, and L2TP. Naturally, Microsoft utilities such as Windows Messenger, Remote Assistance and games and applications that use Direct Play, will be able to work through ICF seamlessly. A number of predefined services are set up as standard and you simply tick the checkbox to activate them.



**3** You can also define additional ports for services. In the Advanced Settings dialogue click on Add and give the service a name. You'll need the name or IP address of the internal computer hosting the server – this will most likely be an internal IP address. Enter the external and internal port numbers for this service. The external port number will be the one Internet users will connect to. The internal port number will be the actual port number on the computer hosting the service listed above. You also need to specify whether they are TCP or UDP ports.



**4** Certain apps, however, such as Callserve's Internet Phone, remain problematic with ICF. Callserve advises users to open UDP ports 1717, 1718 and 1719, TCP port 1720 and all TCP and all UDP ports between 16384 and 32767, ie some 16,000-plus ports. Doing this manually, one port at a time with ICF, isn't feasible. In this case you can either temporarily disable ICF or use Zone Alarm instead – this firewall can automatically open all the ports needed when the app is first run. But remember – the more ports open, the less secure you are.



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**T**he Hands On section of *PCW* is where you can find out more than just what's behind the news and reviews. Our team of experts is made up of people using technology in the front line, whether it's trying to persuade one program to save data in the format of another, or migrating a business and its tools to the online economy.

From graphics tips to visual programming, and disk drives to spreadsheets, you'll find tips and info here from the sharp end of computing. The Hands On team, though, isn't just the writers and editors who put this part of the magazine together – the readers are just as much a part of it.

It's your tips and queries, whether in Question Time or in the form of feedback and questions to the writers, that keep Hands On up to date and relevant. So, while we can't guarantee to respond personally to every question, we do read all the comments that are sent in. Whether it's a knotty problem, or a nifty solution you've found, drop us a line – it's good to share.

Nigel Whitfield, Hands On Editor

## COLUMNISTS



**Tim Anderson** is both an IT journalist and software developer, and began writing for *PCW* in 1993. Since his first computer in 1980, a Commodore PET, he has acquired expertise in RAD programming, Windows and the Internet.



**Roger Gann** got involved with PCs late in the last century after dabbling in law and the construction industry. He edited the UK's first Windows magazine. These days he potters about in his office, among his collection of antique computers.



**Terence Green** has tussled with computers ever since starting as an IBM mainframe operator in 1979. Since 1981 he has documented the gap between what PCs claim to do and reality.



**Gordon Laing** has been a hardware enthusiast ever since his first Sinclair ZX80. Today he benchmarks PC components to within an inch of their lives, but as a 10-year contributor and former editor of *PCW*, he ought to know better.



**Niall Magennis** has been dabbling in MIDI and digital audio since the days of the Atari ST. He writes on a freelance basis for a number of music magazines and lives in London in a flat overrun with music equipment.



**Ken McMahon** became a freelance journalist after he experimented with graphics on a Commodore 64. In 1987 he bought an Apple Mac Plus before founding Pelican Graphics, and has not looked back since.



**Tim Nott** is a full-time freelance journalist. When not writing about Windows and word processing, he tackles subjects as diverse as the Internet economy and France, where he currently lives with his wife and family.



**Barry Shilliday** has worked with computers for almost two decades. By day, he is a Linux and Unix consultant, but in his free time prefers to travel the world – and snap it with his camera.



**Stephen Wells** is a freelance journalist and has been a regular contributor to computer magazines since 1985. He has been writing *PCW*'s Spreadsheets column for seven years. A US citizen, he now resides on the Essex coast.



**Mark Whitehorn** is one of those lost souls who actually likes databases. He splits his time between consultancy, writing, working for two universities and tinkering with old cars. He's also extremely fond of penguins.



**Nigel Whitfield** edited computer magazines before going freelance in 1995. A specialist in Internet and consumer issues, he has a degree in Computing Science from Imperial College. He lives in Hackney with his three cats.



**Benjamin Woolley** is a writer and broadcaster who first started experimenting with 3D graphics when he worked at the BBC. It was during this time that he developed some of the earliest CG work to appear on TV.





## Advice from our experts

Our Hands On experts answer your questions and solve your problems

### Databases

**Q** I want to build an Access project file, but when I do I get a message asking which database I want to use. I don't have SQL Server, but I seem to need something called the SQL Server desktop engine. I gather this is free. Do I have to download it?

Harry Heighton

**A** The Microsoft SQL Server 2000 Desktop Engine (MSDE 2000) doesn't install by default as part of Office XP. Nevertheless it is there on the Office XP-CD-Rom – you just need to install it manually.

The steps are as follows:

1. De-install the MSDE if it is already present on your system.
2. From the Windows Explorer, open the \MSDE2000 folder on the Office XP CD-Rom.
3. Read the Readme.txt file.
4. Double-click setup.exe which lurks in that folder and let it run its course.
5. Reboot.

In the help system it then says: 'Microsoft strongly recommends you change your password if you use the System Administrator (SA) password to log on, especially on a Windows 98 operating system.' See also this month's Database column and screenshot 1.

### Hardware

**Q** My 8GB hard disk is partitioned into drives C, D, E, F and G. I have bought a new hard disk and created three partitions on it, but would like them mapped to drives H, I and J. Every time I try to do this, my three new hard disk partitions become drives D, I and J. My old C partition is still C, but the D, E, F and G partitions have been forced forward to become E, F, G and H!

Michael Cooke

**A** There are three different types of partitions, called Primary, Extended and Logical. You can only have one Primary partition on each hard disk, and Windows always gives priority to them. You have created a Primary partition on both hard disks, so Windows will map them as drives C and D, before going back to the first disk and mapping the other partitions. The solution is to

**External USB CD rewriters, such as this one from Lacie, are useful for notebook users who want to back up data**



delete the partitions on your second disk and start again, but this time, use Extended and Logical partitions instead.

You must create one big Extended partition using all the available space on the second hard disk, then split this up into the three Logical partitions you desire. Windows will then map your partitions in the desired order, starting with the Primary and Extended/Logical partitions on your first disk, followed by the Extended/Logical partitions on your second disk.

Remember that if you want your partitions to be bigger than 2GB, you must say Yes to enable large disk support when you start Fdisk.

**Q** Can I use ADSL services with my notebook? Is there an internal solution I can use?

Stewart Roberts

**A** Yes and no. External ADSL modems are available with either USB or Ethernet connections and modern notebooks will definitely have one or both of those ports. We couldn't find a PC Card ADSL modem which would slip inside your notebook though.

**Q** Will a pair of Via 933MHz C3 processors work on Abit's BP6 motherboard?

Peet McKimmie

**A** Sadly not, for two reasons: first the C3 is an FC-PGA (Flip-Chip Pin Grid Array) processor which won't

work on the BP6's PPGA sockets, and second because dual-processing is not currently supported by the C3. Via says its forthcoming Nehemiah processor, due to be launched later this year, supports dual configurations, but we don't expect it to work in old PPGA boards such as the BP6.

**Q** I would like to buy a notebook and be able to back up its data onto CD-RW, but cannot afford a model with a built-in CD-RW drive. Are there any external CD-RW drives with USB interfaces I could use instead?

Andy Healey

**A** Lacie ([www.lacie.co.uk](http://www.lacie.co.uk)) offers a range of external CD rewriters featuring USB 1.1/USB2 and Firewire ports (if you buy a Sony notebook, you should be able to use the Firewire connection). Lacie's desktop external CD-RW U&I drives start at £150 ex VAT, while its portable Pocket CD-RW drives (pictured above) cost from £210 ex VAT.

lomega ([www.lomega.co.uk](http://www.lomega.co.uk)) also produces external CD-RW drives with USB 1.1 and USB2 support, costing from £120 ex VAT. Note, though, that the lower speed of USB 1.1 means that CD writing is limited to four-speed. Consequently if you're only ever going to plug it into a USB 1.1 interface, you won't see the benefit of the faster and more expensive CD-RW models.

## Graphics and DTP

**Q** How can I convert a square bitmap image to a circular one? I want to take a square image and convert it to a circle by distorting the entire image, not by cropping it. I have access to Corel Photopaint 9, Coreldraw 9, Adobe Photoshop 5.5 and Paint Shop Pro 5.01.

Martin Dasher

**A** Use Photoshop's spherize filter (filter/distort/spherize). Spherize also lets you constrain the distortion in the horizontal or vertical plane producing a cylinder distortion effect (see screenshot 2). Alternatively give the polar co-ordinates filter a try, it remaps pixels from a vertical grid to a polar one, producing a different, more extreme distortion. Lastly, there's the 3D transform filter which you can use to wrap your 2D image around a 3D cube, sphere, or cylinder. Because you can manipulate the object in 3D space, this gives you a bit more scope than spherize. Photopaint 9 also has a spherize filter on the Effects/3D Effects menu.

**Q** In the past few weeks, for no apparent reason, my Epson 870 printer (pictured right) has been adding a strong cyan/magenta cast. I first noticed this when printing a file I'd printed a few months back – the original matched the screen but the new print certainly did not.

I've tried to print other files again, none of which look the same as they did previously, so it can't be this particular file that has been corrupted. After checking that the printer had the correct colour profile, I re-installed the drivers and thus the colour profile in case they had somehow been corrupted, but this has made no difference.

The only change that I have made recently is to install a new colour cartridge, and I wonder if this is somehow faulty. I have been to Epson's website and sent an email concerning this but the company has not replied.

Have you any ideas on what might be causing this?

Bob Isgar

**A** Try running the cleaning routine. Your Epson printer driver should provide an option to do this and to produce a test print that prints a pattern of lines – if not all the lines are present it means the nozzles for that colour are blocked. It's not uncommon to have to have to run the cleaning process up to half a dozen times to unblock the nozzles.

If that's not the problem it could be the

paper – are you using the same as last time and are you printing on the correct side (an easy mistake to make with some coated papers)? If none of that works it could be the cartridge, though our experience is that faulty cartridges, whether produced by the printer manufacturer or a third party are rare.

## Spreadsheets

**Q** Using Lotus 97 I have made a timesheet with times for clocking in and out at work. I have the times in and out, and total hours per day in time format (hh:mm). In a separate column, how do I add each day's total to the total of the day in the row above, allowing them to exceed 24 hours? On trying to add them, they start totalling from zero again if the value rolls past 24 hours. I want my boss to be aware I work long hours each week!

Timothy Belsten

**A** If you look at the Lotus 1-2-3 Smartmaster Template named 'Fill out a Time Sheet' you'll see that its formatting is not hh:mm but a Fixed Number, with two decimals. Spreadsheets record a date as a number, counting from a specific date. Some use Jan 1st, 1900. Time is a fraction of that number. But you're not recording and adding specific times – just numbers of hours. If you work 7.5 hours enter 7.5 hours and not 7:5 or 7:30. You'll find that your hours will add up to an impressive number that way.

**Q** If I highlight a column of figures in Excel and look at the total displayed by Autocalculate in the Status Bar it often differs from that produced by the SUM function at the bottom of the column. Why is this?

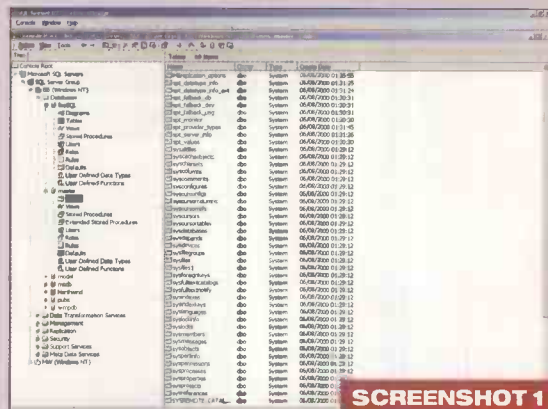
Sam Schwind

**A** I think it is very likely that your list has one or more hidden rows. Autocalculate will only total the highlighted values on the visible rows, while SUM will total the values in the column for all the rows. If you want a function which will reflect the filtered version, use SUBTOTAL.

**Q** Can I copy a range of cells in Excel other than using Copy and Paste?

Matthew Mills

**A** Just highlight the range and point to one edge of the highlight. The pointer turns into an arrow. Hold down the Ctrl key and drag the range to another place on the worksheet.



SCREENSHOT 1

MSDE is a robust database, but it lacks the sort of GUI interface that we have come to expect with a back-end database engine

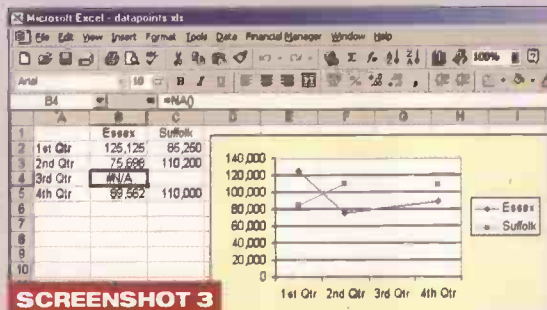


Photoshop's spherize filter can help convert a square image to a round one



Printer problems? Try cleaning the nozzles to even out the colour distribution





**SCREENSHOT 3**

## Allowing for missing data points

Day	Clock-in (PM)	Clock-out (PM)	Time Worked	Accumulated Total
Sat	1:25	5:35	4:10	4:10
Mon	1:25	5:35	4:10	8:20
Tues	1:25	5:35	4:10	12:30
Wed	1:25	5:35	4:10	16:40
Thurs	1:25	5:35	4:10	20:50
Fri	1:25	5:35	4:10	25:00
Sat	1:25	5:35	4:10	29:10

**SCREENSHOT 4**

## How to accumulate times in Excel



**SCREENSHOT 5**

## Quicktime - restrict it to showing movies

**Q** When I have no data for one point in a line chart I'd like Excel to connect the previous and following points. If I leave the entry cell blank, there is a gap in the line. If I enter a zero, the line drops down to zero on the chart. Is there a way around this?

Louise Machin

**A** Yes. In the blank cell enter =NA(). You'll see in screenshot 3 that there are no results for the third quarter. The Suffolk column leaves the cell blank so there is a gap in the Suffolk line. But entering this seldom-used function causes the Essex column to display an error message in row four and the line on the chart is continuous from the second quarter to the fourth quarter.

**Q** How can I enter hours and minutes in Excel 97 and have a third column total the data in hours and minutes format, not in decimal parts of a hour?

Bill Jones

**A** Further emails between us established that you want to total times you have worked. If you use column B for entering your clocking-in times, and column C for your clocking-out times, you should enter the hours and minutes using a colon (as 1:25 and 5:25). Give both these columns the custom format h:m. Column D has the same format, enter the formula =C4-B4 and drag it down the column. This is the total time worked each day or session. Column E can carry an accumulated total, =D5+E4, dragged down the column. The appropriate custom format for this column is [h]:mm. Microsoft says square brackets in an Excel custom format denote elapsed time. But you could also call it accrued time. When you use the square brackets, Excel will convert every 60 minutes in a total of times into another hour. Any remainder is given, not as a decimal fraction of an hour, but in minutes, as you require (see screenshot 4).

## Windows

**Q** I refer to your Windows column in the March issue and write to ask if the file 'user.dat' is of the same variety as 'index.dat' and whether it can be reduced back to embryonic size using the same method?

Nigel Young

**A** No, user.dat, system.dat and classes.dat files are essential parts of the Registry and should be left well alone.

**Q** I recently had problems printing charts from Microsoft Flight Simulator that are in gif and set up to use Quicktime Player. I use a Lexmark Z42 printer and Windows ME. The paper ejects without printing, or at best prints top and bottom of the paper but not the middle. I have had some success but not of any quality. There is not a printer icon listed in Device Manager, but I had always believed that all items connected to the PC would be listed, and wondered whether this might be part of the problem? Otherwise the printer performs quite well, considering it is a relatively inexpensive machine - aside from charts using Quicktime.

Jim Carless

**A** To answer the second question first, the lack of a printer icon in Device Manager is normal. You can access the Printer properties from Start, Settings, Printers or from Control Panel, Printers. Your problem is with Quicktime, which is primarily a tool to display Quicktime movies and other multimedia (see screenshot 5). Using it to print gif files is rather like digging your garden with a hammer: we've tried it (printing, not digging) and the results were awful. Go to Quicktime's Edit menu and choose Quicktime Preferences. From the dropdown list select File Type Associations and untick both the Windows and Internet file types before closing the dialogue. Windows ME should then revert to using its own Image Viewer for showing gif and other common graphic formats, which will also make a far better job of printing them.

**Q** I've noticed that in my temporary Internet files on Internet Explorer 6 the cookies listed now have my full name shown with the cookie name, eg myname@amazon.co.uk. I've also noticed when Installing certain software on my Windows 98 computer, if I click to register the software, the box where it asks me for my name is already filled in with my full name. Where in Windows 98 is my name stored? And is my name being displayed to websites that I visit?

Phil

**A** The answer to the first question is that the name is stored in the Registry at HKEY\_LOCAL\_MACHINE\Software\Microsoft\Windows\Current Version - RegisteredOwner. The answer to the second question is no, not unless you have explicitly filled in a form on a particular site, such as Amazon, so that it remembers you.

## Windows 2000

**Q** My Internet connection icon has disappeared from the Taskbar. I opened Network and Dial-up Connections to edit the settings but the folder was devoid of all connections. When I tried to create a new connection with the same name as the missing one I got a warning that the connection already existed. I accessed the connection settings from Internet Options in Control Panel but the 'Show icon in taskbar when connected' option was already selected!

Ian Balls

**A** Several of you have encountered the same esoteric problem. As the saying goes, misery loves company! The common factor for everyone who experienced this problem is that they were all using a BT dial-up or ADSL connection and had installed the accompanying BT software. Fortunately this problem turns out to be a nuisance rather than a show stopper, because Internet connections continue to work even though the icons have disappeared from the Taskbar and the Network and Dial-up Connections folder.

The solution is relatively straightforward and is documented in the Microsoft Knowledgebase at <http://support.microsoft.com/default.aspx?scid=kb;en-us;Q254631>. Scroll down to the bottom of the article and follow the advice under the heading: Register the following DLLs.

## Word Processing

**Q** My Word 2000 has done something odd and I cannot find a way to clear it. In the last line of a table column of figures, the sum has disappeared from every table where it is used and been replaced by {=SUM(ABOVE)}. I can delete this but when I block the cell, go into Table, Formula and accept =SUM(ABOVE), the one in curly brackets is simply put into the cell. If I then right-click on the cell and select 'Update field', nothing happens.

Clive Pygott

**A** It sounds as if you have 'View Field codes' enabled: if you go to Tools, Options, View you can untick this, and the result of the code, rather than the code itself, will be shown. On a standard Word installation, Shift & F9 toggles field codes on or off (see screenshot 6).

**Q** Where does Word 2000 store the list of files that appears when you click on the arrow beside the File Name

box in the Save As dialogue? It seems to be independent of the List in the File menu and I can't find it with a Registry search.

Jeff Quayle

**A** It is in the Registry, but in binary form, which is why a search won't find it. Go to HKEY\_CURRENT\_USER\Software\Microsoft\Office\9.0\Common\Open Find\Microsoft Word\Settings\Save As\File Name MRU and click on the value named Value, an edit box will appear showing the hex code and a text translation. Back up the Registry before making any alterations.

**Q** A while ago you included an article explaining how to change the resolution of the 'snap to grid' in the Microsoft Office drawing tools. Could you remind me how this is done?

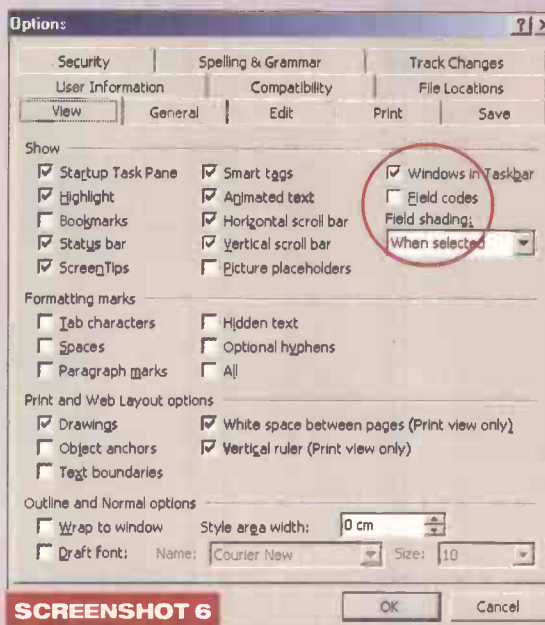
Simon Churchill

**A** This was mentioned, but only in passing, in the March column, so you may well have missed it. All you do is click on the Draw menu on the Office Drawing Toolbar, and then Grid... all the grid and snap options will be revealed (see screenshot 7).

**Q** I installed Office 2000 Professional on my Dell Inspiron notebook, and Word does not run: it crashes the computer with out of memory and dangerously low resource warnings. I have uninstalled and re-installed with same problem. I can get it to work with the winword.exe /a command switch. Is a previous installation still affecting Word 2000? Word 97 works with no problem.

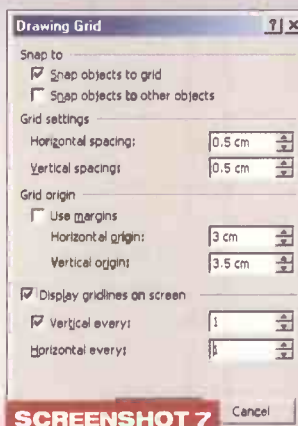
Ian Cooper

**A** When you start Word with the /a switch this disables all global templates and add-ins, so it looks as if one of these is responsible for the problem. Open the Microsoft Office 2000\Office Startup folder and move the contents to a temporary folder elsewhere. If Word then starts normally, move the files back in one at a time until the fault re-occurs – you will then have isolated the culprit. If Word still crashes, then the problem is with normal.dot. Rename this, but keep the .dot extension and Word should then start normally, rebuilding a clean normal.dot. If you have macros, styles or autotext entries in the renamed normal.dot that you want to rescue, you can do this with the Organizer (Tools, Macro, Macros, Organizer). Take care when copying any Auto macros back, these might be the cause of the problem.



SCREENSHOT 6

Disable Field codes to see the results of the code rather than the code itself



SCREENSHOT 7

Grid and snap settings for the Office drawing tools

## CONTACTS

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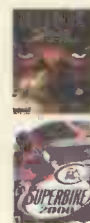
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# Make your own movies

In the second section of our two-part workshop, Gordon Laing produces a professional quality DVD

**W**ith internal DVD writers dropping to £300 ex VAT and below, the ability to produce your own DVD movies is set to be the killer application of 2002. In last month's *PCW* we looked at how to create basic DVDs and Video CDs. This month it's the turn of those who want a bit more from their DVD projects.

## Formats

It's worth briefly reiterating the differences between the current rewritable DVD formats. With DVD-Ram working best as a large PC data storage medium, the two formats vying for the broadest compatibility in the domestic video market are DVD-RW and DVD+RW.

In our tests, only the oldest DVD-Rom drives and domestic players refused to play DVD-RW and DVD+RW discs. But the good news is that all recent players were compatible.

If you want close to 100 per cent compatibility with older drives and players, though, you'll need to use the write-once DVD-R format. Virtual guaranteed compatibility, not to mention lower media cost, makes it the best choice when you want to share home movies or distribute corporate videos.

Pioneer's DVD-RW and Panasonic's latest DVD-Ram models can write to DVD-R discs. While DVD+RW boasts superior rewritable performance, none of these drives can write to DVD-R. The recently announced write-once DVD+R format promises equal levels of compatibility as DVD-R, but it now looks like none of the first-generation DVD+RW PC drives will be upgradeable to support the new blanks.

Until we see how DVD+R performs with brand new DVD+RW drives, we'd recommend anyone wanting to create and share DVD videos should go for a drive that can handle DVD-R. You should also know that Sony plans to release a combination drive supporting DVD-RW, DVD+RW and DVD-R this October.

## Professional DVD authoring

Graduating from the basic DVD authoring packages provides the video enthusiast with a vast number of features to play with, not to mention greater control and ultimate quality. Sure, the beginners' packages can create menus and convert video, but the professional versions offer

custom chapter points, richer menus, support for widescreen, multiple audio and video tracks, subtitles, six-channel surround sound and precise control over the quality of format conversions.

The process of producing a

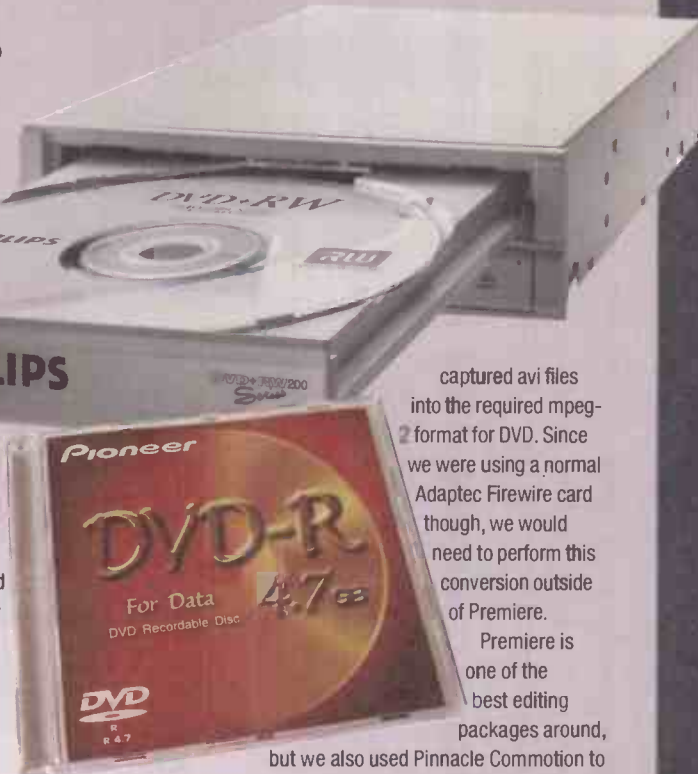
professional quality DVD is essentially the same as a budget one. Start by capturing your footage, editing where necessary, then converting it into the correct audio and video formats required by DVD. Finally you put all the elements together, design a menu and burn the entire project onto a disc. We'll now detail each step and explain our choices.

## Video capture and editing

We shot our original footage using a Canon XM-1 DV camcorder and connected it to a PC using a standard Firewire connection – any OHCI-complaint Firewire card will do. In terms of PC specification, video editing demands a big, fast hard disk. An hour of raw digital video (DV) footage occupies around 11GB, so you do the maths.

A fast processor and plenty of memory won't hurt either when it comes to rendering effects and converting formats. We used a dual Athlon MP 1800+ PC with 512MB of DDR memory and a 36GB Ultra160 SCSI hard disk, running Windows 2000 Professional.

We used Adobe Premiere 6 to capture and edit our footage, along with adding various transitional effects between scenes. Premiere costs £499 by itself, but is often bundled with many high-end video capture cards. Along with saving money, these bundles normally also include the facility to convert



**More advanced DVD authoring gives you greater control and higher quality**

**Adobe Premiere is a good tool for digital video editing**



captured avi files into the required mpeg-2 format for DVD. Since we were using a normal Adaptec Firewire card though, we would need to perform this conversion outside of Premiere.

Premiere is one of the best editing packages around,

but we also used Pinnacle Commotion to create advanced effects. Commotion is a proper special-effects package capable of generating, animating and compositing elements; it costs £379 or £749 in normal and Pro versions respectively.

One of Commotion Pro's neat tricks is motion tracking, allowing animated smoke to emerge from a previously inactive chimney as it moves across the frame.

Special effects can also make things, such as unwanted microphones, wires or even people, disappear. We used Commotion's clone tools to remove a hair that had inadvertently become stuck on our lens while shooting.

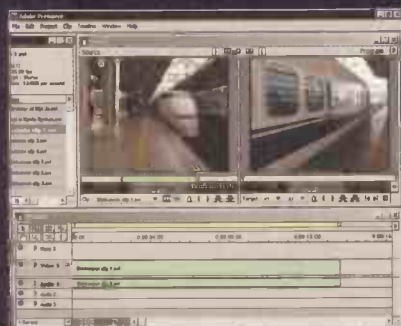
Once completed, each avi video file was exported from Premiere, carefully ensuring the settings were exactly the same as for capture.

## Video conversion

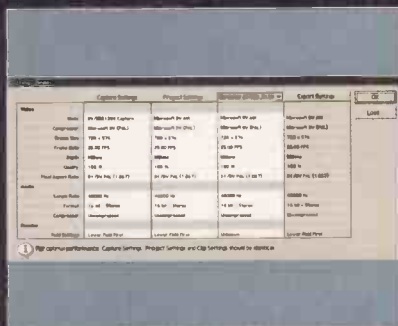
DVD employs an efficient video compression system called mpeg-2, but Premiere natively works with avi files, so a conversion must be performed before continuing. Since our authoring package, Pinnacle Impression DVD Pro 2.1, won't do the conversion either, we'll have to use a separate tool, giving us precise control over the process. The new Impression Pro 2.2 will do conversions.



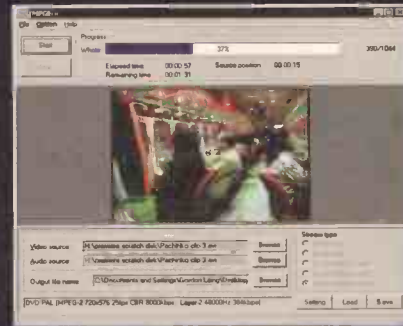
## HOW TO CREATE A DVD, FROM GATHERING CONTENT TO BURNING TO DISC



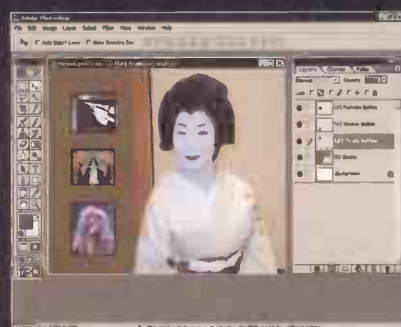
**1** The first step in creating a DVD is collecting and editing your content. While this could include separate audio files, still frames and menu elements, the primary content will normally be video clips. We used Adobe Premiere 6 to capture video directly from a DV camcorder using a digital Firewire connection. Once captured as a standard avi file, Premiere can then be used to edit clips and apply effects such as transitions between scenes.



**2** If you're using a dedicated video capture card such as those made by Pinnacle, then you will be able to export your edited avi files directly from Premiere into the mpeg-2 format required by DVD. Since we're using a normal Firewire card with Premiere 6 though, the mpeg-2 conversion must take place later. Consequently it's crucial that the edited avi clips are exported using exactly the same DV settings as for capture.



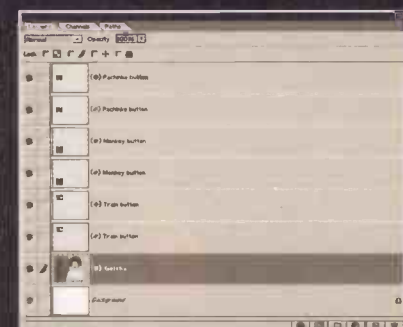
**3** TMPG is a software encoder that can convert our avi files into mpeg-2 format. We wanted the best quality, so we loaded the TMPG template to create a Pal DVD using a constant video bit rate of 8,000Kbits/sec. This preset also creates an mpeg-2 audio file, but our authoring package (Pinnacle Impression DVD Pro 2.1) requires a different format. Use the Output to file option in the TMPG File menu to create a wav audio file for each of your avis.



**7** Our DVD will feature three video clips, each activated by pressing a button on the menu. We've created these buttons by resizing still images in Photoshop, although Pinnacle Impression DVD Pro 2.1 also allows video clips to be used in buttons or as the background. Each button is placed on its own Photoshop layer, named with a (#) code. When you're composing your menu, remember most TVs will crop the image around the edges.



**8** Pinnacle Impression 2.1 allows buttons to be created which change their state when you select them. We wanted buttons that highlighted with a glow when they were selected, so we used Photoshop 6's layer effects to apply an outer glow to duplicates of each button. Above are the options for Photoshop's outer glow effect. We chose a 40 pixel size and a white glow for each of our three buttons.



**9** As described in Steps 6 and 7, Pinnacle Impression 2.1 requires that each menu element be placed on a separate Photoshop layer with a specific code in the names. The background name must start with (B), while each button name should begin with (#). The layers containing the selected button images must have the same name as the normal buttons themselves, but be preceded with (@). Above is the layer palette for our completed menu.

Numerous high-end converters are available, but we enjoyed excellent results from the TMPG software encoder. Download a free 14-day trial from [www.tmpgenc.net](http://www.tmpgenc.net) and unlock it for £35.

TMPG offers a number of conversion options, but we wanted the best video quality, so opted for the constant rate at the highest 8Mbits/sec setting.

The conversion process can take minutes or hours depending on your CPU, and the length of the clips.

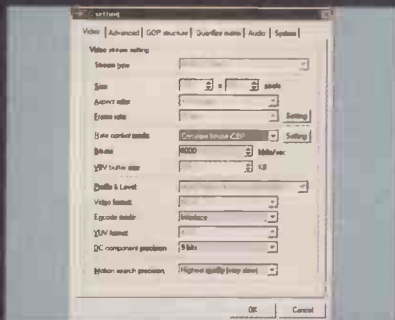
Once completed, you'll have a single mpg file for each clip which contains both the video and audio. Pinnacle Impression 2.1, however, requires separate audio and video files, so the mpg file must be de-multiplexed. TMPG's de-multiplex tools produce separate M2V video and MP2 audio files.

Impression 2.1 can handle all manner of audio formats, but sadly not MP2, so we've also used TMPG to extract a standard wav file from the original avi file.

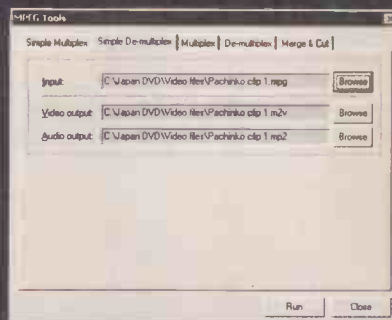
Uncompressed wavs may be much larger than conventional DVD audio formats, but they offer the best two-channel quality and our clips are short in length.

### DVD authoring

Our encoded audio and video files are then simply imported into Pinnacle Impression DVD Pro 2.1 and arranged using a standard timeline interface as shown in the workshop. Impression 2.1



**4** TMPG is a powerful software encoder with a wealth of customisable settings. While we opted to load the supplied Pal DVD template, you could manually choose your own settings. Most DVDs are authored using a variable bit rate for video, which increases the resources for complex or fast-moving scenes. It's also worth checking TMPG's environmental settings, and dual-processor users should activate the multithreaded options for quicker encoding.



**5** Our mpeg files can now be viewed in a software DVD player, but our authoring package requires that the video and audio portions are extracted as separate files. TMPG offers the required 'de-multiplexing' options from the mpeg tools in its File menu. This takes an mpeg file and separates it into M2V video and MP2 audio files; note though that we'll be using the wav file created earlier, instead of the MP2 for audio.



**6** The next step is to create the opening menu for the DVD. While Pinnacle Impression 2.1 can create menus, far greater flexibility is available by using a layered image in Adobe Photoshop. The first step is to create a background image. We've taken a still image and resized it to the 720 x 576 pixels required by the UK Pal video system. Impression requires the background image be placed on a layer named with a (B) code.



**10** Here's the final menu image with all three buttons showing their highlighted states. Notice the buttons have been positioned deliberately away from the edges so they won't be lost when the image is later cropped by a TV set. Preview modes can't truly reveal what the menu will look like on a TV though, so you may need to return and modify the menu, to adjust brightness or colour, along with composition.



**11** Now we can put all the elements together using Pinnacle Impression. Simply import each asset one at a time and drag them from the lower left window into the timeline at the top; the menu is imported as a Photoshop psd file and the video and audio are separate M2V and wav files. Clips are then linked to the menu by dragging them from the timeline onto the relevant button in the lower right preview window.



**12** All that's left is for Pinnacle Impression 2.1 to take all the elements and build a DVD with them. As time goes on, more DVD writers will be supported by Impression, but if yours isn't supported today, then simply choose the option to compile and create a UDF (universal disk format) image only. This img image file can then be opened in, say, the latest version of Ahead Nero and subsequently written to any DVD writer.

costs £349, although prospective buyers should also consider Sonic Solutions' excellent DVDit, available in SE and PE versions for £299 and £599 respectively.

While Pinnacle Impression 2.1 can make its own menus, we've gone one step further and created a more sophisticated interface using a layered Adobe Photoshop image, as explained in the workshop.

A 'light' version of Impression 2.1 is often bundled with some cards, which supports single audio and video tracks.

The full version can handle multiple audio and video tracks, not to mention subtitles, allowing you to cater for foreign languages or make your own director's commentary.

All that's left is for the image to be burnt onto a DVD, or even a CD if the project measures less than 700MB – remember, though, that DVD video on CD will normally only play on a PC drive. If Impression 2.1 doesn't support your writer, import the image into an alternative writing package such as Ahead Nero 5.5.

#### CONTACT

Adobe [www.adobe.co.uk](http://www.adobe.co.uk); Pinnacle [www.pinnaclesys.com](http://www.pinnaclesys.com); Sonic Solutions [www.sonic.com](http://www.sonic.com) or [www.unlimited.com](http://www.unlimited.com)  
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01273 707 200 [www.dvc.co.uk](http://www.dvc.co.uk)

We welcome queries and comments on this month's workshop. Contact us via the PCW editorial office or email: [letters@pcw.co.uk](mailto:letters@pcw.co.uk). Please do not send unsolicited file attachments.



## Searching for a shortcut

Tim Nott untangles the answers to some frequently asked Windows questions

This month I've received several queries which are all frequently asked questions, but don't fit in terms of size or scope into the Question Time section.

The first is a Microsoft Outlook question. Since, unlike Outlook Express, the full Outlook is not part of the Windows operating system, it's arguable that I shouldn't be writing about it. But this is a trick question: 'How do I get Outlook's calendar to show the day of the week in daily or weekly view?' A rider to this continues: 'I've searched all the menus, options, help file etc, to no avail.'

The answer to the question lies not in Outlook, but in Windows. You need to go to Control Panel, Regional Settings and change the long date style. By default this is usually of the form dd MMMM yyyy, which yields 05 August 2002.

If you prefix the style string with dddd, this will yield Monday 05 August 2002. Three ds instead of four returns an abbreviated weekday.

While straying into Outlook territory, here's a quick tip I couldn't resist, as it answers that ancient Windows mystery – 'How do I print a folder contents listing?'

The conventional method is to open a command prompt window, navigate to the chosen folder and type: `dir > myfiles.txt`. This will create a text file of the folder contents that can then be printed from Notepad.

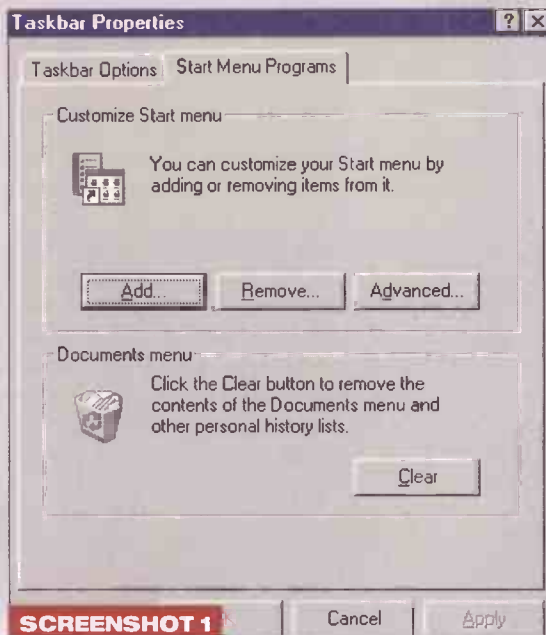
However, Outlook users have another way. Click on the Other Shortcuts button in the Places bar, and you will be able to navigate down through the file system. Having reached the folder you want, hit the Print button, and then choose Table Style. The listing will then be printed out in a neat table.

### Recent developments

Reader Bill Leeson wondered why the Windows\Recent folder had hundreds of files in it which seem to serve no useful purpose at all.

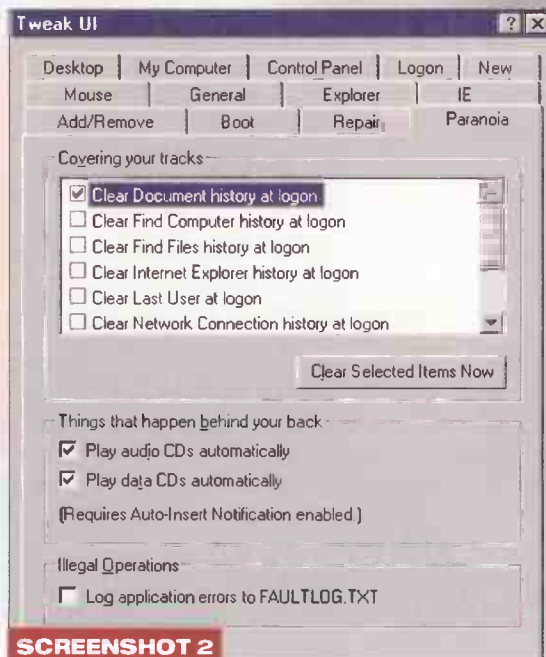
'They all seem to be shortcuts to files. What are they for and can they be safely deleted?' asked Bill.

Answering those questions in order, yes, they are shortcuts, providing a quick way of getting at recently opened files. This is all very well, but it's a feature that has never been very well implemented.



SCREENSHOT 1

Clear the recent file list once...



SCREENSHOT 2

...or every time you start

In Windows 98, not all documents you open make it to the menu – it depends on the application and how you open it. In any event, the contents of the Recent folder seems to correspond to the maximum number of entries in the Documents menu (15), maintaining a first in, first out policy.

Windows ME shows no such restraint – or logic for that matter. Although a spot check shows 15 items in the Documents

menu, the Windows\Recent folder contains 108 shortcuts.

This is partly explained by the common File Open dialogue for the Windows applets such as Notepad and Paint – each will show its own recent files if you click the History icon on the left.

Moreover, the Documents menu doesn't always seem to correspond with files I've been working on recently. Finally, neither the Documents menu nor the Recent folder is smart enough to notice when you move or delete a document – the shortcut stays put, pointing at nothing.

So, in answer to Bill's last question, the shortcuts certainly can be deleted, and there are several ways of doing this. First, you can delete one, several or all shortcuts in the normal way from the Recent folder (see screenshot 1).

In Windows ME this can be a fraught business as, irrespective of the confirmation setting in Recycle Bin properties, Windows will ask if you are 'sure you want to delete...?' Worse still, if you only delete one shortcut, say to `Myfile.txt`, it will ask if you want to delete 'Myfile.txt', which suggests it's about to delete the file itself, not just the shortcut. Fortunately this is just sloppy messaging – the actual file will not be deleted.

An easier way to clear the Recent folder is to go to Start, Settings, Taskbar or right-click on a blank part of the Taskbar and choose Properties. Turn to the Start Menu Programs tab (Windows 98) or Advanced tab (Windows ME), and you can clear the contents. This may also clear other lists, such as the dropdowns from the Start, Run box and the similar lists of typed URLs in the IE Address box.

If you'd like to relieve yourself of this chore then you need Tweak UI. If you haven't got this Microsoft add-on, download it from [www.microsoft.com/networkstation/downloads/powertoys/networking/nttweakul.asp](http://www.microsoft.com/networkstation/downloads/powertoys/networking/nttweakul.asp).

Despite the URL this isn't just for NT – it works with 95, 98, ME and 2000 as well. Once installed, start Tweak UI from Control Panels, and go to the Paranoia tab, where you can elect to have Windows clear the Document History automatically every time you start Windows (see screenshot 2) – there are also similar options for other historical lists.

If you'd like to get rid of the feature entirely, the Tweak UI IE tab has an option

to disable adding new document shortcuts to the Start Menu. This appears to disable the addition of shortcuts to the Recent folder completely, so you won't see anything under History in the ME applet Open Dialogs, nor in third-party programs that depend on this.

### Look out

In April's Question Time I answered Wayne Freke's query on why he couldn't open certain attachments in Outlook Express 6.

To recap briefly, OE6 won't let you open potentially dangerous attachments, such as .exe or .vbs files, unless you turn off this safety feature in Tools, Options, Security. Vivian Dunn points out that if you click the Forward button, the attachment appears in the Attach box in the new message where it can be opened or saved normally. I'm not sure I'm pleased by this handy loophole, or depressed by Microsoft's sloppiness in allowing it.

On a related matter, I've had a great tip from Peter Yates concerning worms that propagate themselves by using your Outlook Express address book.

Add a new contact, giving it the first name !000 – yes, that's an exclamation mark and three zeros – and the email address of Wormalert (see screenshot 3). Don't fill in anything else. Click the Add button, override the warning that the email address is not valid and click OK.

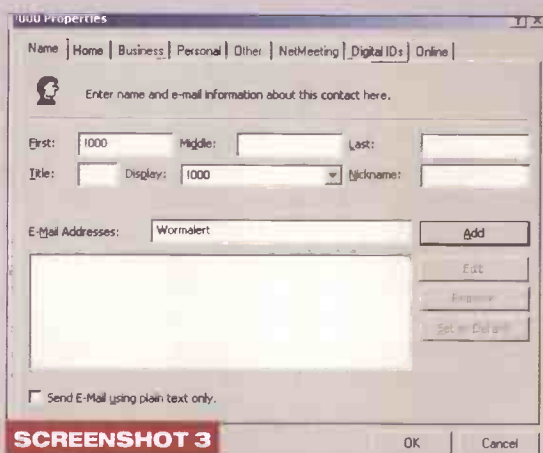
Unless you have some very strange contacts you will now have !000 as the first entry in the list. If a worm attempts to send itself to all the contacts in the list, it will start here. But the attempt will fail, because of the invalid address, the process will go no further and none of your other contacts will be mailed.

Furthermore you will get a warning in your Inbox informing you of the failure, so you will immediately know that you've been wormed and can take appropriate action. So far, so good, but there are some reports that the name !000 doesn't stay at the top of the list. And in addition any minimally competent worm writer should be able to get round this by ignoring !000.

I would advise using a different, but alphabetically prior name – or even two, in case the worm is set to ignore the first name in the address book. You could also stay ahead of the bad guys by changing the name of the invalid email address.

### Dull yellow jacket

Vincent Ho came up with a question that's been aired several times in this column. It's a perennial favourite but as it last surfaced over 18 months ago, let's have another look.



SCREENSHOT 3



SCREENSHOT 4



SCREENSHOT 5

Vincent thought it might be a good idea if the icon that you get when you create a new folder shortcut in Windows ME could be replaced with one that suits the user's personal taste, as the default one is rather plain.

'If you put it among other program icons on the desktop (like I did when I

**Middle: First catch your image...**

**...then cut it down to size (bottom)**

### Stop worms from using your contacts

created a shortcut to one of my folders) it becomes immediately obvious that this new kid is underdressed. It would be wonderful if we could create our own designs using the Paint program which comes with Windows ME, and use them for folder icons.'

It seems a simple enough question, but it actually addresses several different issues, each of which leads to sub-issues.

Let's start with shortcuts. Personally I try to avoid creating anything other than temporary folders on my Desktop.

Anything permanent needing instant access I keep elsewhere, and have a shortcut to that folder on the Desktop.

This makes backing up data easier and lessens the strain on the drive where Windows is installed.

First let's look at how to create a shortcut to a folder. If you right-click on the Desktop, and choose New, Shortcut, you get a dialogue box asking for a Command line. If you know the location of the folder you want a shortcut to, then type it in, hit Next, accept or replace the name offered for the

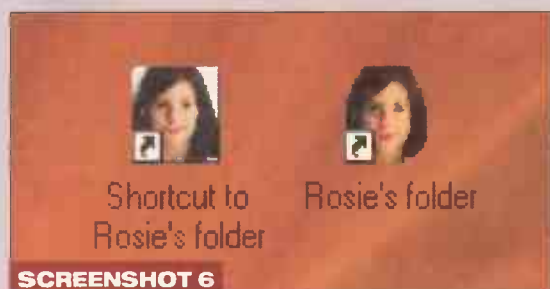
shortcut and click Finish: the shortcut is then created. If, however, you can't remember the path to the folder, and hit the Browse button, you'll find there's a catch: if you try to pick a folder, it opens that folder in the browse window and you can only specify a file within the folder.

One way round this is to select any file in the target folder, and hit the Open button, which will take you back to the 'Create Shortcut' dialogue. The command line will appear filled in and you can edit it to remove the file name, just leaving the folder name.

An easier way is to use Explorer to navigate to the required folder, then drag the latter with the right mouse button on to the Desktop. Release the button and choose 'Create Shortcut here' from the pop-up menu. The shortcut will be created, and if you don't like the name, you can right-click and rename it.

All of this also applies to the Quick Launch bar – again, it's not a good idea to keep real folders in this, and you can either drag shortcuts straight on to it, or





SCREENSHOT 6

right-click on it and Open to see it in folder view, where you can use the 'New, Shortcut' method as well as drag and drop.

So you've got your shortcut, it's wearing that dull yellow jacket, and you want to change it. In fact if it's a Quick Launch shortcut and you don't have 'Show Text' enabled, this is something of a priority as, without labels, all folder shortcuts look the same. Right-click on the shortcut, choose 'Properties', then click on 'Change Icon'.

By default, you'll be offered the range of icons stored in the file C:\Windows\System\Shell32.dll. Many of these will be familiar, as this is the repository for the icons of the Windows shell, such as drives, the recycle bin and printers. If you don't find anything that takes your fancy, hit the Browse button – this will let you browse for any standalone ico file or those embedded in an exe or dll file.

This can be wearying, as most of the last two don't contain any icons. You might, however, have a look in C:\Windows\System\Pifmgr.dll, which contains some rather fine and

**Your own efforts should be better than Windows'**

idiosyncratic examples, including an umbrella and an Ionic column. If you have Windows Desktop Themes installed, you will also find a wide variety of free-range icons in C:\Program Files\Plus!\Themes. Having selected your icon, OK out of both dialogues and the job is done.

If you still can't find an icon you like, there are thousands available on the web, as well as shareware and freeware icon editing programs. But this approach cops out of Vincent's wish to create his own designs in Paint, which brings us to a fine but hidden feature of Windows 95, 98 and ME.

If you set the 'Files of type' box in the Browse dialogue to 'All files', you'll find that you can point it at any bmp file and it will manufacture an icon out of that file. The bmp doesn't have to be any particular

screenshot 4 on previous page). Open the file in Paint, then go to Image, Attributes, and make a note of the size in pixels. Now go to Image, Stretch/Skew and work out what percentage you need to enter to reduce the shorter dimension to 32 pixels or just over: make sure you set the vertical and horizontal percentages the same or your image will be distorted – calculators are permitted.

Now View, Zoom, Custom, 800 per cent so you can see what you are doing: you can also View, Zoom, Show thumbnail to see how the icon looks in real size (see screenshot 5).

Now go back to Image, Attributes to set the pixel size to exactly 32 square: it will crop from the top left. If this isn't going to give you the right part of the image, then you can use the rectangular select tool to

## If you are transforming an icon yourself, choose something simple

size – it will be scaled down to suit, and the original file isn't changed. But clever though this is, it can yield disappointing results, as, by the time a photo is scaled down to the standard 32pixel-square icon, it probably won't be very recognisable. You'll get better results if you either start from scratch or do the transforming yourself.

If you are doing the latter, choose something simple, such as a headshot against a plain background (see

pick the area you do want, then Edit and Copy To a new file. Having got your 32pixel-square picture, save the image as a 256-colour bmp file. You can then use the painting tools to create or modify it.

There's one other hot tip here. The top left pixel sets the transparent colour. If you pick this up with the dropper tool, any area you paint with that colour will become transparent when displayed as an icon (see screenshot 6).



SCREENSHOT 7

## Bang bang

Windows would be intolerable without diversions, and this month I've found a good one. It's a logical puzzle game in which you move your eponymous Laser Tank around a board, using its gun to move blocks and disarm anti-tank guns in your quest to capture a flag (see screenshot 7). One feature is that you can undo any move so you don't have to start all over again if you die.

It comes with over 2,000 levels and the only payment author Jim Kindley asks for is that you use the built-in game editor to construct new levels for the Laser Tank playing community. Check it out at [www.jccontrols.net/laser](http://www.jccontrols.net/laser).

## CONTACTS

Tim Nott welcomes your comments on the Windows column. You can contact him via the PCW editorial office or email: [win@pcw.co.uk](mailto:win@pcw.co.uk). Please do not send unsolicited file attachments.

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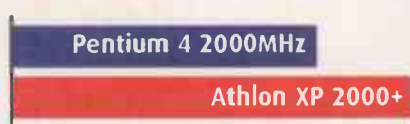
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## Efficient partitioning

Fat 32 is inappropriate for large hard drives, but converting to NTFS is not simple, says Terence Green

Ian Park raised an interesting question on the subject of Fat versus NTFS drive formats. Having recently purchased a new PC preloaded with Windows 2000, Ian found that its entire 60GB hard disk had been formatted as a single Fat 32 partition. Such behaviour demonstrates a worrying lack of basic knowledge on the part of the manufacturer.

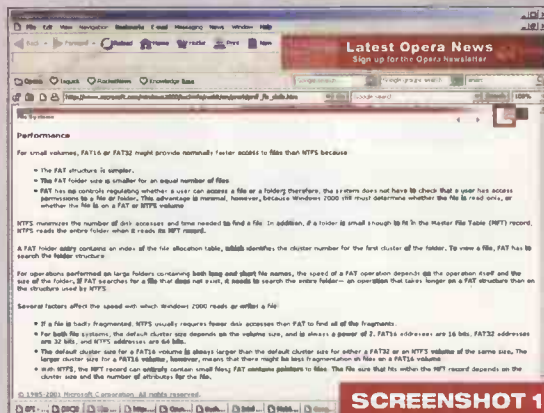
A simple search for 'Fat and NTFS' on [www.microsoft.com](http://www.microsoft.com) soon reveals that Fat 32 partitions larger than 32GB result in extended boot times for Windows 2000 and a reduction in read/write speed. And that's the information for users; manufacturers receive far more detailed guidance.

Ian has two questions: 'I'm wary of having everything on such a big single partition and would I do better to switch over to using NTFS with Windows 2000? I seem to remember reading that Windows 2000 actually runs a bit faster in a Fat 32 partition than in an NTFS partition' (see screenshot 1).

While there is a general perception that Fat is faster, Microsoft's comparison of Fat and NTFS at [www.microsoft.com/windows2000/techInfo/reskit/en/prork/prdf\\_fis\\_skdb.htm](http://www.microsoft.com/windows2000/techInfo/reskit/en/prork/prdf_fis_skdb.htm) tells a different story. To this must be added the fact that Fat 32 partitions offer no real security and will almost certainly be more error-prone than NTFS. (From here on we use the term Fat to cover both Fat and Fat 32). NTFS autorecovers from numerous problems that would kill Fat, and has fine-grained access control permissions. Fat has no access control other than the read-only file attribute.

Cluster size is another little-known factor that may affect comparisons of Fat and NTFS. Windows 2000's Convert utility (See Help or type Convert/? at a command prompt to see what it does) will convert the 60GB C: drive to a 60GB NTFS drive. But, due to the way Convert works, it will set an NTFS cluster size of 512bytes regardless of the partition size.

File system documentation from Microsoft explains the implications in depth but, in short, a 512byte cluster size acts as a drag on performance. To see what cluster size your NTFS drives are using, run Disk Defragmenter, analyse the partition, and view the report (see screenshot 2).



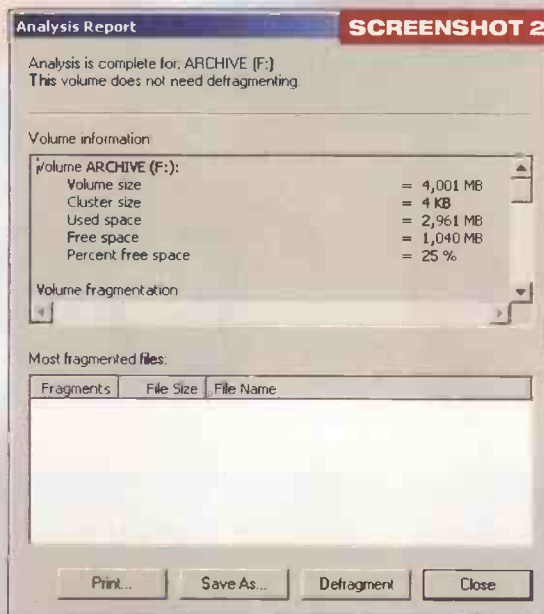
**On small volumes, Fat 32 might provide nominally faster access than NTFS**

### Partitioning

There are only two ways to avoid 512byte sectors when switching from Fat to NTFS. Imaging the partition with Powerquest Drive Image or Norton Ghost is not one of them. Precisely because it is an image, regardless of the state of the target partition, the original Fat image will be restored as a Fat partition. The other drawback with converting a Boot partition from Fat to NTFS is that the security permissions will not be correctly set, because the original Fat file system does not support Windows 2000 security permissions.

Knowledgebase article Q237399 explains why, and details how to restore the default security settings. This article also explains a potential problem and how to work around it by installing a second instance of Windows 2000.

**Disk Defragmenter's analysis reports the cluster size**



The two methods that avoid the above problems are: to perform a new (clean) Windows 2000 install, or format the target partition and copy (or restore from a backup) the information to it. A clean install lets you choose the file format (Fat or NTFS) but the cluster size will be automatically set according to the partition size.

A partition of between 1GB and 2GB (2,048MB) will have a 2KB (2,048bytes) cluster size; over 2GB the cluster size rises to 4KB. Knowledgebase article Q140365 lists the default cluster sizes that will be used if you don't override them.

The maximum you can select on Windows if using the GUI (eg Windows Explorer) to initiate a format is 4,096bytes (4KB clusters), but the Format command (in a Command Prompt window) allows you to choose cluster sizes up to 64KB. Third-party tools may also allow cluster sizes greater than 4KB. In general you don't want to do this, because compression and defragmentation tools won't touch Windows 2000 partitions with cluster sizes greater than 4KB.

This restriction includes third-party tools that use the Windows 2000 defragmentation API; ie all of them with the exception of Norton Speed Disk. Any NTFS drive over 1GB in size can safely be formatted with 4KB clusters.

If you decide on a clean Install, you can partition the hard drive into several sections in order to separate data and operating system files. Windows 2000 doesn't have to go onto the C: drive – it can be installed to any logical drive. But, it does need to install a few small boot files on C: which can be NTFS-format unless you plan to install an operating system (eg Windows 98) or dual-boot system that needs C: to be a Fat-formatted.

Since you're starting from scratch, consider setting aside a small partition of 2GB on which to install a second instance of Windows 2000, as there are a number of disaster recovery scenarios where this can come in very useful.

### Unclean options

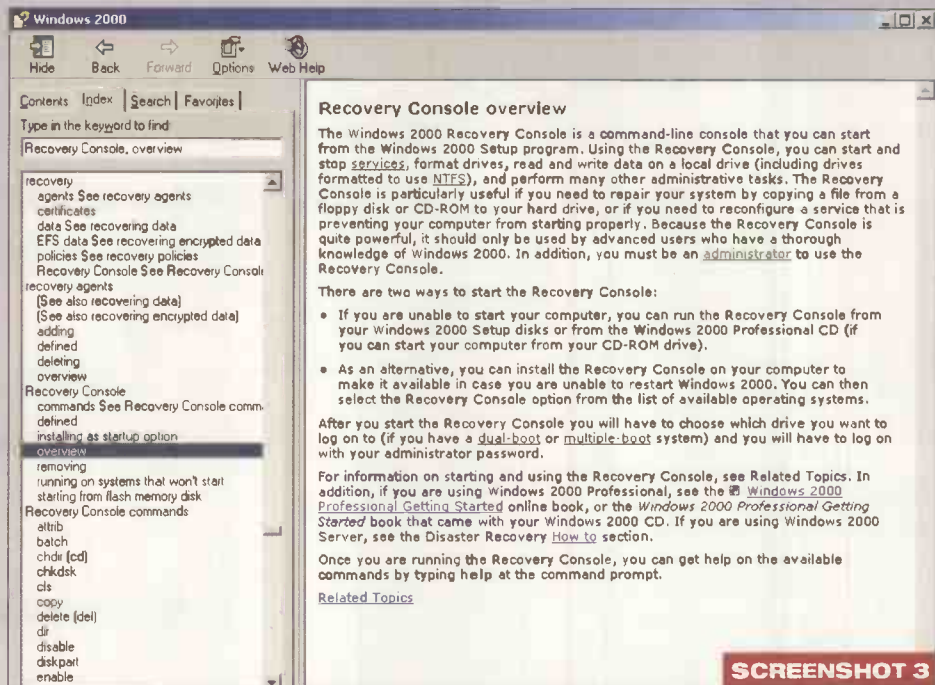
If a clean install isn't possible because you want to retain your existing setup and data, a copy or backup/restore is

an option. Either method is quite labour intensive and there are several gotchas.

First off, you can't copy or restore a Windows 2000 partition to a different drive letter – say from C: to D:. Well, you can but it won't work, because there are myriad absolute paths, such as C:\WINNT\..., stored in the Registry.

Second, unless you are using a backup utility that allows a full restore from Dos, you'll need to install a second instance of Windows 2000 in order to run the copy or restore option from there. An exception to this that you can adapt to your needs is detailed in Q249694 (How to move a Windows 2000 Installation to different hardware). Q249694 is worth reading even if you aren't going down this road.

Third, you can't copy a Windows 2000 installation in total if it's the one you booted into. You can get around this by booting into a different instance of Windows 2000, but in the scenario where Windows 2000 has been pre-installed on a large hard drive containing a single partition – as in Ian's case – you must first split the drive into two or more partitions with a utility such as Powerquest Partition Magic. Be sure to create a partition with enough space to hold the entire original Windows 2000 partition that you're upgrading from Fat to NTFS. Since drives are so large these



SCREENSHOT 3

Now use Windows Explorer to copy the entire original Windows 2000 to its temporary location. Then use Windows Explorer to format the original partition. Select a 4KB cluster size. If you see a warning message saying that you cannot format the drive, insert the boot floppy and reboot into the secondary instance of Windows 2000. It will boot from the

**Boot into  
Recovery Console  
in order to fix the  
boot sector**

this, boot with a Windows 2000 CD and follow the prompts to start the Recovery Console (see screenshot 3). When you get to the prompt, run the command Fixboot. The Recovery Console is documented in the Windows 2000 help file. If you can't boot from CD, use the instructions in Knowledgebase article Q197063 to create a set of four Windows 2000 Professional Setup floppy disks and run Recovery Console from them.

If you're unlucky enough to have bought a PC from a supplier that doesn't provide a proper Windows 2000 CD, try and borrow one or download the four disk images from DRDevice at [www.drd.dyndns.org/Index2.html](http://www.drd.dyndns.org/Index2.html) (see screenshot 4).

It all seems over the top, and it is; Fat 32 is inappropriate for massive hard disks. Under these circumstances, preloading Windows 2000 so it sprawls over the entire hard drive knowing that Convert will produce limiting 512byte sectors and inadequate security is perverse.

Compounding the error as some manufacturers do by only including a recovery CD rather than the full product is doubly perverse, and limiting the recovery CD so it can only be used to restore to the entire hard disk rather than a more sensibly sized partition only adds insult to injury.

## CONTACTS

Terence Green welcomes your comments on the Windows 2000 column. Contact him via the PCW editorial office or email: [win2000@pcw.co.uk](mailto:win2000@pcw.co.uk). Please do not send unsolicited file attachments.

## There are two ways to avoid 512byte sectors when switching from Fat to NTFS

days it makes sense to create two extra partitions, one where you will install the second instance of Windows 2000 and another as a temporary store for the original Windows 2000.

### Copying the files

Install the second instance of Windows 2000 and boot into it as administrator. Now would be a good time to make a complete backup of the original Windows 2000 just in case.

Next (and this may be a crucial recovery aid if your original Windows 2000 is on the C: drive), create a Windows 2000 floppy boot disk by copying the boot files from C: to a blank, formatted, floppy. If necessary, use Windows Explorer/Tools/Folder Options/View to enable 'show all files' and 'show hidden files'. You need the ntldr, ntddetect.com, and boot.ini files. Depending on your hardware you may also have a ntbootdd.sys file. Copy that as well.

floppy instead of the hard drive and you'll be able to format the drive.

Having formatted the drive to NTFS you can now copy the original Windows 2000 back to its original location. If necessary you can copy the boot files from the floppy back to C:. If you have formatted the C: drive you will also need to update the partition data. To do

**DRDevice: home  
of the village  
idiot's boot  
disks. Hmmm...**



SCREENSHOT 4



## Accelerate your start-up time

Roger Gann checks out Windows XP boot times, password protection and booting from a floppy

One of Microsoft's myriad design goals for Windows XP was to get it to boot and resume much faster than previous operating systems. In fact it set some targets for fast start-up time. On a typical consumer PC, Windows XP should boot to a usable state in a total of 30 seconds, resume from Hibernate (S4) in a total of 20 seconds or resume from Standby (S3) in a total of five seconds. Boot and resume times are measured from the time the power switch is pressed to being able to start a program from a desktop shortcut.

While start-up times are noticeably quicker with Windows XP, these guide times are seldom met in reality, as users install all sorts of other software that prolongs the boot process.

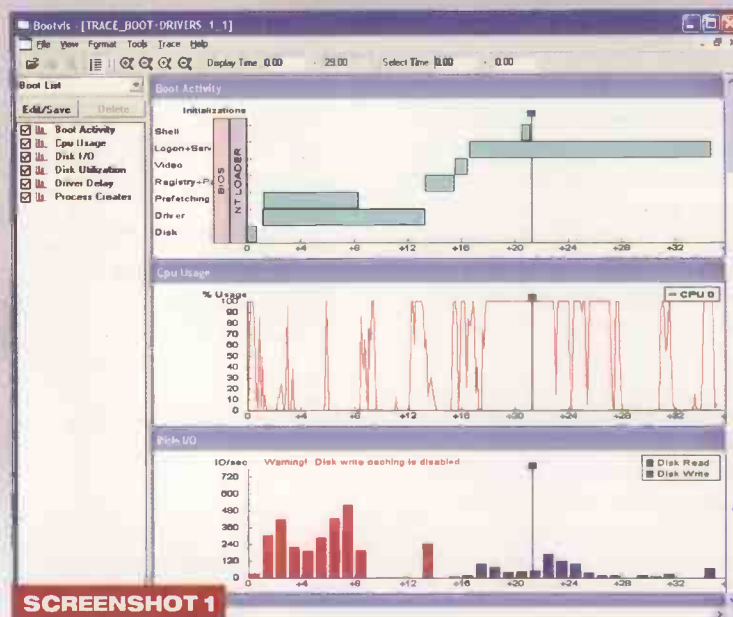
A good example of this is anti-virus programs, which are notorious in this respect. Until recently there was not a lot you could do to accelerate start-up times, but then in February along came a free utility called Bootvis, a 'performance trace visualisation tool' for use with Windows XP systems. A grand name, but put simply it displays a graphical analysis of which processes are doing what and when during boot. Armed with this data it can then automatically optimise your boot sequence for you (see screenshot 1).

Sounds good, eh? To download this 329KB executable, go to [www.microsoft.com/hwdev/platform/performance/fastboot/default.asp](http://www.microsoft.com/hwdev/platform/performance/fastboot/default.asp) where you'll find Bootvis.

Uncompress it and double-click on the resulting executable to run Bootvis. Now go to File, New and choose 'Next boot trace' or 'Next boot and drivers trace'. Leave everything else as it is and the system will reboot in about 15 seconds. Once the system is back up, wait a few seconds and Bootvis will reload automatically. Bootvis will now display five or six horizontal bar charts and graphs, covering things such as CPU utilisation and I/O activity during the boot process.

Alternatively, you can start a report by selecting Next Boot from the Trace menu, or select Next Boot + Driver Delays, which will show you if there are any drivers delaying your boot (they will be displayed in red). To get it to optimise your systems, click on Trace then

**Bootvis can help you speed up Windows XP's already short start-up times**



**SCREENSHOT 1**

Optimize system. Once again the system will reboot. Again, once it has come back up don't touch anything and just wait. You'll see a thin message box 'Please wait for Bootvis to load'... This takes some time because the data files Bootvis generates can be some 30 to 40MB in size. While you can store the different sets of boot data, sadly Bootvis offers no facilities for comparisons.

About 20 seconds later another message box will appear: 'Optimising system for boot performance'. This is Bootvis going to town, rearranging your boot files for a faster start-up. This can take a few minutes, so be patient.

### Help!

Although there's a help button on the menu, a help file isn't included with the program, so here's a brief explanation of its features. The top-most bar chart contains elements labelled Disk, Driver, Prefetching, Registry+Pagefile, Video, Logon+Services and Shell. If you hover your cursor over an item, it will give you the individual time each component took to load.

The Disk element tracks the time to enumerate all the devices in the non-pageable device path. This is everything from the CPU to the boot disk drive; multiple IDE devices and slow ones can affect this time. Typical disk time in Windows XP is two seconds.

The Driver element lists the time it takes to initialise devices. Prefetching

represents the time spent reading pages in from disk used later as devices initialise, and Winlogon, services, the shell and other applications start during boot. The Registry+Pagefile element comprises the time spent to read the Registry and initialise the page file.

The Video element tracks the time spent as the display mode is set for the final resolution and refresh rate. Video driver and Video Bios affect this time.

Last but not least, the Logon+Services and Shell component lists the times to start Winlogon, services, the shell, and so on. This is mostly the operating system. However, third-party software such as anti-virus and firewall software can affect this time. And the proof of the pudding? Well, of course, much depends on the software installed on each different PC and so your mileage may vary, but I obtained some modest improvements having run Bootvis.

According to its own logs, the Boot Done time was reduced from 24.1 to 21.3 seconds, a 12 per cent gain. Using my own timings, which included the time until the Desktop went 'quiet', the overall boot time shrank from 76 to 63 seconds – a 17 per cent gain. OK, nothing to rave about but as Bootvis is buckshee you can't complain too much, can you? As they say in the supermarket ads, 'every little helps'.

### Passwords

First of all a salutary warning for all users of Windows XP Home Edition – check your

Administrator password. For reasons best known to itself, Microsoft has seen fit to have a blank password as default for the Administrator account.

As any fool knows, in order to gain complete control of a machine all you have to do is log in as Administrator, hit Return and then set up your own password, thus preventing the bona fide Administrator from gaining full access to that PC (see screenshot 2).

I've heard of a school network that's been compromised in this manner and the disruption that such an oversight can cause really doesn't bear thinking about – for if the real password can't be obtained (which would allow it to be changed to something else), there's a very real prospect of needing to reinstall Windows XP, though you could use brute-force password crackers at a pinch, I suppose.

So, don't say you haven't been warned – lose that blank Administrator's password right now and replace it with a proper password.

Having said that, there are plenty of situations where you're the only person to use a Windows XP PC and the password protection can get a bit OTT. But how do you go about losing the password? Simple: select Run... from the Start menu and type:

**control userpasswords2**

which will open the User Accounts application. On the Users tab, clear the box for 'Users Must Enter A User Name And Password To Use This Computer', and click on OK. An Automatically Log On dialogue box will appear; enter the user name and password for the account you want to use.

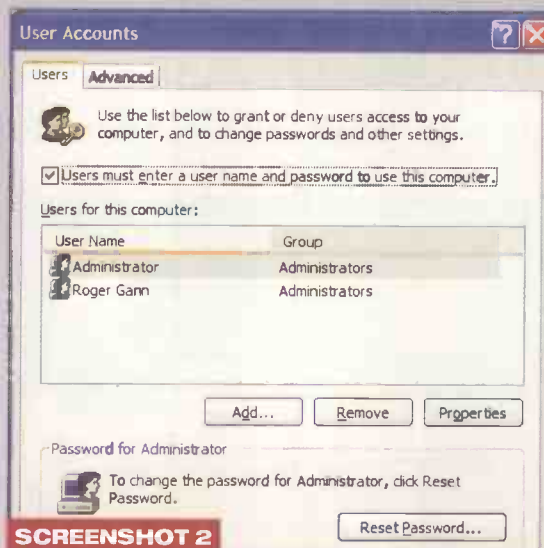
Next, click on Start and open the Control Panel. Double-click on the User Accounts applet and click 'Change the way users log on or off'. Clear the check box for 'Use the Welcome Screen' and the check box for 'Use Fast User Switching'. Click 'Apply'

### Temporary house cleaning

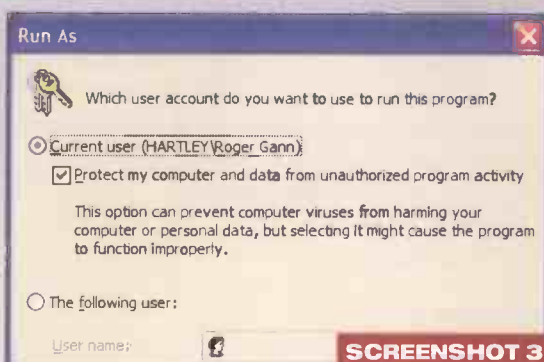
Although you shouldn't really have to do it, it seems that it does pay to spring clean your system every now and again – it can make a real difference to the behaviour of certain programs.

I'm thinking mainly of Internet Explorer. Not only can clearing out Temporary Internet Files improve browsing speeds, but reducing the maximum size of the folder containing these files can also cure unexpected IE behaviour.

Have you been having trouble saving browser graphics, where right-clicking only lets you save in bmp and not the



SCREENSHOT 2



SCREENSHOT 3

native jpg format the image is probably in? There have been reports that reducing the size of the browser cache to something like 50-100MB as opposed to the default of five per cent of disk space fixes this.

I did it anyway – I didn't want 650MB of my hard disk space devoted to this sort of data. These settings are in the Tools, Internet Options menu. You can also use the Disk Cleanup wizard to rid yourself of clutter. You'll be astounded at how much junk is on your Windows XP machine.

This wizard won't look at the Prefetch folder, however. Prefetch is a feature unique to Windows XP. Put simply, it creates a system directory called the Prefetch folder and then fills it with 'precached' data (data it knows it will need) that's used when you start the system. This is part of the reason boot times in XP are faster than Windows 2000 – it's getting data intelligently for the boot cycle based on previous boot cycles.

Over time, though, the Prefetch folder (which is located in the Windows folder) can be cluttered with irrelevant data. It can often help to empty the contents of the Prefetch folder from time to time. Don't worry about this – the folder will be intelligently refilled by the system every time you reboot.

**Top: It's vital to give the Administrator account a password – before somebody else does**

**Bottom: If some programs don't run properly as a limited user, try using the 'Run As' trick**

### Booting from a floppy

Although you can indeed create a system floppy under Windows XP, the OS it installs on that disk is essentially MS-Dos 7, or that included with Windows 9x. This is fine if your system uses the Fat 32 file system but less than helpful if you use the far superior NTFS. Supposing your main hard disk conks out? How can you access it to fix it? Well, the short answer is that you can't, not without resorting to some third-party drivers. The only way forward is to boot from the Windows XP CD-Rom and enter the Recovery Console. If you've never done this, you might want to check it out. It's worth a look because it's pretty powerful. It might also get you out of a tight corner. I'll be looking at this useful tool in a future column.

The good news is that there's now a second option for people whose PCs can't boot CDs or those who don't have Windows XP CDs, ie those with 'pre-installs'. You used to be able to create bootable floppies direct from the Windows NT and 2000 CD-Roms by deft use of a command switch, but this option is absent from the XP CD-Rom.

Instead you can now download them from the Microsoft website – you'll find this facility at <http://support.microsoft.com/default.aspx?scid=kb;en-us;Q310994&ID=310994>. Or search for document Q310994. This utility will spawn no less than six floppies, so not surprisingly it adds up to a 4.4MB download.

### Tips corner

I get more than my fair share of readers reporting that some software won't work properly for 'limited users' but works fine for 'Administrators'. Clearly the obvious solution is to temporarily promote the limited user to an Administrator, install the software then demote them back to a limited user – cruel but fair.

In fact there's quicker alternative to this slightly long-winded approach, and that's to use the 'Run As' option (see screenshot 3). You can run a program as a different user without logging out and back in again. Right-click the icon, select Run As... and enter the user name (eg Administrator) and password you want to use. This 'promotion' only applies for that 'run' and so doesn't affect any users.

### CONTACTS

Roger Gann welcomes your comments on the Windows XP column. Contact him via the PCW editorial office or email: [xp@pcw.co.uk](mailto:xp@pcw.co.uk). Please do not send unsolicited file attachments.



## A chip off the old block

Barry Shilliday surveys the state of Unix on Intel and explains how to set up Internet keyboards

Unix on the PC, or more specifically on the Intel platform, has gone through a fair amount of change over the past few years. It wasn't long ago that companies including Sun Microsystems and SCO were pushing their commercial Unix systems, while dismissing Linux as a toy for spotty teenagers or computer science students (or in some cases both).

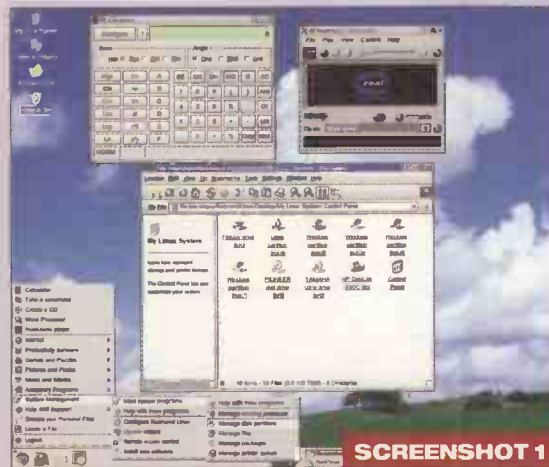
More recently Sun has effectively discontinued support for Solaris on Intel by not releasing the new Solaris 9 version for anything other than its own Sparc hardware. SCO has been consumed by Caldera, embracing Linux as a key platform.

Other vendors, especially IBM, have been desperately waving the 'We love Linux' banner. IBM last year even got into a bit of trouble for literally painting the streets in San Francisco, promoting its dedication to the new operating system ([www.cnn.com/2001/TECH/Industry/04/19/ibm.guerilla.ltdg](http://www.cnn.com/2001/TECH/Industry/04/19/ibm.guerilla.ltdg)).

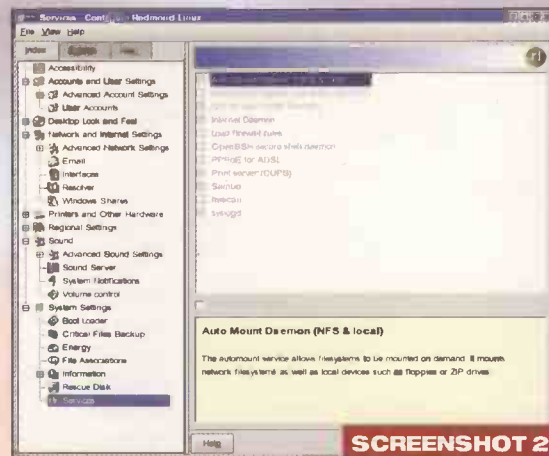
This has left the Intel world devoid of proprietary Unix. What remains now is Linux and the BSD flavours: OpenBSD, NetBSD and FreeBSD. All of these are open-source systems. Even Apple's new Mac OS X, although it doesn't run on Intel hardware, has an open-source Unix kernel known as Darwin. It's no surprise that all the major software vendors, excluding Microsoft, are keen to be 'open-source friendly' and some even appear to be doing some very positive work. IBM has an excellent resource site found at [www.ibm.com/developerworks/linux](http://www.ibm.com/developerworks/linux), which includes tutorials, interviews and downloadable software.

A side effect of the Linux boom is the growth in the number of distributions. Not so long ago there was Slackware and Red Hat and not a lot else. There are now no fewer than 250 or so different distributions ([www.lwn.net/distributions](http://www.lwn.net/distributions)).

There are about seven major distributions – Caldera, Red Hat, Debian, Suse, Mandrake, Slackware and



SCREENSHOT 1



SCREENSHOT 2

**Desktop/LX's KDE control panel. This version of the distribution is often referred to by its previous name, Redmond Linux**

Turbolinux – all of which have been established a while. One distribution that is beginning to move itself from the horde of minor distributions to major is Lycoris Corp's Desktop/LX (see screenshot 1).

### Formerly Redmond

Desktop/LX was until recently known as Redmond Linux, and provides a system familiar to Microsoft Windows users. Its aim is to provide a friendly desktop with a look and feel similar to Windows XP. As a desktop-orientated distribution, the standard version does not come with any development tools, or some of the common server applications found in all the major distributions, although there is a Deluxe edition that includes some development software. This isn't necessarily a negative: new users can be put off Linux and Unix in general by the sheer number of applications.

A surprising feature of the Lycoris distribution is that during installation you cannot select the software you want to

**Left: Lycoris' Desktop/LX KDE desktop... presumably the name Desktop/XP was already taken**

install. This is in stark contrast to major distributions that may have well over 1,000 different applications that can be chosen – dependencies allowing. Desktop/LX also only installs one desktop, KDE, and one application of each type. For example, a typical major distribution will provide maybe five FTP clients and CD players; Desktop/LX has just one of each. The lack of hands-on control that Desktop/LX gives may appeal to new users, if not others (see screenshot 2).

There are some drawbacks to the distribution, mostly for people who've used Unix systems in the past. The missing utilities and applications you might be used to can be frustrating, although these can be installed at a later date – Desktop/LX uses the RPM system for software management.

There are some minor problems that would be obvious to an experienced Unix user but not to a beginner – for instance, if you try to eject a CD and a shell is open in the CD's directory, the GUI gives no feedback and the CD remains firmly unejected.

The installation, however, is one of the best around. It silently and correctly detects sound cards, CD writers, graphics cards and so forth and presents an intelligent X configuration screen with common resolutions. The package installation gets under way in the background while you are given a game of patience to play while you wait.

Lycoris' website is found at [www.lycoris.com](http://www.lycoris.com) and Desktop/LX is available in Europe from The Little Linux Factory ([www.linuxfactory.ie](http://www.linuxfactory.ie)).

### Keyboard configurations

Last month we looked at the poor quality support of the euro symbol across the major Linux distributions. One change made to the X configuration allowed the euro symbol to be entered by using the 'Alt-Gr 4' keyboard combination. This month we'll see how this fix works, and how to add some sort of functionality to the extra keys found on a lot of newer 'Internet' keyboards.

The latest releases of the XFree86 (or X11) system use the 'XKeyboard'

### X11 CONFIGURATION

Option	"XkbRules"	"xfree86"
Option	"XkbModel"	"pc105"
Option	"XkbLayout"	"gb"

FIG 1

```

1  definition for a very simple US/ASCII layout.
2  It has basically the alphanumeric keys, punctuation,
3  a shift key, one control key and caps lock. It
4  uses the punctuation keys configurations common on PC
5  keyboards (e.g. key <AE03> is [ period greater ] )
6
7  $XFree86: xorg programs/xkbcomp/symbols/us,v 3.0 2000/10/27 18:11:11 daveb Exp
8
9  partial hidden alphanumeric_keys modifier_keys
10 xkb_symbols "basic" {
11
12     name[Group1]= "US/ASCII";
13     key <ESC> { [ Escape ] }
14
15     // Alphanumeric section
16     key <TLDE> { [ quoteleft, asciitilde ] }
17     key <AE01> { [ 1, exclam ] }
18     key <AE02> { [ 2, at ] }
19     key <AE03> { [ 3, numbersign ] }
20     key <AE04> { [ 4, dollar ] }
21     key <AE05> { [ 5, percent ] }
22     key <AE06> { [ asciicircum ] }
23
24     --More-- (10%)

```

SCREENSHOT 3

extension to define the characteristics of the keyboard. As X11 is not restricted to running on Intel PCs, the extension defines all sorts of keyboard types, including Sun terminal keyboards, Amiga and Mac keyboards. It also takes into account variations of a keyboard type – for example, the number of keys or the nationality. All of the files that are needed to configure these things are found in the hierarchy /usr/X11R6/lib/X11/xkb/, and the actual keyboard selected for use on the workstation is configured in the standard X11 configuration file, /etc/X11/XF86Config-4.

An example extract from the XF86Config-4 file is given in figure 1. The method that the Xkb extension uses to set up the keyboard is very complicated; it even defines the shape and position of the keys! Fortunately, minor alterations to an existing keyboard are quite easily achieved, and these lines give us the information we need.

The first line refers to a list of rules on how to set up the keyboard with the information provided. Using the XFree86 rules, these lines unsurprisingly point to files that define a 105-key standard British keyboard. In order to keep things simple, we'll examine the files actually used rather than the rules themselves, but if you're interested in the definitions, have a look at the file /usr/X11R6/lib/X11/xkb/rules/xfree86.

## KEYCODES

Keycodes for keys marked Caps Lock, a, s, d and f

<CAPS>	= 66
<AC01>	= 38
<AC02>	= 39
<AC03>	= 40
<AC04>	= 41

FIG 2

Before modifying any files, it's important to understand how XFree86 uses the files and therefore what goes on behind the scenes at a lower level.

When a key is pressed, the kernel receives a code from the keyboard hardware driver and sends this off to the X11 system. This keycode is unique for every key on the keyboard – the left Control key generates a different code from the right Control key, for example. The Xkb definition is what determines that both of these keys produce the same result.

In the file /usr/X11R6/lib/X11/xkb/keycodes/xfree86 there is a list of all of the possible keycodes a keyboard can generate. These numbers are given alphanumeric codes.

As an example, pressing the key marked 'a' on a standard keyboard sends the keycode 38. This is assigned the code <AC01>, while the 's' key, which generates the keycode 39, is assigned the code <AC02>. This is clearly seen in the extract from the file in figure 2.

**The basic US symbols file.**  
This is included in most configurations as the basic keyboard. First the standard key is given followed by the combination with shift

The final step is for XFree86 to relate these alphanumeric codes to the symbols you'd expect when pressing the keys in question. The model and layout are important here, so that pressing the '3' key with a Shift will produce a '£' symbol on a UK keyboard. It also defines the more basic requirements such as an 'A' being generated when keycode 38 is pressed together with the Shift key.

These files are found in the hierarchy /usr/X11R6/lib/X11/xkb/symbols/. Screenshot 3 shows the beginning of the 'us' file whose definitions form the basis of Western keyboards. Other files, as defined in the XFree86 rules, are used to add to or modify definitions, and there are many dependencies and cross-references in these files.

In our case, modifying the /usr/X11R6/lib/X11/xkb/symbols/gb' file will override any configuration for keys set elsewhere because this is applied last. If you are not using a UK keyboard, then modify the appropriate file as listed in XF86Config-4 under XkbLayout.

It's now clearer how you can modify the symbols files to change the results given when you press a key – or at least a key that has already been defined. The gb file contains the line:

```
key <AE03> { [ 3, sterling ] };
```

This overrules any previous definitions for the <AE03> key and sets the standard and shifted symbols for the key.

In order to modify this key, you would need to know what <AE03> and its corresponding keycode number refer to. In this case it's not hard to guess, but for others, especially undefined keys, it is difficult or impossible to work out.

## xev

The solution is a small but extremely useful program called xev. The purpose of this program is to display data about all events that the X server receives. Events include all key presses, as well as mouse movements or window changes, and so on. Run the program from a terminal and an uninteresting window will appear. Any events received while this window is active will print data about the event in the terminal window.

Screenshot 4 shows xev in action. Several 'KeyPress' events are shown, and along with low-level technical data, you can also see the keycode number in question. The first event has resulted from keycode 38 being received, which generates the 'a' symbol.

The next two events show keycode 67 being pressed and released. The XFree86 keycodes file sets this particular code to

## XF86 KEYCODES

```

// Extended keys that may be generated on Internet keyboards.
// These are not standardised, hence the meaningless names.
// The entries commented out are never generated because the raw codes
// in those positions are already used for well-defined keys.
<I5E> = 222;
<I5F> = 223;
<I60> = 224;

```

FIG 3





SCREENSHOT 4

<FK01>, and in the symbol files it is set to the F1 symbol. In this example no character is generated, as the F1 symbol (like Page Up or a cursor key), has no associated character.

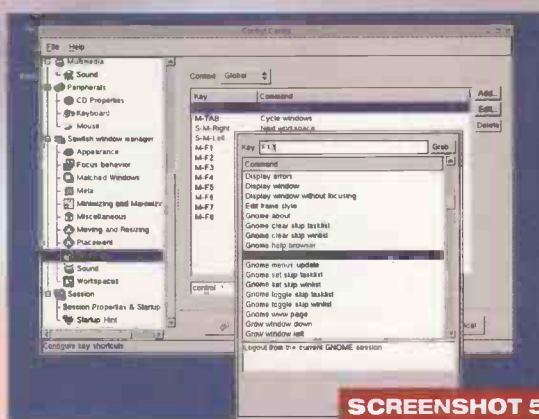
The two final events are from the 'Sleep' key on my Internet keyboard. By using xev, we can now find out the keycode of this non-standard key (223) and we can see that it currently does nothing – it hasn't been defined in the symbols files. On examining the XFree86 keycodes file (/usr/X11R6/lib/X11/xkb/keycodes/xfree86), we see something similar to that shown in figure 3.

FIG 4

## MICROSOFT KEYCODES

Keycodes for a Microsoft Internet keyboard

Back	234
Forward	233
Stop	232
Refresh	231
Search	229
Favourites	230
Web/Home	178
Mail	236
Mute	160
Vol-	174
Vol+	176
Play/Pause	162
Stop	164
PrevTrack	144
NextTrack	153
Media	237
MyComputer	235
Calculator	161
Sleep	223



SCREENSHOT 5

Reassigning basic actions in Gnome is easy, even to keys that wouldn't normally exist!

To add some functionality to the sleep key, just add the necessary lines to the gb symbols file (/usr/X11R6/lib/X11/xkb/symbols/gb) as shown similarly in screenshot 3. For example:

```
key <I5F> { [ F13, currency ],
             [ dead_acute, dead_grave ] };
```

This configures the Sleep key to give an F13 as standard, and a euro (currency) symbol when pressed together with Shift. The two remaining definitions are generated when pressed with Alt-Gr and Shift & Alt-Gr respectively. These symbols are interesting in that they give nothing themselves and are known as 'dead keys'. Dead keys affect the key pressed immediately afterwards, so pressing Alt-Gr+Sleep followed by an e will provide an e-acute (é) character.

Each additional key can be configured like this. Figure 4 shows a list of the keycodes for the extra keys on a Microsoft Internet keyboard.

Any changes to the symbols files are lost when you upgrade or re-install

Left: xev spurring out event information. Behind it is Nautilus running on Red Hat Linux

XFree86. It may be worth creating a separate file for significant changes. Copy the gb symbol file to another file, such as gb\_i, and modify the XkbLayout entry in your XF86Config file to use this new name.

Assigning actions to keys is somewhat more complicated since it involves configuring the window manager (for example KDE or Gnome's Sawfish) to interpret the key and act upon it. A few simple tasks are easy to configure, however, and making the Sleep key log out of Gnome is one possibility. All that needs to be done here is to enter the Gnome control centre and go into the Global Shortcuts section of Sawfish Configuration. As shown by screenshot 5, the 'Gnome logout' action can be assigned to F13. After applying this change the key, sure enough, activates the logout window.

## Less than the GPL

In the April issue, I talked about the differences between the two main types of open-source licences; the GPL and BSD licences. Steve Crook (steve@scholl.demon.co.uk) has emailed to draw attention to the existence of the LGPL, or Lesser GNU Public Licence. As the name suggests, this is a less restrictive version of the standard GPL, and it falls under the BSD-style category of licences.

The LGPL is commonly applied to shared system libraries – it was in fact originally known as the 'Library GPL'. A straightforward example is the omnipresent GNU C library. Almost every program on a Linux system uses this library, and because the GPL licence ensures that all programs using GPL'd code are also placed under the GPL, many people would seek alternatives, especially those writing proprietary code.

The GNU C library, along with the majority of others, is therefore released under the LGPL, allowing programs to use the code without it affecting their licences. The net result is that the libraries are used everywhere, they remain open source, and just about everybody stays happy.

## CONTACTS

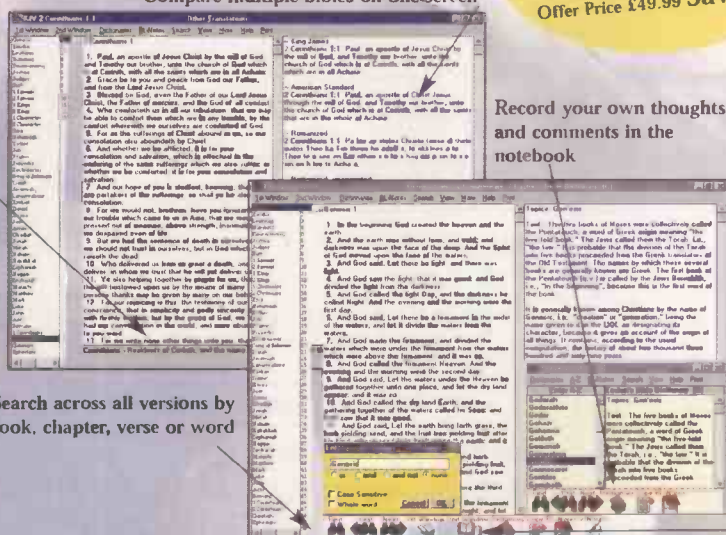
Barry Shilliday welcomes your comments on the Linux/Unix column. Contact him via the PCW editorial office or email: [unix@pcw.co.uk](mailto:unix@pcw.co.uk). Please do not send unsolicited file attachments.

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## Rage against the machine

Gordon Laing finds the obscure cause of a crashing problem and sorts out Bios and dual-boot problems

**C**all me paranoid, but sometimes I really feel my PC has turned against me. It's not subtle either: it'll be fine for weeks, then all of a sudden it will just start crashing for some extraordinarily obscure reason. Before you say 'I told you so', I'm not talking about my tweaking systems that regularly find themselves over- or even under-clocked. I'm referring to my main work PC, which I try to keep as clean and untweaked as possible.

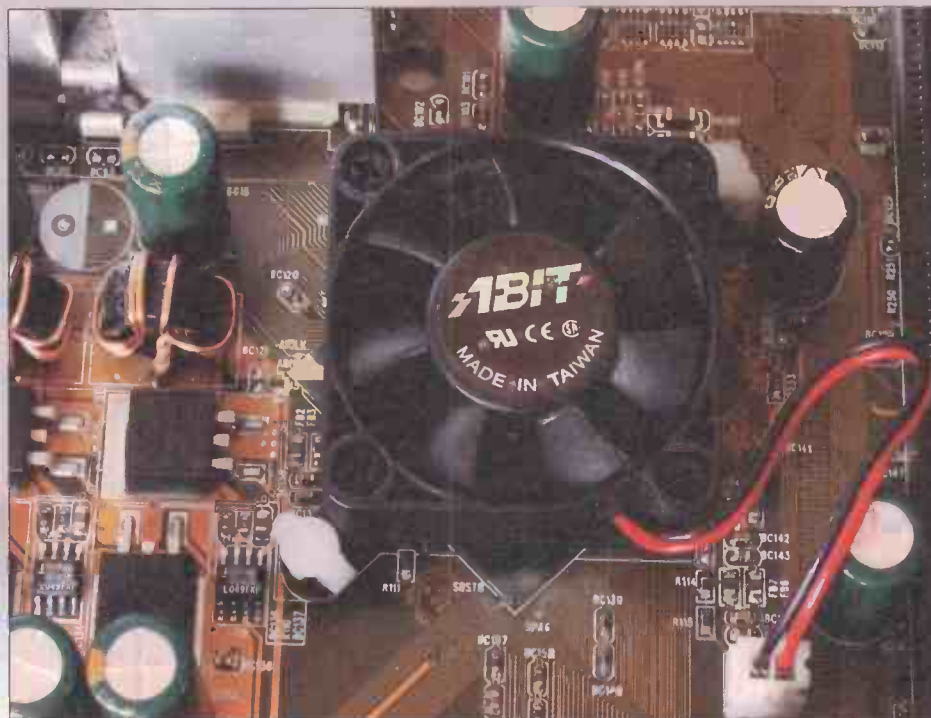
The problem was that my PC would suddenly freeze after between five and 30 minutes of use, requiring a hard reset followed by the usual patronising wrist-slapping of Scandisk. I have a dual-boot machine, so I started up in my other operating system, but found it suffered from exactly the same problem. Obviously, it was a hardware issue; I set about the trial-and-error process of removing and replacing various components.

It's not until you do this that you realise exactly how many things are in your PC that could have gone wrong. This time round I started by swapping the memory Dimms as, believe it or not, a faulty Dimm was responsible for identical symptoms on an earlier system. Fortunately, my Dimms checked out, as did the CPU, heatsink, graphics, disks and a plethora of cards. I must admit I was running out of options.

Then one day I had the side of my case removed and happened to notice something amiss. I have an Abit KT7A-Raid motherboard in my main system and this features a small fan on the northbridge portion of the Via chipset (see picture above). There's nothing unusual with this, although I have to admit to being sceptical about their necessity in a relatively basic PC.

I've used active chipset coolers before, but only on heavily overclocked or dual-CPU systems, and generally believed a basic passive heatsink is more than sufficient for normal systems. The thing is, with the side of my case temporarily removed, I noticed that the chipset fan intermittently stopped spinning and, guess what, once it was inactive for any length of time, my PC froze again.

Powered down, I cleaned some dust out of the chipset fan and ensured it was spinning when I next switched on.



**If your PC starts freezing, remember to check the fan on the chipset – it's more important than you may have thought**

Surprise, surprise, the PC didn't freeze. To confirm my suspicions, I unplugged the chipset fan and recreated the system freezing. The really annoying thing was that I had previously checked the fans inside my system and they were all working fine – the one on the chipset was actually waiting to fail until I had closed the case or stopped looking.

So that was my problem solved and a lesson learnt. The chipset fan really was performing an important task on this relatively modest and very much untweaked system. I'll certainly be looking out for this should similar problems occur in the future, and hope that as chipsets become more demanding, their temperature is accurately monitored in the same way as the main CPU, and not just estimated as an overall motherboard temperature – that way at least we'll have some clue as to what has gone amiss.

### Dual CPUs and ADSL

As a postscript, I should add that during these problems, I switched to an old dual-Pentium III system as a backup and found that it, too, started crashing regularly. This time, though, the problem was tracked down to my Alcatel USB ADSL modem, which had never been connected to this PC. It turns out that the drivers for this USB modem are

incompatible with dual-CPU systems, and cause them to freeze intermittently! I downloaded a fix, but it didn't make any difference on my system.

This was going to be a problem, because my new main machine was also going to feature dual CPUs. Last month I built a dual-Athlon system using an Asus A7M266-D motherboard and a pair of Athlon XP 1800+ chips, and obviously wanted it to work with my ADSL connection.

Despite being told the contrary by some engineers, it is in fact possible to use any ADSL modem with an ADSL line – it's just that your ISP may not officially support it or help you with the configuration. I wanted an Ethernet ADSL modem that could also share my broadband connection between my PCs, so I opted for a D-Link DSL-504 (pictured on the opposite page). This is an ADSL modem with a router, firewall and four 10/100 switched Ethernet ports – yours for a bargain £150 ex VAT.

I unplugged the Alcatel USB modem and connected the D-Link DSL-504. After configuring it via a web browser, I could connect to the Internet immediately without installing drivers or bothering with any of that tedious dial-up networking. The router and switch facilities also allowed me to share the

broadband between all my PCs and quickly network them together. And, crucially for me, the Ethernet connection didn't cause any problems with my dual-CPU systems.

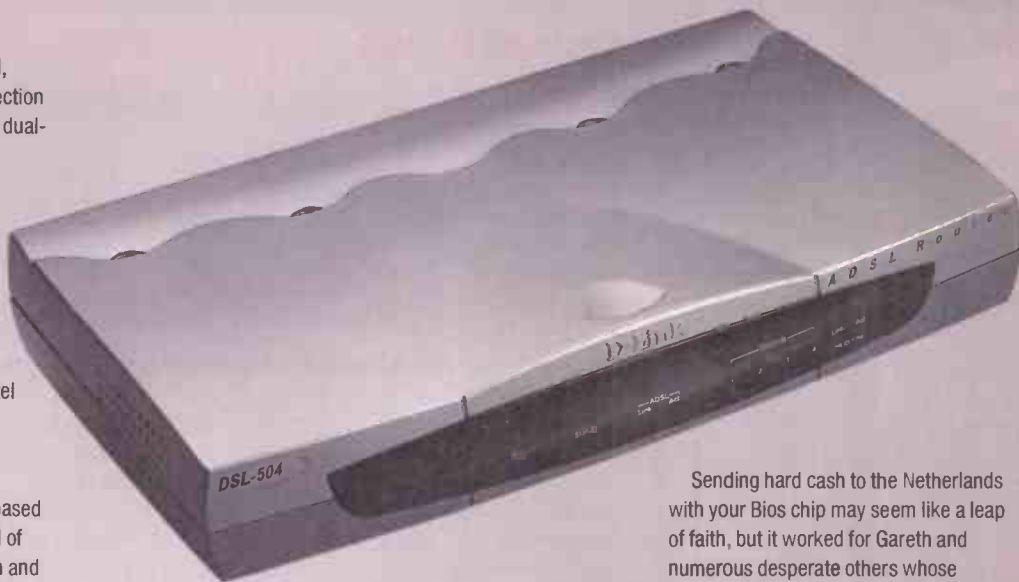
When my current ADSL contract expires, I'm going to swap to one of the recently announced DIY options that requires you to provide your own ADSL modem. Fortunately, my D-Link router will do the job, and only costs about £50 more than the entry-level Alcatel USB model.

I would recommend that anyone thinking of sharing ADSL between multiple PCs goes for an Ethernet-based router such as the DSL-504 instead of messing around with a USB modem and Windows' Internet Connection Sharing (ICS). Believe me, it works much better. The only reason you'd want to use the USB ADSL modem is if you need to save a few quid or absolutely do not want to fit an Ethernet card in your PC.

### Tricky Bios

I'm not the only one who's suffering from obscure PC problems. Gareth Jenkins wrote several months back, posing the popular question of how to upgrade his old Slot 1 motherboard with a modern FC-PGA (Flip-Chip Pin Grid Array) Intel CPU and socket converter. I was, however, surprised to learn Gareth's problems were not to do with tracking down an elusive socket, but with updating his Bios.

Gareth has an Asus P2B, which must be running the latest version 1012 of the Bios to take a socket upgrade; trouble was that Gareth's was stuck on version 1007. It was refusing to be flashed to the latest version for some reason.



After scratching my head for a while, Gareth solved the problem for himself by heading over to the Flashbios site at [www.flashbios.org](http://www.flashbios.org). Run by Arthur Kerkmeester in the Netherlands, Flashbios offers a service that does exactly what it says on the tin: either reprogramming Bios chips that have gone wrong or supplying brand new Bios chips with the exact software you're after.

This is invaluable for anyone who's flashed their Bios with the wrong software and not been able to recover it, or for Bios chips that for some reason won't accept new software. It's quite a hardcore process that involves you physically removing your Bios chip (pictured below), then sending it to Flashbios with a cash payment and instructions on precisely which software you'd like it to be programmed with. Flashbios will then either reprogram it for £5, or supply a completely new chip for £20; both prices include postage.

**D-Link's DSL-504 Ethernet ADSL modem can be used to share your broadband connection between PCs**

Sending hard cash to the Netherlands with your Bios chip may seem like a leap of faith, but it worked for Gareth and numerous desperate others whose references are on the website; Flashbios normally seems to be able to return the required chip in around one week. Gareth went for a new chip with the version 1012 software and now enjoys running an 800MHz Celeron in his system, which previously housed a 333MHz CPU; he did also have to increase the socket voltage from the recommended 1.75v to 1.8v to get it working though.

Finally, there's a great utility called CTbios that you can download from this website, which provides detailed information about your motherboard and Bios. This is incredibly useful for anyone who needs to know the manufacturer, model or version of their motherboard and Bios, but didn't know where to look. On the downside, the current version is in German, but the required system information is easy to spot.

### Powerleap P2B Bios fix

Several months ago, US-based Powerleap released a new socket adaptor that could take the very latest Tualatin Celeron and Pentium III processors. This gives old Slot 1 motherboards an even greater lease of life, but with two caveats: first, Powerleap only sells its PL-iP3/T adaptor with a new Intel CPU already attached, and second, it didn't work on the popular Asus P2B motherboard.

I'm now pleased to report that Powerleap has written a customised Bios for the Asus P2B that allows it to work with its Tualatin adaptor. Powerleap charges an extra \$10 (£6.66) for this Bios on top of the \$149 for the adaptor and a 1.2GHz Tualatin Celeron; postage, import tax and VAT are extra.

The Bios fix also only supports the basic Asus P2B and P2B-F motherboards, not any other models in the P2B family – Powerleap is constantly testing different



**Has your Bios chip given up the ghost? Get it reprogrammed!**



configurations and motherboards though, so check on its website for the latest information. Go to [www.powerleap.com](http://www.powerleap.com) and click on the Pentium II, Pentium III or Slot 1 Celeron links.

## Secure dual-boot

Gregory Pym emailed with an interesting question concerning dual-boot systems. He likes to keep his Windows installation as clean as possible, but his kids love downloading software. The solution is, of course, to have a dual-boot system, with one partition for him and one for his kids, but he's justifiably concerned about one partition being able to see the other. Ideally he'd like to have a dual-boot system where the two Windows installations are entirely separate and cannot see each other's files.

My first idea was to employ the fact that different operating systems can only use certain file systems. For instance, Windows 98 can only use Fat 16 and Fat 32 file systems and simply cannot see any other type. Windows 2000 and XP can also use Fat 16 and Fat 32, but additionally support NTFS. Consequently you could install Windows 98 on a Fat 32 partition, and Windows 2000 or XP on an NTFS partition. The Windows 2000 or XP partition would be able to see the Fat 32 Windows 98 partition, but not vice versa. Hence the kids can boot into Windows 98 and play to their heart's content without ever getting near Gregory's NTFS partition.

I put this to Gregory and he replied that he would prefer to use Windows 98 on both partitions, as he and his kids were keen on the best games performance. Even if he did go for the Windows 2000/98 route there was still a potential situation where his kids could boot his NTFS partition by mistake and start using that instead. Since Gregory had two hard disks, he wondered if there was an easy way to put separate Windows installations on each and use some kind of electrical switch allowing only one to be powered up at a time.

After toying with the idea of internal electrical power switches, I came to my senses and remembered removable hard disk caddies. These are simply small trays into which you fit a hard disk. The tray then slides into a cradle fitted in the PC, which itself is connected to the internal disk

## ASUS ACCESSORIES

Motherboard manufacturers are acutely aware that there's often not a great deal to differentiate their products from a competitor's. Consequently, the

board designers rack their brains for a feature that makes them stand out in the crowd. Recent innovations have included Abit's much copied Softmenu, Gigabyte's dual-Bios and Asus' Ipanel. Having recently switched to an Asus motherboard in my main PC, I decided to check out the Ipanel.

The Asus Ipanel is a simple but very useful accessory that works with the vast majority



Ipanel provides useful diagnostics and handy ports for Asus motherboard owners

of recent Asus motherboards, pretty much from the CUSL onwards (sadly the P2B is too old). Supporting motherboards will have a row of 24 pins labelled AFpanel and a reference in their manual; an Ipanel entry in the I/O Device Configuration in the Bios should be also enabled.

The Ipanel comes in basic and deluxe versions costing around £20 and £30 each. They slip into a free 5.25in

front-mounted drive bay and connect to various headers on the motherboard. Both models offer software-configured hot-keys, a pair of front-mounted USB ports and an LED display which can toggle between clock frequencies and temperatures along with showing diagnostics on startup. The deluxe model additionally offers a front-mounted 9pin serial port, Irda module and audio jacks.

controller and power. They're traditionally used for easily removing and swapping SCSI hard disks in big Raid arrays.

Fortunately for Gregory and a wealth of other PC enthusiasts, hard disk caddies are available for standard IDE interfaces. All you do is insert the main cradle into a spare 5.25in drive bay in your PC and connect a power and IDE cable to the back as if it were a normal drive. The actual 3.5in hard disk is fitted into the caddy, which itself has very short data and power cables. The caddy can then be slotted into the cradle and work as normal, or be removed for security or easy data transportation.

You could have cradles in two PCs, allowing both to share the same removable hard disk and easily transport data. Alternatively you could have one cradle in your PC, and give each user their own hard disk in a caddy or simply use multiple disks to try out different operating systems. This is clearly the best solution for Gregory, as he can buy a caddy for each of his hard disks, and only ever have one connected to the PC at a time. His two Windows installations would therefore be kept completely separate. In this situation, both disks would be set as

the master of their IDE channel, as only one will ever be connected at a time.

IDE hard disk caddies and cradles are sold together from £10 all the way to £50 and beyond, depending on quality. Searching Google for hard disk caddies or cradles comes up with many options – check out the Hard Disk accessories section of Kustom PCs at [www.kustompcs.co.uk](http://www.kustompcs.co.uk). Alternatively you should find plenty on sale at your local computer fair.

There are several things to look out for though. Most important of all, ensure there is some kind of locking mechanism that prevents a disk from being inserted or removed while the power is on, as this could permanently damage your disk and motherboard. Second, many cradles have fans fitted, which can be handy for keeping a disk cool. Finally, check out the cabling inside the caddy and cradle itself, as to support UltraDMA66, 100 or 133, it will need to employ the 80-wire higher density ribbon cable. If it uses an older-style 40-wire cable, then the bandwidth on that channel will be limited to UltraDMA33, or 33Mbytes/sec.

## CONTACTS

Gordon Laing welcomes your comments on the Hardware column. Contact him via the PCW editorial office or email: [hardware@pcw.co.uk](mailto:hardware@pcw.co.uk). Please do not send unsolicited file attachments.

**IDE hard disk caddies and cradles are sold together from £10 to £50 and beyond, depending on quality**



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# Sum like it hot

Tim Nott manipulates some numbers in Word tables and modifies the word count feature

As we've seen in the past, Word tables are a wonderful aid to formatting a document, doing practically everything that tabs can do and much more. Apart from the obvious lining up of columns and rows of text or figures, we've recently looked at creating letterheads with left and right-aligned text or graphics, printing text landscape on a page with portrait headers and footers, producing labels and creating concordances.

In fact there's so much you can do with tables that there's a danger of getting overenthusiastic – when your favourite tool is a hammer, everything starts to look like a nail.

Word tables are no substitute for a spreadsheet, especially as most people with a copy of Word will either have Excel or the Microsoft Works Suite spreadsheet. However, basic number manipulation can be achieved in Word tables.

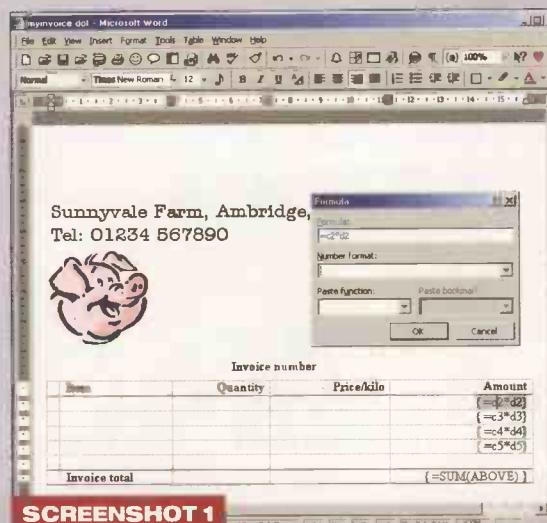
You may have been mystified by Clive Pygott's query in this month's Question Time. What is this {=sum(above)} stuff? Well, combining field codes and tables lets you reference one or more table cells from another, and manipulate their contents.

To take a simple example, let's say you want to produce an invoice using your usual letterhead. First create a new template, either based on a blank document or your existing letterhead.

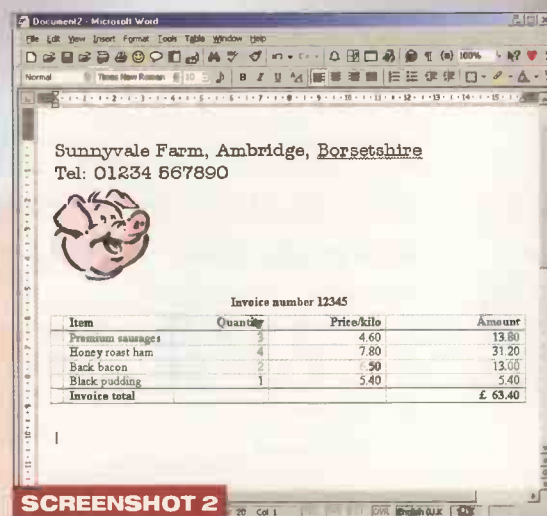
Next create your table and give it suitable headings, as I've done in screenshot 1. Then you need to enter some formulae. Put the cursor in the cell where you want the formula – in this case the rightmost cell on the second row, and go to Table, Formula, Dialog. You want to multiply the quantity by the unit price so in the formula box type in =c2\*d2. This is similar to what you would do in a spreadsheet: the columns are referenced as a,b,c... and the rows as 1,2,3...

Normally you'd also include a Number Format, which is added to the field, but I've left this out to make the screenshot clearer. Repeat for the other item rows: note that there's no equivalent of the Excel Fill feature that can repeat a formula with cell references updated, so you have to do this all by hand.

Finally, in the bottom-right cell enter the formula =sum(above). You must either use the Table, Formula dialogue, the



SCREENSHOT 1



SCREENSHOT 2

**Top: Setting up the template**

**Above: Word does the arithmetic**

Insert, Field dialogue, or if you're really in a hurry Control & F9 to get an empty field: you can't just type in curly brackets from the keyboard. Having saved the template, create a new document based on it: you can keep the template open as you may well want to modify it.

Now it's time to populate the invoice, so type some suitable items, quantities and prices into the new document. Having done that, make sure View Field codes is off, as you want to see the results. Select the entire document (Control & A) and press F9: this will update all the fields and you should see something like screenshot 2.

Notice that I've cheated and added in the Number formats. I've also deleted the empty next-to-last row. The =sum(above) formula is very picky. In fact, in the case of blank cells

immediately above the =sum(above) it seems to work properly in Word 2000, but a blank cell in the middle of a column results in only the cells below the blank being summed. Putting a zero in the blank cell fixes the problem.

Although I've shown a very simple example, you can use all Word's field codes in tables – so you could, for example, make a cell's contents conditional on the state of another by using an IF field.

## Out for the count

One feature of Word I use a lot is the word count. I've assigned it to a button on the main toolbar, and also to the right-click edit menu, where it's particularly useful for counting the words in a selection.

Word 2002 (XP) has a toolbar specifically for this, but going on the basis that you can't have enough of a good thing, here's a macro that I found on the Microsoft Office website. This puts the word count up on the title bar – I've modified the original slightly as it also showed the number of characters and paragraphs, which doesn't really add value as far as I'm concerned.

**Sub showcount()**

```
With ActiveDocument.
ActiveWindow
.Caption =
.Document.Name & " - " & _
.Document.BuiltIn
DocumentProperties(wd
PropertyWords) & " Words "
End With
End Sub
```

(Key: ✓ code string continues)

This has the advantage that it works in Word 2000 as well and, unlike the XP toolbar, doesn't take up any screen space other than the toolbar button you assign it to. It isn't dynamic – but then nor is the XP toolbar – so you need to hit the button or shortcut key you've assigned to update it. And as mine has just come up with the target count for the column, that's it for this month.

## CONTACTS

Tim Nott welcomes your comments on the Word Processing column. Contact him via the PCW editorial office or email: [wp@pcw.co.uk](mailto:wp@pcw.co.uk). Please do not send unsolicited file attachments.

# Scheduling meetings and naming files

Stephen Wells shows you how to get organised, and offers some tips on renaming documents

Long-time reader of this column, Bill Alexander, has volunteered a far more flexible answer to a problem discussed in the March column. An Excel user had asked how to figure the dates of his voluntary organisation's meetings, which fall on the second Wednesday of every month.

The beauty of Bill's solution is that you can quickly change the day of the week, or position in the month.

First enter the values 1 to 12 in the range A5:A16. These represent the months of the year. In B5 enter:

```
=DATE($B$1,A5,$K$2*7)-  
MOD(WEEKDAY(DATE($B$1,  
A5,$K$2*7))-(K$1-7),7)
```

(Key:  code string continues)

then drag this down to cell B16.

In Cell B1 enter the year of your choice, such as 2002. In cell K1 enter the day of your choice as a number, 1 to 7: Sunday being 1, Wednesday being 4 and so on. In cell K2 enter 1 for the first Wednesday, or other day, in the month; 2 for the second, and so on. If you want to keep the programming solution simple, that's it.

However, if you would like to make this application even more user friendly you could well go further and add dropdown choices as in screenshot 1. Spell out the days of the week in cells I1 to I7, and the numbers 1 to 7 in the range J1:J7. Highlight this range I1 to J7 and, using Insert, Name, Define, give it the Name, Days. In the range I9:I13 enter 1st, 2nd, and so on. In the range J9:J13 enter the numbers 1 to 5. Highlight the range I9 to J13 and Name it Weeks. Choose View, Toolbars, Forms.

	A	B	C	D	E
1	In Year	2002	meetings will be held		
2	on the	2nd	Wednesday	of each month.	
3					
4	The dates are as follows				
5			9/1/2002		
6			13/2/2002		
7			13/3/2002		
8			10/4/2002		
9			8/5/2002		
10			12/6/2002		
11			10/7/2002		
12			14/8/2002		
13			11/9/2002		
14			9/10/2002		
15			13/11/2002		
16			11/12/2002		

SCREENSHOT 1

Hover the mouse on the tools to display their names. Select the Combo Box tool. Draw a box over cell B2. Right-click and choose Format Control.

In the new dialogue box enter Weeks for the Input range; K2 as the Cell link; and 5 for the number of Dropdown lines. The first time you use the dropdown arrow you'll see the choice available of 1st, 2nd and so on. Draw another Combo Box, this time over cell C2 – you'll probably have to make column C wider. For this box the Input range is Days; the Cell link is K1; and the number of Dropdown lines is 7.

Fill in the surrounding text as shown in screenshot 1. The user doesn't need to see the numbers of the months in column A, so format the font colour to match the background colour – White for White or, as here, Pale Blue.

When the user picks a day in C2, or the monthly position in B2, the link cell will automatically change and consequently the dates beneath will display correctly.

Calculating the dates of meetings held on any particular day in the month

## Picking up a file name

Paul Thompson asks: 'Is it possible to save a worksheet with the file name determined from cell info within the worksheet? I import a report file from the manufacturing database in the factory where I work and need to save a copy.'

About a year ago, regular reader Chris Page offered an effective short macro that does this and it's worth repeating. The listing assumes that the file name is in cell A1 but obviously you can specify any cell you like. You can also put a full path in the cell, such as D:\PCW\PCW 2002\NewFile. In that example the copy will be called NewFile.xls and the new file will be put in the specified folder.

```
Sub SaveSheet()  
Application.Display  
Alerts = False  
ActiveSheet.Copy  
ActiveWorkbook.Close  
SaveChanges:=True,  
Filename:=Range("A1").  
Value  
Application.Display  
Alerts = True
```

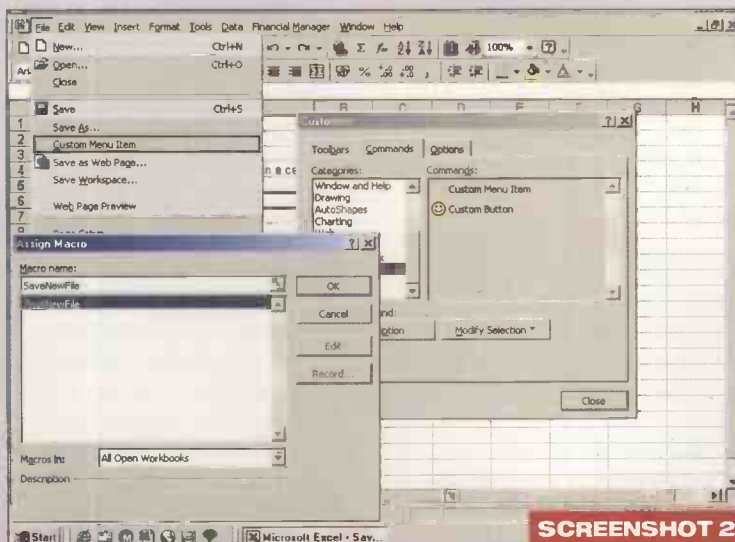
End Sub

To make a new menu item for firing the macro choose Tools, Customise, Commands and under Categories choose Macros. Drag the line, Custom Menu Item, up to the File menu. When the File menu drops down, position the new item where you want it on the list. Right-click on the new item, and under Assign Macro, pick the name of your new macro, see screenshot 2.

Under Name, on the item Properties menu, change 'Custom Menu Item' to &New Save (or an ampersand followed by your chosen menu item name). To finish, click the Close button on the Customise dialogue box. The File menu will now offer the chance to Save (the existing file); Save As (the existing file with another name), or to use New Save (which will save the file with the name given in cell A1).

## CONTACTS

Stephen Wells welcomes your comments on the Spreadsheets column. Contact him via the PCW editorial office or email: [spreadsheets@pcw.co.uk](mailto:spreadsheets@pcw.co.uk). Please do not send unsolicited file attachments.



SCREENSHOT 2

Creating another version of Save As on the File menu



# Clean sweep

Mark Whitehorn digs deep inside the Microsoft Database Engine and gives some tips on cleaning data

Microsoft supplies Access and SQL Server as its database engines. However, with Access 2000 the company introduced Microsoft Database Engine (MSDE). Most people will come across MSDE first when they are using Access. You can develop Access applications in the normal way as an mdb file, in which case Access will use its Jet engine as the underlying database engine. Or you can elect to develop a so-called 'project' file in which case Access will use either MSDE or SQL Server as the database engine. It allows you to choose which, although clearly you have to have either or both installed in order for this choice to be meaningful (see below for information about installation).

So why would you bother developing an Access application as a project file? Well, in the past, many Access applications have started as single-user databases, then moved to multi-user and then eventually, as they become mission critical for the company, are upsized to a full-sized client-server application.

This upsizing can be a complex operation – but one that is made much easier if the database engine used remains effectively the same throughout – which brings us back to MSDE.

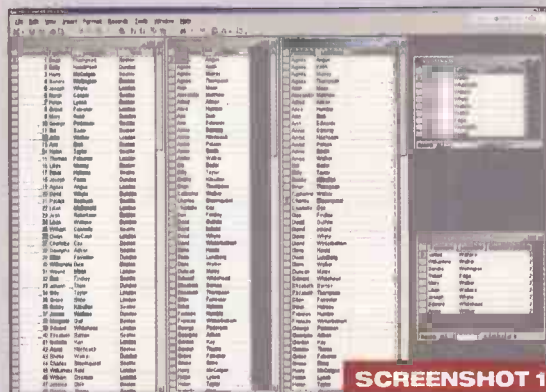
MSDE is essentially the same database engine as SQL Server but it lacks a user interface, management tools such as Enterprise Manager, any of the analysis capabilities and the more complex features such as merge replication support, client access licences, developer libraries and the SQL Server Books Online.

It also limits database size and its performance throttled – carefully constructed so its performance plummets when the number of concurrent users rises above something like five. (The actual figure of concurrent users that it can support depends on the application.)

These limitations make MSDE sound like a waste of space, but in practice it is wonderful for the purpose for which it was designed. It runs fine as a back end to Access applications and makes upsizing much easier.

## New name

Naturally, as the MSDE had grown in popularity, Microsoft has decided to change its name with the release of



**The Customer table Customerdups, which has duplications, and the four queries used to find those duplications**

Access 2002 to the snappier 'Microsoft SQL Server 2000 Desktop Engine'.

All of which was prompted by two emails I received recently. One was about installing the Microsoft SQL Server 2000 Desktop Engine (see Question Time) and the other was from Simon West.

He installed MSDE and was trying to get to grips with both the engine and its security implications. He found an article on Technet (Q285097) which told him how to change from integrated Windows security to SQL security, but that didn't allow him to set a password for the sysadmin account (which is, by default, called 'sa').

Since he didn't want to leave the MSDE server running with no password on the sysadmin account, he was keen to know how he was supposed to achieve this, given that MSDE has no GUI tools such as Enterprise Manager. Before I could even reply, he turned up the answer for himself, which is to use the command line utility called osql.exe that is installed with MSDE. This allows 'Transact-SQL' commands to be typed.

The following sequence works fine.

```
c:\>osql /E
1> EXEC sp_password ✓
NULL, 'newpassword', 'sa'
2> GO
3> EXIT
```

(Key: ✓ code string continues)

Simon also says that there is a great resource for learning about it at [http://msdn.microsoft.com/library/default.asp?url=/library/enus/tsqlref/ts\\_sp\\_pa-pz\\_5x44.asp](http://msdn.microsoft.com/library/default.asp?url=/library/enus/tsqlref/ts_sp_pa-pz_5x44.asp).

## Cleaning data

In the February issue I talked about a problem which, as a side issue, involved cleaning up some data, specifically a

customer list. It is clear to me now that I made an error of judgement in treating this as a side issue. To judge by the number of emails I've had, cleaning up data is one of the major obsessions of people who read this column, and they are desperate to know how to do it.

The bad news is I really can't tell you how to clean up your customer list, or any other set of data containing duplications etc. It's not that I don't want to, it's just there is too much variation for me to be able to give you a formula to follow which will result in clean, sparkling data.

Cleaning data turns out not to be a science, but an art. On the other hand, that's the good news as well. I actually enjoy sitting down with a big table of messy data and cleaning it up – the job is an intellectual challenge as there is no formula to follow.

Dirty data typically suffers from not just one problem, but several. For example, you might have two customer lists that you want to combine into one. However, you know that there are duplicates between the tables (some customers appear in both tables), and that there are duplicates within the tables (some customers appear multiple times in each table). Even worse, the spelling of the customer names has not been carefully controlled – so Brian Right and Brain Wright may, or may not, be the same person.

The trick is to look at the data and identify the main problem, then you can select one or more tools from the toolbox of techniques that you have acquired over the years. You apply those until that problem has been beaten into a corner, and then start on the next one.

I really can't tell you how to do it, but I can at least introduce you to some of the tools I use. I'm not saying that I have the definitive set, so if you have one, send it in and we'll publish the best.

## Tools for the job

OK, the first and most obvious tool in the box is the Select query. You can use it to sift through data to find out what is wrong with it. Never leave home without it.

Next favourite has to be the Group by Query. This is wonderful for finding out what duplicated data you have in a table. In the sample database, DBCJUL02, which I have posted on my website



[www.penguinsoft.co.uk/mdbs](http://www.penguinsoft.co.uk/mdbs)) there is a Customer table (see screenshot 1) called Customerdups containing 115 records in total, but some are duplicates.

The query called Find Duplicates:

```
SELECT FirstName,
LastName
FROM CUSTOMERDUPS
GROUP BY FirstName,
LastName;
```

groups together customers with the same first and last name. This reports 105 records which, combined with the knowledge that there are 115 records in the table, tells us that 10 are duplicated.

We can get the query called Find Duplicates2 to count the number of records in each group by adding:

```
SELECT FirstName,
LastName,
Count(FirstName) AS
CountOfFirstName
FROM CUSTOMERDUPS
GROUP BY FirstName,
LastName;
```

This tells us how many records of each type are duplicated. But if only we could get the query to show us just the ones that are showing duplicated values. Well, those are the ones where the count of records is greater than one, so what about Find Duplicates3:

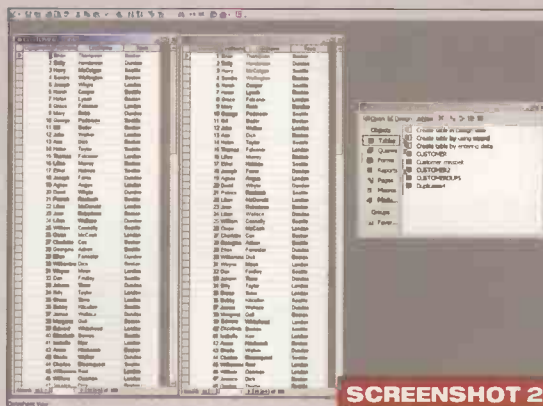
```
SELECT FirstName,
LastName,
Count(FirstName) AS
CountOfFirstName
FROM CUSTOMERDUPS
GROUP BY FirstName,
LastName
HAVING
```

```
Count(FirstName)>1;
and, as the final icing on the cake, we could get the query to order the duplicates in descending order: Find Duplicates4:
```

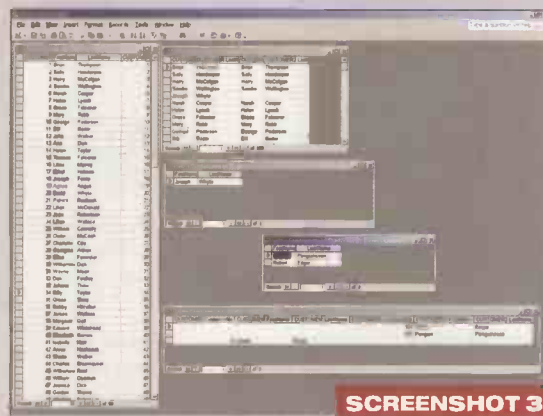
```
SELECT FirstName,
LastName,
Count(FirstName) AS
CountOfFirstName
FROM CUSTOMERDUPS
GROUP BY FirstName,
LastName
HAVING Count(FirstName)>1
ORDER BY Count(FirstName)
DESC;
```

Now we can see who the offenders are and take the appropriate action, bearing in mind that, if you so desire, you can turn this into a Make Table query, which will give you a permanent record of the duplicates.

Is this a good idea? It depends on the real-life problem you are trying to solve. I can't tell you that it is always



SCREENSHOT 2



SCREENSHOT 3

appropriate to use a Make Table query, but the option is always there. It's simply another tool in the box.

## Finding common records

Now suppose we have a different problem. We have two customer lists Customer and Customer2.

The first has 100 records, the second 101 (see screenshot 2). However, the majority are duplicates, not within the tables, but between them. So how can we find the records that are common?

An easy one this: use a Select query. The query 'Find Common Customers' does the job (see screenshot 3):

```
SELECT
CUSTOMER.CustomerNo,
CUSTOMER.FirstName,
CUSTOMER.LastName,
CUSTOMER2.CustomerNo
FROM CUSTOMER
INNER JOIN CUSTOMER2
ON (CUSTOMER.LastName =
CUSTOMER2.LastName) AND
(CUSTOMER.FirstName =
CUSTOMER2.FirstName);
```

Here we are saying to the query: 'Match the first and last name, and show us all the records where you can find the same first and last name in both tables.' As a bonus, we are seeing the CustomerNo from each table that may make life easier. The answer table shows us that there are 99 common records.

**Top: These two customer tables have a large set of common records. How can we find those, and how can we find the unique ones in each table?**

**Bottom: The answer – with queries of course**

OK, that was easy, now a slightly more tricky one. What about a query to show the records which are found in Customer but aren't found in Customer2? Here we need a Select query, but we need to use what is called an Outer join – one that returns all the records from one of the tables (in this case Customer), and only those from the other table that match. The query 'Extra Customers in Customer' does the trick:

```
SELECT
CUSTOMER.FirstName,
CUSTOMER.LastName,
CUSTOMER2.FirstName,
CUSTOMER2.LastName
FROM CUSTOMER
LEFT JOIN CUSTOMER2
ON (CUSTOMER.LastName =
CUSTOMER2.LastName) AND
(CUSTOMER.FirstName =
CUSTOMER2.FirstName);
```

(Outer joins come in two flavours, Left and Right, which explains why this is still an Outer join, even though the word itself doesn't appear in the SQL).

This works OK and actually identifies the extra records in the Customer table, but we have to scroll around to find them. In fact, the only records in this answer table that interest us are the ones where there is no matching record from Customer2. So we can isolate those by adding a Where clause that only extracts those records where the information from Customer2 is non-existent (query 'Extra Customers in Customer Second Attempt'):

```
SELECT
CUSTOMER.FirstName,
CUSTOMER.LastName
FROM CUSTOMER
LEFT JOIN CUSTOMER2
ON (CUSTOMER.LastName =
CUSTOMER2.LastName) AND
(CUSTOMER.FirstName =
CUSTOMER2.FirstName)
WHERE
(((CUSTOMER2.FirstName)
Is Null) AND
((CUSTOMER2.LastName) Is
Null));
```

As an exercise try to build a query that does the same for Customer2 and then try to build on that to show the extra records from both tables at the same time. (Hint: Union).

## CONTACTS

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## You're surrounded

Niall Magennis immerses himself in the world of 4.1 and 5.1 surround sound speakers

**S**peakers are simple, right? You connect them to your PC and they produce sound. Well that's how it used to be, but things have become more complicated over the past couple of years, thanks to the arrival of surround sound.

Let's get one thing clear before we begin. A good surround sound setup really makes a huge difference to games and movies. There's nothing as good for scaring yourself witless as being able to hear, but not see, an alien baddie moving in behind you in a first-person shooter. And once you've watched DVD movies with full 5.1 Dolby Digital surround sound, a normal stereo setup will never suffice.

But with so many surround sound formats and speaker setups on the market, trying to pick one that is right for you, and then getting it set up properly, can make your head swim more than any surround sound effect ever could.

Early surround sound implementations offered four-channel output. This was simply a case of adding an extra stereo output to the sound card to cater for two rear channels. These two stereo outputs were then pumped directly to two sets of stereo inputs on a 4.1 surround speaker system.

A 4.1 system simply means that it has four satellite speakers and one low-frequency speaker (called a subwoofer) for bass effects. On these early surround sound cards there was no extra output for a subwoofer, so the speaker system simply pumped the low frequencies to the subwoofer.

This kind of setup is great for gaming as four-point systems are generally cheaper than 5.1 systems (which add a front centre speaker), yet offer good surround possibilities for games developers to exploit in order to scare the pants off you.

### Game formats

The two main surround sound formats for gaming are A3D and EAX. Since the remains of Aureal were taken over by Creative, only EAX is still being actively developed. This is a shame, as A3D had a lot to offer. Whereas EAX only used reverb algorithms to simulate a 3D room's size in audio, A3D could actually work out reflections and refractions based on the



SCREENSHOT 1

**Some software DVD players can downmix a 5.1 signal to make it suitable for four-speaker systems**

geometry of not just the room, but the obstacles in it too, so it was much more accurate. However, it was also more processor intensive.

Luckily Creative is beginning to add some of the modelling features of A3D to EAX. Pretty much all surround-sound-capable cards support at least one version of both A3D and EAX.

Four-point systems can also be used for DVD surround sound playback, however there obviously has to be some clever jiggery-pokery going on to make a 4.1 system sound like a 5.1 system (see screenshot 1).

What is missing in a 4.1 system that is present in a 5.1 system is a centre channel. The approach most software DVD players take is to feed the centre channel audio stream equally to both of the front speakers in an effort to create a 'ghost' centre speaker. The results are

generally good, but there are scenes in some movies where the centre dialogue may sound quieter than it should. However, as most people place their front speakers either side of their monitor, and sit quite close to them, the problem is usually diminished in a typical PC setup.

Of course, the best overall solution for PC sound is a full 5.1 speaker setup. But the world of 5.1 is more complex than you may initially think. In order to hear 5.1 surround sound you'll need a decoder as well as a set of 5.1 speakers. The decoder takes the surround sound information from the audio in the game or DVD movie and deciphers which sounds are meant to go to which speaker.

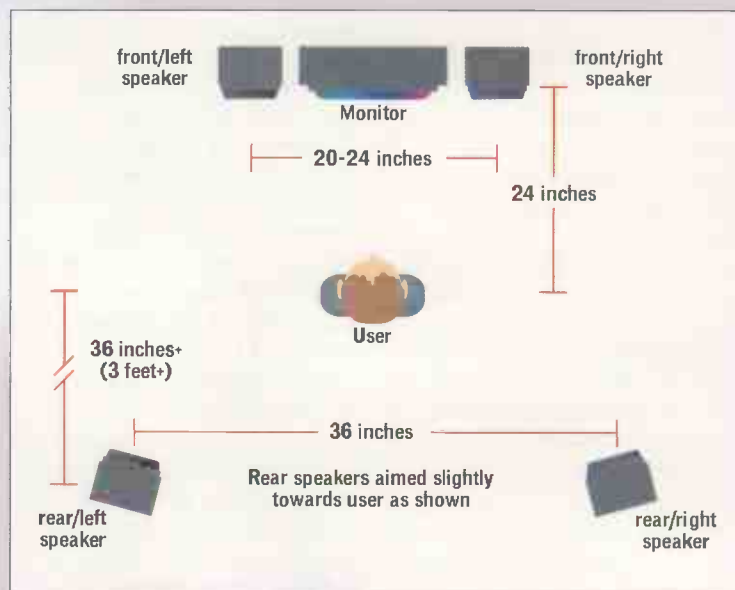
Up until last year if you wanted to decode 5.1 surround sound you had to use an external decoder. In this scenario you run a lead from the coax or optical digital output of your sound card to the digital input of the decoder. The decoder then feeds the decoded audio stream to the 5.1 amp that drives the five speakers and the subwoofer.

### Breaking the code

Decoders are generally quite expensive, costing anywhere from £100 to many thousands of pounds for a top-of-the-range model.

Luckily, sound card manufacturers started to develop chips for their cards that allowed the card itself to decode the surround-sound streams and output it via multiple analogue connectors.

**It's important to get your speaker placement correct when using a surround sound setup**



The Creative Live 5.1, Creative Audigy, Philips Acoustic Edge and Terratec DMX 6Fire24/96 (pictured right) can all do onboard 5.1 decoding. With these cards you only need a set of 5.1 speakers and surround sound amp, saving you the cost of an external decoder.

However, for some people it may still be better to opt for a setup that includes an external decoder, but why is this? Well the decoder will allow you to use your 5.1 surround sound speakers with many different devices, whereas if you use a sound card for the decoding you can only use the speakers with the PC.

DVD players, games consoles and digital set-top boxes can all output a digital surround sound stream, but if you don't have an external decoder you won't be able to use your speakers with them. External decoders also tend to support more surround sound formats. The range of surround sound formats currently in use is quite large and, as a result, there is much confusion over what each one does, so let's run through the capabilities of the main players.

First up is Dolby Surround. This is the oldest of the surround sound standards currently in use. A Dolby Surround signal contains four channels of information encoded in a single analogue stereo stream. The decoder looks at the stereo stream and extrapolates out Front Left, Centre, Front Right, and Rear Surround channels from the two-channel signal. The two rear speakers simply produce an identical mono signal so full surround panning is not supported and the centre channel is really just a ghost channel of the left and right front speakers.

Next comes Dolby Pro Logic. This format is now the standard for VHS tapes and some TV broadcasts. It improves on Dolby Surround by adding support for a dedicated centre channel and better sound placement, although the rear channels are still essentially mono.

Both Dolby Surround and Dolby Pro Logic decode the signal from an analogue stereo stream, but modern hardware such as computers and DVD players can output digital streams, and this is where the next step, Dolby Digital, comes in.

Dolby Digital adds stereo rear surround channels that allow sound to be much more accurately placed. It also has a



**The Terratec DMX 6Fire is one of the new generation of sound cards that can do onboard 5.1 decoding**

dedicated subwoofer channel that allows for low-frequency effects.

Finally, there's DTS. This is a competing format to Dolby Digital. The main difference between DTS and Dolby Digital is that the DTS stream uses less compression so it should theoretically sound better. However, Dolby Digital is more widely supported and relatively few DVD discs offer DTS sound, though this may change in the future.



**Full 5.1 surround sound systems make a huge difference to DVD movies**

Basically, if you're looking for an external surround sound decoder you need to make sure it does Dolby Pro Logic and Dolby Digital to cover you for both analogue and digital streams. But if you're looking for slightly better audio from some DVDs, then you may want to get a decoder that also supports DTS.

### Setting up

Once you've chosen your surround sound system you'll want to get the most out of it. The first thing to do is to

get the right speaker placement. The centre speaker should naturally be placed dead centre with your screen and the two front stereo speakers should sit equidistant from either side of it. Because humans generally don't pick up directional information from low frequency sounds, it doesn't really matter where you place your subwoofer, but most people place it near the centre speaker for convenience.

Normally you would place the rear surround sound speakers at about the same distance behind your head as the front speakers are from the front. However, because when we're playing games we sit so close to the screen, it's probably a good idea to locate the surround speakers slightly further back than normal.

Just as important as speaker placement is getting your connections right. Speakers in a surround setup (or a stereo one for that matter) should move together in the same direction, or in technical speak, be in phase.

If you connect them in the wrong way then some of the speakers will be moving in the opposite direction to some of the others, or be out of phase. Speakers that are wired out of phase will lack bass response, have woolly tonal quality and sound a lot less punchy than speakers that are correctly wired. In a surround sound setup this will also mess up the surround sound balance and reduce the overall effect.

Speakers are connected by two-strand cable and each strand is given a different colour, usually red and black or black and white, to help you get the connections right. It doesn't really matter which way around you connect the speaker wire on an individual speaker, but it's very important to be consistent between both speakers.

The simple rule is to always connect the red or white wire to the red or + connector on the rear of the speaker and amp and always connect the black wire to the black or - (negative) connector on the speaker and amp.

With everything set up, all that's left is to load up your scariest game or most action-packed movie and sit back and enjoy the experience. But don't blame us if you scare yourself silly!

### CONTACTS

Niall Magennis welcomes your comments on the sound column. Contact him via the PCW editorial office or email: [sound@pcw.co.uk](mailto:sound@pcw.co.uk). Please do not send unsolicited file attachments.





## Ready to roll

Ken McMahon investigates the art of rollover graphics for the web using Imageready's new features

**A**ny image-editing application worth its salt provides tools for producing the Javascript rollovers beloved of web designers the world over. Despite the fact that you can produce visually appealing, bandwidth-friendly and efficient rollovers using DHTML, the flexibility that images provide means Javascript is still by far the most popular way of doing things.

In the past I've used Macromedia Fireworks, Dreamweaver and Photoshop to create rollovers, although, I confess, I haven't attempted to hand code them for a long while. Why bother, when it's far easier with the tools now available in these applications?

Photoshop 7, or rather Imageready 7, has introduced a number of new features that extend what you can do from within the application and mean less messing about filling in the gaps afterwards.

Essentially, Imageready will create layer-based rollover states for the normal, over and down states of a button, which is all most of us ever bother with. But Imageready goes further, allowing you to select layers and produce code for additional states including click, out, up and selected – you can even define your own states, though you have to do your own Javascript tweaking to make use of them.

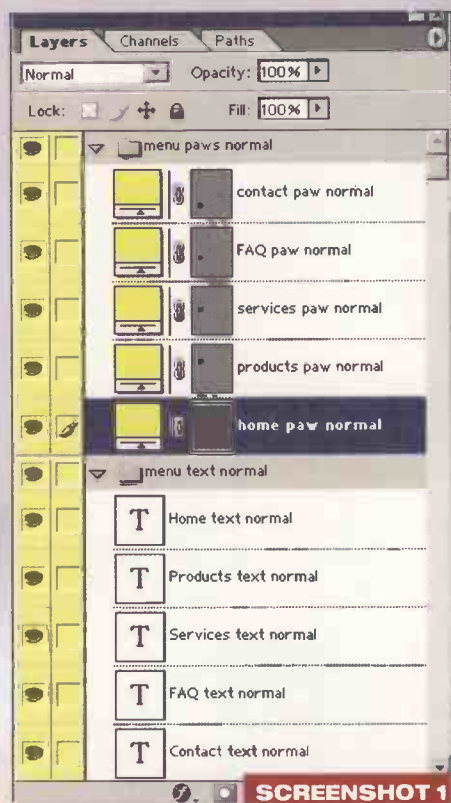
The key to producing successful rollovers is planning. While it's easy enough to produce a simple two-state button without much forethought, even a simple navbar, like the one I've produced here for a pet products site, will benefit from a five-minute planning session first.

### Anatomy of a navbar

My navbar consists of five selection options, each of which has a paw graphic to the left of it. I've enlarged it on the opposite page so you can get a better look at it.

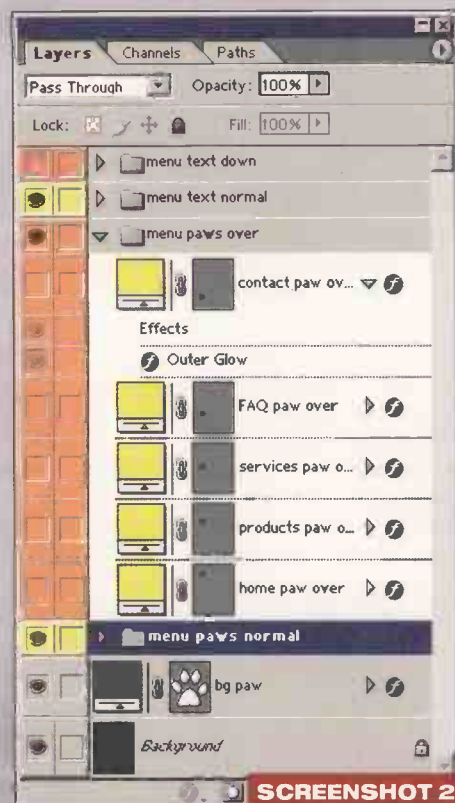
The plan is to create layer-based rollovers so the paw glows when the menu text is rolled over, and the text turns white when the menu item is selected. I'm also going to use the new selected state so that when the browser loads up the selected page, the menu text remains white, indicating the current location.

Because the rollover slices will be layer-based, each element must go on a separate layer (see screenshot 1).



**Above: Text and paws organised into two layer sets**

**Above right: All four layer sets with the paws over set expanded to show the glow layer effect**



**SCREENSHOT 2**

Using Photoshop's layer sets helps streamline the process and keep everything organised. The big paw on the background layer, like the menu paws, is a custom shape with a layer effect applied (Bevel and Emboss in this case).

I drew the first paw and then duplicated and renamed the layer four times. Then I linked the five menu paw layers and selected New Set from Linked in the Layers palette menu. Assigning a colour to the layer set will help you keep track of things.

The procedure for creating the text is exactly the same – create one text layer, duplicate and overwrite it (there's no need to rename because Photoshop does this for you using the text itself as the basis for the layer name), link the text layers and create a new set from linked.

### Adding states

You should now have two layer sets for the normal state of each menu option. I've called them menu paws normal and menu text normal.

To create the over state for each menu item, duplicate the menu paws normal layer set and rename it menu paws over, for clarity I've added the

word 'normal' to each layer in the normal set and the word 'over' to each layer in the over set.

Select each of the layers in the menu paws over layer set and apply the outer glow layer effect with the default settings. Don't be tempted to copy and paste text between shape layer names or you'll get some unexpected results.

Next you need to duplicate the menu text normal set, rename the layers by replacing the word normal with the word down, and change the text colour to white.

You should now have four layer sets, menu text normal, menu text down, menu paws normal and menu paws over. I've coloured my normal layers yellow and rollover layers orange.

The layer order is quite important – if the layer for the over state is beneath the normal layer you will need to turn off the normal layer as well as turn on the over layer when it comes to making the rollover, a small extra effort, but it all adds up.

Turn off layer visibility for the rollover layer sets and hit the jump button at the bottom of the toolbox to open Imageready 7 (see screenshot 2).

## Making the rollovers

In Imageready, select Window/Rollovers to display the rollovers palette if it isn't already there. I find it helpful to make the layers and rollovers palettes as big as possible and position them next to each other. Select the products text normal layer in the menu text normal set and click the Create Layer-Based Rollover button at the bottom of the rollovers palette – the slice is created and Imageready automatically creates the over state. In the slice palette enter products.html in the URL field.

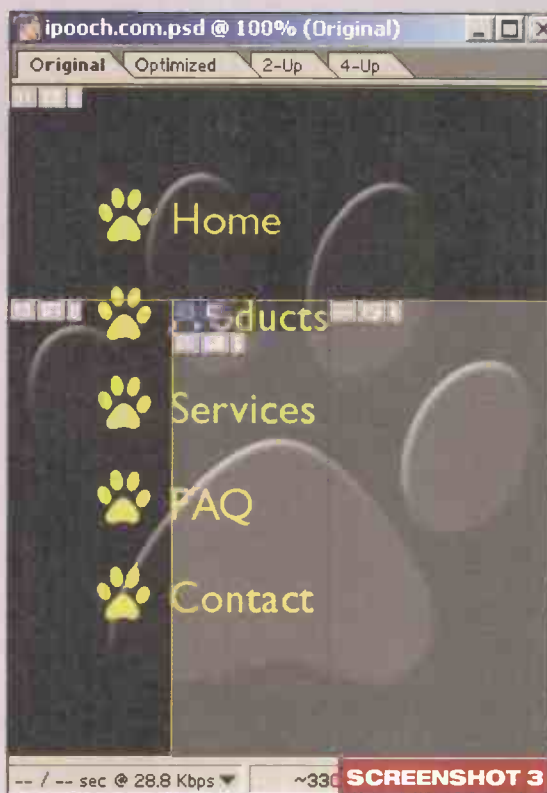
Select the over state, expand the menu paws over layer set and make the products paw over layer visible. You can check everything is working at this stage by clicking the preview in default browser button in the toolbox, as you rollover the Products text the paw should glow (see screenshot 3). To create the down state click the create rollover state button on the rollovers palette and make the products text down layer visible. The products menu text should turn white, if it doesn't and you are in the optimised tab, switch to the original or two-up view (press Ctrl & y to toggle through).

If you preview again this should all work fine, the paw glows when you rollover the Products text and the text itself turns white when you click it. It works, but it's not very efficient. Take a look at the way the image has been sliced and you'll see that to create the slice for the products text layer, Imageready has had to create four slices around it to carve up the entire image into rectangles. If the only thing changing were the products text layer this wouldn't be a problem, but our rollover works on the paws. To make the products paw glow, two very big slices currently need to be changed.

## Optimisations

To remedy the situation click the products paw normal layer and select Layer/New Layer Based Slice. The products paw now has its own small slice and this should be the only graphic that needs updating when the Products text is rolled over. Select File/Save Optimized As, Save As Type HTML and Images and All Slices into a new folder.

Double-click the HTML file to open it in your default browser and check everything works OK. Imageready creates an Images folder for all of the image slices; open the folder and take a look at the contents. There are an awful lot of slices for a menu bar with only one rollover. If you go back to Imageready, choose the slice select tool and check the



**Left:** To make the products paw glow, both auto-generated slices one and two need updating

with the outer glow – to define the slice (see screenshot 4).

This kind of thing shows why, with any application that automatically generates HTML tables, Javascript and associated images, you can't just hit the export button and expect everything to be fine. In this case, while everything appears OK, the navbar is weighed down with extraneous, irrelevant gif files.

## The selector

What about that Selected state I mentioned earlier? Well, if you select product text normal in the rollovers palette and click the add state button, a new state labelled click will appear. Right-click this, choose Selected from the contextual menu and arrange your layers accordingly – I've turned off the glowing paw and turned on products text down, so the products menu item will appear white on the products page.

If you preview this, or Save Optimised you'll find no difference in the HTML or images. To get it to work you'll need to double-click the selected state in the rollovers palette and check the Use as Default Selected State box. Now Save Optimised As and select HTML only from the Save As type pulldown menu.

Don't change the filename at this stage as it will change all the image references. Instead, save the page to a new location with the same filename as the original, then rename it products.html and place it in the folder with the original page and images folder.

You now have two HTML pages, the first contains the navbar with the functioning Products rollover, which links to products.html containing the navbar with the products menu item in the selected state. Despite its improved tools for creating rollovers, don't expect Imageready to provide everything you'll need. What it does give you is a good starting point from which to produce navbars and other animated graphics from layer-based images. To make the most of it, you need to plan, and be prepared for plenty of tweaking.

## CONTACTS

Ken McMahon welcomes your comments on the Graphics and DTP column. Contact him via the PCW editorial office or email: [graphics@pcw.co.uk](mailto:graphics@pcw.co.uk). Please do not send unsolicited file attachments.



**SCREENSHOT 4**

Hide Auto Slices button on the tool options bar you'll see the only two slices we should have rollovers for – products text normal and product paw normal. The gifs for these rollovers are products-paw-normal.gif, products-paw-normal-Product.gif, Products-text-normal.gif and Products-text-normal-down.gif. But in addition there are numerous rollover state gifs for slices that shouldn't change.

On closer examination these turn out to be slices that are adjacent to the paw rollover. What is happening is that because the outer glow layer effect breaks the boundaries of the image slice – which was defined by the products paw normal layer – the adjacent slices are all affected. The solution is to use the product paw over layer – the one

**Always base slices on the outermost boundary of a rollover – unlike here, where the glow spreads into adjacent slices**



## Blender shaky but Maya is set free

Benjamin Woolley investigates Maya Personal Learning Edition and asks if Blender will be revived

In the spring I received the following email, which I am reproducing, not just because of the flattering remarks about this column, but also because it contained some news that will be received with sadness by every 3D enthusiast. The email was sent by rookie graphics pro Shane Christopher: 'I've been an avid amateur 3D (and lately 2D) artist since your January 2001 article introduced me to Blender (see screenshot 1). I was 15 and spent a lot of my spare time working with Blender.

'In February of that year I joined a project to create a game based on the Civilisation series. Our main feature was a spherical world using hexes, a 'Buckyball'. Unfortunately that project ended, like many Internet game projects do, due to lack of programmers. Since then I have joined another project that has been going for three years and has strong support at its site [www.rjcyberware.com](http://www.rjcyberware.com). I would like to thank you for introducing me to the world of computer graphics and probably changing the course of my life.

'But that isn't why I mailed you. I have noticed that you have mentioned Blender in some previous articles and so you are probably interested in it. I learned today that Nan Technologies has shut down... I feel like many thousands of other Blender users that this is a shocking and unjust end to such a product that has changed in some way the lives of so many.

'I would just like to express my sadness about this loss to the graphics industry and my hope that somehow funds will be raised to restart the project.'

Since that letter was written, the picture has improved. At the time of writing (April), Nan was still operating and undergoing a 'reorganisation', and offered a curtailed version of its website ([www.blender.nl](http://www.blender.nl)). Clearly the cost of developing and supporting a 3D package that most used for free presented problems, which the company is now being forced to address.

Discussions of Nan's troubles have, as you would expect, been vigorous among members of the Blender community, for example at [www.elyslun.com](http://www.elyslun.com). Gatherings are being scheduled, petitions arranged, and everyone is hoping for the best. The story is moving too fast for a monthly column such as



**What future Blender? The distinctive interface that made the 3D software so bewildering to newcomers, but so beloved by experienced users faces an uncertain future**

this to keep up, so readers are advised to hit the web to discover the state of play. Whatever happens, Blender's problems have cast a shadow over 3D software developed under these sorts of licensing arrangements. Clearly, it is not the enthusiasm of users, but distant meetings and banking arrangements far beyond our understanding or influence that will shape its future.

When it first announced its problems, Nan sounded an optimistic note: 'There are a lot of believers and non-believers for every topic and scenario. But in general there's a unified feeling among everyone — users, employees and shareholders — that Blender still has a warm living heart, still alive, and worth being continued.' Amen to that.

### Maya PLE

The Lord taketh away and the Lord giveth... Almost simultaneously with the news of Blender's potential demise came a more welcome, indeed astonishing announcement: Alias Wavefront was offering free copies of its 3D software Maya.

**The Alias Wavefront website provides tutorials and case studies for Maya PLE users**



To put this in perspective, at around the same time the company also announced a reduction of the price of its full package, Maya Unlimited, from £13,560 to just under £5,000. Naturally there are a few differences between the retail and free versions, but not as many as you might expect.

Maya's publisher, Alias Wavefront, is a part of Silicon Graphics (SGI), the company that made its name creating some of the most powerful graphic workstations in the world.

Its decision to offer a version of Maya for free is clearly part of a strategy designed to consolidate the company's position as a leader in the graphics field. But it is also an attempt to address a problem mentioned by Shane in his email above: the current dearth of 3D expertise.

Maya Personal Learning Edition (PLE), the version available for free, lacks some of the plug-ins provided with Unlimited. Nor, as you would expect, does it come with support. But you do get a full working edition of the core product, complete with Nurbs modeller, inverse kinematics, particles, physical dynamics and even a couple of plug-ins: Maya Artisan and Maya Paint Effects.

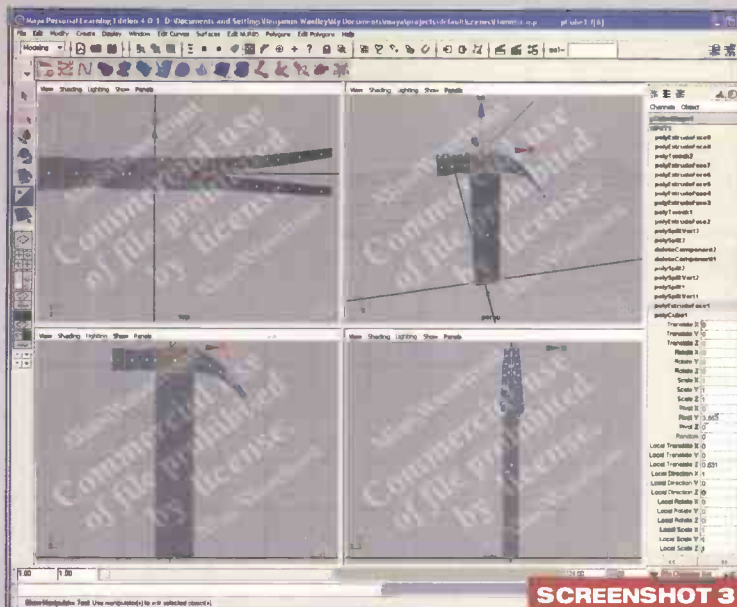
You also get, crucially, a collection of well-designed tutorials, which take you quite deep into a very complex and powerful package (see screenshot 2). There are a few limitations, however: renders are limited to a resolution of 1,024 x 768, the software uses a special .mp file format rather than the standard Maya ones (.ma and .mb), you cannot import or export any other file formats, and the viewports, rendered images and some texture maps are heavily watermarked with the legend 'Commercial use of file prohibited by license' and the Alias Wavefront logo.

### More free software

Maya is not in fact the first professional-grade commercial 3D package to be provided for free.

Discreet offers Gmax, a games development platform based on 3D Studio Max (see 3D Hands On, February 2002). Gmax is a powerful package too, and does not use watermarking. However, it does have other limitations.

You cannot, for example, produce a finished render, watermarked or



SCREENSHOT 3

Left: Maya Personal Learning Edition, with a scene from a modelling tutorial about creating a hammer object

quickly or easily given that the company is based in Toronto.

### Running Maya

What, then, is Maya PLE like? I suspect few readers will have used Maya before. I certainly hadn't, and did not know what to expect from software that is worth the thick end of £10,000.

First impressions are overwhelmed by the prominence of the watermark. Once you have got over the shock of that, however, you start to delve into what is undoubtedly a powerful piece of software. It was also extremely stable on my system, though full rendering, which makes predatory demands on the processor, more or less froze the display.

When you run the software, a welcoming web page also opens in a browser window providing links to tutorials and other resources. The 'Instant Maya' tutorial is excellent, although the expertise you will acquire by working through it is hardly instant. It will take days or even weeks to get through the 10 modules, but at the end of it you will have a pretty good grasp of 3D graphics editing techniques as well as Maya (see screenshot 3).

In other words, even if you are likely never to use Maya in anger, it is still worth getting hold of Maya PLE and working through the tutorial. I tried out a few of the more advanced features of the software (I will look at a selection in more depth in future columns).

One I particularly liked was Interactive Photorealistic Rendering (IPR) (see screenshot 4), a neat intermediary between realtime shading in the viewport and a production render.

You can produce an IPR in a fraction of the time of the full render, but still get enough detail to check textures and lighting. Furthermore, the interactive element allows you to choose an area of the image and have that updated in more or less real time as you edit the scene in the viewports. Very neat.

Everyone with an interest in 3D should download a copy of Maya PLE from [www.aliaswavefront.com/freemaya](http://www.aliaswavefront.com/freemaya). It is an unmissable opportunity. My only reservation is the prominence of the watermark – I hope the company tones it down in future releases.

### CONTACTS

Benjamin Woolley welcomes your comments on the 3D Graphics column. Contact him via the PCW editorial office or email: [3d@pcw.co.uk](mailto:3d@pcw.co.uk). Please do not send unsolicited file attachments.

otherwise. Discreet claims to have nearly 140,000 users already, and those who are not already among them should download the latest version from [www.discreet.com/products/gmax/gmaxconsumer](http://www.discreet.com/products/gmax/gmaxconsumer).

Gmax has one advantage over Maya, besides the absence of watermarks. It is a mere 50MB download and will run under Windows 98 as well as 2000. Presumably it also runs under Windows ME, although this is not specified on the download page and I have not tried it myself – there is no Mac or Linux version nor is there likely to be, as the 3D Studio product family from which it is derived grew up in the Dos/Windows environment and has resolutely stayed there ever since.

The Windows version of Maya is 136MB and the Mac OS X version 149MB (there is no Linux version). The Windows version will only run under NT, 2000 or XP and requires hefty hardware: a Pentium running at 600MHz or faster, 512MB and a graphics card with OpenGL hardware acceleration.

The Mac minimum requires the same Ram and graphics card spec, and a G4 processor (though G3 systems 'may be acceptable for general Maya use').

Most users will know whether their system has the right amount of Ram, but it is important to check that your graphics card provides OpenGL hardware acceleration as well.

Support for OpenGL under Windows 2000 and XP depends on the graphics card you are using, not on Windows (which only provides native support for DirectX out of the box). You will need to check either the diagnostics/driver software installed with your graphics card or on the vendor's website.

For certain operations, particularly



SCREENSHOT 4

those associated with Artisan or Paint Textures technology, you also need hardware support for Overlay Planes to get decent performance. Quite a few cards do not have this, including those based on the Nvidia Geforce2, ATI Rage128 and Matrox G400 chipsets. My system, a 1.4GHz Dell 8100 with a 32MB Nvidia Geforce2-based card just about managed to cope, but it wasn't comfortable. I suspect the graphics card was the bottleneck.

Before downloading, it is therefore worth checking out the list of 'qualified' hardware posted by Alias Wavefront at [www.aliaswavefront.com/en/Community/Support/qualified\\_hardware/QUAL/maya\\_40\\_NT.html](http://www.aliaswavefront.com/en/Community/Support/qualified_hardware/QUAL/maya_40_NT.html).

When Maya Personal Learning Edition was first announced, the company's servers were clogged for days on end, and only the very dogged and patient were able to download the massive distribution file (including yours truly, who spent the best part of a week trying to get it).

It is possible to get a CD-Rom for a few dollars, though probably not very

Above: The Interactive Photorealistic Rendering window (bottom right) shows a near production-quality which updates to show changes to the scene in near-real time



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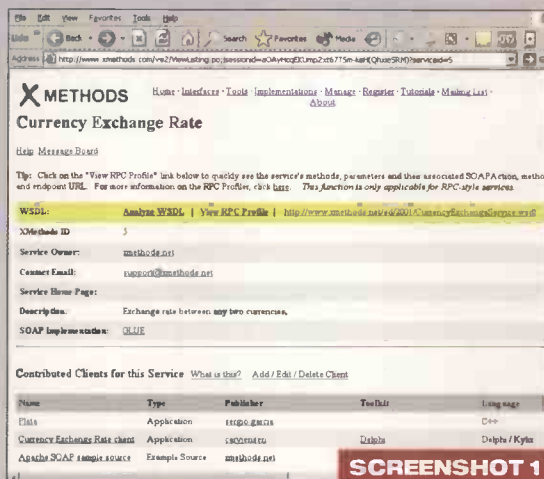
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# On the money

Tim Anderson builds a web service with Jbuilder and Visual Studio.Net to keep up with exchange rates

Early versions of the Windows CD player applet were simple affairs. Pop in a CD, and the applet would display 'Unknown CD' along with a list of tracks entitled track 1, track 2 and so on. There was an option to edit the details so the CD player would recognise it next time, but it was tedious and many people did not bother. In 1995, programmer Ti Kan set up the CDDb, an online database of CDs and their tracklists. Instead of millions of individuals typing in ragged little databases on their own PCs, CDDb created a central database that everyone could update and access. Playing a CD in the Windows CD player, and others like Real Jukebox and Music Match Jukebox, is now more rewarding. The title and track list comes up automatically; if I'm lucky a bitmap of the cover displays; and a few clicks will take me to reviews, artist biography, and so on. Of course CDDb got commercialised (see [www.freedb.org](http://www.freedb.org) for an alternative), Windows Media Player uses AMG's database, and so on, but I mention it because these CD databases are classic examples of web services. They are local applications that access the Internet programmatically, handling the user interface and data presentation without recourse to a web browser.

Within the past year or so, it has become easier for developers to build applications that create and consume web services. The chief enabling technology is Soap, which used to stand for Simple Object Access Protocol, but now according to the W3C (World Wide Web Consortium) is just Soap, since it does not require objects nor is it always simple. Soap is an XML specification that works over HTTP, so that if your clients can browse the web, they can also access Soap web services. Specific development tools include the Soap Toolkit for Visual Basic 6.0, Borland products such as Delphi, Kylix and Jbuilder, Microsoft's Visual Studio .Net, Apache Soap, and Perl's Soap Lite. These tools and libraries handle the low-level plumbing, leaving you to work out the implementation of your client or server. Interoperability between different implementations is an issue, but one that will improve. Leading vendors have established the Web Services Interoperability Organisation ([www.ws-i.org](http://www.ws-i.org)) to develop tests and



SCREENSHOT 1

guidelines that will make the different platforms work together.

## Using Soap

It is one thing to have the technology in place, another to put it to good use. For small businesses or hobbyists, the most likely use of web services is in client applications. The idea is to enhance an application by including up-to-the-minute data, access to a specialist database, or other functionality that cannot easily be achieved locally. The problem currently is that there isn't a great range of enticing services on offer. If you look down the list at [www.xmethods.com](http://www.xmethods.com) (see screenshot 1), you will find a few obvious things such as weather reports, parcel tracking and stock quotes, a few online games, currency converters and so on, but nothing that suggests a major revolution in programming. These web services are fun to try, but not yet a great advertisement for the technology.

The potential for interesting business-to-business applications is much greater. You won't see these listed at Xmethods.com, but there is an obvious place for applications that can query stock levels, place orders, request quotes, or subscribe to other services such as customer credit checks. In theory, Soap can easily bridge platforms, so that Java on Unix can speak to Visual Basic or C++ on Windows, without the need for expensive middleware.

Soap can also be useful on internal networks of any size, particularly where you want to bridge languages or platforms. For example, perhaps you have a web application running on Linux, and

would like to integrate it with an older Windows VB application on another server. Using the Soap toolkit for VB, you could create a Soap API for the older application and access it from the Linux web application using Apache Soap, Perl or Jbuilder.


## An example Soap client

To try out a live web service, I selected the CurrencyExchangeRate from Xmethods. This gets the exchange rate between any two currencies, and is implemented in Glue, a Java product from The Mind Electric ([www.themindelectric.com](http://www.themindelectric.com)). The Xmethods reference page conveniently describes the service, gives the URL for the .wsdl description file that tells clients how to call the service, and offers a few added resources such as a message board and an example client, in this case written in Delphi. Here's how I created a web service client, first with Jbuilder, and then with Visual Studio.Net.

## Using Jbuilder

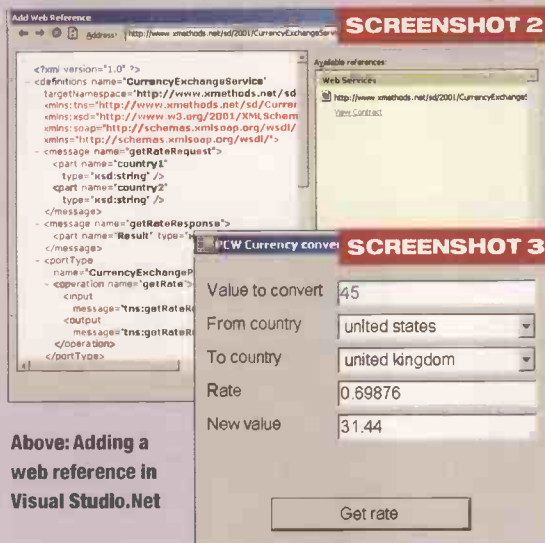
Jbuilder 6.0 has a Web Services Kit which is available for download from Borland's website. This is a preview release and currently requires Jbuilder Enterprise, which can also be downloaded in trial form. It is likely to be integrated with future versions of Jbuilder. After installing the kit, I created a new project, and then added a new application. I added labels, text boxes, combo boxes and a button to create a simple user interface for currency conversion. I've used XYLayout for simplicity, although for a resizable cross-platform application it is best avoided. This particular web service accepts country names, rather than currencies themselves, and the list of supported countries is given in the web service description. Hundreds are listed, but for this test I limited them to just three, populating the combo boxes accordingly:

```
String[] Countries = {
    "united states", "
    united kingdom", "Euro"};
JComboBox cboFrom =
Currency = new
JComboBox(Countries);
```

(Key:  code string continues)

Next, I downloaded CurrencyExchangeService.wsdl from Xmethods.com. I then used the Import WSDL wizard to generate classes for the CurrencyExchangeService.





Above: Adding a web reference in Visual Studio.Net

The reason I downloaded the WSDL file, rather than simply giving Jbuilder the URL, is that I connect through a proxy server. The wizard generates five Java classes, including CurrencyExchangeBindingStub.java. This class gives access to the methods of the web service.

In order to use it, I opened up the source for Frame1, the application window, and added a couple of import statements:

```
import net.xmethods.www.*;
import java.net.*;
import java.text.*;
```

The first of these is the package name generated by the Import WSDL wizard, derived from the specific WSDL file used. Next, I added some code to the application constructor to configure the proxy server:

```
//Connect through proxy server
System.getProperties().put("http.proxySet", true);
System.getProperties().put("http.proxyHost", "192.168.255.100");
System.getProperties().put("http.proxyPort", "4480");
```

The actual values here will depend on what proxy server you use; if you do not use a proxy server the code is not necessary. Finally, I added code to invoke the web service, in the ActionPerformed event handler for the button (see figure 1.1). Note that the URL which is passed to the stub object's constructor is the 'endpoint', the target address of the Soap invocation. You can read this from the WSDL file as the location attribute of the <soap:address> element.

I then ran the application, which works fine. The only disappointing aspect was the speed: around three seconds. Still,

Above: This VB.Net application works well, showing that interoperability is not altogether a myth

Fig 1

## 1.1 Invoking the Jbuilder web service

```
void jbConvert_actionPerformed(ActionEvent e) {

try {
//instantiate web service stub
CurrencyExchangeBindingStub stub = new
CurrencyExchangeBindingStub
(new URL("http://services.xmethods.net:80/soap"));
//get the rate between selected currencies
float fRate = stub.getRate((String)cboFromCurrency.getSelectedItem(),
(String)cboToCurrency.getSelectedItem());

//display it
jtxtRate.setText(String.valueOf(fRate));

//display the resulting currency value
float resultValue = Float.valueOf(
jtxtFromValue.getText().floatValue() * fRate);
DecimalFormat df=new DecimalFormat("0.00");
jtxtResultValue.setText(df.format(resultValue));
}

catch (Exception exc) {
exc.printStackTrace();
}
}
```

## 1.2 Code for Convert button

```
Private Sub cbConvert_Click(ByVal sender As System.Object,
ByVal e As System.EventArgs) Handles cbConvert.Click
Try

' instantiate the web service object
Dim converter As New net.xmethods.www.CurrencyExchangeService()
Dim fromValue As Double = Val(txtFromValue.Text)

'get the rate
Dim rate As Double = converter.getRate(cboFromCountry.Text,
cboToCountry.Text)

'display the rate
txtRate.Text = rate.ToString("n5")

'calculate and display the result
txtResultValue.Text = (fromValue * rate).ToString("n2")
Catch exc As Exception
MsgBox(exc.Message)
End Try
End Sub
```

(Key: ✓ code string continues)

that is a lot quicker than firing up a web browser, navigating to a financial site, and doing the calculation yourself.

## Using Visual Studio.Net

Unlike Jbuilder, Visual Studio.Net was designed for web services from the beginning. As a result, it is even easier to use. Here's how to build the currency converter in Visual Studio.Net.

First, I started a new VB Windows Form application, and designed a form similar to that used in Jbuilder, adding the country names to the combo boxes from the properties editor. Next, from the Project menu, I chose Add Web Reference. In the address bar I entered: `www.xmethods.net/sd/2001/CurrencyExchangeService.wsdl`

Visual Studio.Net conveniently uses the same proxy settings as Internet Explorer,

so it could find the .wsdl file on the net (see screenshot 2). Then I clicked Add reference to add it to the current project. Visual Studio generated a CurrencyExchangeService class. The code for the Convert button is shown in figure 1.2 (see screenshot 3).

The application worked first time. Even though the CurrencyExchangeService is implemented in Java, it is if anything a little easier to create the client in Visual Studio.Net than in Jbuilder.

## CONTACTS

Tim Anderson welcomes your comments on the Visual Programming column. Contact him via the PCW editorial office or email: [visual@pcw.co.uk](mailto:visual@pcw.co.uk). Please do not send unsolicited file attachments. Examples from this column are posted at [www.itwritting.co.uk/pcw](http://www.itwritting.co.uk/pcw).

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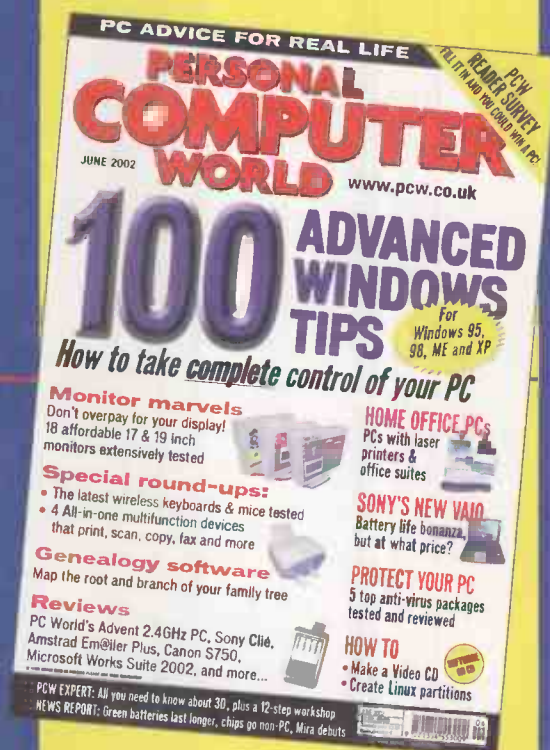
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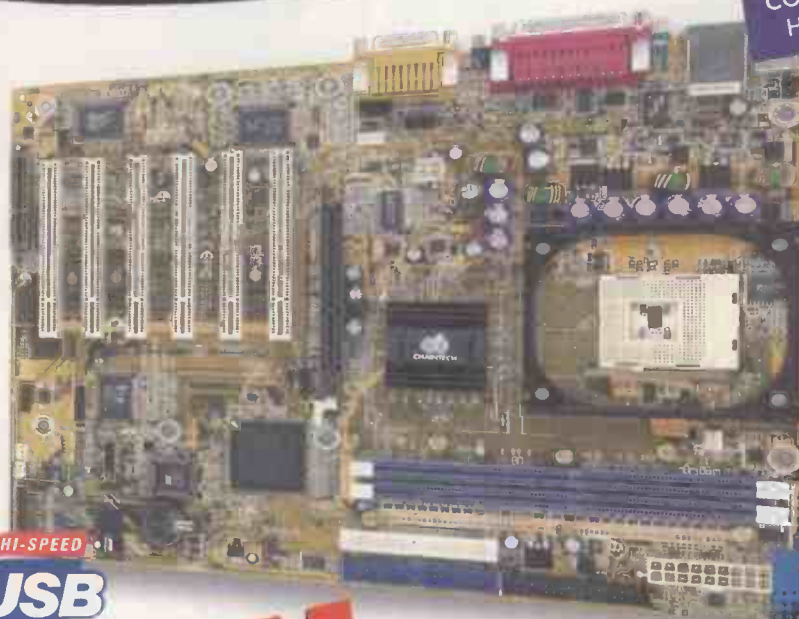
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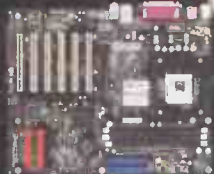
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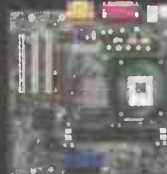
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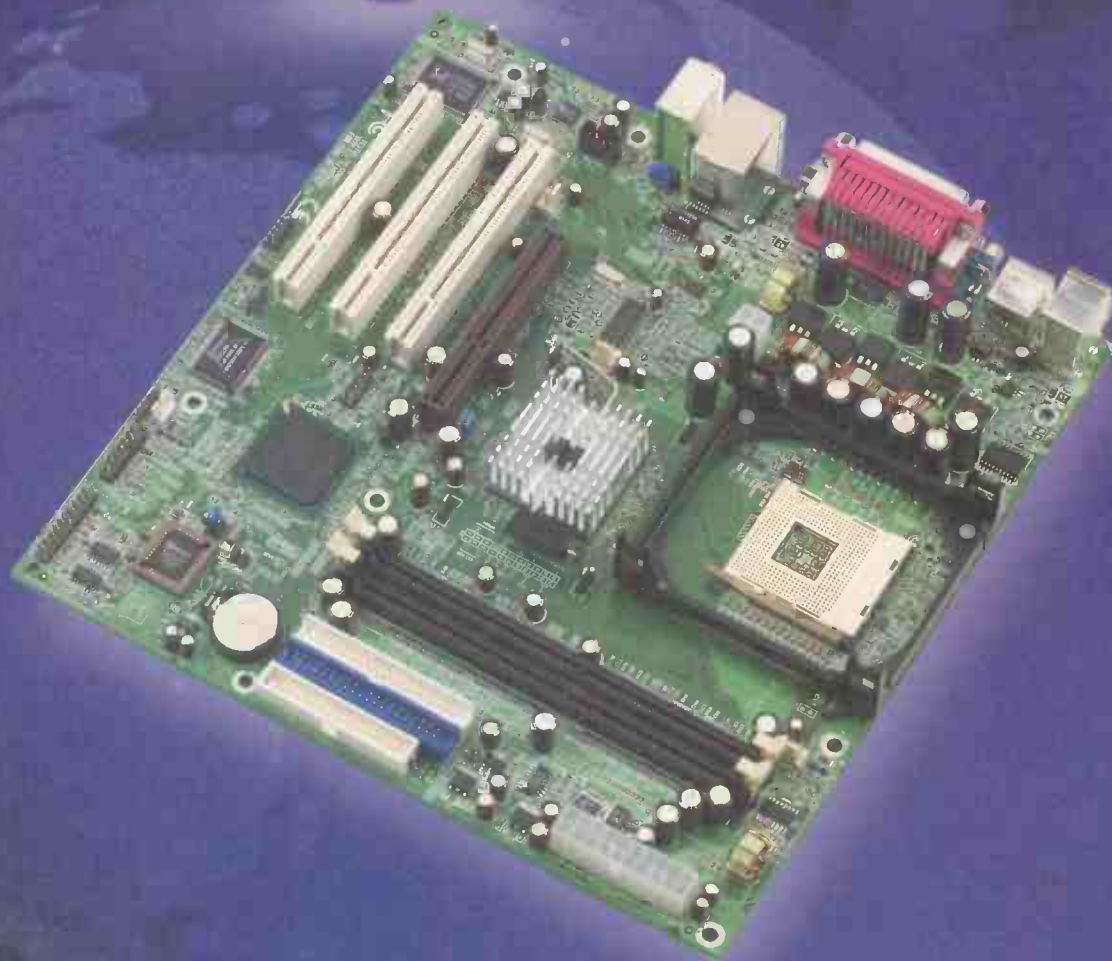
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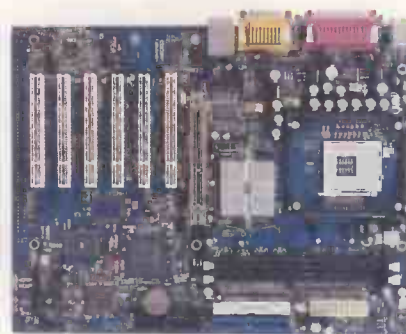
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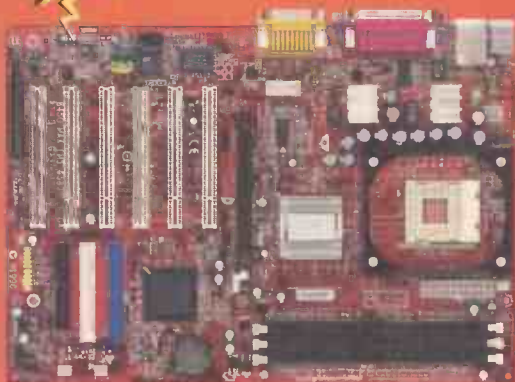
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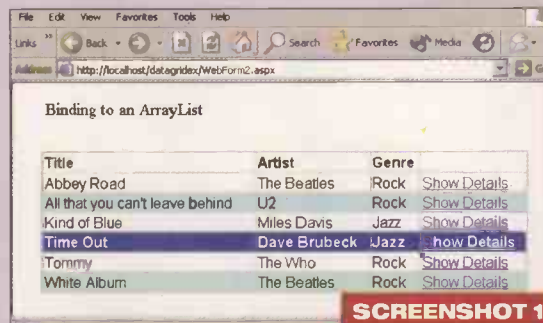
## Defining data

Tim Anderson explores the options that Visual Basic .Net offers for creating DataGrids on the web

**G**rid controls have always been important to Rad (rapid application development) developers. From the earliest days of Visual Basic, third-party grid components have been among the most popular add-ons. The reason is that users find grids a flexible and intuitive means of browsing data. In the past, most grids have operated in either bound or unbound mode, with the unbound mode offering greater control at the expense of increased programming effort.

Visual Studio .Net offers two DataGrids, one for Windows forms and one for web forms. It does not have an unbound mode, but you do not have to bind to database tables. You can bind to any object that implements Systems.Collections.IEnumerable, such as an ArrayList. The ASP.Net DataGrid is true Rad for web developers, making it relatively easy to build web applications that display dynamic data. Here I'm going to show the basics of working with the DataGrid, and then show how to display master-detail data using two DataGrids on an ASP.Net page.

In this column I'm using Visual Basic for the language. Having just ploughed through a book that gave both Visual Basic and C# code for all its examples, I know how tedious this duplication is. It is easy to adapt from one language to the other, so I'll focus on Visual Basic alone.



SCREENSHOT 1

**The customised grid looks better, but remains simple. Note the highlighted row to indicate a selection, in a similar style to Windows applications**

### DataGrid basics

As its name implies, the grid's Datasource property identifies the data to be displayed in the grid. This can be any .Net object that implements IEnumerable. Thus, the minimal code in figure 1.1 places data into an ASP.Net DataGrid.

Binding to an array is inflexible, but an ArrayList is a good choice if you don't need to connect to a Datasource. In figure 1.2 the PCWEx.CD class represents a music CD and has ID, Title, Artist and MusicGenre properties. I've not listed the code for this class, but there is nothing special about it. It has a constructor that takes Title, Artist and MusicGenre arguments to simplify its use. Genre is an enumerated type that can be set to Rock, Jazz or Classical (of course you could extend this). The code in figure 1.2 lists CDs in a DataGrid.

This results in a plain grid that displays the properties in the class, with the

property name becoming the column title. The MusicGenre property is not displayed, since columns are only generated for primitive, String, DateTime or Decimal types. Note that if Viewstate is enabled (which is the default), then the DataGrid retains its contents if the page is reloaded, for example on form submission. Therefore, there is no need to repopulate it when IsPostBack is true.PostBack is an ASP.Net term for the process of reloading the same page, while making changes according to the user's actions.

It is easy to improve on this presentation. Working in the web form designer, right-click the DataGrid and choose Property Builder from the pop-up menu. I selected the Columns tab. First, I unchecked the option to Create columns automatically at run time. Next, I added three Bound columns, and entered values for Header Text and Data Field. In this case, the field names are the property names. Then I added a Button column of the Select type. On the Format tab, I increased the border width and set different colours for alternating and selected items.

Finally, I added a line of code to sort the ArrayList. Screenshot 1 shows the result. When the page first appears, no row is selected, but clicking Show Details causes the page to reload with the selected row highlighted.

Fig 1

#### 1.1 Placing data into an ASP.Net DataGrid

```
Dim myArray() As String = {"One", "Two", "Three"}
DataGrid1.DataSource = myArray
DataGrid1.DataBind()
```

#### 1.2 Listing CDs in a DataGrid

```
Imports DatagridEx.PCWEx
Private Sub Page_Load(ByVal sender As System.Object,
ByVal e As System.EventArgs) Handles MyBase.Load
If Not IsPostBack Then
BindTheData()
End If
End Sub

Private Sub BindTheData()
DataGrid1.DataSource = GetDataSource()
DataGrid1.DataBind()
End Sub

Private Function GetDataSource() As ICollection
Dim cdArrayList As New ArrayList()

cdArrayList.Add(New CD("Abbey Road", "The Beatles",
```

```
CD.Genre.Rock,1))
cdArrayList.Add(New CD("White Album", "The Beatles",
CD.Genre.Rock,2))
cdArrayList.Add(New CD("Kind of Blue", "Miles Davis",
CD.Genre.Jazz,3))
```

```
Return cdArrayList
End Function
```

#### 1.3 Customising the DataGrid

```
Private Sub DataGrid1_ItemDataBound(ByVal sender As
Object, ByVal e As System.Web.UI.WebControls.
DataGridItemEventArgs) Handles DataGrid1.ItemDataBound
Dim itemType As ListItemType = e.Item.ItemType
If (itemType = ListItemType.Item) Or (itemType =
ListItemType.AlternatingItem) Or (itemType =
ListItemType.SelectedItem) Then
Dim thisCD As CD
thisCD = e.Item.DataItem
If thisCD.MusicGenre = CD.Genre.Jazz Then
e.Item.Font.Italic = True
End If
End If
End Sub
```

(Key: ✓ code string continues)

## Changing appearance

A natural next step is to customise the appearance of grid rows according to their value. This is a great technique and has many applications, such as showing significant figures in bold or in different colours, or highlighting special offers, or amending data to expand abbreviations.

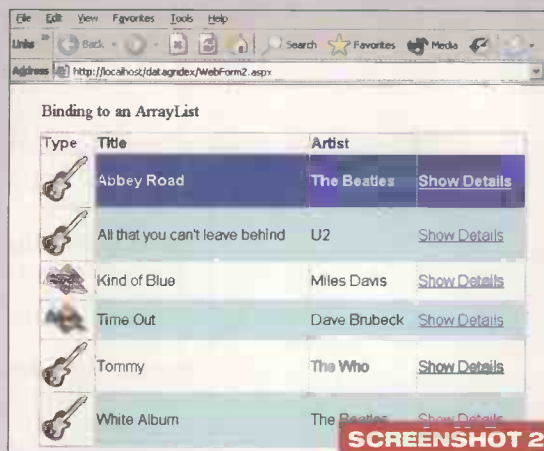
To put it to work, handle the DataGrid's ItemDataBound event. In Visual Studio, I selected the DataGrid in the left-hand dropdown in the code editor, and then ItemDataBound in the right-hand dropdown. For example, rather than showing the genre as a field, another possibility is to put Jazz titles in italics.

The code in figure 1.3 makes use of the DataItem, which is a reference to the object bound to this row of the DataGrid. This reference does not persist; the data is not cached in the DataGrid. It is intended for use while the DataGrid is being populated, so that you have access to the entire source object to make any desired modifications.

## Including Images in rows

What if you wanted an image or a checkbox to render a field in the grid? You can do this with template columns. A template column lets you specify what controls to use to render the data. For this to work, you have to include a databinding expression in the page source. This appears within specific delimiters: `<%# data-binding expression %>`

Databinding expressions are evaluated when DataBind() is called for the component. To illustrate template columns, the next idea is to have an image to represent the music type of each CD. There is one image for each of the values of CD.Genre: Jazz, Rock and Classical. To do this, I opened the Columns editor for the DataGrid and



added a bound column. Then I clicked 'Convert this column into a Template Column'. Looking at the HTML for the asp page, the column I just added appears like the code in figure 2.1.

The EditItemTemplate is not required at this stage, so this can be deleted. The ItemTemplate is set by default to a Label, and it is unbound. I need to change it to an Image, and add a binding expression to retrieve the correct image according to the current value of CD.MusicGenre. In preparation, I added the function in figure 2.2 to the code-behind page. Figure 2.3 shows the TemplateColumn element with the databinding expression added.

The DataBinder.Eval method takes a reference to the data container, and a reference to the required value. There is also an option to specify a string formatting expression. It simplifies code by letting you use a consistent syntax. However, you do not need to use DataBinder. Note that I've also added an ItemStyle-BackColor attribute to the asp:TemplateColumn, so that the image does not appear on a coloured background. This overrides the background colour for the row. The results are in screenshot 2, with images

**Adding a template column lets you display bound data as images, or any control of your choice**

in place in the grid. Using this technique, there are few limits on how you choose to present the data.

## Show details

The Show Details column lets the user select a row, but currently does nothing more. The aim here is to show the tracks of each CD in a separate DataGrid, similar to a subform in an Access application. You can create an event handler for the button by selecting the ItemCommand event for the DataGrid in the Visual Basic editor. This takes a DataGridCommandEventArgs argument, from which you can get a reference to the currently selected DataGridItem. This has a Cells collection from which you can read the values in the selected row. It is no use inspecting the DataItem property, as this will be set to Nothing. Assuming you want to retrieve the primary key for the record, there are two obvious strategies. One is to include an ID column in the grid, with its visible property set to False. The other is to populate the grid's DataKeys collection. For example, you could add this line to the BindTheData routine, before calling DataBind:

```
DataGrid1.DataKeyField = "Id"
```

Now you can retrieve the ID value in the ItemCommand handler:

```
currentID = DataGrid1.DataKeys(e.Item.ItemIndex)
```

In order to put this to work, I amended the code to connect to an SQL Server database, rather than binding to an ArrayList.

## Binding to SQL Server

The starting point for data access is the connection. SQL Server is a secure database, with support for two authentication models. SQL Server security employs a user name and password unique

**Fig 2**

### 2.1 HTML for a Template column

```
<asp:TemplateColumn HeaderText="Type">
  <ItemTemplate>
    <asp:Label runat="server"></asp:Label>
  </ItemTemplate>
  <EditItemTemplate>
    <asp:TextBox runat="server"></asp:TextBox>
  </EditItemTemplate>
</asp:TemplateColumn>
</Columns>
```

### 2.2 Adding a function to the code

```
Public Function GetImage(ByVal GenreVal As CD.Genre) As String
  If GenreVal = CD.Genre.Jazz Then
    GetImage = "images/trumpet.gif"
  ElseIf GenreVal = CD.Genre.Rock Then
```

```
    GetImage = "images/guitar.gif"
  ElseIf GenreVal = CD.Genre.Rock Then
    GetImage = "images/violin.gif"
  End If
End Function
```

### 2.3 The Template column with Databinding expression added

```
<asp:TemplateColumn HeaderText="Type" ItemStyle-
  BackColor="White">
  <ItemTemplate>
    <asp:Image runat="server" Enabled="False" ImageUrl='<%#
      GetImage(DataBinder.Eval(Container.DataItem,
        "MusicGenre"))
    %>' >
  </asp:Image>
  </ItemTemplate>
</asp:TemplateColumn>
```

(Key: ✓ code string continues)





Fig 3

**3.1 Binding to SQL Server**

```
Function GetDataSource() As ICollection
    Dim sConnection As String
    Dim sSQL As String
    Dim da As SqlDataAdapter
    Dim ds As DataSet
    Dim dt As DataTable
```

```
sConnection = "server=MYSERVER;initial
catalog=codelist;integrated security=SSPI"
```

```
sSQL = "Select titles.title, titles.musicgenre,
titles.ID, artists.artist"
sSQL &= " from titles,artists where titles.artistid =
artists.id"
sSQL &= " order by artists.artist, titles.title;"
'You can add search restrictions to this statement
```

```
da = New SqlDataAdapter(sSQL, sConnection)
ds = New DataSet()
da.Fill(ds, "CDTitles")
dt = ds.Tables(0)
Return dt.DefaultView
End Function
```

**3.2 Retrieving child data**

```
If e.Item.ItemIndex >= 0 Then
    ShowTracks(DataGrid1.DataKeys(e.Item.ItemIndex),
e.Item.Cells(1).Text)
End If
```

**3.3 A routine to display track titles**

```
Private Sub ShowTracks(ByVal TitleID As Integer, ByVal
Title As String)
    DataGrid2.DataSource = GetTrackData(TitleID)
    DataGrid2.DataKeyField = "Id"
    DataGrid2.Columns(0).HeaderText = "Tracks for: " + Title
    DataGrid2.DataBind()
End Sub
```

**3.4 The SQL for GetTrack Data**

```
sSQL = "Select Tracks.Track, tracks.ID from tracks where"
sSQL &= " tracks.titleID = " & Str(TitleID)
sSQL &= " order by tracks.OrderNumber"
```

**3.5 Displaying tracks automatically**

```
Private Sub BindTheData()
    DataGrid1.DataSource = GetDataSource()
    DataGrid1.DataKeyField = "Id"
    DataGrid1.DataBind()
```

```
If DataGrid1.DataKeys.Count > 0 Then
    DataGrid1.Visible = True
    DataGrid2.Visible = True
    DataGrid1.SelectedIndex = 0
    ShowTracks(DataGrid1.DataKeys(0),
DataGrid1.Items(0).Cells(1).Text)
Else
    DataGrid1.Visible = False
    DataGrid2.Visible = False
End If
```

End Sub

(Key: ✓ code string continues)

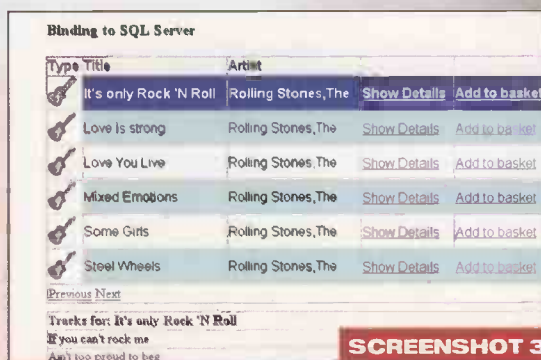
to SQL Server, while integrated Windows security uses the currently logged-on user. SQL Server security is straightforward: just supply the appropriate username and password. If you use integrated security, you need to give the ASP.Net account appropriate access (by default the account is MYSERVER\ASPNET), or else set up identity impersonation using the web.Config file in the web application's directory. After setting up the connection, I rewrote GetDataSource to something like that in figure 3.1.

**Setting up paging**

The code ran as before, except that the data is retrieved from SQL Server rather than from custom objects. However, if there are a lot of rows returned, the page is going to become unwieldy. There are two solutions for this. One is not to allow unrestricted queries that return hundreds or thousands of rows. The other is to turn on paging in the DataGrid. To do this, set the DataGrid's AllowPaging property to True, and the PageSize to something appropriate; I chose just six to keep things tidy. Finally, implement a handler for the DataGrid's PageIndexChanged event. The code is like this:

```
DataGrid1.CurrentPage
Index = e.NewPageIndex
BindTheData()
```

The grid's paging mechanism is effective, but not very sophisticated.



**The completed application, displayed in Netscape Navigator. To get the application working properly in older browsers, the default settings in Visual Studio.Net must be changed**

It works by retrieving data from its Data-source, starting at an index derived from the CurrentPageIndex. There are two problems with this: First, if you are retrieving a lot of data, it is inefficient; most of the data you retrieve is never displayed. Second, if the data is changing, the paging system might get it wrong. For example: the first page is displayed with six records. Elsewhere, a user deletes one of these records. Now the web user pages forward. What was the seventh record is now the sixth and won't be displayed. If this might be a problem, look into the custom paging feature, which lets you write your own code to handle paging.

**Retrieving child data**

With the paged grid up and running, it is time to look again at the retrieval of child records. I placed a second DataGrid on the form, and set up a single column

bound to the Track field. Next, I put the code from figure 3.2 into the ItemCommand event handler. Figure 3.3 shows the routine to display the tracks.

There's no need to show the code for GetTrackData, since it is virtually the same as that for GetDataSource. Figure 3.4 shows the SQL. Finally, I fixed the data binding routine (figure 3.5) so that tracks would be displayed automatically for the first CD in the list. The DataGrids don't look good when there is no data to display, so this routine also makes them invisible if the query is empty.

Screenshot 3 shows the final result. I've used Netscape 4.x for this illustration, to show that it works on older browsers. In order to achieve browser compatibility, you need to set the Target schema accordingly in the project properties. For older browsers, positioning is done with tables rather than using styles.

**CONTACTS**

Examples from this month's column are available at [www.itwritng.com/pcw](http://www.itwritng.com/pcw). The code in figures 1, 2 and 3 are also on this month's cover disc.

Next month this column becomes the Web Development and Ecommerce column. Contact us via the PCW editorial office or email: [webdev@pcw.co.uk](mailto:webdev@pcw.co.uk). Please do not send unsolicited file attachments.

# The final transaction

Nigel Whitfield looks back at some important developments and forward to a revamped ecommerce column

As Sid Vicious once said, and now the end is near. It is, in fact, the final curtain for PCW's Hands On Ecommerce column in its current incarnation, though not for our coverage of ecommerce.

This is the twenty-fourth column, so we've been going for two years, during which time I've looked at various aspects of ecommerce, including the procedures involved from a business point of view and the configuration and installation of ecommerce packages.

We've also touched on how to promote your site, the hurdles and hassles involved in taking certain types of payment, and the tips and tricks you'll need to get the most out of some of the software that's been featured.

You'll be glad to know that ecommerce isn't going away completely; from next month's issue of PCW there'll be a Web Development and Ecommerce column, where we'll tackle both issues, so you can be sure we'll continue to look at how you can put your business online and make it attractive to potential customers.

## Looking back

So over the past two years, what have been the most significant developments in ecommerce, and which issues have elicited the greatest response?

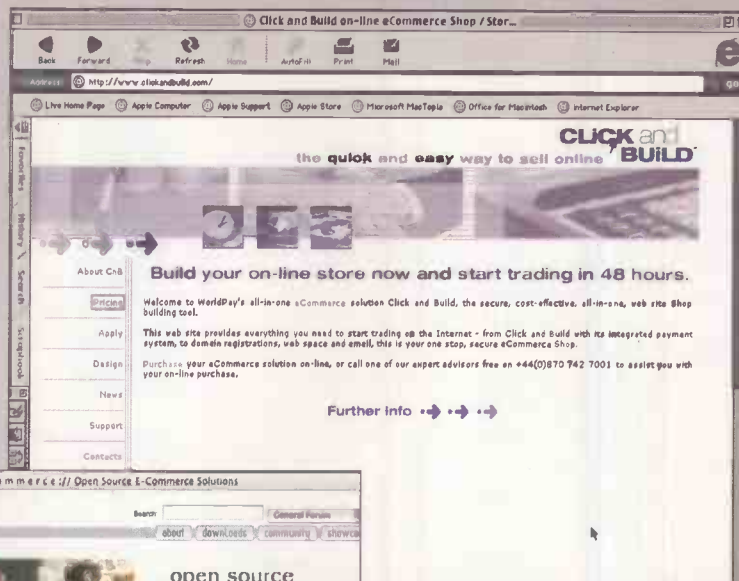
One of the most interesting areas, not surprisingly, is how to set up your own online shopping system, and we've covered some of the alternatives. Some of them, in fact, don't even involve you doing anything other than setting up a site full of links – why not take the route of many others and affiliate with a giant such as Amazon, creating a virtual shop that still pays you commission?

You can always look at selling your products through someone else's online shop, too, but then, of course, you'll almost certainly be looking at paying a commission on the sales – and some of the 'online mall' type stores charge quite a lot.

It's far better, then, to set up your own shop if at all possible, and there are a number of different ways to do it. You could use a system like World Pay's Click And Build, for example, which allows you to design an online shop simply by filling in a series of web forms, choosing templates and uploading

**Right: Design an online shop with Click and Build**

**Below: OSCommerce is a major project to undertake**



information about products, including pictures, to the Click And Build site ([www.clickandbuild.com](http://www.clickandbuild.com)).

The advantage of this is that you won't have to worry about the technical side of things. As long as you can follow a walkthrough, and fill in the forms properly, you'll be up and running fairly quickly. The World Pay solution also includes a bureau option, for those who aren't set up to deal with credit cards, or don't want to jump through the hoops that banks insist on for those who want to do online transactions.

## Off the shelf

If you want something more than the options provided by Click And Build, we've looked at dedicated ecommerce packages, including Actinic's Catalog ([www.actinlc.com](http://www.actinlc.com)), which you can run on your PC, with a self-installing set of scripts to add a secure shopping basket to your web server, and OSCommerce ([www.oscommerce.com](http://www.oscommerce.com)), formerly known as The Exchange Project (TEP).

Both are quite different approaches. Catalog is very powerful and flexible, but you still don't need to know anything about how your web server works to add it to your site.

OSCommerce, by contrast, is a major undertaking. While you can get it running without knowing too much, you will require a lot more knowledge of things under the hood to make the most of it – and it provides a lot of opportunities for customisation.

There's also Shop @ssistant at [www.floyd.co.uk](http://www.floyd.co.uk), which is perhaps a middle way – you can add it to your site with a few drag and drop movements in Dreamweaver, but you'll have to get your hands dirty to fine tune the configuration, as we saw in the November 2000 issue.

And for the diehards who want to go it alone, we've gone further under the hood over the past two years, looking at how you could start to roll your own ecommerce solution, and housekeeping tasks such as securing parts of your site, and installing secure certificates to protect transaction data as it passes over the Internet.

We've also seen how you can track visitors as they move around your site, to help find out if positioning a product on the front page, for example, increases sales.

## More than just shops

But the ecommerce column has been about more than just setting up a



commerce package. We've looked at some of the other aspects of getting up and running too.

One that's common to every type of shop is getting your catalogue of products online. Filling in a web form or a page in a sales application, such as Catalog, for each one can be laborious, and since you already probably have the data in a database or spreadsheet, it makes sense to use that file and automate the process.

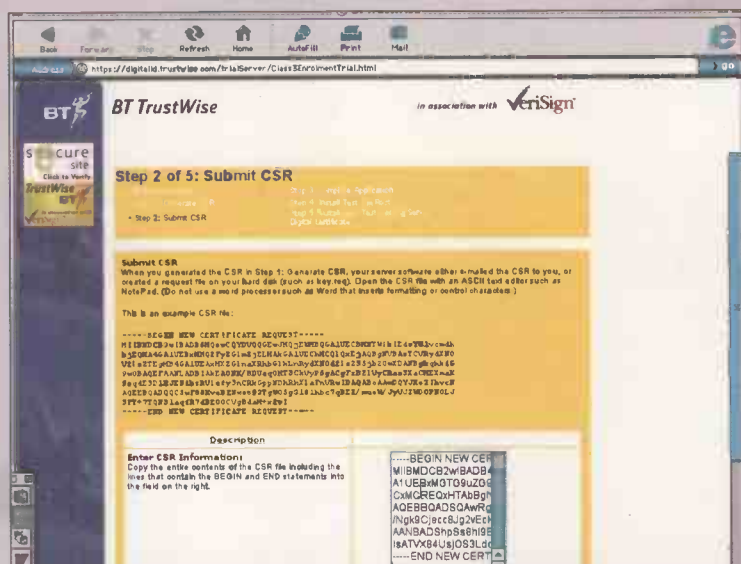
We've covered that problem for a number of different systems, with plenty of tips and tricks that should make it easier for you to transfer all your products online without having to spend ages slaving over a browser rekeying information you already have.

There are other considerations, too, besides the purely technical. And ecommerce itself isn't necessarily just about selling things online.

One of the current Government's stated aims is that a large proportion of our transactions with it should be possible online. For many businesses, one of the most important of those is filing your VAT return, something that is now possible via the Government gateway. You might find, however, that doing so isn't quite such plain sailing as the officials might have you believe.

Marketing is another big problem. Just how do you get people to visit your online store? Direct email is one

**We've covered Information such as securing parts of your site and installing secure certificates**



solution, but one that I'd certainly discourage and, despite some of this column's correspondents saying 'How else do we promote our business?' I don't think I'll ever be persuaded that polluting the inboxes of people who haven't asked for your email creates a good impression.

As one reader who tried it found, it did little for his sales, but certainly ensured he received lots of junk in return.

And finally, there are the trials and tribulations of taking payment from people. Are your margins good enough to absorb the cost of processing credit

cards, especially if you have to use a bureau service? And what about other mechanisms, such as Paypal, or reverse billing via SMS?

Every method has its pros and cons, depending on what sort of business you're running, and who'll be buying from you. I hope that over the past two years, I've given many of you enough information to at least make you think about the best ways of approaching these problems.

## Farewell

There is, of course, no one answer to anything, and there are plenty of different ways to approach ecommerce. Though this column may be ending, I'll still be delighted to hear from people with their views and ideas, though I can't promise a reply to everyone's email.

And in the context of both the Hands On Web Development and Ecommerce column and occasional features, PCW will still be looking at some of the issues affecting people who want to do business online.

I hope you've found this column as informative to read as I have to write and research it. Please join me over in the new Web Development and Ecommerce column in coming months.

Meanwhile, I'll be putting as many of the past ecommerce columns as I can together online at [www.nigelwhitfield.com](http://www.nigelwhitfield.com).

## CONTACTS

Nigel Whitfield welcomes your comments on the new Web Development and Ecommerce column. Contact him via the PCW editorial office or email: [webdev@pcw.co.uk](mailto:webdev@pcw.co.uk). Please do not send unsolicited file attachments.

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# The correct protocol

Roger Gann continues his look at TCP/IP with explanations of IP addresses and subnetting

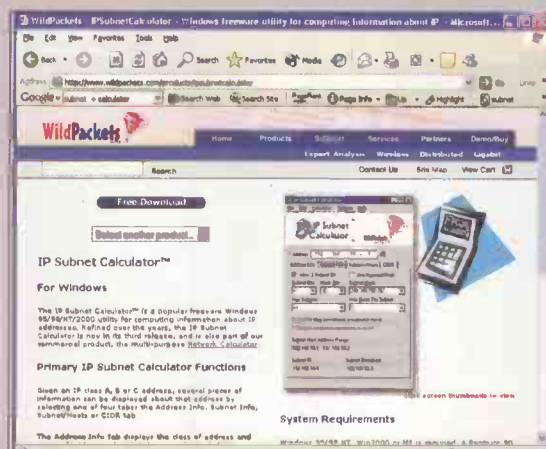
Last month I began exploring the mysteries of the Transmission Control Protocol/Internet Protocol – TCP/IP to you and me. I'll conclude this month by looking at IP addresses and the vexed matter of subnetting.

So let's start with an easy one – what's an IP address? As we saw last month, it's a unique number used to identify a particular interface on a PC or other host. At the moment, an IPv4 address contains 32 bits of data, but if IPv6 becomes more widespread, then this will double to 64 bits. Thirty-two ones and zeros are less than memorable and so to make things more palatable to human eyes, IP addresses are normally rendered in a decimal notation that uses periods to separate each byte (more correctly, an 'octet'). For example, the IP address 00001010 00000000 00000000 00000001 is a lot easier to remember when expressed as 10.0.0.1. Which notation would you prefer?

So far so good. However, the IP address has to do two jobs – it has to indicate both the network and the host within the network. Back in the mists of techno-antiquity, it was imagined that eventually there would be lots of IP networks. Most would be small, and 24 bits could represent all the different IP networks. It was also felt that some very big networks might need 24 bits to represent all their hosts, which would lead to 48bit addresses. A compromise was therefore reached – 32 bits. Assuming that most networks would be small, the original TCP/IP specifiers set up different ranges or classes of IP address, where the values of the leftmost four bits of an address determine its class.

All 'Class A' addresses, for example, have the leftmost bit set to zero, thus: 0xxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx

Converting this template to decimal notation shows that Class A addresses



include all values in the range 0.0.0.0 to 127.255.255.255. Addresses beginning with 1 to 126 use only the first octet for the network number. Thus 24 bits are available for hosts. As you might imagine, few normal organisations qualified for a Class A address.

Class B addresses must have the leftmost bit set to one, and the next bit set to zero, but all other bits may vary. Thus network numbers are 128.1.x.x through to 191.254.x.x. Addresses commencing 127.x.x.x are avoided – these have a special use – for example the 'dummy' loop-back connector used for testing purposes is usually 127.0.0.1. The last two octets are available for host addresses, giving 16 bits of host address. This allows for 65,534 computers, which should be enough for most organisations.

The runt of the litter is the Class C address. Class C addresses use three octets, in the range 192.1.1 to 223.254.254. These allow only 254 hosts on each network, but there can be lots of these networks. Addresses above 223.x.x.x are reserved for future use – Class D has been pencilled in for multicasting, while Class E remains undefined. Table 1 (below) summarises the overall breakdown of all IP addresses into this class system.

Computing the required subnet mask for a given range of IP addresses is mind-boggling – it's easier to download the free IP Subnet Calculator from [www.wildpackets.com/products/ipsubnetcalculator](http://www.wildpackets.com/products/ipsubnetcalculator)

Nearly all of the Class A and Class B IPv4 address domains have already been assigned to large organisations. Addresses in the Class D and E ranges have been reserved for special purposes by the IP administrative authorities. Effectively this leaves only the Class C address ranges available.

In any event, the class concept is now legacy terminology, superseded by CIDR – Classless Inter Domain Routing, effectively a type of subnetting. Network address classes failed to scale up with the size of the Internet. There were two problems with them. The first is that network address classes are not an efficient way to allocate IP addresses. A network of 12 workstations really doesn't need a class C network but had little choice, meaning the unused addresses in the class C went to waste.

Class A networks were far too large for anyone to justify needing the space, and were difficult to allocate. Class C networks were too small for most organisations. The most commonly requested size of network was the Class B network; so much so that there weren't enough to go around. When that happened, the authority responsible for allocation started forcing smaller organisations to apply for several class C networks rather than a class B network.

Since the result is neither one thing nor the other, in CIDR terminology, they're not called classes any more. Instead, the network number is quoted, followed by a / and then the number of bits that indicate the network.

An old class C, then, becomes a /24, for example 192.168.1.0/24. Four adjacent class-C style networks could be described as a /22. CIDR makes even smaller network allocations possible too – a /27 gives 32 addresses, for example, while a /28 gives 16. But to understand more, we need to look at netmasks and subnetting.

## Subnets

Lans consist of individual segments of network cable. Gateway devices such as routers and bridges are used to link these segments together.

There are administrative reasons to want to partition a network as well, and it is possible to break a network down in to virtual network segments that partition

## IP ADDRESSES

TABLE 1

Class	Leftmost bits	Start address	Finish address	Default mask
A	0xxx	0.0.0.0	127.255.255.255	255.0.0.0
B	10xx	128.0.0.0	191.255.255.255	255.255.0.0
C	110x	192.0.0.0	223.255.255.255	255.255.255.0
D	1110	224.0.0.0	239.255.255.255	N/A
E	1111	240.0.0.0	255.255.255.255	N/A



the traffic flowing through the cable rather than the cables themselves. These virtual segments are known as subnets.

Subnetting allows network administrators some flexibility in defining relationships among network hosts. Hosts on different subnets can only 'talk' to each other through gateway devices such as routers. The ability to filter traffic between subnets can make more bandwidth available to applications and can limit access in desirable ways. It can improve manageability, too: for any given /16 (class B) network, there are 65,534 usable addresses. This is usually way too many computers to have on any one physical segment of the Lan.

## Subnet masks

Just like IP addresses, subnet masks contain 32 bits of data and usually appear in the same 'dotted decimal' notation. For example, a very common subnet mask in its binary representation: 11111111 11111111 00000000 will usually be shown in the equivalent, more human-readable form: 255.255.255.0

Applying a subnet mask to a full IP address has the effect of splitting it into two parts, an 'extended network address' and a host address. For a subnet mask to be valid, its leftmost bits must be set to one and its rightmost bits must be set to zero. Put simply, subnets take some of the bits that represent hosts and use them to represent a subnet instead.

Nowadays you'll often see addresses written in the form 192.168.1.13/25 to indicate that the address has a 25bit netmask. The concept of subnetting can be tricky to grasp. Let's say my company uses a private address network in the 192.168.1.x range for its internal hosts. It is a /24 (class C) network and its default subnet mask of 255.255.255.0 will allow all PCs to be peers on the network by default. But we don't want that as we'd like to keep the accounts and HR sections private. To subnet this network, more than 24 bits must be set to one on

## A TWO-SUBNET NETWORK

Network address (24 bits)	Subnet number (1 bit)	Extended network	Host address range
11000000 10101000 00000001	0	192.168.1.0	192.168.1.1 – 192.168.1.127
11000000 10101000 00000001	1	192.168.1.128	192.168.1.129 – 192.168.1.255

```

C:\>ipconfig /all

Windows IP Configuration

Host Name . . . . . : althorn-1000
Primary Dns Suffix . . . . . : shellbusiness.local
Node Type . . . . . : Unknown
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Ethernet adapter Local Area Connection:

Connection-specific DNS Suffix . . . :
Description . . . . . : 3Com 3C905IX-based Ethernet Adapter
(PN091C)
Physical Address. . . . . : 00-60-97-01-C8-29
Dhcp Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
IP Address. . . . . : 10.0.0.11
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 10.0.0.2
Dhcp Server . . . . . : 23 March 2002 10:58:42
Lease Obtained . . . . . : 31 March 2002 10:58:42
Lease Expires . . . . . : 31 March 2002 10:58:42
    
```

**IPConfig is a handy little command utility that sums up all your IP settings – Windows 9x users get the slightly sexier WinIPCFG**

the left side of the subnet mask. For instance, the 25bit mask 255.255.255.128 creates a two-subnet network as shown in table 2.

For every additional bit set to one in the mask, another bit becomes available in the subnet number to index additional subnets. A two-bit subnet number can support up to four subnets, a three-bit number supports up to eight, and so on.

Just as the netmask can be used to route information on your Lan, so it's now used in CIDR to specify routing over the Internet, helping to allocate addresses much more flexibly than in the past.

## Special numbers

In TCP/IP-speak, 0 and 255 have special meanings. 0 is reserved for machines that don't know their address. In certain circumstances it is possible for a machine not to know the number of the network it is on, or even its own host address. For example, 0.0.0.23 would be a machine that knew it was host number 23, but didn't know on what network.

255 is used for 'broadcast'. A broadcast is a message that you want every system on the network to see. Broadcasts are used in some situations where you don't know who to talk to.

For example, if you need to look up a host name and get its Internet address; sometimes you don't know the address of the nearest name server. In that case, you might send the request as a broadcast.

In order to send a broadcast, you use an address that is made by using your network address, with all ones in the part of the address where the host number goes. For example, if you are on network 62.104.200, you would use 62.104.200.255 for broadcasts. For convenience, the TCP/IP standard also allows 255.255.255.255 to be used. This refers to all hosts on the local

network. It is often simpler to use 255.255.255.255 instead of finding out the network number for the local network and forming a broadcast address such as 62.104.200.255.

So, because 0 and 255 are used for unknown and broadcast addresses, normal hosts should never be given addresses containing 0 or 255 – which is why, as those adept at binary arithmetic will have noticed, a /16 network only gives you 65,534 host addresses and not 65,536. Addresses should never begin with 0, 127 or any number above 223.

## Private number

Some TCP/IP networks are set up with the intent that they will never be connected to the global Internet. This type of network is usually referred to as a Private Network and they use 'private' IP addresses.

Some private networks are set up for security reasons and others simply because their purpose does not require Internet connectivity. The Internet Assigned Numbers Authority (IANA) has reserved the following three blocks of IP addresses space for private Internets aka local networks, using the old class system:

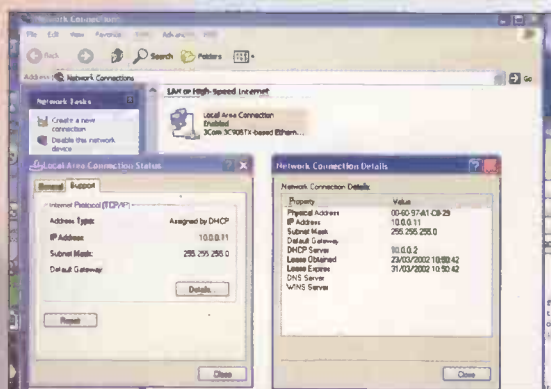
Class A 10.0.0.0 – 10.255.255.255  
Class B 172.16.0.0 – 172.31.255.255  
Class C 192.168.0.0 – 192.168.255.255

As you see, you can have multiple class C networks with about 250 computers in each one. That allows you to have multiple sites with a coherent addressing scheme, especially if you take advantage of CIDR. Additionally, IP addresses in the range of 169.254.0.0 – 169.254.255.255 are reserved for Automatic Private IP Addressing (APIPA).

Needless to say, these are private (as opposed to public) IP addresses and so shouldn't be used on the Internet. And because they are not connected to the Internet, it means that private IP addresses can be reused (ie duplicated) by various networks.

## CONTACTS

Roger Gann welcomes your comments on the Networks column. Contact him via the PCW editorial office or email: [networks@pcw.co.uk](mailto:networks@pcw.co.uk). Please do not send unsolicited file attachments.



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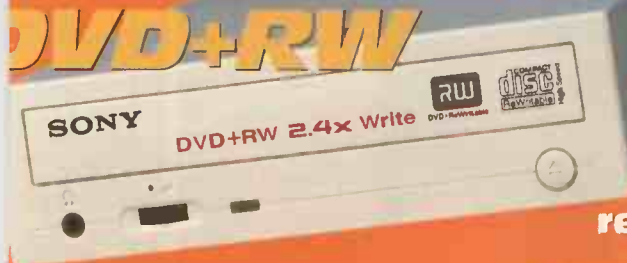
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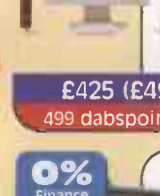
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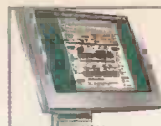
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APPLE PowerBook			
160KPW	G4 550 256/12/CD-RW/DVD/15.2"	1635	1921.12
160LPW	G4 667 512/30/CD-RW/DVD/15.2"	2115	2485.12
SONY			
168CPW	FX503 PIII1GHz 256/20 CD-RW/DVD	1089	1279.57
16MTPW	SRX41P PIII800A 256/30 LAN/WXP	1499	1761.32
17J5PW	R600HFPD PIII1GHz 256/30 CD-RW/DVD	1469	1726.07
12D2PW	GR214MP PIII1GHz 256/20 CD-RW/DVD	1290	1515.75
12D5PW	GR215MP PIII1GHz 256/30 CD-RW/DVD	1850	2173.75
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13ONPW	iPAQ H3850 64MB PC2002 Colour	429	504.07
137ZPW	iPAQ H3760 Pocket PC Colour 64	379	445.32
HEWLETT PACKARD			
11JGPW	Jornada 565 32MB	330	387.75
11JUPW	Jornada 568 64MB	370	434.75
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## Satellite 1800-354S

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16FVFW	Sat 1800-314	679	797.82
16VPPW	Sat 3000-X4 C935 128/15/DVD/WXP	739	868.32
16VMPW	Sat 1800-354S C1100 128/15/CD/W98	765	898.87
16VDPW	Sat 1800-514 C1000 128/15/DVD/WXP	865	1016.37
16VNPW	Sat 1800-654S C1100 128/20/DVD/W98	959	1126.82

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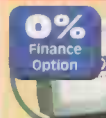
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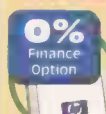


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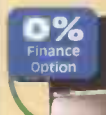


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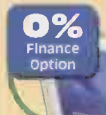


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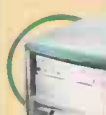


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**CTX VL700 17" FST**  
quicklink 7C8PW  
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**CTX**

- Resolution 1024 x 768@114Hz
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- Pixel Pitch: 0.27mm
- Plug and Play
- PC/MAC
- 3 Year on-site warranty

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quicklink 162DPW  
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**£119 (£139.82)**

**NEC/MITSUBISHI**

- 16" viewable screen area
- 0.24mm aperture grille
- 1600 x 1200 resolution
- Invar shadow mask
- Anti-glare
- Plug and Play
- 3 Year Warranty

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**VM1451 19" FST Display**  
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quicklink 15CPW

**Sony CPD-E430 19"**  
quicklink 12PCPW  
www.dabs.com/sony

**£299 (£351.32)**

**SONY**

- 1.3 MegaPixel resolution (1280 x 1024) at 91 Hz
- Stylish design and great images
- Visually flat screen
- L-SAGIC electron gun
- 3 Year Warranty

**CTX VL950T 19"**  
quicklink 7CFPW  
www.dabs.com/ctx

**£165 (£193.87)**

**CTX**

- Resolution 1600x 1200 @75Hz
- 19.0" CRT (18.0" viewable)
- Pixel Pitch: 0.26mm
- Plug and Play
- PC/MAC
- 3 Year on-site warranty

**iiyama VM Pro 454 19"**  
quicklink 1689PW  
www.dabs.com/iiyama

**£289 (£339.57)**

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- 19" CRT (18" viewable)
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quicklink PSNPW

**Sony CPD-E530 21"**  
quicklink 14KCPW  
www.dabs.com/sony

**£499 (£586.32)**

**SONY**

- 1.9 MegaPixel resolution (1600x1200) @95 Hz
- Stylish design and great images
- Visually flat screen
- L-SAGIC electron gun
- 3 Year Warranty

**CTX VL1300 21"**  
quicklink 14PLPW  
www.dabs.com/ctx

**£389 (£457.07)**

**CTX**

- Resolution 1600 x 1200@91Hz
- 21" FST (20" viewable)
- Pixel Pitch: 0.26mm
- Plug and Play
- PC/MAC
- 3 Year on-site warranty

**iiyama VM Pro 512 22"**  
quicklink 12LDPW  
www.dabs.com/iiyama

**£539 (£633.32)**

**iiyama**

- 20" viewable
- Maximum resolution 1800 x 1440@82Hz
- PC/Mac compatible
- Plug & Play
- 0.24mm AG Pitch
- Tilt & Turn Stand
- On-screen display

**Relisys**  
**TL540 15" TFT Monitor**  
Portrait/Landscape  
Swivel Panel  
Silver/Carbon Trim  
Includes speakers  
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quicklink 10HBPW

**Sony SDM-M51D 15.1"**  
quicklink 10PZPW  
www.dabs.com/sony

**£369 (£433.57)**

**SONY**

- Designer TFT LCD
- 1024 x 768
- DVI-I Digital/Analogue Input
- Intelligent Auto-Adjust
- Double pivot stand

**CTX PV505 15.1" TFT**  
quicklink 11J7PW  
www.dabs.com/ctx

**£249 (£292.57)**

**CTX**

- 1024 x 768
- Pixel Pitch: 0.30mm
- 16.7 million colours
- TCO '99
- Pivot Screen (software extra)

**Dabsvalue 15" TFT LCD**  
quicklink 10C7PW  
www.dabs.com/value

**£249 (£292.57)**

**dabsvalue**

- TCO '99
- 1024 x 768
- 250:1 Contrast
- Great quality at a great price!
- 3 Year On site Warranty

**iiyama**  
**VL770 17" FST Display**  
18" viewable  
Max resolution 1280x1224  
0.264mm dp  
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www.dabs.com/iiyama

**£449 (£527.57 inc VAT)**  
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quicklink 15CPW

**Relisys TL770 17"**  
quicklink 11J9PW  
www.dabs.com

**£435 (£511.12)**

**RELISYS**

- 1280 x 1024
- 60-75Hz
- 0.264mm pitch
- Built in speakers and headphone socket

**CTX PV720A 17.1" TFT**  
quicklink 1138BPW  
www.dabs.com/ctx

**£459 (£539.32)**

**CTX**

- 17.1" TFT LCD Panel
- 0.26 mm Pixel Pitch
- Resolution 1280 x 1024
- 24-bit (16.7M colour)
- 3 years warranty

**Dabsvalue 17" TFT LCD**  
quicklink 10C8PW  
www.dabs.com/value

**£375 (£440.62)**

**dabsvalue**

- TCO '99
- 1280 x 1024 @60Hz
- 16million colours
- Great quality at a great price!
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quicklink 15CPW

**Sony SDM-M81 18.1"**  
quicklink 108FPW  
www.dabs.com/sony

**£799 (£938.82)**

**SONY**

- Max. resolution 1280 x 1024
- Ultimate modern design
- Integrated speakers
- PC & Mac Compatible
- 3 Year Warranty

**CTX PV880C 18.1" TFT**  
quicklink 116DSPW  
www.dabs.com/ctx

**£679 (£797.82)**

**CTX**

- 18.1" LCD
- 0.28 mm Pixel Pitch
- Resolution 1280 x 1024
- On Screen Display
- USB
- Plug and Play
- 3 Year on-site warranty

**LCD 1830 18" LCD TFT**  
quicklink 11Y9PW  
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**£699 (£821.32)**

**NEC/MITSUBISHI**

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quicklink 177KPW

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- 3.1 megapixel
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quicklink	FUJIFILM	ex VAT	inc VAT
YBKPW	FinePix 6900 zoom Digital Camera	505	593.37
14CKPW	Axia-ix 100 Digital Camera	82	96.35
11JWPW	FinePix 2600 Zoom Digital Camera	209	245.57

FUJIFILM

### Sony DCR-TRV340 Digital Handycam D8

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Take exceptional-quality digital video & great digital still photos that you can quickly & easily transfer to your computer using Memory Stick® or the built-in USB connection.

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- Digital Still Memory Mode
- MPEG Movie Mode
- 2.5" SwivelScreen™ LCD Display
- Super SteadyShot®
- 12-Bit/16-Bit PCM Digital Stereo

SONY

### Minolta Dimage X

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A Revolutionary Digital Camera Design Incorporating a 3x Optical Zoom

- 2.0 million pixel digital
- 20 mm depth
- 3.8cm TFT colour - Total number of pixels: 110,000

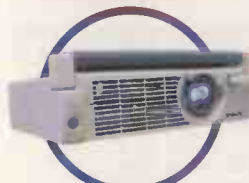
quicklink	MINOLTA	ex VAT	inc VAT
XZ1PW	Dimage S	419	492.32
ZZFPW	Dimage 5304	279	327.82

MINOLTA

### Sony VPL-CS4 Ultra Portable Projector

quicklink 13MTPW

www.dabs.com/sony



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Finance  
Option

Designed to work with almost any computer and video source, this projector offers "true plug and play" operation

- SVGA 1000ANSI Lumens
- Weighs just 2.4kg
- Auto pixel alignment
- Stereo Speakers
- Quiet operation

SONY

### Canon Ixus V2 2.0 Megapixel DC

quicklink 1YCHPW

www.dabs.com/canon



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- 2 Megapixel CCD
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- USB Interface

quicklink	CANON	ex VAT	inc VAT
XNMDC	Digital IXUS V	309	363.07
10HXDC	PowerShot G2	539	633.32
13VDCD	PowerShot S30	399	468.82

### DX-4900 EasyShare

quicklink 1Y75PW

www.dabs.com/kodak



Kodak

- 4.0MP resolution
- 6X zoom (2X optical, 3X Advanced Digital Zoom)
- COMPACTFLASH memory card expansion slot
- Compatible with the KODAK EASYSHARE camera dock

quicklink	KODAK	ex VAT	inc VAT
1YJ5PW	DX3600 Easyshare	189	222.07
1YJ6PW	Easyshare Dock	37	43.47

### HP 812 Digital Camera

quicklink 1Y1DPW

www.dabs.com/hp



hp  
invent

- 4 Megapixel Digital Camera
- Exceptional Image quality
- Easy-to-use
- Destination pre-selection
- HP Instant share
- Docking station (optional)

quicklink	HP	ex VAT	inc VAT
1Y1BPW	120 Digital Camera	75	88.12
1Y1HPW	318 Digital Camera	145	170.37
1Y1JPW	612 Digital Camera	180	211.50
1Y1CPW	715 Digital Camera	265	311.37

### Epson EMP-50 SVGA 1000 ANSI Lumens

quicklink VRWPPW

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- DVD compatible

EPSON

- A lightweight, high bright compact projector targeted at the mobile presenter and home entertainment enthusiast and provides maximum portability without sacrificing advanced features and brightness.

quicklink	SONY	ex VAT	inc VAT
17GTPW	EMP-51 SVGA 1200 Lumens 3.1kg	1749	2055.07
VRXPPW	EMP-70 Ultraportable XGA	1799	2113.82
17GVPW	EMP-71 XGA 1000 Lumens 3.1kg	2149	2525.07
12W6PW	EMP-600 1700 ANSI Lumens SVGA	2486	2921.05
VRYPW	EMP-505 Ultraportable SVGA	2499	2936.32



### Nikon CoolPix 885 Digital Camera

- 3.2 Megapixel Resolution
- 16MB Flash Card
- Built-in Flash
- 1.5" Colour LCD-display

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### NEC VT45C LCD Projector

- 1000 ANSI Lumens
- SVGA (800x600) with three 0.7" LCD panels
- Weighs only 2.5kg
- 3-year warranty

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www.dabs.com

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### OLYMPUS C220 Zoom Digital Camera

- 2.1 Megapixel
- 8MB SmartMedia Card
- 3x optical zoom
- 2.5x digital zoom

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### CREATIVE Webcam USB 1.1 Interface

- Video resolutions from 160x120 to 352x288
- Advanced CMOS sensor (352x288 resolution)

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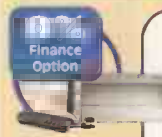


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quicklink	CREATIVE	ex VAT	inc VAT
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XCPSPW	DAW311 CD Player	55	64.62
14CLPW	DAW316 CD Player	59	69.32
14CMPW	MCD380	79	92.82
	<b>SONY</b>		
1101PW	NW-E7 Network Walkman	165	193.87
T6TPW	NWE3 Network Vers	175	205.62

### Speakers

quicklink	CREATIVE	ex VAT	inc VAT
11YFPW	Inspire 5.1 5300	75	88.12
13WTPW	Inspire 5.1 5700	212	249.10
12PGPW	CSW Megaworks 5100	255	299.62
	<b>VIDEOLOGIC</b>		
GCOPW	Digitheatre	175	205.62
16YFPW	ZXR-500	57	66.97
WHHPW	Digitheatre LC	89	116.32

### Inkjet Printers

quicklink	Canon	ex VAT	inc VAT
1646PW	S200	48	56.40
1648PW	S300	79	92.82
1649PW	S520	119	139.82
	<b>Epson</b>		
X4GPW	Stylus Color C20	44	51.70
X4HPW	Stylus Color C40	52	61.10
10GVPW	Stylus Color C80	131	153.92
11LHPW	Stylus Color C70	103	121.02
119JPW	Stylus Photo B10	89	104.57
Y2JPW	Stylus Photo B95	133	156.27

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quicklink	CANON	ex VAT	inc VAT
Z51PW	LBP-810	165	193.87
	<b>KYOCERA</b>		
ZJLPW	FS-1000+	237	278.47
R2SPW	FS-1800	575	675.62
R2TPW	FS-3800	755	887.12
	<b>LEXMARK</b>		
10TSPW	E210	145	170.37
13LGPW	E320	189	222.07
13LHPW	E322	232	272.60
	<b>MINOLTA QMS</b>		
MQLPW	PagePro 1100L	145	170.37
MQKPW	PagePro 1100	195	229.12
	<b>OKI</b>		
LC3PW	Okidata 8p Plus	199	233.82
R29PW	Okidata 14ex	209	245.57
	<b>PANASONIC</b>		
SQ2PW	KX-P6300	165	193.87
SQ1PW	KX-P6500	199	233.82

### Multifunction Devices

quicklink	Brother	ex VAT	inc VAT
QW1PW	MFC-9060	255	299.62
V1JPW	MFC-840	335	393.62
	<b>Canon</b>		
M4MPW	MultiPass C70	209	245.57
M4NPW	MultiPass C80	219	257.32
1Y27PW	Smartbase MPC600F	309	363.07
1Y38PW	Smartbase MPC400	299	351.07
1Y39PW	Smartbase PC12100	469	551.07
1Y3BPW	Smartbase P12300	565	663.87
	<b>HP</b>		
TY2PW	OfficeJet V40	155	182.12
KY5PW	OfficeJet G55	230	270.25
KX6PW	OfficeJet G85	309	363.07
	<b>LEXMARK</b>		
Z2SPW	X73 All-in-One Imaging Centre	135	158.77
Z2TPW	X83N All-in-One Print Centre	159	186.82

### HP DeskJet 940C 2400 x 1200dpi

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11GPPW	Deskjet 845C	60	70.50
11GSPW	Deskjet 920C	59	69.32
Q3VPW	Deskjet 990Cxi	155	182.12
11HOPW	Deskjet 995C	245	287.87
GLJPW	SupportPack	40	47.00

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- Up to 10ppm print speed, A4
- 600 dpi
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quicklink	HP LASERJETS	ex VAT	inc VAT
VYBPW	LaserJet 1200 14ppm 1200dpi 8MB	225	264.37
VYCPW	LaserJet 1200n 14ppm 1200dpi 16MB	345	405.37
VYDPW	LaserJet 1220 Printer/Copier/Scanner	295	346.62
12NHPW	LaserJet 2200 18ppm 1200dpi 8MB	450	528.75
VYGPW	LaserJet 4100 24ppm 1200dpi 16MB	760	893.00

### Epson EPL-5900 Laser Printer

quicklink 160SPW  
www.dabs.com/epson

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The new EPSON EPL-5900 is the ideal laser printing solution for the PC or Mac user, offering high speed black and white laser printing at speeds up to 12PPM. EPSON's advanced resolution technologies such as EPSON RITech for professional business documentation.

quicklink	EPSON	ex VAT	inc VAT
160RPW	EPL 5900L	159	186.82
14WRPW	AcuLaser C1000	765	898.87
14WSPW	AcuLaser C1000N	849	997.57

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### Lexmark Z45 A4 Colour Jetprinter

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**NEW**

- 3600 x 1200 dpi resolution (colour)
- Up to 17 pages per minute (mono) and 13 pages per minute (colour)
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quicklink	LEXMARK	ex VAT	inc VAT
18GNPW	Z25	41	48.17
18CPPW	Z35	47	55.22
18GVPW	Z65	99	116.32

### Canon S9000 Colour Printer

quicklink 164GPW  
www.dabs.com/canon

only  
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- 2400x1200dpi
- MicroFine Droplet Technology™
- 6-colour ink system
- Prints A4 and A3
- USB and Parallel



Imaging across networks

### Samsung ML-6060 12MB Laser Printer

quicklink N91PW  
www.dabs.com/samsung

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**(£245.57)**



- The ML-6060 is ideal for the smaller workgroup.
- 12 ppm print
- 1200dpi image quality
- 12MB memory
- 6000 page one piece drum toner cartridge
- PCL 6 Emulation
- 550 sheet standard paper tray



quicklink	SAMSUNG	ex VAT	inc VAT
YTQPW	ML-1210 Mono Laser printer	99	116.32
PWQPW	ML-6040 Mono Laser printer	165	193.87
ZGJPW	ML-1250 Mono Laser printer	99	116.32
N92PW	ML-6040N Ethernet Mono Laser	299	351.32

### Brother HL-1230 Mono Laser printer

quicklink 10GMPW  
www.dabs.com/brother

only  
**£152**  
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The HL-1230 printer is quick and easy to install and includes the benefit of comprehensive, state of the art technical support with Windows Interactive Animations.

- 600 x 600 dpi resolution
- 12 ppm - max speed
- 250 sheet paper capacity



quicklink	BROTHER	ex VAT	inc VAT
10GNPW	HL-1440	179	210.32
10GQPW	HL-1450	244	291.45
10GTPW	HL-1470N	315	370.12



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178BPW	WiFi PC/MCIA Card	59.99
178DPW	WiFi USB Adapter	59.99
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- 35mm Transparency Unit
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- QuickStart buttons
- USB connectivity

**EPSON**

quicklink	EPSON	ex VAT	inc VAT
100DPW	Epson Perfection 1250	67	78.72
100GPW	Epson Perfection 1650	127	149.22
100HPW	Epson Perfection 1650 Photo	134	157.45
110KPPW	Epson Perfection 2450 Photo	224	263.20

### Canoscan D1250U2F 48-bit colour scanner

quicklink 1643PW

[www.dabs.com/canon](http://www.dabs.com/canon)



- 48-bit colour flatbed scanner
- 9600 x 9600 dpi (Interpolated)
- 1200 dpi x 2400 dpi (Optical)
- Software Included: Drivers & Utilities, Adobe PhotoShop Elements, ArcSoft PhotoBase, Canon PhotoRecord, ScanGear CS-U 6.3, plus lots more

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quicklink	CANON	ex VAT	inc VAT
1642PW	D1250U2	97	113.97
1643PW	D1250U2F	132	155.10
10TWPW	F54000US	555	652.12

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### ScanMaker 5600 A4 Flatbed Scanner

2400x4800dpi  
True 48bit colour  
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USB Mac & Windows

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### Astra 4450 Flatbed Scanner

48-bit, colour CCD  
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quicklink	NETGEAR	ex VAT	inc VAT
NSPPW	FA311 10/100 PCI NIC	12	14.10
QW3PW	FA312 10/100 PCI NIC WOL	14	16.45
6K2PW	8 Port Hub	27	31.72
6K5PW	16 Port Hub	69	81.07
132WPW	USB Wireless Adaptor	75	88.12
YKNPW	PC/MCIA Wireless Adaptor	68	79.90
YKQPW	Wireless Access Point	125	146.87
QX2PW	Netgear Network Starter Kit	30	35.25

### Belkin USB 4 Port Economy Hub

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- 5 power & port status lights
- Fully compatible with Windows\*95, Windows\*98, Windows\*2000, OS/2 and Mac\*OS 8.1 or higher

quicklink	BELKIN	ex VAT	inc VAT
QXCPW	IEEE 1394 Firewire PCI Card PC	50	58.75
108HPW	USB 2.0 PCI Card	42	49.35
SF1PW	QuadraBus 4 Port USB PCI Card	29	34.07
1785PW	USB Media reader/Writer - CF / i/i	25	29.37
1786PW	USB Media reader/Writer - SM	25	29.37
1787PW	USB Media reader/Writer - MMC/SD	25	29.37

### Microsoft Internet Keyboard Pro

quicklink G53PW

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Launch your browser and surf the web directly from your keyboard. 19 Hot Keys to give you superior control over your PC. Two desktop USB ports for easy plug and play. Detachable palm rest. USB and PS/2 compatible keyboard.

quicklink	MICROSOFT	ex VAT	inc VAT
G54PW	Internet PS/2	14	16.45
G53PW	Internet Pro USB & PS/2	24	28.20
G52PW	Natural Pro USB & PS/2	29	34.07
Z1WPW	Office Keyboard PS/2 USB	35	41.12

### Logitech Cordless Optical Mouse

quicklink 1670PW

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quicklink	LOGITECH	ex VAT	inc VAT
W78PW	Cordless Mouseman Optical USB	33	38.77
SX3PW	Wheel Mouse Optical	19	22.32
TOVPW	Pilot Wheel Mouse - PS/2 & USB	13	15.27
KR7PW	Pilot Mouse PS/2 & Serial	10	11.75

### Scanners

quicklink	MICROTEK	ex VAT	inc VAT
PD3PW	ScanMaker X12 USL Photo-inc TMA	185	217.37
SQJPW	FilmScan 35 USB 1800dpi 36-bit	129	151.57
VBSPW	Minolta Dimage Scan Dual II USB	279	327.82

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quicklink	BELKIN	ex VAT	inc VAT
QBWPW	Regulator Gold Series 325VA	59	69.32
QBXPW	Regulator Gold Series 425VA	69	81.07
QXMPW	Single Outlet Surge Protector+Tel	10	11.75
QOKPW	4Way Strip Surge Protector 2M	11	12.92
QF9PW	6Way Strip Surge Protector 2M	20	23.82
QCNPW	8Way Strip Surge Protector 2M	35	41.12

### Gaming Devices

quicklink	LOGITECH	ex VAT	inc VAT
PRMPW	Wingman Formula Force GP USB	52	61.10
MF8PW	Wingman Extreme Digital 3D USB	17	19.97
RYKPW	Wingman Force 3D - Force Feedb MICROSOFT	32	37.60
9YCPW	Sidewinder GamePad Pro USB	22	25.85
K5GPW	Sidewinder ForceFeedback Wheel	64	75.20
QR5PW	Sidewinder ForceFeedback 2 USB	59	69.32

### Keyboards

quicklink	CHERRY	ex VAT	inc VAT
G5HPW	Soft Touch 105key Win95 PS/2	15	17.62
G5GPW	Soft Touch 105key Win95 AT	15	17.62
G5RPW	83key Mini Keyboard PS/2	39	45.82
S92PW	Cordless Desktop Keyboard	39	45.82
S93PW	Deluxe Access Keyboard	11	12.92
12PSPW	Internet navigation Keyboard	18	21.15
135PPW	Cordless Desktop iTouch & Mouse	55	64.62

### Mice

quicklink	MICROSOFT	ex VAT	inc VAT
ZPMPW	WheelMouse Optical PS/2 USB	15	17.62
Z1XPW	Wireless Intellimouse Explorer	36	42.30
WDBPW	Trackball Explorer USB/PS2	29	34.07
Z1YPW	Intellimouse Explorer USB/PS2	32	37.60

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XYNPW	Siluro T200 Retail VO 32MB	42	49.35
XYRPW	Siluro T400 Retail VO 64MB	51	59.92
14R1PW	Siluro Ti-200 64MB	107	125.72
17NDPW	Siluro GF4 MX440 64MB ACP AOPEN	82	96.35
177JPW	GF2Ti-V032 32MB	64	75.20
147LPW	GF2Ti-V64 64MB	75	88.12
17QMPW	GF3-Ti200 DV128 128MB	128	150.40
177XPW	GF3-Ti500 DV164 64MB ASUS	233	273.77
17PMPW	GeForce 3 Ti 200 VIVO 64MB	130	152.75
17QPPW	GeForce 4 MX 440 VO 64MB	89	104.57
17PTPW	GeForce 4 Ti 4400 DVI 128MB	239	280.82
17XPW	GeForce 4 Ti 4400 DVI VO 128MB	250	295.75
17QPPW	GeForce 4 Ti 4600 DVI 128MB	327	384.22
17QPPW	GeForce 4 Ti 4600 DVI VO 128MB CREATIVE	334	392.45
1356PW	GeForce 2 Titanium 64MB	72	84.60
17NBPW	3D Blaster 4 MX 440 VO 64MB	91	106.92
17NCPW	3D Blaster 4 Ti4600 VO 128MB MERCULES	261	306.67
X23PW	3D Prophet 4500 Retail 64MB	84	98.70
X25PW	3D Prophet 4500 Retail VO 64MB	96	112.80
13VNPW	3D Prophet II Titanium Retail VO 64MB	121	142.17
13VQPW	3D Prophet III Ti 200 Retail VO 64MB	177	207.97
13VTPW	3D Prophet III Ti 500 Retail DVI VO 64MB	252	296.10
17RYPW	3D Prophet III All in Wonder 7500 64MB	155	182.12
17SOPW	3D Prophet FOX 8500 LE VO 64MB	129	151.57
1753PW	3D Prophet All in Wonder 8500DV 64MB LEADTEK	230	270.23
18GDPW	WinFast GeForce4 Ti 4400 Retail 128MB	230	270.23
18GFPW	WinFast GeForce4 Ultra Ti 4600 128MB MATROX	300	352.50
11HSPW	Millennium G550 Dual Retail 32MB	83	97.52
T2P2PW	Marvel G450 eTV 32MB VIDEOLOGIC	161	189.17
13WVPW	VIVID! XS Retail 64MB	80	94.00

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quicklink	CREATIVE	ex VAT	inc VAT
13QTPW	SoundBlaster 4.1 Digital	23	27.02
13QVPW	SoundBlaster 5.1 Digital	45	52.87
113PPW	SoundBlaster Platinum EX MERCULES	179	210.32
VCYPW	Game Theatre XP	39	46.32
Y3QPW	Gamesurround Fortissimo II RP	33	38.77
Y3SPW	Gamesurround Muse XL RP ABIT	17	19.97
XV9PW	AU-10R	30	35.25
XVBPW	UA-10	42	49.35
XVCPW	UA-11 AOPEN	39	45.82
YPLPW	Yamaha YMF744 4 Channel PCI	19	22.32
YPMWP	Crystal CS4614 PCI	11	12.92
YPNPW	AOpen AS9200 PCI VIDEOLOGIC	8	9.40
VHOPW	SonicFury PCI OEM	43	50.52
P19PW	SonicFury PCI RP	56	65.80

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quicklink	ASUS	ex VAT	inc VAT
11JVPW	DVD-E616 IDE 16xDVD 40xCD Int Aopen	44	51.70
XX9PW	DVD-1648 Pro Bonus IDE 16xDVD 48xCD	48	56.40
16KSPW	DVD-1640 Pro-A Retail IDE 16xDVD 40xCD	48	56.40
16KTPW	DVD-1640 Pro-A BD* IDE 16xDVD 40xCD	45	52.87
16KVPW	RWS120A Bonus Pack	348	408.90
16KWPW	RWS120A BD* (*BareDrive) FREECOM	335	393.62
1223PW	16982 TRAVELLER II Graphite 8xDVD	140	164.50
VGHWP	15877 Starter Kit IDE 16xDVD 48xCD	69	81.07
XT1PW	15116 PORTABLE II Graphite	99	116.32
1631PW	17338 DVD+RW LITE-ON	381	447.67
12VTPW	IDE 16xDVD 48xCD Int PANASONIC	38	44.65
12RFPW	SR-8587 IDE 16xDVD 48xCD Int PIONEER	47	55.22
N32PW	DVD-116 IDE 16xDVD Int	46	54.05
X15PW	DVD-1065 IDE 16xDVD Int	54	63.45
14VLPW	DVD-1065 IDE 16xDVD 40xCD	63	74.02
16NBPW	DVR-A04 IDE 4xDVD 24xCD Int RICHOM	346	406.55
13MPPW	MPS120A-DP IDE INT TOSHIBA	325	381.87
136LPW	SD-M162B OEM IDE 16xDVD 48xCD Int	46	54.05

### Radeon 8500™ 64MB DDR AGP Retail Video Out

quicklink **136VPW**  
[www.dabs.com/ati](http://www.dabs.com/ati)



- Features ATI's TRUFORM™, SMARTSHADER™, SMOOTHVISION™, and HYPER™ Z II technologies
- The only GPU to support DirectX® 8.1
- Supports OpenGL® 1.3 features
- 64MB of powerful double data rate (DDR) memory



quicklink	ATI	ex VAT	inc VAT
136RPW	RADEON™ 7000 VO 32MB	53	62.27
136TPW	RADEON™ 7500 DVI VO 64MB	95	111.62
136VPW	RADEON™ 8500 DVI VO 64MB	186	218.55
3QBPW	ALL-IN-WONDER RADEON™ VIVO 32MB	136	159.80

### Hauppauge WinTV PVR PCI

quicklink **RHHPW**  
[www.dabs.com/hauppauge](http://www.dabs.com/hauppauge)



With its 125-channel cable ready TV receiver, you can watch TV in a resizable window or full screen. Or listen to FM radio with its built-in stereo FM receiver.

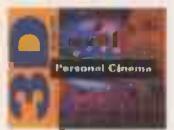
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quicklink	HAUPPAUGE	ex VAT	inc VAT
X61PW	WinTV Primio FM PCI 793	55	64.62
DHCPW	WinTV FM PCI 747	72	84.60
DHLPW	WinTV Theater PCI 498	89	104.57
DHMPW	WinTV GOI PCI 607	34	39.95
DHNPW	WinTV USB 566	63	74.02
LBQPW	WinTV FM USB 573	80	94.00
LBSPW	WinTV DVB-S PCI 717	199	233.82
Q7JPW	DV-Wizard Pro PCI 848	110	129.25
Z9FPW	WinTV Nova-T USB	159	186.82
Z9QPW	WinTV Nova-T PCI	119	139.82

### Hauppauge!

### 3D Blaster Cinema

quicklink **14RGPW**  
[www.dabs.com/creative](http://www.dabs.com/creative)



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- Full GeForce2™ MX400™ 3D gaming performance

**CREATIVE**

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quicklink **113KPW**  
[www.dabs.com/creative](http://www.dabs.com/creative)



- HIGH DEFINITION 5.1 multi-channel audio
- Audigy processor and EAX ADVANCED HD
- Connect SB1394 compatible devices
- Gold connectors

**CREATIVE**

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quicklink **XYPPW**  
[www.dabs.com](http://www.dabs.com)



- NVIDIA Geforce2 MX400
- 64MB SDRAM (128-bit SDR bus)
- 200MHz Core Speed
- 166MHz RAM Speed
- 640x480@240Hz to 2048x1536@75Hz

**ABIT**

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quicklink **14R4PW**  
[www.dabs.com/abit](http://www.dabs.com/abit)



- 64MB
- DDR AGP RP VO
- Siluro
- DVI & VideoOut

**ABIT**

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111PPW	SIS 6326 8MB PCI	13	15.27
16VSPW	Rage 128 Pro 32MB AGP	23	27.02
14BJPW	Radeon RV100 64MB AGP	35	41.12
10MMPW	GeForce 2 MX 200 32MB AGP	31	36.42
10MNPW	GeForce 2 MX 400 64MB AGP	40	47.00
16V3PW	Radeon 7500 DVI VO 64MB DDR ACP	65	76.37
1723PW	GeForce 4 MX440 VO 64MB DDR ACP	75	88.12
14BPW	GeForce 2 Ti 64MB ACP	64	75.20
14C2PW	GeForce 3 Ti 200 64MB ACP	91	106.92

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121WPW	16726 TRAVELLER II Graphite	Use Cable	24r 8w 4rw	164	192.70
121XPW	15231 TRAVELLER II Graphite	Use Cable	24r 8w 4rw	246	289.05
XSNPW	15114 PORTABLE II Graphite	Use Cable	32r 8w 4rw	115	135.92
1220PW	15142 PORTABLE II Graphite	Use Cable	40r 16w 10rw	123	144.52
14J7PW	15987 PORTABLE II Graphite	USB 2.0	40r 24w 10rw	164	192.70
RS4PW	15398 FC CLASSIC	USB	6r 4w 4rw	96	112.80
RS5PW	15400 FC CLASSIC	Parallel	6r 4w 4rw	96	112.80
1221PW	FREECOM DVD-ROM/CD-RW	Use Cable	8xDVD-ROM 32r 8w 4rw	164	192.70
XSHPW	17033 PORTABLE II Graphite Combo				
XSJWP	FREECOM CABLES				
	Series II USB			25	29.37
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12QSPW	CD-SS20 IDE 52x Internal	29	34.07
1224PW	16981 TRAVELLER II Graphite 24x External	71	83.42
XT3PW	15115 PORTABLE II 48x External	58	68.15
HSFPW	FX-4820 OEM IDE 48x Internal	23.50	27.61
9MWPW	UltraPlex PX40TSI RP SCSI 40x Internal	58	68.15
ZZDPW	SC-152 IDE 52x Internal	20	23.50
HSXPW	CD-540E OEM IDE 40x Internal	31	36.42
9PXPW	CD-532S OEM SCSI 32x Internal	46	54.05
MCJPW	CD-224PEK PCMCIA 24x External	76	89.30

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1552PW	CRW-3200E-810 IDE Internal		87	102.22
1553PW	CRW-3200E-VK IDE Internal		95	111.62
1554PW	CRW-3200SX-VK SCSI External		161	189.17
1555PW	CRW-3200UX-VK Firewire External		178	209.15
1556PW	CRW-3200UX-VK-KIT USB 2.0 External		163	191.52

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14W4PW	CRX1750U CD-RW 24x10x40 Ext	165	193.87
14W5PW	CRX85U CD-RW/DVD 20x8x24x8 Ext	219	257.32
14W6PW	CRX85A CD-RW/DVD 20x8x24x8 Ext	229	269.07
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16KSPW	CRW3248 Bare Drive IDE 48r 32w 12rw	76	89.30
16KQPW	CRW3248 Bonus Pack IDE 48r 32w 12rw	79	92.82
16KRPW	CRS446U USB External 6r 4w 4rw	103	121.02
	FREECOM		
V89PW	FC CLASSIC Write Proof IDE 32r12w10rw	61	71.67
1222PW	FC CLASSIC Write Proof IDE 32r16w10rw	66	77.55
15M2PW	FC CLASSIC Write Proof IDE 40r32w10rw	101	118.67
	IOEMGA		
14Q9PW	CD-RW 40r 16w 10rw External USB	107	125.72
16YJPW	Predator 32r 24w 10rw External USB	169	198.57
ZVXPW	LTR201018-30YC IDE 40r 24w 10rw Int	58	68.15
15NFPW	LTR32123S IDE 40r 32w 12rw Int	60	70.50
	MIRAI		
V4YPW	CRD-BP4-M 40r 16w 10rw SCSI Int	107	125.72
YQWPW	CRD-BP1500P-M 40r 24w 10rw IDE Int	70	82.25
	MITSUMI		
136MPW	CR48091E IDE 40r 24w 12rw Internal	58	68.15
	PHILIPS		
130CPW	PCRW1610K 40r16w10rw IDE Internal	53	62.27
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	PLEXTOR PleXwriter		
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174GPW	PX-W4012TA 40r 40w 12rw Int IDE	105	123.37
138BPW	PX-S88TU 24r 8w 8rw USB External	183	215.02
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R1LPW	MP9120A-DP IDE 8xDVD 32r 12w 10rw	113	132.77
120BPW	MP9200A-DP IDE 12xDVD 40r 20w 10rw	123	144.52
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16VLPW	Cyclone IDE 40r 32w 10rw Internal	90	105.75
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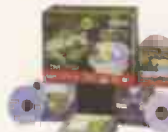
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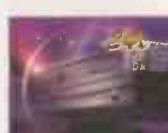
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1603PW	Celeron 1.3GHz 100MHz	74	86.95
1557PW	Pentium III 1.13GHz 133MHz	102	119.85
097PW	Pentium III 1.13GHz 133MHz	117	137.47
1558PW	Pentium III 1.26GHz 133MHz	129	151.57
096PW	Pentium III 1.26GHz 133MHz	148	173.90
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12NPPW	AthlonXP 1500+1.35GHz 266MHz	85	99.87
12NQPW	AthlonXP 1600+1.4GHz 266MHz	89	104.57
12NRPW	AthlonXP 1700+1.47GHz 266MHz	89	104.57
12NSPW	AthlonXP 1800+1.53GHz 266MHz	96	112.80
13TJPW	AthlonXP 1900+1.6GHz 266MHz	121	142.17
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106MPW	Pentium 4 2.0GHz Socket 478	248	291.40
1562PW	Pentium 4 2.0GHz Socket 478	249	292.57
1565PW	Pentium 4 2.2GHz Socket 478	368	432.40

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<b>Maxtor</b>			
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Z0TPW	D540X 40.0 5400RPM	58	68.15
Z0VPW	D540X 60.0 5400RPM	72	84.60
Z0WPW	D540X 80.0 5400RPM	88	103.40
1210PW	D540X 120.0 5400RPM	137	160.97
1211PW	D540X 160.0 5400RPM	196	230.30
<b>WESTERN DIGITAL</b>			
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16TSPW	73LZX Ultra 160 73.4 10000RPM	610	716.75
16TXPW	36Z15 Ultra 160 18.4 15000RPM	236	277.30
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1373PW	Atlas 10k III Ultra 160 18.4 10000RPM	145	170.37
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Z2TPW	Travelstar 30CN 20.0 UDMA100 4200RPM	73	85.77
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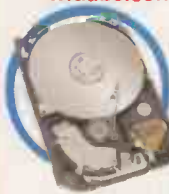


quicklink	IBM	ex VAT	inc VAT
WQJPW	Deskstar 60GXP 41.2 7200	65	76.37
18F1PW	Deskstar 120GXP 61.5 7200	78	91.65
15BDPW	Deskstar 120GXP 41.2 7200	65	76.37
15BFPW	Deskstar 120GXP 82.3 7200	97	113.97
15BGPW	Deskstar 120GXP 123.5 7200	170	199.75

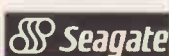
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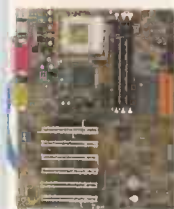
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1051PW	BW7 Intel 845 Socket 423 ATX	90	105.75
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1034PW	TH7-II Intel 850 Socket ATX	136	159.80
1053PW	BL7 Intel 845 Socket 478 ATX	90	105.75
1035PW	BL7-RAID Intel 845 Socket 478 ATX	100	117.50
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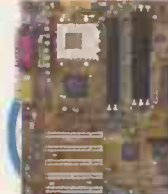
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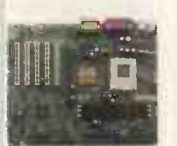
quicklink	ASUS	ex VAT	inc VAT
Y7QPW	A7S-VM Socket A MATX	69	81.07
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128CPW	MS6309 694T PRO-LE VIA 694X ATX	56	55.22
131NPW	MS6545 850 PRO/S Intel 850 ATX	104	122.20
131PPW	MS6330 K7T Turbo KT133A ATX	64	75.20
131QPW	MS6380 K7T Pro2RU KT266A ATX	97	113.97
131SPW	MS6380 K7T Pro2 KT266A ATX	82	96.35
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16XVPW	SL-75LV VIA KLE133 Socket A MATX	52	61.10
11V5PW	SL-75KAV VIA KT133A Socket A ATX	59	69.32
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2P8PW	MS Money 2002 Deluxe	29	34.07
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W6ZPW	MYOB Accounting Plus	239	280.82
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17XDPW	Sage Instant Accounts v8	105	123.37
87FPW	Sage Accountant Plus v7.0	575	675.62
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PFPWP	McAfee Total Virus Def 10Node 2yr	429	504.07
10NDPW	McAfee VirusScan v6.0 Classic	20	23.50
10NFPW	McAfee VirusScan Professional v6.0	21	24.67
15FMPW	Symantec Norton Antivirus SB 5-user	189	222.07
27NPW	Symantec Norton Internet Security Std	39	45.82
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15OBPW	Orlogix Backup myPC v4.7	49	57.57
YR4PW	Roxio GoBack v3	24	28.20
10H8PW	Symantec Norton Ghost 2002	33	38.77
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15B6PW	Autodesk AutoSketch v8.0	125	146.87
<b>COMMUNICATIONS</b>			
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15W6PW	Laplink PC Sync	45	52.87
14PGPW	Symantec PC Anywhere H+R v10.5	115	135.12
MSLPW	Symantec Procomm Plus v4.8	69	81.07
LG9PW	Symantec WinFax Pro v10.0	41	48.17
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16ZRPW	Act! + Bonus Pack	119	139.82
16ZSPW	Act! 5 User + Bonus Pack	529	621.57
<b>DATABASES</b>			
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WMRPW	Visio Professional 2002	305	358.37
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X2QPW	Adobe Pagemaker v7	370	434.75
15W1PW	Adobe Publishing Collection v11	759	891.82
16MOPW	Adobe Design Collection v5	755	887.12
W1NPPW	MS Publisher 2002	85	99.87
1741PW	Quark Xpress v5	969	1138.57
<b>GRAPHICS</b>			
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XY8PW	Scansoft OmniPage Pro v11	295	346.62
NW4PW	Scansoft Scansuite Plus v10.0	315	370.12
P8LPW	Scansoft TextBridge Pro Millennium	39	45.82
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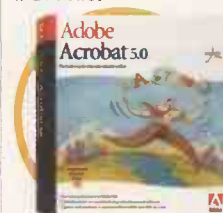
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<b>PROGRAMMING</b>			
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159NPW	MS Visual Basic .NET Standard	75	88.12
159XPW	MS Visual C++ .NET Standard	75	88.12
K68PW	MS Visual InterDev v6.0	339	398.32
163PW	MS Visual J++ v6.0	65	76.37
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YXQPW	MS Encarta 2002 Standard	10	11.75
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QHQPW	IBM ViaVoice v8.0 Pro	62	72.85
QDQPW	L and H VoiceXpress Standard	25	29.37
QSPWP	L and H VoiceXpress Advanced	45	52.87
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10W2PW	Power Quest Partition Magic v7.0	35	41.12
16V1PW	Roxio Easy CD Creator v5 Platinum	32	37.60
10HBPW	Symantec Norton Ghost 2002	33	38.77
2NFPW	Symantec Norton CleanSweep 2002	24	28.20
2NBPW	Symantec Norton Utilities 2002	27	31.72
10GLPW	Norton SystemWorks 2002 Std	49	57.57
10GSPW	Norton SystemWorks 2002 Pro	63	74.02
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SR9PW	NTM WEB! Professional Edition	29	34.07
133WPW	Serif Web Plus v7	23	27.02
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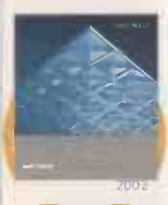
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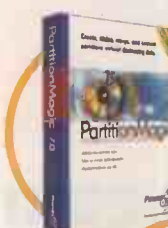
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**OPTIONS/UPGRADES/DELIVERY - SEE PAGE 4**

**12 Months Interest Free Credit** with PPI

\*Speakers shown do not come with this system.



AMD® Athlon®		No Monitor	Inc. VAT	17" Monitor	Inc. VAT
Athlon	1800 XP	£521	£612.18	£599	£703.83
Athlon	1900 XP	£534	£627.45	£618	£726.15
Athlon	2000 XP	£569	£668.58	£651	£764.93
Athlon	2100 XP	£599	£703.83	£683	£802.53

Intel® Pentium® 4		No Monitor	Inc. VAT	17" Monitor	Inc. VAT
P4	1.7Ghz	£549	£645.08	£625	£734.38
P4	1.9Ghz	£588	£690.90	£662	£777.85
P4	2Ghz	£599	£703.83	£679	£797.83
P4	2.2Ghz/2.26	£627	£736.73	£719	£844.83

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Monitor for illustration purpose only

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- ♦ 2 High Speed USB Ports
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- ♦ Price UpDate Line: 0700 5622347

**OPTIONS/UPGRADES/DELIVERY SEE PAGE 4**

AMD®	No Monitor	inc.VAT	15" Monitor	inc.VAT
Duron 1100Mhz	<b>£263</b>	£309.03	<b>£323</b>	£379.53
Athlon 1.3Ghz	<b>£282</b>	£331.35	<b>£342</b>	£401.85
Athlon 1700XP	<b>£298</b>	£358.15	<b>£358</b>	£420.65
Athlon 1800XP	<b>£305</b>	£358.38	<b>£365</b>	£428.88
Athlon 2000XP	<b>£378</b>	£444.15	<b>£438</b>	£514.65
Athlon 2100XP	<b>£411</b>	£482.93	<b>£471</b>	£553.43

Intel®	No Monitor	inc.VAT	15" Monitor	inc.VAT
Celeron 1.1Ghz	<b>£276</b>	£324.30	<b>£336</b>	£394.80
Celeron 1.2Ghz	<b>£286</b>	£336.05	<b>£345</b>	£405.38
Celeron 1.3Ghz	<b>£289</b>	£339.58	<b>£349</b>	£410.08

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- ♦ nVIDIA GeForce 2mx Graphics
- ♦ 6 Channel Audio (AMD) & Dolby 5.1 Audio on P4
- ♦ Sub Woofer Speakers ♦ 56kbps Voice/Fax Modem ♦ 2 High Speed USB Ports ♦ High Quality Keyboard & Mouse ♦ Five Year Warranty - 1st Year On-site, 4yrs RTB Labour
- ♦ FastTrak (72hr) delivery available
- ♦ On-Line Special Offers [www.ssc.co.uk](http://www.ssc.co.uk)
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**OPTIONS/UPGRADES/DELIVERY SEE PAGE 4**

## 12 Months Interest Free Credit with PPI

AMD®	No Monitor	inc.VAT	17" Monitor	inc.VAT
Duron 1100	<b>£369</b>	£433.58	<b>£444</b>	£521.70
Athlon 1300	<b>£388</b>	£455.90	<b>£463</b>	£544.03
Athlon 1700 XP	<b>£404</b>	£474.70	<b>£479</b>	£562.83
Athlon 1800 XP	<b>£410</b>	£481.75	<b>£485</b>	£569.88
Athlon 2000 XP	<b>£467</b>	£548.73	<b>£542</b>	£636.85
Athlon 2100 XP	<b>£499</b>	£586.33	<b>£575</b>	£675.63

Intel®	No Monitor	inc.VAT	17" Monitor	inc.VAT
Celeron 1.1Ghz	<b>£374</b>	£439.45	<b>£472</b>	£554.60
Celeron 1.7Ghz	<b>£405</b>	£475.88	<b>£480</b>	£564.00
P4 1.7Ghz	<b>£445</b>	£522.88	<b>£520</b>	£611.00
P4 1.9Ghz	<b>£481</b>	£565.18	<b>£556</b>	£653.30
P4 2.0Ghz	<b>£498</b>	£585.15	<b>£573</b>	£673.28

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- ◆ 60Gb Ultra DMA HDD 100 with buffer
- ◆ 17" NEC Mitsubishi Ultraflat Monitor
- ◆ All Monitor options available on this model
- ◆ nVidia GeForce 4 - 64Mb Graphics
- ◆ 16x DVD-ROM Drive (40x CD ROM)
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## focus extreme from **£916+vat**

- ◆ AMD® Athlon™/Intel® Pentium®4 Processors
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- ◆ 256Mb High Performance Memory
- ◆ 80Gb Ultra DMA 100 with buffer HDD
- ◆ 1.44Mb Floppy Drive ◆ 15" TFT Monitor
- ◆ All Monitor options available on this model
- ◆ nVidia GeForce 4 - 128MbTi4400 + DVI Graphics (minus £104 for std card) ◆ 16x DVD-ROM Drive
- ◆ CD-RW (32x12x48) with Burn Proof Technology (DVD Writer + £270) ◆ Sound Blaster Audigy Platinum 5.1 with FireWire Port ◆ Cambridge Soundworks DT5300 Inspire 5 Point Surround Speakers ◆ 56kbps Voice/Fax Modem

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- ◆ 60Gb Hard Drive
- ◆ 1.44Mb Floppy Drive
- ◆ 15" TFT Monitor
- ◆ All monitor options available on this model
- ◆ 24bit graphics accelerator with 64Mb (max) frame buffer TV out
- ◆ 16x DVD-ROM Drive

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- ◆ Choice of 56kbps Modem or TV Tuner
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- ◆ Five Year Warranty - 1st Year On-site, 4yrs RTB Labour
- ◆ FastTrak (72hr) delivery available
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AMD®	No Monitor	inc.VAT	17" Nec Monitor	inc.VAT
Athlon 1800 XP	£584	£686.20	£674	£791.95
Athlon 1900 XP	£608	£714.40	£698	£820.15
Athlon 2000 XP	£641	£753.18	£731	£858.93
Athlon 2100 XP	£672	£789.60	£762	£895.35

Intel®	No Monitor	inc.VAT	17" Nec Monitor	inc.VAT
P4 1.7Ghz	£633	£743.78	£723	£849.53
P4 1.8Ghz	£655	£769.63	£745	£875.38
P4 1.9Ghz	£669	£786.08	£759	£891.83
P4 2Ghz	£686	£806.05	£776	£911.80
P4 2.2Ghz/2.26	£727	£854.23	£817	£959.98
P4 2.4Ghz	£861	£1011.68	£951	£1117.43

AMD®	No Monitor	inc.VAT	15" TFT Monitor	inc.VAT
Athlon 1900 XP	£916	£1076.30	£1146	£1346.55
Athlon 2000 XP	£949	£1115.08	£1179	£1385.33
Athlon 2100 XP	£969	£1138.58	£1199	£1423.83

Intel®	No Monitor	inc.VAT	15" TFT Monitor	inc.VAT
P4 1.9Ghz	£950	£1116.25	£1180	£1386.50
P4 2Ghz	£967	£1136.23	£1197	£1406.48
P4 2.2Ghz/2.26	£999	£1173.83	£1237	£1453.48
P4 2.4Ghz	£1142	£1341.85	£1372	£1612.10
P4 2.5Ghz/2.53	£1343	£1578.03	£1573	£1848.28



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AMD®	No Monitor	inc.VAT	15" TFT Monitor	inc.VAT
Celeron 1Ghz	£436	£512.30	£699	£821.33
Celeron 1.4Ghz	£479	£562.83	£744	£874.20

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Ram	128Mb	128Mb	256Mb	256Mb
Hard Drive	15Gb	20Gb	20Gb	20Gb
Screen Size	13.3" XGA TFT	14.1" XGA TFT	14.1" XGA TFT	14.1" XGA TFT
CD/DVD	CD	DVD	DVD	DVD/CD RW
Sat Nav GPS	Yes	Yes	Yes	Yes
Remote Control	No	Yes	Yes	Yes
Win '98 / ME	Yes	Yes	Yes	Yes
<b>Price</b>	<b>£849 +vat</b>	<b>£948 +vat</b>	<b>£1099 +vat</b>	<b>£1184 +vat</b>

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17" Carrera SVGA	<b>£89</b>	£104.58
19" Carrera SVGA	<b>£148</b>	£173.90
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19" NEC Mitsubishi Ultraflat	<b>£175</b>	£205.63
17" Iiyama Visionmaster 1402	<b>£121</b>	£142.18
17" Iiyama Visionmaster 407	<b>£185</b>	£217.38
19" Iiyama Visionmaster 1451	<b>£156</b>	£183.30
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15" TFT NEC Mitsubishi	<b>£275</b>	£323.13
17" TFT Carrera	<b>£389</b>	£457.08
18" TFT NEC Mitsubishi	<b>£599</b>	£703.83

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<b>Storage Upgrades</b>		
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CD ReWriter 32x12x48 burnproof	<b>£69</b>	£81.08
Upgrade to DVD RAM/R	<b>£245</b>	£287.88
Logitech cordless keyboard & mouse	<b>£49</b>	£57.68
<b>Memory &amp; Graphics Upgrades</b>		
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256Mb > 512Mb	<b>£54</b>	£63.45
GeForce 2MX > GeForce 4 64Mb 440	<b>£58</b>	£68.15
GeForce 4 440 > 128Mb Ti4400	<b>£118</b>	£138.65
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<b>Software Option 4</b>	• DELUXE DVD SOFTWARE PLUS 2 DVD FILMS £19 +vat
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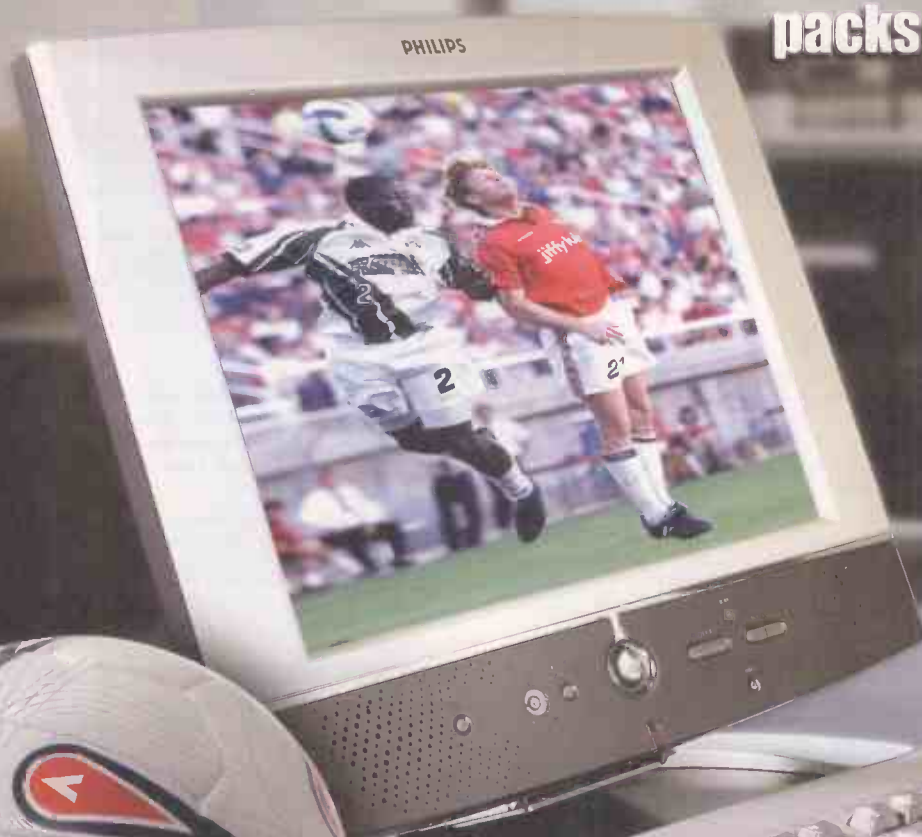
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## Introduction



Welcome to the June edition of Green Pages. Whether working from home or an office, the chances are you will not want to miss this year's world cup competition. With this in mind we've negotiated the best deals on TV tuner cards from Hauppauge so you'll get the opportunity to enjoy the action where ever you need to be. We are also giving away thousands of Mitre's popular ISO England match quality replica football with a selection of our PC's (look out for the footballs for qualifying systems).

If you want a great deal on the latest PC technology you should definitely check out our brand new Aries offerings for June which include the Precision 1900 Intel Pentium 4 notebooks incorporating a 15" TFT and DVD or DVD/CDRW Combo drive all from only £1132 Ex VAT & the SpaceCube sporting the brand new Intel Celeron 1.7Ghz processor from only £499 Ex VAT.

**We hope you all enjoy the world cup and we hope you'll join us in wishing our teams the best of luck!**

I would like to thank you all for your custom and continued enthusiasm in our products and services. During this, our 30th year in business we will continue to bring you special deals and new innovations so make a mental note to visit us again here or online!

**Shiraz Jessa**  
Managing Director  
sj@watford.co.uk



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**sales@watford.co.uk**

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Jessa House, Finway,  
off Dallow Road, Luton.  
LU1 1WE

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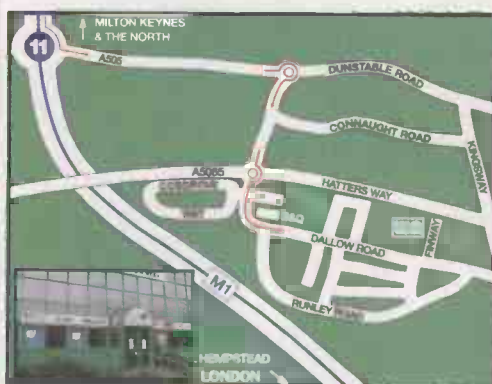
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Jessa House, Finway, off Dallow Road, Luton. LU1 1WE  
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## Terms & Conditions of Sale

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- Goods are not sold on a trial basis.
- Goods offered subject to being unsold. In the event of non availability of goods, we reserve the right to rescind the contract.
- We do not warrant the suitability of goods. Please check the suitability of the products with your system and/or the manufacturer before ordering.
- Photographs of products featured may be for illustration and identification purposes only. Minor specification variations do not entitle the purchaser to rescind the contract.
- A full copy of the Terms and Conditions is supplied on the reverse of every invoice, and is available on request.

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- For certain products a warranty may be available direct with the manufacturer. Any manufacturer/on-site arrangement are to be used by the purchaser.
- Where items are returned to us for repair under warranty we do not provide goods on loan.
- Claims for damage and mis-shipping must be made within 24 hours of receipt.
- Claims for non-functionality must be made within 7 days of receipt, after this date, and in all circumstances after 28 days, repair and not replacement will be offered.
- A restocking fee of up to 25% is charged on returns, which prove to be non-defective and we reserve the right to return the goods to you.
- No opened software will be accepted for refund.
- It is imperative that items returned for refund are sent in their original packaging.
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- 0% Finance offer. Finance available subject to status. Written details available upon request. All trademarks are acknowledged. E&OE.

## Special Offer Bundles

CD software is subject to availability, and may be in promotional packaging (packaging may refer to boxes, manuals, etc.). In most instances, a digital copy of the manual or on-line support will be included within the software package. Software pack shots are for illustrative purposes only.

## Price Effectiveness

ALL PRICES QUOTED IN THIS ADVERT ARE EFFECTIVE FROM 01.06.02 TO 30.06.02. Some specifications may change after 01.06.02.

For latest and most up-to-date prices, Please check our web site [www.watford.co.uk](http://www.watford.co.uk)

Some prices may change due to circumstances beyond our control. Whilst we endeavour to provide pricing which is correct at the time of going to press, please confirm prices at the time of ordering. Prices quoted in the Green Pages refer to mail order sales only. Prices in CompUK stores may vary.

These statements do not affect and are in addition to the customers statutory rights. Except where stated otherwise, all prices exclude VAT and Carriage. E&OE. All pictures, unless otherwise stated, are for illustrative purposes only.

## Official Orders:

Orders received from the Public Sector, Educational Establishments and approved companies are welcomed. To open an account please call our Major Accounts Team on 0870 220 0706. Official Purchase orders can be faxed on 0870 220 0707.

## Price Promise

If you find the identical product cheaper elsewhere we will beat the advertised total price (including delivery) subject to not selling below our cost price. This refers to UK products available ex-stock that are shipped within 3 days. We reserve the right not to beat prices on liquidated, end of line or OEM items, and will not match prices that have been printed incorrectly or prices that the advertiser cannot supply owing to lack of stock. Please note that the price pledge is only available at the time of ordering and is applicable to mail order purchases only. Excludes all corporate customers with special pricing agreements.

## Mystery Prize

Free with every customer invoking our unique price pledge, while stocks last.

## Low Price Finance

**Typical Example:** Cash Price £1000. 10% deposit. Total Loan £900. Payable by 36 monthly payments of £32.67. Total Amount Payable £1276.12 APR 19.9%. Written details on request. All credit subject to status.

## Delivery Charges

for the UK and Southern Ireland

**Web Ordering**

FREE on all orders within mainland UK\*.

Small Order charge of £2.95+ on orders less than £75+VAT. £4.95+VAT converts 2-4 day delivery in to a next working day delivery. \*Check website for exclusions

**Mail Order**

PC's + Notebooks	£19.95 +VAT
Consumables & Cables	£2 +VAT
All other Orders	£9.95 +VAT
Orders under £80.00	£4.95 +VAT

**Channel Islands, Northern Ireland, Scottish Highlands & Islands**

All orders delivered to the Channel Islands, Northern Ireland and the Scottish Highlands & Islands will be charged carriage at a flat rate of £20+VAT. Please allow 2 to 4 working days from date of despatch for delivery of your order.

A next working day service is not available for delivery to these areas.

### Eire

All orders delivered to Eire will be charged carriage at a flat rate of £25+VAT up to 20Kg. Small items will be charged at £4.95. Please allow 2 to 4 working days from date of despatch for delivery of your order. A next working day service is not available for delivery to Eire.

### Overseas Delivery

We regret that currently we are not able to accept orders from outside the UK and Ireland as our insurance policy does not cover goods for export.

### General Sales

FAX: 0870 220 0707

**0870 220 0700**

sales@watford.co.uk

### Major Accounts

FAX: 0870 220 0707

**0870 220 0706**

major.accounts@watford.co.uk

### Customer Services

FAX: 0870 220 0705

**0870 220 0704**

customers.services@watford.co.uk

### Technical Support

FAX: 0870 220 0846

**0870 220 0847**

technical.support@watford.co.uk

### Aries PC Support

FAX: 0870 220 0846

**0870 220 0848**

ariespc@watford.co.uk

### Credit Control

FAX: 0870 220 0709

**0870 220 0708**

accounts@watford.co.uk

### Switchboard

FAX: 0870 220 0045

**0870 220 0044**

**Aries Precision 1300****Specification**

**14.1" TFT XGA Display**  
 Upto **32Mb** Shared Graphics Video  
**64 bit 2D & 3D GUI Engine**  
**CD ROM Drive**  
 16 bit Business Audio Sound  
 56Kbps V90 Modem with **FREE** Internet Access  
 10/100 Ethernet LAN Adapter  
 1 x IEEE1394 Firewire Port  
 Li-ion Battery  
 Dual integrated stereo speakers  
 Internet Hot Key  
 2 x USB, Parallel, Fast Infra-Red  
 TV Out and external CRT monitor connector  
 PS/2 Keyboard/Mouse  
 PCMCIA Type II Card Slot  
 ACPI Power Management  
 12 months collect & return Warranty upgradeable to 3 years

**Intel® Celeron 1.0GHz**

10 GB Hard Disk Drive  
 128MB RAM  
 Upgradable to 512MB  
 PartCode 28440

**£699.00** Ex VAT **£821.32** Inc VAT

**Sony****GRX415MP Notebook**

PartCode 28745

Mobile Intel® 1.6 GHz Pentium® 4 processor. 15" TFT XGA screen. ATI Mobility Radeon 7500 16Mb. Removable CDRW/DVD ROM. 30 GB hard disk drive and 256Mb RAM V90 56K Modem, i-Link Port, Magic Gate Memory Slot, Built in RJ-45 10/100 Base TX TV Out

**£1534** Ex VAT **£1802.45** Inc VAT

**FX701 Notebook**

PartCode 28746

Mobile AMD Athlon™ 1400XP Processor, 20 GB hard disk drive and 256 MB SDRAM. ATI-3D Rage-Mobility M1 with 8MB SDRAM 14.1" TFT XGA colour display. 8xDVD drive. i-Link Port V90 56K Flex Modem. Built in RJ-45 10/100 Base TX TV Out & custom suite of Sony software, including Adobe Photoshop Elements.

**£1019** Ex VAT **£1197.33** Inc VAT

**Aries Precision 1700****Specification**

**14.1" TFT XGA Display**  
**ATI M6D 16Mb** Graphics Video  
**64 bit 2D & 3D GUI Engine**  
**DVD ROM or Combo Drive**  
 16 bit Business Audio Soundblaster Sound  
 56Kbps V90 Modem with **FREE** Internet Access  
 10/100 Ethernet LAN Adapter  
 1 x IEEE1394 Firewire Port  
 Li-ion Battery  
 Dual integrated stereo speakers  
 Internet Hot Key  
 2 x USB, Parallel, Fast Infra-Red  
 S-Video Out and external CRT monitor connector  
 PS/2 Keyboard/Mouse  
 PCMCIA Type II Card Slot  
 ACPI Power Management  
 1 Years collect & return Warranty upgradeable to 3 years

**Intel® P4 1.7GHz**

20 GB Hard Disk Drive  
 256MB RAM, DVD Rom  
 Upgradable to 1Gb  
 PartCode 28496

**£939** Ex VAT **£1103.32** Inc VAT

**Intel® P4 2.0GHz**

40 GB Hard Disk Drive  
 256MB RAM, Combo Drive  
 Upgradable to 1Gb  
 PartCode 28497

**£1099** Ex VAT **£1291.33** Inc VAT

**Sony****GRX316MP Notebook**

PartCode 28530

Mobile Intel® 1.6 GHz Pentium® 4 processor Supports Enhanced Intel® SpeedStep™ technology. 16.1" TFT UXGA screen. ATI Mobility Radeon 7500 16Mb. Removable CDRW/DVD ROM. 30 GB hard disk drive and 256Mb RAM

**£1580** Ex VAT **£1856.50** Inc VAT

**Aries Precision 1800****Specification**

**14.1" TFT XGA Display**  
**S3 Twister** Graphics Video  
**64 bit 2D & 3D GUI Engine**  
**DVD ROM Drive**  
 16 bit Business Audio Soundblaster Sound  
 56Kbps V90 Modem with **FREE** Internet Access  
 10/100 Ethernet LAN Adapter  
 1 x IEEE1394 Firewire Port  
 Li-ion Battery  
 Dual integrated stereo speakers & Microphone  
 2 x USB, Parallel, Fast Infra-Red  
 S-Video Out and external CRT monitor connector  
 PS/2 Keyboard/Mouse  
 PCMCIA Type II Card Slot  
 ACPI Power Management  
 1 Years collect & return Warranty upgradeable to 3 years

**AMD® K7 1.2GHz**

30 GB Hard Disk Drive  
 256MB RAM  
 Upgradable to 384Mb RAM  
 PartCode 28494

**£859** Ex VAT **£1009.32** Inc VAT

**TrafficMaster PartCode 12499****FREEWAY**

Compact speech-based live traffic information module.



Advance warning of delays up to 2 junctions or 12 miles ahead of vehicle.

Functional on all motorways and trunk roads on the Trafficmaster network. Battery-powered, fully portable.

Usual price £79.99 including 12 months information service.

Information service renewal fee, £30.00 for 12 months.

**£35** Ex VAT **£41.13** Inc VAT

**Editors Choice****Aries Precision 1900****Specification**

**15" TFT XGA Display**  
**ATI M6D 16Mb** Graphics Video  
**64 bit 2D & 3D GUI Engine**  
**DVD ROM Drive**  
 16 bit Business Audio Soundblaster Sound  
 56Kbps V90 Modem with **FREE** Internet Access  
 10/100 Ethernet LAN Adapter  
 1 x IEEE1394 Firewire Port  
 Li-ion Battery  
 Dual integrated stereo speakers  
 Internet Hot Key  
 2 x USB, Parallel, Fast Infra-Red  
 S-Video Out and external CRT monitor connector  
 PS/2 Keyboard/Mouse  
 PCMCIA Type II Card Slot  
 ACPI Power Management  
 1 Years collect & return Warranty upgradeable to 3 years

**Intel® P4 1.7GHz**

20 GB Hard Disk Drive  
 256MB RAM, DVD Rom  
 Upgradable to 1Gb  
 PartCode 28727

**£1132** Ex VAT **£1330.10** Inc VAT

**Intel® P4 2.0GHz**

30 GB Hard Disk Drive  
 256MB RAM, Combo Drive  
 Upgradable to 1Gb  
 PartCode 28728

**£1299** Ex VAT **£1526.32** Inc VAT

**Additions & Upgrades**

Ex VAT Inc VAT

**Additional RAM**

27773 128MB	£25.00	£29.37
27774 256MB	£50.00	£57.56

**DVD to CDRW/DVD Combo**

27603 CDRW/DVD	£110.60	£129.95
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**Power**

27775 Lithium ION Battery	£68.04	£79.95
27776 In Car Adaptor	£42.51	£49.95

**Cases**

28521 Nylon	£16.98	£19.95
26491 Leather	£110.60	£129.95

**Microsoft Operating Systems are Pre-installed.**

27715 Windows® Xp Home	£59.53	£69.95
27717 Windows® Xp Pro	£136.13	£159.95
25569 Windows® Me	£59.53	£69.95
27482 Windows® 2000	£136.13	£159.95



AMD

XP 1700  
from £299NEW  
LOW  
PRICEPOWERED BY  
DDR  
MEMORY™

## Additions

	Ex VAT	Inc VAT
<b>Aries Monitors</b>		
10075 15" EnergyPro	£79.00	£92.82
21934 17" EnergyPro	£87.00	£102.23
22178 19" EnergyPro	£132.00	£155.10
24895 15.2" TFT LCD	£249.00	£292.57
26118 17" TFT LCD	£379.00	£445.33
28127 17" TFT LCD, Speakers	£410	£481.75

## Keyboards

19969 Aries EasySpace 105 Key	£5.06	£5.95
29112 Aries SoftTouch Internet	£9.99	£11.63
29113 Aries Multimedia 105 Key	£15.00	£17.63
22946 Microsoft Ergonomic	£29.00	£38.08
22823 Logitech Cordless	£49.00	£57.58
21075 Logitech Access	£12.99	£15.26
22945 Microsoft Internet	£15.00	£17.62

## Mice

19826 Aries PS2	£2.51	£2.95
24025 Aries Wheel PS2	£5.99	£7.03
26616 Logitech Cordless Optical	£33.00	£38.78
20002 MS Wheel Mouse	£6.00	£7.63
23004 MS Intellimouse	£32.00	£37.50

## Graphics

Geforce 2 MX400 Upgrade to		
28605 Geforce 4 MX440	£29.00	£34.07
28756 Geforce 4 Ti4200	£99.00	£116.33

## Upgrades

	Ex VAT	Inc VAT
<b>SD RAM</b>		
23851 128MB	£25.00	£29.38
24195 256MB	£47.00	£55.23
26245 512MB	£79.00	£92.83
<b>DDR RAM</b>		
26383 128MB	£26.00	£30.55
26384 256MB	£47.00	£55.23
27801 512MB	£115.00	£135.13

## DVD/CD-RW ROM

27816 16x DVD ROM	£20.00	£23.50
28713 32x10x40 CDRW	£48.00	£56.40
28008 DVD/CDRW Combo	£89.00	£104.58
28162 DVD+RW (Re-Writer)	£299	£351.32
27615 DVD-RAM/DVD-R	£295	£346.63

## Speakers Aries

10699 Aries 100 Watt	£10.00	£11.75
23566 Aries 150 Watt	£15.00	£19.99

## Speakers Creative/Philips

27582 4 Point Surround	£42.00	£49.35
27583 Inspire 5.1 5300	£75.00	£88.13
25649 Philips A1.2 Fun	£11.00	£12.93
25653 Philips A2.3	£28.00	£32.90
28428 Philips A2.6	£49.00	£57.58

## Operating System Microsoft

27715 Xp Home*	£59.53	£69.95
27717 Xp Professional*	£136.13	£159.95
27482 2000*	£136.13	£159.95
25569 Me*	£59.53	£69.95

\*Pre-loaded for your convenience

## Aries Performance 200

## Specification

MD Duron™ Processor  
MSi 6378 Motherboard V2  
128MB PC133 RAM Memory  
8MB 3D Shared Graphics  
AC 97 Onboard Sound  
52x CD ROM  
Internal 56k V.92 Fax/Modem  
Mini Tower Case  
Floppy Drive  
1 Year's On-site Warranty

## AMD® Duron 1GHz

40 GB Hard Disk Drive  
PartCode 28687  
£239.00 Ex VAT £280.82 Inc VAT

## 60 GB Hard Disk Drive

PartCode 28636  
£255.00 Ex VAT £299.63 Inc VAT

## AMD® Duron 1.2GHz

40 GB Hard Disk Drive  
PartCode 28688  
£249.00 Ex VAT £292.58 Inc VAT

## 60 GB Hard Disk Drive

PartCode 28637  
£269.00 Ex VAT £316.08 Inc VAT

## AMD® Athlon 1.4GHz

40 GB Hard Disk Drive  
PartCode 28689  
£279.00 Ex VAT £327.83 Inc VAT

## 60 GB Hard Disk Drive

PartCode 28638  
£315.00 Ex VAT £351.33 Inc VAT



**Aries**  
PartCode 27003  
15" TFT Monitor  
£229 Ex VAT £269.08 Inc VAT

## Sitecom PartCode 28534

## USB-Fast IrDa Adapter

Any modern mobile telephones and PDA's (handheld computers) are equipped with an Infrared (IrDa) port for communicating with a PC or peripheral equipment.

This makes it possible to store information as backup or synchronise a PC diary and address databases. You can even link two computers together to send files.

USB V1.1 & IrDa V1.1. Standard. Supports Infrared & Fast Infrared applications with data transfer at 115Kbps to 4Mbps. DMA data transfer for stable & reliable data transfer. Suitable for Windows 98/ME/2000/Xp. Includes manual

£59 Ex VAT £69.32 Inc VAT

## Aries Performa Xp

## Specification

AMD Athlon™ Processor  
MSi 6378 Motherboard V2  
256MB PC133 RAM Memory  
8MB 3D Shared Graphics  
AC 97 Onboard Sound  
52x CD ROM  
Internal 56k V.92 Fax/Modem  
Mini Tower Case  
Floppy Drive  
1 Year's On-site Warranty

## AMD® Athlon Xp 1700

40 GB Hard Disk Drive  
PartCode 28691  
£299.00 Ex VAT £351.33 Inc VAT

## 60 GB Hard Disk Drive

PartCode 28639  
£319.00 Ex VAT £374.83 Inc VAT

## AMD® Athlon Xp 1800

40 GB Hard Disk Drive  
PartCode 28692  
£319.00 Ex VAT £374.83 Inc VAT

## 60 GB Hard Disk Drive

PartCode 28640  
£339.00 Ex VAT £398.33 Inc VAT

## AMD® Athlon Xp 1900

40 GB Hard Disk Drive  
PartCode 27955  
£339.00 Ex VAT £398.33 Inc VAT

## 60 GB Hard Disk Drive

PartCode 28641  
£359.00 Ex VAT £421.83 Inc VAT

## AMD® Athlon Xp 2000

40 GB Hard Disk Drive  
PartCode 28676  
£369.00 Ex VAT £433.58 Inc VAT

## 60 GB Hard Disk Drive

PartCode 28642  
£389.00 Ex VAT £457.08 Inc VAT



**LEASING** From £29.00 to £35.00 per month  
Monthly Re-Payments over 3 years (subject to status).

**INTEREST FREE CREDIT**

12 months interest free credit options available.

CALL FOR DETAILS **08702200700**

**Aries PerformaXp DDR2****Specification**

AMD Athlon™ Processor  
MSi 6380 Motherboard  
**128MB** PC2100 DDR RAM  
**64MB** GeForce 2 **MX400** Graphics  
AC 97 Onboard Sound  
**40GB** or **60GB** Hard Drive  
**16x DVD** ROM (40xCD ROM)  
Internal 56k V.92 Fax/Modem  
Mini Tower Case  
Floppy Drive  
1 Year's On-site Warranty

**AMD® Athlon Xp 1700**

40 GB Hard Disk Drive

PartCode 28643

**£379.00** Ex VAT **£445.33** Inc VAT

60 GB Hard Disk Drive

PartCode 28644

**£399.00** Ex VAT **£468.83** Inc VAT**AMD® Athlon Xp 1800**

40 GB Hard Disk Drive

PartCode 28645

**£399.00** Ex VAT **£468.83** Inc VAT

60 GB Hard Disk Drive

PartCode 28646

**£419.00** Ex VAT **£492.33** Inc VAT**AMD® Athlon Xp 1900**

40 GB Hard Disk Drive

PartCode 28647

**£419.00** Ex VAT **£492.33** Inc VAT

60 GB Hard Disk Drive

PartCode 28648

**£439.00** Ex VAT **£515.83** Inc VAT**AMD® Athlon Xp 2000**

40 GB Hard Disk Drive

PartCode 28649

**£449.00** Ex VAT **£527.58** Inc VAT

60 GB Hard Disk Drive

PartCode 28650

**£469.00** Ex VAT **£551.08** Inc VAT**Z Bluetooth USB Key**

Desktop PC's, Notebooks, Printers and similar USB devices can easily become Bluetooth enabled by plugging the bluetooth usb key directly into a USB-port or through a USB cable provided with the product. In addition, a full Bluetooth protocol stack with user-interface is included with the product. Once Bluetooth enabled, Notebooks and PCs can wirelessly communicate with each other or with Bluetooth enabled devices to wirelessly share and

**Aries PerformaXp 4****Specification**

AMD Athlon XP™ Processor  
MSi 6380E KT333 Motherboard  
**256MB** PC2100 DDR RAM  
**64MB** GeForce 4 **MX420** Graphics with TV Out  
6 Channel Sound System  
**40GB** or **80GB** Hard Drive  
**16x DVD** ROM (40xCD ROM)  
**32x10x40 CD Writer**  
Internal 56k V.92 Fax/Modem  
Mini Tower Case  
Floppy Drive  
1 Year's On-site Warranty

**AMD® Athlon Xp 1700**

40 GB Hard Disk Drive

PartCode 28693

**£479.00** Ex VAT **£562.83** Inc VAT

80 GB Hard Disk Drive

PartCode 28411

**£519.00** Ex VAT **£609.83** Inc VAT**AMD® Athlon Xp 1800**

40 GB Hard Disk Drive

PartCode 28694

**£449.00** Ex VAT **£586.33** Inc VAT

80 GB Hard Disk Drive

PartCode 28695

**£539.00** Ex VAT **£633.33** Inc VAT**AMD® Athlon Xp 1900**

40 GB Hard Disk Drive

PartCode 28414

**£519.00** Ex VAT **£609.83** Inc VAT

80 GB Hard Disk Drive

PartCode 28415

**£559.00** Ex VAT **£656.83** Inc VAT**AMD® Athlon Xp 2000**

40 GB Hard Disk Drive

PartCode 28416

**£549.00** Ex VAT **£645.08** Inc VAT

80 GB Hard Disk Drive

PartCode 28417

**£589.00** Ex VAT **£692.08** Inc VAT

exchange data and access network resources and the Internet, eliminating cables and entanglements associated with cables.

Ideal for multiuser gaming too!!

28765 20 Meter Range **£39.99** £46.9828766 50 Meter Range **£49.99** £58.73**Award Winning Review****Aries Performa 8500 DDR**

'ATI's Radeon 8500LE card sets this system way above the pack... It also has the added bonus of DVI and S-Video outputs... The Epson Stylus C60 is one of the best printers here and, paired with the Perfection 1250 scanner; also from Epson, this system includes one of the most solid peripherals package. Personal Computer World May 2002

**Specification**

AMD Athlon XP 1600  
CTX 17" SVGA Monitor  
MSi 6380 Motherboard v2  
256MB PC2100 DDR RAM  
40GB Hard Drive (7200rpm)  
64MB Radeon DDR AGP  
SoundBlaster LivePlayer 5.1  
MiniTower ATX Case  
3.5" 1.44MB FDD  
12x DVD ROM  
16x10x40 CDRW Drive  
Aries 56k Winsoft Modem  
Creative Inspire 5.1 Surround Speakers  
Logitech Keyboard, Optical PS2 Mouse



Epson Stylus C60 Colour Printer  
Epson perfection 1250U USB Scanner  
Philips Toucam Fun USB Camera  
Five FREE DVD Movies  
1 Year On-site Warranty

**£999** Ex VAT **£1173.83** Inc VAT**Review Machine****Aries Performance DDR**

'We were gob-smacked to get a 17in CTX Monitor with a PC at this price.

Likewise the Logitech keyboard is just far superior to the kind of peripheral we're used to seeing with machines at this price. Throw in an optical wheelmouse and you've got your perfect score'.

'what is there is of a much higher quality than you'd normally expect in a £499 PC. You wouldn't normally get a 17in monitor of this quality with a PC unless it was a hundred quid more expensive than this'.



Computer Buyer April 2002

**Specification**

AMD Duron 1.GHz  
MSi 6380 Motherboard  
**128MB** DDR PC2100 RAM  
**20GB** Hard Drive (7200rpm)  
**AGP GeForce 2 MX400**  
**64MB** Graphics Card  
AC97 Onboard Sound  
Creative CSW320 Speakers  
Mini Tower ATX Case  
3.5" 1.44MB FDD

**12x DVD ROM**  
Aries 56k V92 Modem  
CTX VL700 17" SVGA Monitor  
Logitech Delux Access Keyboard  
Optical PS2 Mouse  
MS Works V6 Software  
MS Windows ME\*  
1 Year's On-site Warranty

**£499** Ex VAT **£586.33** Inc VAT





# 1.9GHz

from **£399**



## Additions

	Ex VAT	Inc VAT
<b>Aries Monitors</b>		
10075 15" EnergyPro	£79.00	£92.82
21934 17" EnergyPro	£87.00	£102.23
22178 19" EnergyPro	£132.00	£155.10
24895 15.2" TFT LCD	£249.00	£292.57
26118 17" TFT LCD	£379.00	£445.33
28127 17" TFT LCD, Speakers	£410	£481.75
<b>Keyboards</b>		
19969 Aries EasySpace 105 Key	£5.06	£5.95
29112 Aries SoftTouch Internet	£9.99	£11.63
29113 Aries Multimedia 105 Key	£15.00	£17.63
22946 Microsoft Ergonomic	£29.00	£38.08
22823 Logitech Cordless	£49.00	£57.58
21075 Logitech Access	£12.99	£15.26
22945 Microsoft Internet	£15.00	£17.62
<b>Mice</b>		
19826 Aries PS2	£2.51	£2.95
24025 Aries Wheel PS2	£5.99	£7.03
26616 Logitech Cordless Optical	£33.00	£38.78
20002 MS Wheel Mouse	£6.00	£7.63
23004 MS Intellimouse	£32.00	£37.50
<b>Graphics</b>		
Geforce 2 MX400 Upgrade to		
28605 Geforce 4 MX440	£29.00	£34.07
28756 Geforce 4 Ti4200	£99.00	£116.33

## Upgrades

	Ex VAT	Inc VAT
<b>SD RAM</b>		
23851 128MB	£25.00	£29.38
24195 256MB	£47.00	£55.23
26245 512MB	£79.00	£92.83
<b>DDR RAM</b>		
26383 128MB	£26.00	£30.55
26384 256MB	£47.00	£55.23
27801 512MB	£115.00	£135.13
<b>DVD/CD-RW ROM</b>		
27816 16x DVD ROM	£20.00	£23.50
28713 32x10x40 CDRW	£48.00	£56.40
28008 DVD/CDRW Combo	£89.00	£104.58
28162 DVD+RW (Re-Writer)	£299	£351.32
27615 DVD-RAM/DVD-R	£295	£346.63
<b>Speakers Aries</b>		
10699 Aries 100 Watt	£10.00	£11.75
23566 Aries 150 Watt	£15.00	£19.99
<b>Speakers Creative/Philips</b>		
27582 4 Point Surround	£42.00	£49.35
27583 Inspire 5.1 5300	£75.00	£88.13
25649 Philips A1.2 Fun	£11.00	£12.93
25653 Philips A2.3	£28.00	£32.90
28428 Philips A2.6	£49.00	£57.58
<b>Operating System Microsoft</b>		
27715 Xp Home*	£59.53	£69.95
27717 Xp Professional*	£136.13	£159.95
27482 2000*	£136.13	£159.95
25569 Me*	£59.53	£69.95

\*Pre-loaded for your convenience

## Aries Perfecta 800

### Specification

Intel® Celeron™ Processor  
MSi 6368 Motherboard Rev5  
128MB PCI33 RAM Memory  
8MB Shared Graphics  
AC 97 Onboard Sound  
52x CD ROM  
Internal 56k V.92 Modem & 10/100 Network  
Mini Tower Case  
Floppy Drive  
1 Year's On-site Warranty

### Intel® Celeron 1GHz

40 GB Hard Disk Drive

PartCode 28690

£249.00 Ex VAT £292.58 Inc VAT

60 GB Hard Disk Drive

PartCode 28651

£269.00 Ex VAT £316.08 Inc VAT

### Intel® Celeron 1.2GHz

40 GB Hard Disk Drive

PartCode 27983

£269.00 Ex VAT £316.08 Inc VAT

60 GB Hard Disk Drive

PartCode 28652

£289.00 Ex VAT £339.58 Inc VAT



## Aries PartCode 27003

### 15" TFT Screen

This 15" TFT combines the traditional Aries design, with it's easy to use shuttle OSD. Packed into a minimised housing, bringing you the most modern technical features.

£229 Ex VAT £269.08 Inc VAT

## Aries Perfecta 4160

### Specification

Intel® Pentium® 4 Processor  
MSi 6524GL Motherboard  
256MB PCI33 RAM Memory  
16MB Shared Graphics  
AC 97 Onboard Sound  
52x CD ROM  
Internal 56k V.92 Modem  
Midi Tower Case  
Floppy Drive  
10/100 Network Adaptor  
1 Year's On-site Warranty

### Intel® P4 1.6GHz

40 GB Hard Disk Drive

PartCode 28591

£349.00 Ex VAT £410.08 Inc VAT

60 GB Hard Disk Drive

PartCode 28592

£369.00 Ex VAT £433.58 Inc VAT

### Intel® P4 1.7GHz

40 GB Hard Disk Drive

PartCode 28593

£379.00 Ex VAT £445.33 Inc VAT

60 GB Hard Disk Drive

PartCode 28594

£399.00 Ex VAT £468.83 Inc VAT

### Intel® P4 1.9GHz

40 GB Hard Disk Drive

PartCode 28595

£399.00 Ex VAT £468.83 Inc VAT

60 GB Hard Disk Drive

PartCode 28596

£419.00 Ex VAT £492.33 Inc VAT

### Intel® P4 2GHz

40 GB Hard Disk Drive

PartCode 28597

£429.00 Ex VAT £504.08 Inc VAT

60 GB Hard Disk Drive

PartCode 28598

£449.00 Ex VAT £527.58 Inc VAT

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#### Epson C20SX Colour Printer

720 x 720dpi resolution for High Quality Black and Colour Printing.  
4 colour printing for a wide range of printing applications. Print speeds of up to 6.5ppm black text and 3.5ppm colour. EPSON 6pl Ultra Micro Dot with Variable Sized Droplet Technology.

#### Hewlett Packard 2200C Colour Scanner

600 dpi optical, 600 x 1200 dpi hardware, 9600 dpi enhanced resolution. One-pass colour and monochrome. 42-bit colour. USB interface.

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**Aries Perfecta 4260****Specification**

Intel® Pentium® 4 Processor  
MSi 6524GL Motherboard  
**256MB** SDRAM Memory  
**64MB** GeForce 2 MX400 Graphics  
AC 97 Onboard Sound  
**16x DVD** ROM (40xCD)  
Internal 56k V.92 Modem  
Midi Tower Case  
Floppy Drive  
10/100 Network Adaptor  
1 Year's On-site Warranty

**Intel® P4 1.7GHz**

40 GB Hard Disk Drive

PartCode 28255

**£439.00** Ex VAT **£515.83** Inc VAT

60 GB Hard Disk Drive

PartCode 28256

**£459.00** Ex VAT **£539.33** Inc VAT**Intel® P4 1.9GHz**

40 GB Hard Disk Drive

PartCode 28257

**£459.00** Ex VAT **£539.33** Inc VAT

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PartCode 28258

**£479.00** Ex VAT **£562.83** Inc VAT**Intel® P4 2GHz**

40 GB Hard Disk Drive

PartCode 28259

**£489.00** Ex VAT **£574.58** Inc VAT

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PartCode 28260

**£509.00** Ex VAT **£598.08** Inc VAT**Intel® P4 2.4GHz**

40 GB Hard Disk Drive

PartCode 29111

**£639.00** Ex VAT **£750.83** Inc VAT

60 GB Hard Disk Drive

PartCode 29112

**£659.00** Ex VAT **£774.33** Inc VAT**Aries Perfecta 4460 DDR****Specification**

Intel® Pentium® 4 Processor  
MSi 6533GL Motherboard  
**256MB** PC2100 DDR RAM Memory  
**64MB** GeForce 4 MX440 Graphics  
AC 97 Onboard Sound  
**40GB** or **80GB** Hard Drive  
**16x DVD** ROM (40xCD ROM)  
30x10x40 **CD Writer**  
Internal 56k V.92 Modem  
Mini Tower Case  
Floppy Drive  
1 Year's On-site Warranty

**Intel® P4 1.7GHz**

40 GB Hard Disk Drive

PartCode 28264

**£499.00** Ex VAT **£586.33** Inc VAT

80 GB Hard Disk Drive

PartCode 28265

**£549.00** Ex VAT **£645.08** Inc VAT**Intel® P4 1.9GHz**

40 GB Hard Disk Drive

PartCode 28266

**£529.00** Ex VAT **£621.58** Inc VAT

80 GB Hard Disk Drive

PartCode 28267

**£569.00** Ex VAT **£668.58** Inc VAT**Intel® P4 2GHz**

40 GB Hard Disk Drive

PartCode 28268

**£559.00** Ex VAT **£656.83** Inc VAT

80 GB Hard Disk Drive

PartCode 28269

**£599.00** Ex VAT **£703.83** Inc VAT**Intel® P4 2.4GHz**

40 GB Hard Disk Drive

PartCode 29113

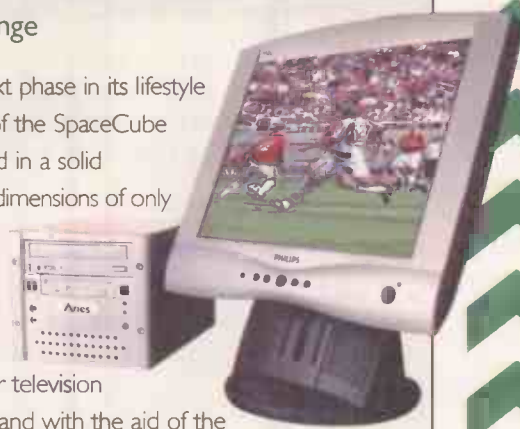
**£709.00** Ex VAT **£833.08** Inc VAT

80 GB Hard Disk Drive

PartCode 29114

**£749.00** Ex VAT **£880.08** Inc VAT**Introducing Aries LifeStyle Computers****Aries LifeStyle Range**

Aries introduce the next phase in its lifestyle PC range in the guise of the SpaceCube series of PC's. Presented in a solid aluminium chassis with dimensions of only 28cm x 20cm x 18cm this console sized computer packs a powerful punch. It will connect directly to your television to replay DVD movies and with the aid of the optional wireless keyboard & mouse you can surf the web from the comfort of your armchair. Connect and edit your digital camera or camcorder footage through the multiple front and rear USB & Firewire IEEE1394 ports or just kick back and play the latest game – it's your choice.

**Aries SpaceCube 1200****Specification**

Intel Celeron Tualatin Ready  
FV25 Motherboard  
4x USB Ports  
2x Rear IEEE 1394 Firewire Ports  
**128Mb** PC133 Ram Memory  
**40Gb** Hard Drive  
**16x DVD** Drive  
AC97 Onboard Sound  
On-Board 2D/3D Graphics  
TV Out  
Internal 56K v.92 Modem  
Realtek 10/100mbps Network  
Onboard  
3.5" Floppy  
1 Year's On-site Warranty

**Intel® Celeron 1.0GHz**

PartCode 28678

**£399.00** Ex VAT **£468.83** Inc VAT**Aries SpaceCube 2200****Specification**

Intel Socket 478 Ready  
FS50 Motherboard  
**256Mb** DDRPC2100 Memory  
**60Gb** Hard Drive  
**16x DVD** Drive  
Surround Sound 6 Channel  
Sound System  
On-Board 3D Graphics  
TV Out  
Internal 56K v.92 Modem  
10/100 Network  
3.5" Floppy  
1 Year's On-site Warranty

**Intel® Celeron 1.7GHz**

PartCode 29185

**£499.00** Ex VAT **£586.32** Inc VAT**Intel® P4 1.7GHz**

PartCode 28679

**£569.00** Ex VAT **£668.58** Inc VAT**Intel® P4 2.0GHz**

PartCode 28680

**£599.00** Ex VAT **£703.83** Inc VAT**SpaceCube Upgrade Option**

	Ex VAT	Inc VAT		Ex VAT	Inc VAT
<b>Monitors</b>			<b>Memory</b>		
21934	17" Aries	<b>£87.00</b> <b>£102.23</b>	24195	256Mb SDRAM	<b>£47.00</b> <b>£55.33</b>
25714	15.2" TFT LCD	<b>£269.00</b> <b>£316.08</b>	26245	512Mb SDRAM	<b>£79.00</b> <b>£92.83</b>
25555	Philips 150X 15" TFT + Wireless Keyboard & Mouse	<b>£479.00</b> <b>£562.82</b>	26384	256Mb DDR	<b>£47.00</b> <b>£55.23</b>
<b>Keyboards &amp; Mice</b>			27801	512Mb DDR	<b>£115.00</b> <b>£135.12</b>
22823	Logitech i-Touch Wireless Keyboard & Mouse	<b>£49.00</b> <b>£57.57</b>	<b>Speakers</b>		
<b>DVD/CDRW</b>			28527	Philips A3.6 1200watt Flat Panel + SubWoofer	<b>£99.00</b> <b>£166.32</b>
28713	CDRW 32x10x40x	<b>£48.00</b> <b>£56.40</b>	<b>Operating System</b>		
28008	12x8x32x8x	<b>£89.00</b> <b>£104.58</b>	27715	Xp Home	<b>£59.53</b> <b>£69.95</b>
27615	DVD-RAM/DVD-R	<b>£295.00</b> <b>£346.62</b>	27717	Xp Professional	<b>£136.13</b> <b>£159.95</b>
			27482	2000	<b>£136.13</b> <b>£159.95</b>
			25569	Me	<b>£59.59</b> <b>£69.95</b>

Supplied with **FREE** Printer Cable



## Graphic Cards

	Ex VAT	Inc VAT
<b>Asus GeForce 4 TV-Out</b>		
28533 V8170 MX440 DDR 64mb	£89.00	£104.58
28631 V8440 Ti4400 128mb DDR DVI	£239.00	£280.83
28632 V8460 Ti4600 128mb DDR DVI	£295.00	£346.63

## ATI Radeon

27904 7000 32MB DDR Retail VO	£49.00	£57.58
27899 7500 64MB DDR Retail DVI VO	£95.00	£111.63
28288 8500 64MB DVI	£265.00	£311.38
27902 8500 64MB DDR DVI VO	£172.00	£202.10
28201 8500LE 64MB DDR DVI TV DH OEM	£107.00	£125.73

## Creative GeForce 4 TV-Out

28554 Graphics Blaster MX440 64Mb	£89.00	£104.58
28518 GraphicsBlaster Ti4400 128Mb DVI	£211.00	£247.93
28555 GraphicsBlaster Ti4600 128Mb DVI	£261.00	£306.68

## Gainward GeForce 4 TwinView

28401 MX420 64mb AGP TV DVI	£62.00	£72.85
28402 MX440 64mb AGP TV DVI	£79.00	£92.83
28403 MX460 64mb AGP VIVO DVI	£112.00	£131.60
28759 Ti-4200 128mb VIVO DVI	£169.00	£198.58
28404 Ti-4400 128mb VIVO DVI	£219.00	£257.33
28405 Ti-4600 128mb VIVO DVI	£269.00	£316.08

## Leadtek GeForce 4 TV-Out

28441 MX440 64mb TV DDR	£82.00	£96.35
28681 Ti4400 Ultra 128mb DDR DVI RT	£225.00	£264.38
28633 Ti4600 Ultra 128mb DDR DVI	£289.00	£339.58

## Matrox Millennium

27624 G550 32mb DDR (OEM)	£79.00	£92.83
27929 G550 32mb DDR	£75.00	£88.13

## Matrox Marvel

26578 G450 eTV 32Mb DDR	£159.00	£186.83
26579 G450 eTV 32Mb DDR (OEM)	£155.00	£182.13

## MSI GeForce TV-Out

28627 GeForce 2 MX440 64Mb AGP (OEM)	£59.00	£69.33
28605 GeForce 4 MX440 64Mb AGP (OEM)	£75.00	£88.13
28628 GeForce 4 Ti4400 128mb AGP (OEM)	£185.00	£217.38
28629 GeForce 4 Ti4640 128Mb AGP (OEM)	£267.00	£313.73

## Videologic TV-Out

28194 Vivid! XS 64Mb TV OUT	£79.00	£92.83
24185 Grafistar 670 OEM	£34.99	£41.11

## Motherboards

Motherboard Kits Available on Page 10. For larger selection visit our web site [www.watford.co.uk](http://www.watford.co.uk)

PartCode	26125	28190	28493	28519	26717	28519	27504	28513	27541	28115
Manufacturer	Abit	Abit	MSI	Asus	Gigabyte	Asus	Intel	MSI KT3ARU	MSI	MSI
Model	KT7-A	KT7A-RAID	KT3	A7V333-A	GA-7DXR	A7V333	D845WN	Pro RAID	K7T 266 Pro	850 Pro
CPU	Duron/Athlon	Duron/AthlonXp	Duron/AthlonXp	Duron/AthlonXp	Duron/AthlonXp	Duron/AthlonXp	P4	Duron/AthlonXp	Duron/AthlonXp	Pentium 4
Chipset	VIA KT133A	VIA KT266A	VIA KT333	VIA KT333	AMD 761/VIA 606B	KT333	Intel 845	VIA KT333	VIA KT1266	Intel 850
FSB	266MHz	266MHz	266MHz	266MHz	266MHz	266MHz		266MHz	266MHz	400MHz
RAM Type	SDRAM	DDR	DDR	DDR	DDR SDRAM	DDR	SDRAM	DDR	DDR	RDRAM
PCI	6	6	5	5	5	5	6	5	5	4
ISA	1	0	0	0	0	0	0	0	0	0
AGP	AGP x4	AGP x4	AGP x4	AGP x4	AGP x4	AGP Pro	AGP x4	AGP x4	AGP x4	AGP x4
Graphics	No	No	No	No	No	No	No	No	No	No
Sound	No	No	6 Channel	AC97	Creative CTS880	Cmedia 8738	adi 1885	6 Channel	VIA AC97 CODEC	Intel AC97 CODEC
Memory Slots	3	3	3 DDR	3 DDR	3	DDR	3	3 DDR	3	4
Form Factor	ATX	ATX	ATX	ATX	ATX	ATX	ATX	ATX	ATX	ATX
USB Ports	4	2	6	4	4	4	2	6	4	4
IDE Controller	2xATA 100	2x ATA 100 2x ATA 100 RAID	2x ATA 133	2x ATA 133	2x ATA 100, 2x ATA 100 RAID	2x ATA 133/100/66	ATA 100	2x ATA 133 2xATA 133 RAID	2x ATA 100	2x ATA 100
Ex VAT	£62.00	£79.00	£74.00	£99.00	£73.00	£99.00	£85.00	£99.00	£74.00	£89.00
Inc VAT	£72.85	£92.82	£86.95	£166.32	£85.77	£116.32	£99.87	£116.32	£86.95	£104.57

## Processors

	Socket	Ex VAT	Inc VAT
<b>AMD</b>			
27596 Duron 1.0 Ghz 200mhz	A	£38.00	£44.65
28125 Duron 1.1 Ghz 200mhz	A	£46.00	£54.05
28126 Duron 1.2 Ghz 200mhz	A	£47.00	£55.23
28362 Duron 1.3 Ghz 200mhz	A	£65.00	£76.38
27808 Athlon XP 1600 1.4Ghz	A	£72.00	£84.60
27809 Athlon XP 1700 1.47Ghz	A	£79.00	£92.83
27810 Athlon XP 1800 1.53Ghz	A	£86.00	£101.05
28090 Athlon XP 1900	A	£104.00	£122.20
28300 AMD Athlon XP 2000	A	£144.00	£169.20
28634 AMD Athlon XP 2100	A	£169.00	£198.58

## Intel

27350 PII Celeron 1.1Ghz	370	£57.00	£66.98
28091 PII Celeron 1.2Ghz	370	£61.00	£71.68
28407 Celeron 1.3Ghz	370	£65.00	£76.38
28771 Celeron 1.4Ghz	370	£79.00	£92.83
27351 Pentium III 1.13Ghz	370	£129.00	£151.58
27358 Pentium 4 1.7Ghz	478	£112.00	£131.60
27359 Pentium 4 1.8Ghz	478	£135.00	£158.63
27360 Pentium 4 1.9Ghz	478	£149.00	£175.08
27361 Pentium 4 2Ghz	478	£169.00	£198.58
28406 Pentium 4 2.2Ghz	478	£199.00	£233.83
28774 Pentium 4 2.4Ghz	478	£321.00	£377.18
28776 Pentium 4 2.5Ghz	478	£506.00	£594.55

## Memory

	Ex VAT	Inc VAT
<b>SDRAM PC133</b>		
23850 64Mb 168 Pin for 133MHz Bus	£17.00	£19.98
23851 128Mb 168 Pin for 133MHz Bus	£25.00	£29.38
24195 256Mb 168 Pin for 133MHz Bus	£47.00	£55.23
26245 512Mb 168 Pin for 133MHz Bus	£79.00	£92.83

## DDR PC2100

26383 128MB 184Pin DIMM	£26.00	£30.55
26384 256MB 184Pin DIMM	£47.00	£55.23
27801 512MB 184Pin DIMM	£115.00	£135.13

## DDR PC2700

28514 256MB 184Pin DIMM	£65.00	£76.38
28515 512MB 184Pin DIMM	£132.00	£155.10

## RAMBUS 800MHz

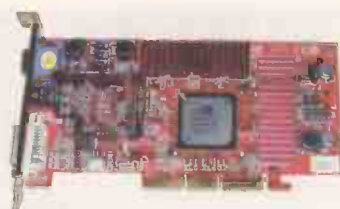
27466 64mb Non-ECC RIMM	£19.90	£23.38
26741 128mb Non-ECC RIMM	£39.00	£45.83
26742 256mb Non-ECC RIMM	£79.00	£92.83

## Compact Flash

22682 32Mb	£28.00	£32.90
25940 64Mb	£25.00	£29.38
25938 128Mb	£39.00	£45.83

## Smart Media

26382 32Mb	£19.00	£22.33
27479 64Mb	£23.00	£27.03
22679 128Mb	£59.00	£69.33



## Gainward PartCode 28759

## GeForce4 Ti-4200

The GeForce4 Ti-4200 GPU in combination with Gainward's unique High-Performance/Wide-Bandwidth hardware design, 128MB 4.0ns DDR memory, two VGA connectors, DVI, plus video-in and video-out offers by far today's best price/performance ratio and will again easily blow away competitive products simply based on NVIDIA's reference design. The Gainward GeForce4 PowerPack! Ultra/650 XP "Golden Sample"™ will continue Gainward's tradition of offering advanced, leading edge, products for the utmost enthusiastic 3D gaming community at a very reasonable price.

£169Ex VAT £198.58Inc VAT

## Abit PartCode 28706

## AT7 Motherboard

ABIT is still the hot favorite among overclockers and DIY enthusiasts. The AT7 based on VIA KT333CE chipset removing the PS/2 legacy ports replacing them with 4 USB 1.1 ports, 2 USB 2.0 ports and 2 Firewire ports. Up to 12 IDE devices can be attached.

£122Ex VAT

£143.35Inc VAT



## CPU Fans

	Ex VAT	Inc VAT
<b>Various</b>		
25005 Socket A Athlon/Duron/S370/Skt 7 Fan & Heatsink	£5.00	£5.88
28281 CoolerMaster SocketA upto AMD XP1900 Fan/Heatsink	£12.00	£14.10
28482 CoolerMaster Thermal Compound Kit Retail	£3.99	£4.69
27813 P4 Socket 478 2.0Ghz Heatsink+Fan	£12.00	£14.10

## CoolerMaster PartCode 28479

## CPU Cooler, Socket A, 370, 478

Best performance to noise ratio. Long life Ball-bearings. Spring clip for easy installation. Ideal cooler for overclocking. Fits Celeron 1.5GHz and higher PIII 1.3GHz + Athlon 1.8GHz Athlon 4 up to 2.2GHz Duron 1GHz +

£29.00Ex VAT £34.00Inc VAT



## CDR/CDRW Disk Drives

	Ex VAT	Inc VAT
<b>Benq (Acer) Internal IDE</b>		
28531 CDRW 32x10x40x	£57.00	£66.97
28532 CDRW 40x12x48x	£89.00	£104.58

## BTC Internal IDE

28713 BCE3212IM CDRW 32x10x40	£55.00	£64.63
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## Iomega

28206 CDRW 10x16x40x USB 2.0 Ext.	£115.00	£135.13
27100 ZipCD Predator Firewire adapter	£69.00	£81.08

## Lite-On Internal IDE

28278 32x12x40x CDRW	£57.00	£66.98
28457 40x12x48x CDRW	£69.00	£81.08

## Philips Internal IDE

28373 PCRW2412K 24x12x40 CDRW	£53.00	£62.28
28450 PCRW3210K 32x10x40 CDRW	£79.50	£93.41

## Plextor Internal IDE

28398 PX-W4012TA 12x40x40x CDRW	£99.00	£116.33
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## Yamaha Internal IDE 24x10x40x

28082 CRW3200E-VK	£82.00	£96.35
28083 CRW3200X-VK Firewire Ext	£144.00	£169.20
28084 CRW3200UX-VK USB 2	£136.00	£159.80
28085 CRW3200SX-VK SCSI Ext	£149.00	£175.08

## Intenso PartCode 28116

25x 80min 24 speed CD's

£5.00 Ex VAT £5.87 Inc VAT



## Intenso PartCode 28355

25x 90min 24 speed CD's

£9.95 Ex VAT £11.69 Inc VAT



## IDE Hard Drives

	Ex VAT	Inc VAT
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## Seagate Ultra ATA 100

Covered By 3 Year Limited Manufacturer Warranty

27054 ST340810A 40.6GB 5400RPM	£53.00	£62.28
27055 ST360020A 60GB 5400RPM	£65.00	£76.38
27056 ST380020A 80GB 5400RPM	£85.00	£99.88

## Seagate Barracuda ATA IV 100

28037 ST320001A 20Gb 7200RPM	£56.00	£65.80
28038 ST340016A 40Gb 7200RPM	£62.00	£72.85
28039 ST360021A 60Gb 7200RPM	£78.00	£91.65
28040 ST380021A 80Gb 7200RPM	£99.00	£116.3

## Western Digital Ultra ATA

Covered By 3 Year Manufacturer Warranty

23834 WD200EB 20.5Gb 5400RPM	£52.00	£61.10
26370 WD400AB 40Gb 5400RPM	£56.00	£65.80
26371 WD600AB 60Gb 5400RPM	£69.00	£81.08
26373 WD400BB 40Gb 7200RPM	£68.00	£79.90
27429 WD800BB 80Gb 7200RPM	£93.00	£109.28
27428 WD800BB 80Gb 7200RPM I	£161.66	£189.

## Western Digital UIDE

28078 100Gb UIDE 5400rpm	£139.00	£163.33
28079 120Gb UIDE 5400rpm	£148.00	£173.90

## IBM EIDE/Ultra ATA-100 7200RPM

Covered by 3 Years Manufacturer Warranty

28447 Deskstar 120GXP 40Gb	£59.00	£69.33
28654 Deskstar 120GXP 60Gb	£70.00	£82.25
28448 Deskstar 120GXP 80Gb	£81.00	£95.18
28449 Deskstar 120GXP 120Gb	£149.00	£175.08

## Maxtor EIDE UDMA 100

27395 540X 40Gb 2Mb 12ms 5400RPM	£58.00	£68.15
27396 540X 60Gb 2Mb 12ms 5400RPM	£62.00	£72.85
27397 540X 80Gb 2Mb 12ms 5400RPM	£79.00	£92.83
28041 540X 120Gb 2Mb 12ms 5400RPM	£125.00	£146.88

## Maxtor EIDE UDMA 133

28041 540X 120Gb 2Mb 5400RPM	£125.00	£146.88
28042 540X 160Gb 2Mb 5400RPM	£165.00	£193.88
28044 740X 40Gb 12ms 7200rpm	£56.00	£65.80
28045 740X 60Gb 7200rpm	£69.00	£81.08
27909 740X 80Gb 12ms 7200rpm	£89.00	£104.58

## CDRW/DVD Combo Drives

	Ex VAT	Inc VAT
<b>Various</b>		
28008 LG 12x8x32 8x	£89.00	£104.58
25360 Ricoh MP9120A-DP 12x10x32x8x	£110.00	£129.25

## DVD Drives

	Ex VAT	Inc VAT
<b>Various</b>		
27816 BTC 16x Internal IDE	£45.00	£52.88
24996 Pioneer 16X Int Slot Bare ATAPI	£52.00	£61.10
27598 Lite-On 16x 48x Internal IDE	£39.00	£45.83

## Acer PartCode 28388

## CRW-3210A CDRW

The Acer CRW-3210A offers the latest in CD-RW speed and quality.

32X Writing, 10X Rewriting, 40X Reading, Seamless Link technology! 2MB Buffer Size, Flash Memory / Upgrade System, E-IDE / ATAPI Interface, Popular Recording Software Package, Anti-Vibration System Play/Skip function buttons on panel, Emergency Eject, Dust protection design, Power Saving Feature

## Accessories

Nero CD burning software  
4X black ReWritable CD  
Quick installation guide &  
Audio cable, DOS device driver,  
disk (3 1/2" floppy)

£57 Ex VAT £66.97 Inc VAT



## CD Media

	Ex VAT	Inc VAT
28120 Intenso 80min CDR (10 Pack) 24x	£3.90	£4.58
27925 80min CDR (10 pack) 24x	£2.12	£2.49
28116 Intenso CD-R80 25 spindle 24x	£5.00	£5.88
26637 Intenso CD-R80 50 spindle 24x	£9.00	£10.58
28005 CD-R80 100 pack 24x	£17.00	£19.98
28355 Intenso CD-R90 25 spindle 24x	£9.95	£11.69
16348 Press-it CD Labelling Kit	£16.00	£18.80
28475 Press It CD Labelling Kit Lite	£8.50	£9.99
17251 Press itPack of 50 White Labels	£4.95	£5.82

## Pressit PartCode 28541

## CD Labelling Kit

80-minute CD Media.  
100-pack mounted on a spindle, Suitable for up to 16x CD-Writers>Create stunning labels in seconds. Sample pack of high quality CD labels & Jewel Case Insert. Guarantees accurately centred labels. Quick and Easy to use.

£22 Ex VAT £25.85 Inc VAT



## Editors Choice

## Philips PartCode 28162

## DVDRW208 DVD+RW

Philips' new DVDRW208 DVD+RW drive is one of the most powerful optical recording solutions we've tested, and it works very well. This internal IDE drive comes with a great software bundle and some advanced features like Seamless Link to ensure you have a great experience using it.

DVD+RW is a competing standard to DVD-RAM that was released over a year ago. The problem inherent to DVD-RAM is that it requires the use of proprietary media cartridges that cannot be played back in any device other than a DVD-RAM drive. DVD+RW, on the other hand, lets you record onto a blank 4.7GB (Gigabyte) disc and play it back in any DVD player, even a set-top box. It's because of this level of compatibility that the DVD+RW format is taking off.



£289 Ex VAT  
£316.07 Inc VAT

## PC Cases

PartCode	Case Size	Power Supply	Board Size	Expansion Slots	Drive Bays	Ex VAT	Inc VAT
27589	ATX Midi,	250 Watt,	Full ATX,	7 Full 2 Half,	2x5.25" 1x3.5"	£25.00	£29.37
27587	ATX Midi,	300 Watt,	Full ATX,	7 Full 2 Half,	2x5.25" 1x3.5"	£38.25	£44.95
27712	ATX Midi,	300 Watt,	Full ATX,	7 Full 2 Half,	3x5.25" 2x3.5"	£38.25	£44.95
21365	Full Tower,	250 Watt,	Full ATX,	7 Full 2 Half,	6x5.25" 2x3.5"	£39.00	£45.83
17470	ATX Desktop,	255 Watt,	Full ATX,	7 Full 2 Half,	2x5.25" 2x3.5"	£36.99	£43.46

## Sound Cards

	Ex VAT	Inc VAT
<b>Creative SoundBlaster</b>		
27573 4.1 Digital	£22.00	£25.85
27574 5.1 Digital	£45.00	£52.88
27570 Audigy Player	£65.00	£76.38
27571 Audigy Platinum	£132.00	£155.10
27572 Audigy Platinum EX	£169.00	£198.58
28508 Extigy - External USB S/Card	£117.00	£137.48

## Speakers

	Ex VAT	Inc VAT
26733 Altec Powercube 3 peice 200w PMPO	£30.25	£35.54
27582 Creative FPS1600	£42.25	£49.64
27583 Creative Inspire 5.1 5300 Surround	£75.50	£88.71
27584 Creative Inspire 5.1 5700 Surround	£121.25	£143.39
25243 Creative SBS 35	£12.25	£14.39
27931 Creative SoundWorks CSW-320 2.1 Black	£28.28	£33.23
24749 Creative SoundWorks Digital Sys	£51.25	£60.22
28189 Aries Surround Sound System 120W	£82.25	£96.64
25649 Philips A1.2 Fun 50 watts	£11.25	£13.22
25653 Philips A2.3 250watt, 2 spk's + Sub	£35.25	£41.42
28375 Videologic ZXR-500 5.1 Channel System	£59.25	£69.62

## Philips PartCode 28428

## A2.600 5.1 Compact Surround Power

Multimedia 5.1-Channel Speaker System.

Active High Power

50 Watts (RMS)

Compact Powerful

Subwoofer, Rich, deep bass

a deceptively small enclosure. Aerodynamic front firing design, High Clarity Satellite Speakers, Easy Placement, 5 meters of wire, Wall mounting as an option, Remote Control, Bass Boost, Magnetically Shielded.

£49 Ex VAT £57.57 Inc VAT



## Videologic PartCode 28375

## ZXR-500

5.1 Channel Amplified Speaker System

65W RMS, Connects to any 5.1

soundcard or DVD Player with

decoder, Powerful

dual-ported

sub-woofer, Perfect

for home cinema,

games or music,

Capable of reproducing

Dolby Digital and DTS Soundtracks, Stylish and

compact silver design

£57 Ex VAT £66.97 Inc VAT





## Editors Choice



## Motherboard Kits

No one predicted the amazing success of our motherboard kits. Not only do they ensure peace of mind for compatibility but also in addition offer reassuringly competitive price. Log on to our web-site [www.watford.co.uk/](http://www.watford.co.uk/) for other motherboard kits available.

Receive your kit fully-assembled and soak tested for an additional  
**£9.99** Ex VAT **£11.74** Inc VAT

**Duron® 1GHz** PartCode 28381  
 Duron 1GHz + Fan + MSI MS-6378  
 MotherBoard + 256Mb Memory  
**£129.00** Ex VAT **£151.58** Inc VAT

**Athlon® 1.4GHz** PartCode 27586  
 Athlon 1.4GHz + Fan + MSI MS-6380  
 MotherBoard + 256Mb Memory  
**£179.00** Ex VAT **£210.33** Inc VAT

**Athlon® XP1700** PartCode 28071  
 Athlon XP1700 + Fan + MSI MS-6380  
 MotherBoard + 128Mb DDR Memory  
**£189.00** Ex VAT **£222.00** Inc VAT

**Celeron® 1GHz** PartCode 28390  
 Celeron 1GHz + Fan + MSI MS-6368  
 MotherBoard + 256Mb Memory  
**£119.00** Ex VAT **£139.83** Inc VAT

**Intel® PIII 1GHz** PartCode 27281  
 Intel PIII 1GHz + Fan + MSI MS-6368  
 MotherBoard + 256Mb Memory  
**£189.00** Ex VAT **£222.08** Inc VAT

**Intel® P4 1.6GHz** PartCode 28702  
 Intel P4 1.6GHz + Fan + MSI MS-6524GL  
 MotherBoard + 256Mb Memory  
**£209.00** Ex VAT **£245.58** Inc VAT

## Digital Cameras

Ex VAT Inc VAT

## Canon

27494	PowerShot A20	£252.00	£296.10
25388	Digital IXUS	£372.00	£437.10
26786	Digital IXUS 300	£389.00	£457.08
27907	PowerShot G2	£528.00	£620.40

## FujiFilm

25363	FP-1300	£128.00	£150.40
28217	FinePix 2600	£219.00	£257.33
28431	AXIA-100	£119.00	£139.83
28173	Finepix A101	£116.50	£136.89
28174	Finepix A201	£169.00	£198.58
26368	FP-6800	£479.00	£562.83
26810	Im FP-6900	£529.00	£621.58

## Epson

28723	PhotoPC 2100Z	£269.00	£316.08
26885	PhotoPC 3100Z	£416.00	£488.80

## Olympus

26417	C1	£165.00	£193.88
27300	C1 Zoom	£206.00	£242.05
28305	C-2 Zoom	£205.00	£240.88
28304	C-100	£199.00	£233.83
27107	C-700	£465.00	£546.38
28306	C3020Z	£399.00	£468.83
27610	C40Z Zoom	£535.00	£628.63
27458	C-4040Z Camedia	£599.00	£703.83
26493	E-10 SLR	£979.00	£1,150.33

## Kodak

26808	DX3500	£169.00	£198.58
26809	DX3600	£183.00	£215.03
28202	DX3700	£225.00	£264.38
27297	DX3215	£137.00	£160.98
27298	DX3900	£259.00	£304.33
28601	DX4900	£315.00	£370.13

## Networking

Ex VAT Inc VAT

## Various

28735	Intel Pro Wireless 2011 USB Ethernet	£89.00	£104.58
28736	Intel Wireless Ethernet Gateway (11MB)	£129.95	£152.69
28737	Intel PRO 2011 Adapter/Ethernet PC Card Wireless I	£105.00	£123.38
28738	Intel Pro Wireless 2011 11MB Access Point	£349.00	£410.08
28739	Intel Pro Wireless 2011 LAN PC Card PCMCIA	£65.00	£76.38
28205	Excel 10/100 USB Adaptor	£19.00	£22.33
27475	Linksys LNE -950TX 10/100	£13.00	£15.28

## Video Conferencing

Ex VAT Inc VAT

## Various

28427	Creative Labs PC Cam 500 16mb 3-in-one Camera	£99.00	£116.33
27594	Creative Labs Webcam 5 USB	£29.00	£34.08
28512	Creative Labs WebCam USB	£29.00	£34.08
25444	Logitech QuickCam Pro 3000 VC, USB	£49.00	£57.58
28054	Modular Technology Pocket Cam 100	£35.00	£41.13
28160	Philips WebCam Pro 3D USB PCVC750K	£60.00	£70.50
26001	Philips Toucam Fun USB PCVC730K	£36.00	£42.30
25546	Philips Toucam Pro USB Webcam PCVC740K	£48.00	£56.40

## Projectors

Ex VAT Inc VAT

## Various

28696	CTX PS-5110 SVGA 1000 ansi	£1,499.00	£1,761.33
28289	Epson EMP-51 LCD	£1,599.00	£1,878.83
28290	Epson EMP-71 LCD	£1,799.00	£2,113.83
28434	Phillips CSmart 1000 lms Svga	£1,402.00	£1,647.35
27779	VPL-Cs4 LCD SVGA 1000 ANSI	£1,309.00	£1,538.08

## Digital Audio Players

Ex VAT Inc VAT

## Various

28485	Aries MP3 32MB	£49.00	£57.58
26876	Archos Jukebox 6000 6Gb Storage	£189.00	£222.08
27933	Creative DAP Jukebox 20Gb	£249.00	£292.58
26577	Diamond Rio 800 128Mb	£169.00	£198.58
25242	Creative Labs Jukebox	£152.00	£178.60

## PalmTops

Ex VAT Inc VAT

## Various

28576	iPAQ H3870 64MB SD Slot Bluetooth	£489.00	£574.58
28063	HP Jornada 565 Colour 32MB	£399.00	£468.83
27711	Palm M125 8Mb	£129.00	£151.58
28585	Palm M130 8Mb	£173.00	£203.28
26606	Palm m500 8Mb Mono	£199.00	£233.83
28588	Palm m515 16Mb Colour	£285.00	£334.88
28546	Sony Clie T625 16mb DRAM Palm	£299.00	£351.33

## Scanners

Ex VAT Inc VAT

27636	Canon CanoScan N670U	£55.00	£64.63
27637	Canon CanoScan N1240U	£142.00	£166.85
27638	Canon CanoScan N1240U	£89.00	£104.58
27388	Epson Perfection 1250U	£66.99	£78.71
27389	Epson Perfection 1250U Photo	£89.99	£105.74
27390	Epson Perfection 1650U	£112.00	£131.60
27391	Epson Perfection 1650U Photo	£134.00	£157.45
28112	Epson Perfection 2450U Photo	£224.00	£263.20
28150	HP Scanjet 2200C A4 Flatbed USB	£50.00	£58.75
27305	HP Scanjet 4400C	£70.00	£82.25
27307	HP Scanjet 5400C	£119.00	£139.83
27308	HP Scanjet 5470C	£158.00	£185.65
28242	Microtek ScanMaker 3800	£62.00	£72.85
28384	Microtek ScanMaker 4800	£99.00	£116.33

## Epson PartCode 28112

## Perfection 2450U Photo

True 2400x4800 dpi high quality scanning. Built-in 4" x 9" Transparency Unit. 48-bit colour scanning. Ultra fast scanning speeds for better efficiency. New EPSON TWAIN 5.5. QuickStart button & intelligent Smart Panel interface for one-touch scanning! New Adobe Photoshop Elements imaging software. On-Chip Microlens Technology for increased image clarity & detail. 'Scan to Web' button to share your photo's.

**£224** Ex VAT **£263.20** Inc VAT

## Modems &amp; ISDN

Ex VAT Inc VAT

## Various

28778	Aries ADSL USB Modem	£59.00	£69.33
21484	Aries K56 55.6 Internal PCI PnP	£16.98	£19.95
28424	Creative Modem Blaster 56K V92	£32.00	£37.60
20943	Diamond Supra Express 56i Pro	£31.00	£36.43
26148	Hayes Accura 56K V92 External	£59.00	£69.33

## Sitecom PartCode 28534

## Multi Memory Reader/Writer

USB Connection. CF, SM, MS, SD, MMC and Microdrive compatible. All types of media can be used at once. Including USB connection cable. Win 98/ME/2000/Xp/Mac compatible.

**£59** Ex VAT **£69.32** Inc VAT

Copy from any media... to any Media

## Creative PartCode 28427

## PC Cam 600

Extensive still image quality and storage options include 200 images at 640x480 (VGA), 85 images at 1024x768 (XGA), and 20 images at 1280x960 (1.3 megapixels). Up to 75 seconds of video at 352x288 (SIF) resolution and 15fps with audio, or up to 60 minutes of audio-only recording.

**£99** Ex VAT **£116.33** Inc VAT

## FujiFilm

## PartCode 28217

## FinePix 2600 Zoom

2.1 MegaPixel CCD with simple user-friendly controls and easy USB computer connection. A sliding lens cover protects the lens during storage. It fits discreetly into a purse or pocket. Featuring a Fujinon 3X optical / 25X digital zoom, video recording, and PC-Cam Internet mode. Fujifilm's Advanced Color Technology captures near film-like digital color. Set to automatic, or select manual for greater control over each exposure. 16 MB SmartMedia™, 2 NiMH AA batteries & Charger, Cables, PhotoDeluxe™.

**£219** Ex VAT **£257.32** Inc VAT



**Creative** PartCode 28508**SoundBlaster Extigy**

Introducing Sound Blaster Extigy-the fully external Sound Blaster for your PC or notebook. Simply connect it to the outside of your PC or notebook and experience stunning digital audio fidelity with Sound Blaster Extigy's 24bit/96kHz DACs at 100dB SNR clarity.

24-bit multi-channel performance with 100dB SNR clarity. Transform your PC into a home-theater with Dolby Digital 5.1 surround sound. Enrich your listening experience with innovative EAX ADVANCED HD music enhancement tools.

**£114.89** Ex VAT **£134.99** Inc VAT

**Pinnacle** PartCode 28547**Studio Deluxe**

Pinnacle Studio Deluxe delivers everything you need to make fantastic Digital movies on your PC, all in one easy to use package. Pinnacle Studio Deluxe includes full versions of Pinnacle Studio version 7, Pinnacle Express and Pinnacle Hollywood FX for Studio. In addition, Pinnacle Studio Deluxe includes the new Pinnacle AVDV Analog and Digital video capture card for super high quality capture from just about any source. From Analog or Digital video capture and editing all the way through to burning a disc to play on your set top DVD player, Pinnacle Studio Deluxe makes it easy to make great movies at home.

**£217** Ex VAT **£254.97** Inc VAT

**Epson** PartCode 27580**C80**

20ppm high quality plain paper printer. Money saving separate ink cartridges. Laser-crisp text and vibrant colour up to 2880 dpi. Smudge proof and water-proof pigment based inks. 4 colour printing for a wide range of printing applications. Intellidrive system providing accurate ink information for each individual colour tank. EPSON 3pi Ultra Micro Dot with Variable Sized Droplet Technology. 150 auto sheet feeder for large print runs and multiple document handling. Parallel and USB connectivity

**£116** Ex VAT **£136.30** Inc VAT

**Canon** PartCode 28369  
**S9000 Bubblejet Printer**

Capable of printing borderless A3 photos in approximately two and a half minutes and A4 photos in only one and a half minutes, it combines fast speeds with brilliant output. The S9000 delivers exquisite prints that look just like genuine silver-halide photos. To attain such fast print speeds, the Bubble Jet S9000 features sophisticated print head technology, bi-directional printing and a super efficient paper feeder for smooth paper handling.

**£347** Ex VAT **£407.72** Inc VAT

**Canon** Inkjet

28364	S300	£69.00	£81.08
28365	S520	£145.00	£170.38
28366	S750	£155.00	£182.13
28367	S820D	£325.00	£381.88
	S820	£219.00	£257.33
28368	S900	£325.00	£381.88
28369	S9000	£347.00	£407.73

**Epson** Stylus

27035	C20SX	£44.00	£51.70
27036	C20UX	£44.00	£51.70
27038	C40SX	£52.00	£61.10
27039	C40UX	£52.00	£61.10
27740	C60	£59.00	£69.33
27741	C70	£89.00	£104.58
27580	C80	£116.00	£136.30
23455	Colour	£192.00	£225.60

**Epson** Stylus Photo

27755	810	£74.00	£86.95
25681	890	£126.00	£148.05
26858	895	£133.00	£156.28
28758	950	£289.00	£339.58
25682	1290	£259.00	£304.33

**Hewlett Packard** Deskjet

27543	656c	£40.00	£47.00
27544	845c	£60.00	£70.50
27545	920c	£68.00	£79.90
27546	940c	£81.00	£95.18

**Hewlett Packard** PhotoSmart

27548	P100	£102.00	£119.85
27550	P1115	£137.00	£160.98
25258	1215	£177.00	£207.98
27551	1315	£226.00	£265.55

**Lexmark** Inkjet

28732	Z55	£79.00	£92.83
28733	Z65	£125.00	£146.88
28734	Z65N	£169.00	£198.58

**Brother** Laser Printer

27920	HL-1440	£185.00	£217.38
27581	HL-1450	£214.00	£251.45
28378	HL-1470N	£395.00	£464.13
25855	HL1650	£399.00	£468.83

**Epson** Laser Printer

28720	AcuLaser C1000N	£799.00	£938.83
28433	EP-L5900L	£159.00	£186.83
28714	EPL-5900	£199.00	£233.83

**Hewlett Packard** Laserjet

27560	1000w	£177.00	£207.98
26250	1200	£229.00	£269.08
26317	1200N	£339.00	£398.33
27561	2200	£425.00	£499.38
26249	2200D	£479.00	£562.83

**Kyocera** Laserjet

27362	FS-1000+	£235.00	£276.13
25610	FS1800	£575.00	£675.63
25614	FS3800	£745.00	£875.38

**Panasonic** Laser Printer

27602	KXP-7100	£139.00	£163.33
28271	KXP-7105	£169.00	£198.57

**Brother** Multi-Function

26351	MFC-9750	£569.00	£668.58
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**Hewlett Packard** Multi-Function

26782	1220	£389.00	£457.08
26251	3200	£399.00	£468.83
24158	G55	£228.00	£267.90
24159	G85	£305.00	£358.38
24160	G95	£385.00	£452.38
26877	PSC750	£160.00	£188.00
27557	PSC950	£230.00	£270.25

**Canon** Multi-Function

24505	MultiPass C80n	£294.99	£346.61
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**Panasonic** Multi-Function

27192	Workio DP-150P	£729.00	£856.58
27193	Workio DP-150FP	£965.00	£1,133.88
28492	KX-FLB751	£385.00	£452.38

**Hewlett Packard** Consumables

11522	350C/600/656	£25.00	£29.38
22465	610C/640C/656	£21.00	£24.68
24507	840/843/845C	£22.00	£25.85
24508	840/843/845/		
	920/940C	£20.00	£23.50
24836	C20/C40SX	£9.00	£10.58
24838	C20/C40SX	£13.00	£15.28
27917	C60	£19.95	£23.44
27918	C60	£16.00	£18.80
28013	C70/C80	£19.95	£23.44
28050	HP 51626A	£12.99	£15.26
28051	HP 51629A	£13.99	£16.49

**Epson** Consumables

28015	C70/C80	£9.99	£11.74
28016	C70/C80	£9.99	£11.74
28014	C70/C80	£9.99	£11.74
28048	810	£8.90	£10.45
28049	810	£9.90	£11.63
28052	C20/C40	£6.99	£8.21
28053	C20/C40	£9.99	£11.73

**Printer** Cables

19777	USB	£8.46	£9.95
12385	Parallel	£8.46	£9.95

**Special Feature****Panasonic**

PartCode 27602

**KX-P7100**

The KX-P7100 laser printer from Panasonic is the ideal solution for desktop, SOHO and office environments. Equipped with auto duplex function, 2MB RAM and a 150-sheet output tray, it is optimized to support applications for Windows. The KX-P7100 also comes with a versatile manual feed, Auto Interface switching, and an ergonomic design, and the quality you have come to expect from Panasonic. Auto Duplex standard (prints on both sides of the page). 600 dpi resolution. Parallel and USB connectivity. Toner Save mode. Universal.

**£139** Ex VAT **£163.33** Inc VAT

**Panasonic**

PartCode 28271

**KX-P7105**

A laser printer, which supports advanced PCL 6 emulation. Higher resolution printing (Max. 1200dpi x 600dpi), faster 100MHz RISC processor and standard 16MB RAM will assure higher quality printing for you at up to 14ppm. As standard interfaces, it has IEEE 1284 parallel and USB 1.1 port. Optional items such as 2nd feeder which allows a total of 800 paper stock, expandable memory up to 48MB capacity and PostScript level 2 upgradability ensures the KX-P7105 meets your various printing requirements and the Power and Toner saving features will assure cost efficiency.

**£169** Ex VAT **£198.57** Inc VAT

**Panasonic** PartCode 28760**KX-FL501 Laser Fax**

Plain Paper

Fax/Copier/Phone

With 10 ppm printing, 600 x 600 dpi resolution, Caller ID, fax pager call, 100# speed dialing, monitor speaker; enlarge/reduction, 15 sheet ADF, 150 sheet paper tray, up to 120 page document memory, sequential broadcasting, 14.4 Kbps modem, electronic volume control, 64 level halftone. 1 year warranty through Panasonic.

**£205** Ex VAT **£240.89** Inc VAT

**FREE TONER**

The first 100 customers to purchase a Panasonic KXP7105 Laser Printer are eligible to receive a FREE Toner Cartridge worth **£69**.





**AOC** PartCode 24895**LM500 15" TFT**

The LM 500 combines the traditional design of the AOC Spectrum series with it's easy to use shuttle OSD. Packed into a minimised housing, bringing you the most modern technical features.

Size	15"
Visible Size	38.1cm
Dot Pitch	0.3mm
Hor. Frequency	30-60kHz
Ver. Frequency	60-75Hz
Low Radiation	TCO99
Standards	CE, TÜV/GS
<b>£249</b> Ex VAT	<b>£292.58</b> Inc VAT

**Guillemot** PartCode 28011**Prophet View 720**

Hercules' track record of providing features that no one else offers, unique features that enhances the gaming experience, continues with the Prophetview 720. Unique in look and performance, the Prophetview 720 is like no other TFT flat panel LCD. It's sleek metallic-blue skin, digital titanium buttons, boomerang-like stand and enhanced video playback capability.

**£315** Ex VAT **£370.12** Inc VAT

**Pinnacle** PartCode 28602**DV Clip**

Transfer footage from your DV camcorder to your PC for editing with absolutely no quality loss using the included Firewire card. Then edit using the award-winning Studio editing software. Choose your best shots and arrange them in any order. Add transitions and effects, professional looking titles and sound effects. You can even add a background music track that fits exactly with the mood and length of your movies. With StudioDVclip you have the full choice of digital output formats for watching your movies, on DV or VHS tape, VideoCD or files for the web.

**£49** Ex VAT **£57.58** Inc VAT

**CTX** PartCode 25592**EX710F 17" CRT**

A proud extension to the EX Series, the newest Executive "Flat" Series is a step-up from the regular Invar Shadow Mask flat square CRT technology. The monitor screen is truly flat! You'll get great image quality and performance all at an attractive price.

17" Invar Shadow Mask FST (16" Viewable Image Size).  
0.25mm Dot Pitch. ARAG®  
Screen Treatment

**£136** Ex VAT **£159.80** Inc VAT

**Philips** PartCode 25560**107T21 17" Flat Monitor**

**LightFrame™** for brightest and sharpest display.

**XSD Xtra Space Design™**

for large screen display in a small footprint: World's shortest 17"

Real Flat monitor with maximum depth of only 419 mm / 16.5".

High-res. 0.25 mm dot pitch.

Autoscan covers horizontal frequencies up to 71kHz offering a maximum res. of 1280 x 1024 with flicker free display of 1024 x 768 at up to 89Hz

**£145** Ex VAT **£170.37** Inc VAT

**Editors Choice****Hauppauge** PartCode 23511**WinTV USB**

WinTV-USB is a 125 channel cable-ready TV tuner. Easily installed via the USB port, you can watch television in a resizable window on your PC screen. It is also possible to print stills from whatever you're watching or record video clips from your camcorder. Add titles, soundtracks and special effects for professional-looking presentations.

**£42.55** Ex VAT **£49.99** Inc VAT

**LCD TFT**

	Ex VAT	Inc VAT
<b>AOC</b>		
24895 15.2" LCD TFT	£249.00	£292.58
26118 17" LCD TFT	£379.00	£445.33

**ADI MicroScan**

25721 1610 15"	£319.00	£374.83
28767 L712 17"	£559.00	£656.83
24701 9L 18"	£949.00	£1,115.08

**Belinea**

28110 10 15 15 15"	£239.00	£280.83
25288 10 15 40 15"	£329.00	£386.58
25289 10 17 10 17"	£519.00	£609.83
24120 10 18 10 18"	£789.00	£927.08

**CTX**

27137 PV505/Beige 15.1"	£287.00	£337.23
25713 PV505/Blue 15.1"	£287.00	£337.23
25714 PV520 15.1"	£297.00	£348.98

**Hansol**

28358 530TFT 15"	£279.00	£327.83
26917 700F 17"	£599.00	£703.83

**Iiyama**

28276 AS4315U 17"	£509.00	£598.08
28277 AS4332U 17"	£615.00	£722.63
28215 AS4314UT 17"	£459.00	£539.33
28529 AS4611UT 18"	£599.00	£703.83

**LG Electronics**

28058 15" 563LE	£282.00	£331.35
26129 577LM 15.1"	£490.00	£575.75

**Mitac**

28451 15 EX6 15" +Spkr	£299.00	£351.33
28175 17AES 17" +Spkr	£455.00	£534.63

**NEC**

28124 1510+ 15"	£299.00	£351.33
28545 1550X 15"	£459.00	£539.33
20927 1810X 18"	£1,099.00	£1,291.33

**Philips**

26570 150S - 15" XGA	£275.00	£323.13
26626 150B2 15"	£315.00	£370.13
26627 150P2 15"	£369.00	£433.58
28031 150P2M 15"	£369.00	£433.58
25567 150P1B 15.1" Black	£535.00	£628.63
25555 150X 15.1"	£523.00	£614.53
28729 180P2B 18.1"	£749.00	£880.08

**Philips Plasma**

25558 420P 42"	£3,739.00	£4,393.33
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**Sony**

28294 SDM-M51D 15"	£399.00	£468.83
28279 SDM-N50R 15.1"	£589.00	£692.08
26509 M81 18.1"	£799.00	£938.83
25551 N50PS 15"	£525.00	£616.88
26510 N80 18.1"	£1,465.00	£1,721.38

**CRT Monitors**

	Ex VAT	Inc VAT
<b>AOC Energy Pro</b>		
10075 15" ELR 28mm	£79.00	£92.83
21934 7VLR 17" 0.27mm	£87.00	£102.23
28604 7VLR 17"+Speakers	£99.00	£116.33
22178 19" 0.26mm	£132.00	£155.10

**AOC Flat Screen**

26117 17" 7Klr	£115.00	£135.13
26119 19" 9Klr	£179.00	£210.33

**CTX**

18687 1769SE/VL700 17"	£99.00	£116.33
26113 EX700F 17"	£113.00	£132.78
25592 EX710F 17"	£136.00	£159.80
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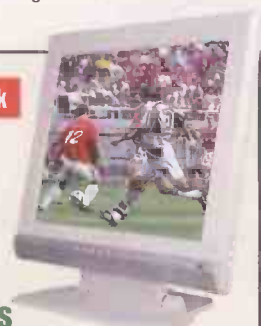
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### Portable Readers



- 512K unit with wand
- Scan and key data to memory
- Battery operated (3 AAs)
- Upload collected data to host computer - serial, keyboard or USB
- 2 built-in inventory programmes
- Patented voice prompts
- Easy to create custom prompts and custom voice messages
- Cord attached Wand, Laser or CCD
- Very small - long battery life

#### 512K built-in laser model

- Laser scanner built into top
- One-hand scanning
- Right hand or left hand
- Eliminates cord and separate scanner
- Very rugged and lightweight
- Lifetime warranty on scan element
- Weighs 418 g. with 3 AA batteries
- 80,000 scans per set of batteries
- Custom voice messages
- Keyboard or serial uploading



### Bar Code Labelling Software

- Any format, any label. WYSIWYG
- Formats for Odette
- Code 128, UPC/EAN, 2 of 5, Codabar, Code 39, PDF417
- Lines, boxes, rotations, colour, PCX, BMP, etc.
- Simple custom operator interface
- Prints to LaserJet, DeskJet, etc.



### Keyboard Laser Reader



- Keyboard decoder built-in
- No extra box
- For PC and Mac
- Two-year warranty
- Code 39, Codabar, Interleaved 2 of 5, UPC/EAN, Code 128, Code 93, Codabar, etc.

### Keyboard Wedge Wand

- Attaches as second keyboard or USB!
- No software needed
- For Windows, DOS, & Mac
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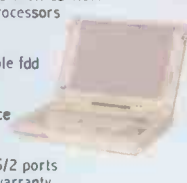
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Black	Photo 810 TO26401	£18.99
Colour	Photo 810 TO27401	£15.39

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### CANON COMPATIBLES

	Black	Colour
BJC 2000/4000/5000 Series	£2.98	£4.99
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BJC 3000/6000/6500/S400/		
S450/S4500/S600/S630	£4.99	£4.99

### XEROX COMPATIBLES

	Black	Colour
XJ4C/XJ6C/450C	£4.99	£4.99
C6/C8	£4.99	£4.99
M750/760/940/950		£5.99
- Hi Yield Black	£8.99	

LEXMARK Call for prices on original & remanufactured cartridges

Epson compatibles: (not Buy 1 get 1 Free!)

	Black	Colour
680	£6.99	£7.99
790/870/890/	£7.49	£7.49
1270/1290		
C60-NEW	£7.49	£7.49
Photo 810-NEW	£7.99	£7.99



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51626A	£22.99	£11.99
51625A	£23.49	£13.99
51629A	£21.99	£11.99
51645A	£21.99	£9.99
C6614A	£19.99	£12.99
51649A	£22.99	£14.89
C6615D	£19.99	£11.99
C6625A	£20.99	£16.99
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Stylus Color 480/580	Single Black	£2.25
S Col 900/S Photo 1200/750	Single Colour	£3.95
Stylus 500/Photo		
Photo 700/EX	5 black	£10.95
Stylus 820/Color II/IIIS/1500	5 colour	£18.95
Stylus Color/Pro/Pro XL		
Stylus Color 880/C20/C40		



### Compatible Epson 'Chipped' Cartridges

Stylus Color 680	Matched pair	£14.45
Stylus Photo 790	2 pairs	£26.95
Stylus Photo 870	4 pairs	£48.95
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Stylus Photo 890	Single Colour	£6.95
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Stylus Photo 1290		
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A4 Premium ink jet paper	100/pack 5.95
A4 OHP Transparency film	20/pack 5.95
A4 Photo gloss paper 210gsm	50/pack 16.95
A4 Dri-photo gloss paper 150gsm d/s	50/pack 16.95
CD Labels (Press-It comp)	(labels) 50/pack 4.50

### Compatible cartridges for HP Lasers

Printer	Comp
LJ11/III	23.50
LJ11P/III	24.50
LJ4L/P	34.50
LJ4/5	36.50
LJ6P	36.50
LJ6L	34.50
LJ1100	34.50
LJ2100	54.95

### Original HP/Lexmark ink jets



#### Original Lexmark

1380619	Colour	24.95
13400HC	Black	23.95
1382050	Black	24.95
1382060	Colour	25.95
12A1970	Black	20.95
12A1980	Colour	26.25
15M0120	Colour	27.85

### Original Hewlett Packard Ink Jet Cartridges

51625A	Colour	21.75
51626A	Black	21.45
51629A	Black	21.45
51645A	Black	21.45
51649A	Colour	21.95
C1823D	Colour	23.95
C4844A	Black	29.95
C4841/2/3	Colour	29.95
C6578D	Colour	25.75
C6614A	Black	20.95
C6615D	Black	21.50
C6625A	Colour	24.95

#### Original Olivetti

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Black	84431W	18.75
Colour	84436G	29.75

#### Xerox Ink Carts

Ref:	Comp	OEM
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7661/2/3	2.35	9.25

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C6011AA4 Photo note card	20/pack	7.95
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51634Z A4 Premium coated paper	100/pack	12.25
C6050A A4 Iron-on T-shirt media	10/pack	9.95
C6040A A4 Premium photo paper	15/pack	6.10
C3837A A4 Premium glossy paper	50/pack	31.95
C3832A A4 Transparency film	20/pack	12.95

#### Epson Ink Jet Print Media

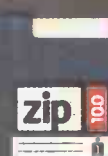
S0411215" x 8" Ink jet card	30/pack	5.35
S041134 4" x 6" Photo paper	20/pack	4.90
S041061A4 Photo quality paper	100/pack	7.95
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### Original cartridges - Canon & Epson Ink Jets

#### Original Canon Ink Jet Cartridges

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BC-05	Colour	18.95
BC-06	Photo	19.95
BC-20	Black	21.50
BC-30	Black	23.50
BC60	Black	24.95
BCI-10	BI x 3	8.75
BCI-11B	BI x 3	7.95
BCI-11C	Col x 3	10.95
BCI38k	Black	7.75
BCI3	Colour	5.95
BCI-21B	Black	4.75
BCI-21C	Colour	10.25
BCI61	Colour	16.45



#### Original Epson Ink Cartridges

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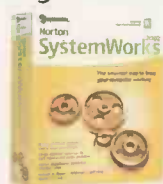
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BC02 Black	BJC150/BJ200/BJ220EX/BJC1000	£ 9.35
BC05 Colour	BJC150/BJ210/BJ220EX/BJC1000	£12.75
BC06 Photo	BJC240/BJC250/BJC1000	£13.75
BC20 Black	BJC2000/BJC4000	£10.45
BX02 Black	FAX B320/3410	£ 9.45
BX03 Black	FAX B100/110/MP10	£ 9.45
BJC4000 Twin	2000/4000/5000 (BCi21B & BCi21C)	£ 4.39
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## HP Compatibles

Cartridge Ref.	Suitable for Use in	
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51625A Colour	310/320/340/540/550/560	£12.99
51629A Black	600/660/690C/695C	£10.45
51649A Colour	600/610C/612C/660C/690C/695C	£14.99
51645A Black	710C/720C/820CXI/850CXI/870CXI	£ 9.95
51633A Black	310/320/340	£10.45
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C6615ABlack	810C/840C/843C	£11.75
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C6578AColour	970CXI/930C/950C/1220C/P1000	£16.99
C6625AColour	840C/843C	£16.99

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Cartridge Ref.	Suitable for Use in	
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13400HC Black	1000/1020/1100/2030/2050/3000	£13.89
12A1980 Colour	3200/5000/5700/7000/Z11/Z31	£15.29
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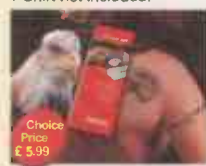
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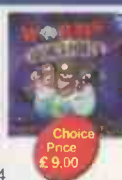
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Here are some *PCW* guidelines to help ensure that the buying process is smooth and trouble-free

## KEEP RECORDS >

When you phone a supplier, make a note of the name of the person you speak to, and when. Note down any claims they make for the product in which you are interested, or any specifications they mention. If you are unsure that what they are offering is right for the task, then ask.

## BE CLEAR ABOUT SUPPORT AND WARRANTIES >

Make sure you get a warranty that suits your needs and is fully detailed in the quotation. If you need swift repairs, consider paying extra for an eight-hour repair service. Also make sure you understand the level of service you can expect to receive, including who pays for couriers if your machine has to be returned for repair.

## GET A FULL SPEC OF THE MACHINE >

Before you place an order for a machine, insist on being faxed or emailed a full specification, detailing all components and peripherals. Check what is included: for example, when buying a printer, are all cables and cartridges bundled? If you've used a review in a magazine to guide your decision, make sure that what is quoted matches what you have read. Sometimes, machine specifications can change from the model sent for review.

## CREDIT CARD PROTECTION >

When you place your order, use a credit card. The Consumer Credit Act ensures that credit card purchases between £100 and £30,000 are covered. Check the address to which the goods will be sent. Often, if you buy with a credit card you can only receive the goods at the address on the card. If you are buying over the Internet, make sure you are using a secure server, sometimes denoted by the prefix 'https'.

## SET THE DELIVERY DATE AND CHECK WHAT IS DELIVERED >

This gives you some comeback if the goods are not delivered on time. When the goods arrive, check the packaging before you sign for them, to guard against damage in transit.

PERSONAL  
COMPUTER  
WORLD

## BUYERS' CHARTER

**MAIL ORDER PROTECTION SCHEME (MOPS) >** When you order goods as a private individual reader from a UK supplier's advertisement in *PCW* and pay by post in advance of delivery to that Mail Order Advertiser, which subsequently ceases to trade and goes into Liquidation or Bankruptcy prior to delivery of such goods, you may, under the 'Buyers' Charter', qualify for compensation, providing:

1. You have not received the goods or had your money returned.
2. You have followed the *PCW* guidelines when placing your order (see above).
3. You have taken all reasonable steps to effect delivery or refund.
4. You have retained irrefutable proof of purchase, for verification purposes:
  - a) The original advertisement from which the goods were ordered.
  - b) Comprehensive proof of payment.

**GUIDELINES >** Claims must be submitted so as to arrive 'NOT EARLIER THAN TWENTY-EIGHT DAYS AND NOT LATER THAN THREE MONTHS' from the official on-sale date of the magazine. Claims must be submitted to the Customer Services Manager IN WRITING, summarising the situation and lodged strictly within the time schedule stated. Claims received outside this period will not qualify for consideration for compensation under the 'Buyers' Charter'.

Once a supplier who has advertised in this magazine has become subject to either Liquidation or Bankruptcy proceedings and upon completion of all winding-up procedures, *PCW* guarantees to expeditiously process those private individual readers' claims made and submitted, in accordance with those procedures outlined, up to the following limits.

- a) £2,000 in respect of any claim submitted by one Private Individual Reader.
- b) £100,000 in respect of all advertisers so affected in any one year.
- c) £30,000 in respect of any one advertiser.

These sums define the Publisher's maximum liability under the scheme, and any additional payments above and beyond these thresholds will be entirely at the Publisher's discretion. As soon as legal confirmation that a state of liquidation or bankruptcy exists, the processing of claims will immediately commence. If,

however, assets are available and the receiver/liquidator appointed confirms that an eventual payment will be made by way of a dividend, all claims under the 'Buyers' Charter' will be subject to reprocessing and will take into account any shortfall which may then exist. Payments under the scheme will also take into consideration the obligations and liabilities of other interested parties, such as credit card and/or insurance organisations, etc.

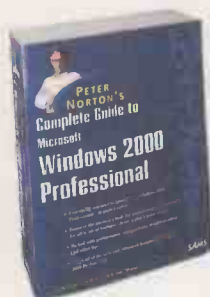
**EXCEPTIONS >** This guarantee only applies to advance postal payments made by private individuals in direct response for goods itemised/illustrated in display advertisements. It does not cover goods ordered from advertising Inserts or Cards, classified advertisements or Micromart, or Catalogues obtained from, or supplied by, any advertiser regardless. Similarly, protection does not exist in relation to purchases made as a result of reviews and/or editorial comment. The 'Buyers' Charter' is designed to safeguard the PRIVATE individual reader. It does not provide protection to any companies, societies, organisations, unincorporated bodies or any other commercially orientated outlet of any description. Neither is cover provided for orders placed from, or to, any overseas suppliers or for goods purchased for resale.

**CAVEAT EMPTOR >** Readers are reminded that the Mail Order Protection Scheme was solely implemented to provide protection to the private individual when goods are ordered 'Off the Page' and paid for by post. It was not designed for, nor will it offer any protection, in the event whereby goods are purchased via the Internet.

**CREDIT CARD PROTECTION >** Always pay by credit card when ordering goods valued in excess of £100, thereby ensuring maximum protection in the event that an advertiser ceases to trade prior to such goods actually being received.

**DISCLAIMERS >** Readers are reminded that the opinions expressed, and the results published in connection with reviews and/or laboratory test reports carried out on computing systems and/or related items, are confined to, and are representative of, only those goods as supplied and should not be construed as a recommendation to purchase. Whilst every precaution is taken to ensure that reliability and good business practices prevail, the Publisher cannot be held responsible for the overall trading activities of any supplier referred to, or advertising within, this publication.





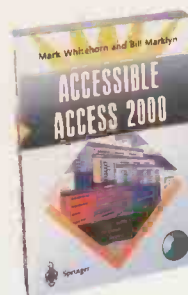
**PETER NORTON'S COMPLETE  
GUIDE TO MICROSOFT  
WINDOWS 2000 PROFESSIONAL**

Peter Norton, John Mueller and  
Richard Mansfield

This book follows the comprehensive, user-friendly and highly acclaimed Norton style. Its unique, hands-on, step-by-step approach teaches the features of Windows 2000 Professional. 1,628pp

REC. RETAIL	READER PRICE	SUBSCRIBER PRICE
£28.99	£26	£24

QUOTE ORDER CODE: VR09



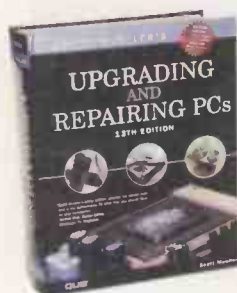
**ACCESSIBLE ACCESS 2000**

Mark Whitehorn and Bill Marklyn

Written by Hands On columnist Mark Whitehorn and Bill Marklyn (development manager for the first two major releases of Access), this book assumes you have no knowledge of Access or databases and takes you to the point where you can create and use a multi-table database. 318pp plus CD-Rom.

REC. RETAIL	READER PRICE	SUBSCRIBER PRICE
£24.50	£22	£19.50

QUOTE ORDER CODE: VR19



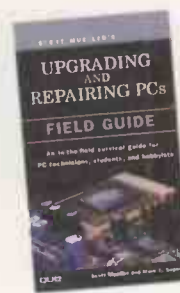
**UPGRADING AND REPAIRING PCs  
13TH EDITION**

Scott Mueller

Whether you're a PC technician, student or hobbyist, this is for you. Includes new and revised illustrations for more technical detail, a step-by-step guide to building a PC and information on motherboards, Bios, EIDE and SCSI interfaces, net connectivity and all the latest PC innovations. 1,566pp

REC. RETAIL	READER PRICE	SUBSCRIBER PRICE
£43.23	£39.99	£38.99

QUOTE ORDER CODE: VR02



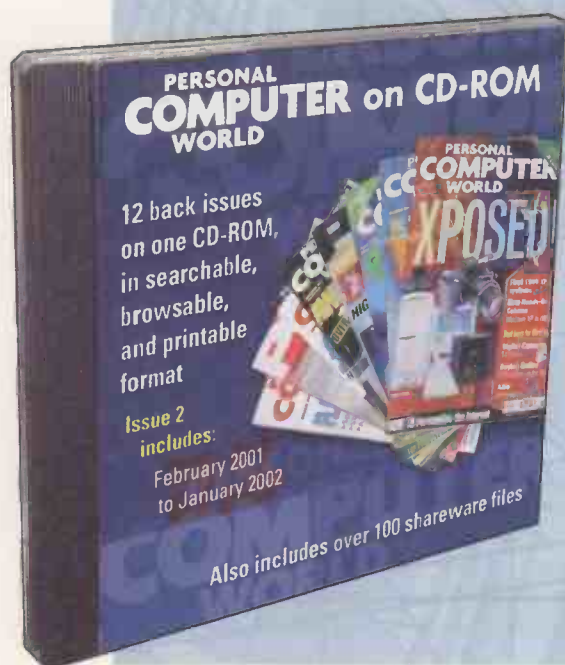
**UPGRADING AND REPAIRING PCs  
FIELD GUIDE**

Scott Mueller

The Field Guide is a portable 'essentials' version of the 13th edition (see left). If you're out of the office and need some advice on upgrading or repairing a PC, this book will give you all the essentials. And, weighing less than half a pound, it'll fit into your briefcase or bag. 320pp

REC. RETAIL	READER PRICE	SUBSCRIBER PRICE
£14.50	£13.79	£13

QUOTE ORDER CODE: VR03



**PCW ON CD-ROM  
ISSUE 2**

**NEW! AVAILABLE NOW**

Includes February 2001 to January 2002 issues

Issue 2 of PCW on CD-Rom is now available. The disc contains 12 complete back issues from February 2001 to January 2002.

The new CD-Rom includes news items, reviews, features, group tests, *pcwexperts* and Hands On articles plus a list of all advertisers from the 12 issues. We've also included over 100 shareware files.

All articles appear on screen exactly as they did in the magazine, and the editorial content is searchable, browsable and printable in Acrobat format.

CD 2 NOW AVAILABLE!	READER PRICE	SUBSCRIBER PRICE
	£14.95	£13.45

QUOTE ORDER CODE: VR21

**HOW TO ORDER**

Using the form opposite, you can post your order to:  
PCW Offers Direct  
Tower Publishing Services Ltd  
Tower House  
Sovereign Park  
Market Harborough  
Leicestershire LE16 9EF

Or phone us: 01858 438 883

Or fax us: 01858 468 969

Or log on to:

<http://offersdirect.pcw.co.uk>

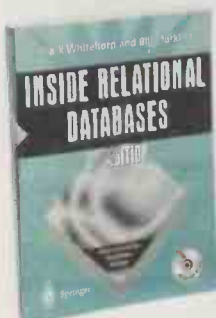


PHOTOCOPIED COUPONS WILL BE ACCEPTED IF YOU DO NOT WISH TO CUT UP YOUR MAGAZINE.

PLEASE ALLOW 28 DAYS FOR DELIVERY.

ONLY SUBSCRIBERS TO PCW ARE ENTITLED TO DISCOUNTED PRICES MARKED 'SUBSCRIBER PRICE'.

For more discounted books, *PCW* back issues and CD-Roms, please visit  
<http://offersdirect.pcw.co.uk>



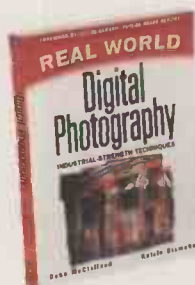
## INSIDE RELATIONAL DATABASES 2ND EDITION

Mark Whitehorn and Bill Marklyn

This best-selling book has been revised and updated, bringing you a reader-friendly explanation of the relational model and its importance to database designers and builders. Clear explanations and examples show you how understanding the relational model can make databases better. 339pp.

REC. RETAIL	READER PRICE	SUBSCRIBER PRICE
£24.59	£22	£19.99

QUOTE ORDER CODE: VR11



## REAL WORLD DIGITAL PHOTOGRAPHY

Deke McClelland and Kartin Eismann

*Digital Photography* features up-to-date descriptions of digital cameras, expert advice for shooting better photographs and tips for preparing images for print and web output. It also includes information on how to build a digital darkroom, plus practical image-editing techniques. 403pp plus CD-Rom.

REC. RETAIL	READER PRICE	SUBSCRIBER PRICE
£33.99	£32	£30

QUOTE ORDER CODE: VR13



## WINDOWS XP FAST AND EASY

Diane Koers

This guide provides a visual learning tool for Windows XP, with step-by-step instructions and action shots

REC. RETAIL	READER PRICE	SUBSCRIBER PRICE
£16.99	£16.50	£16

QUOTE ORDER CODE: VR20



## PROTECT YOUR DIGITAL PRIVACY SURVIVAL SKILLS FOR THE INFORMATION AGE

Glee Harrah Cady, Pat McGregor

A book teaching you how to protect your privacy when using digital devices that connect to the Internet such as PCs, wireless phones and game consoles.

REC. RETAIL	READER PRICE	SUBSCRIBER PRICE
£21.99	£20.89	£19.79

QUOTE ORDER CODE: VR08



## PHOTOSHOP 6 KILLER TIPS

Scott Kelby

A book for the professional Photoshop user, full of tips showing you how to be more efficient and productive.

REC. RETAIL	READER PRICE	SUBSCRIBER PRICE
£30.99	£30	£28

QUOTE ORDER CODE: VR04



## TUNE UP YOUR PC IN A WEEKEND

Faithe Wempen

Essential for the home PC enthusiast, this book enables you to troubleshoot and correct processes on your PC. It helps you speed up Windows, correct errors, detect and remove viruses and upgrade.

REC. RETAIL	READER PRICE	SUBSCRIBER PRICE
£14.99	£14.50	£13.50

QUOTE ORDER CODE: VR12



# LEISURE LINES COMPETITION

## COMPETITION

**WIN!**



## CAMERAS, SCANNER & CD-RW FROM BENQ

**T**o celebrate the rebranding of Acer Communications and Multimedia, the newly named Benq is offering five *PCW* readers the chance to win some great prizes.

The first prize is the DC3310 digital camera, worth £349.90 inc VAT. This stylish 3.1 megapixel camera has a retro feel, a compact design and is easy to use. Next up is the 2.1 megapixel DC2110 digital camera, worth £199.90. This has a 2x digital zoom and auto-focus lens. It also allows you to produce up to 20 seconds of video.

If you win the third prize, you'll get Benq's 7400UT flatbed scanner. This is a top-of-the-range 2,400dpi (dots per inch) offering, with a built-in transparency unit and USB2 connection. The scanner, which costs £199.99, is compatible with USB 1.1, although a USB2 PCI card is included in the box.

The next name out of the hat wins a CRW 2410 EU external USB2 CD writer, worth £189.99. This is bundled with a USB2 PCI host card. It includes a Seamless Link III buffer under-run function for safe and high-quality burning.

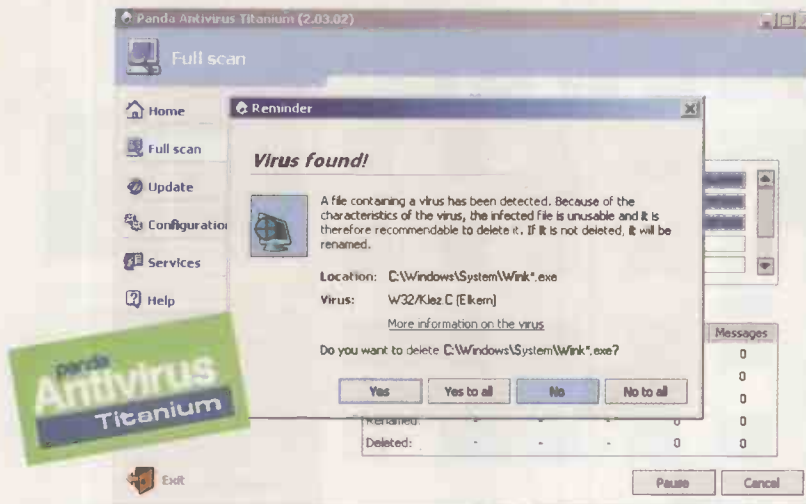
The final prize is the DC300 Mini digital camera, worth £59.90. This combined PC cam/webcam is a stylish, compact, entry-level camera that is also fun to use.

For more information on Benq, check out [www.benq.co.uk](http://www.benq.co.uk) or call us on 01633 628 600.

For your chance to win one of these great prizes answer the following question and follow the 'How to enter' instructions opposite.

**What is the megapixel resolution of the DC3310 camera?**

## 50 COPIES OF PANDA ANTIVIRUS TITANIUM



**P**anda Antivirus Titanium is a new generation of anti-virus products whose innovative features provide complete protection for your computer.

Designed with the home user in mind, Panda Antivirus Titanium, is an easy-to-use solution complete with the latest in anti-virus technology.

It detects and eliminates more than 63,000 known viruses and other threats to your computer's security, including Trojans, worms and other nasty infections. You can now feel safer as you read your email, browse the Internet or use unsecured discs.

This 'install and forget' solution has been developed with ease of use in mind: it is user-friendly, intuitive, provides automatic updates and produces straightforward reports whenever it scans. It will also run on any edition of Windows, including XP.

The new Ultrafast virus scan engine is extremely fast; Titanium exhaustively scans all information and barely uses any system resources. You'll be protected from danger without even noticing what's going on in the background.

Whenever you connect to the Internet, Titanium automatically checks for updates to its virus

database and downloads the necessary changes. The whole process takes place rapidly, while you continue working or browsing, giving you peace of mind without any effort.

Courtesy of PCW and Panda, 50 readers can win a copy of Panda Antivirus Titanium. For your chance to get hold of a copy of Panda Antivirus Titanium, just answer the following question and follow the 'How to Enter' instructions opposite.

**In excess of how many viruses and other threats will Antivirus Titanium detect and eliminate?**

### How to enter

Fill in the coupon and send to the following address by 28 June 2002:

July Competition, PCW, VNU Business Publications,  
32-34 Broadwick Street, London W1A 2HG  
Or email your answer, name, address, daytime and  
mobile telephone number to us at  
[pcw\\_competition@vnu.co.uk](mailto:pcw_competition@vnu.co.uk)

We may use the contact details supplied to communicate with you regarding PCW. Please indicate in your email if you are also happy for us to contact you via email, daytime telephone or mobile about other products or services available from PCW and the VNU Business Publications Ltd Group, and if you are happy for us to pass your details on to other carefully selected companies to contact you about their products or services. Please state in your email if you do NOT wish us to contact you BY POST about products or services available from PCW or the VNU Business Publications Group, and if you do NOT wish us to pass your details on to other carefully selected companies to contact you BY POST about their products or services.

Competition open to UK residents only.

### PCW JULY 2002 PANDA ANTIVIRUS TITANIUM COMPETITION ENTRY FORM

**Answer** In excess of how many viruses and other threats will Antivirus Titanium detect and eliminate?

Name: .....

Address: .....

Email address: .....

Daytime telephone number: .....

Mobile telephone number: .....

We may use the contact details supplied to communicate with you regarding PCW.

If you are also happy for us to contact you about other products or services available from PCW and the VNU Business Publications Ltd Group, please indicate here. Contact by: Email ☐ Telephone ☐ Mobile ☐

If you are happy for us to pass your details on to other carefully selected companies to contact you about their products or services, please indicate here. Contact by: Email ☐ Telephone ☐ Mobile ☐

If you do NOT wish us to contact you BY POST about products or services available from PCW or the VNU Business Publications Group, please indicate here ☐

If you do NOT wish us to pass your details on to other carefully selected companies to contact you BY POST about their products or services please indicate here ☐

**PERSONAL  
COMPUTER  
WORLD**



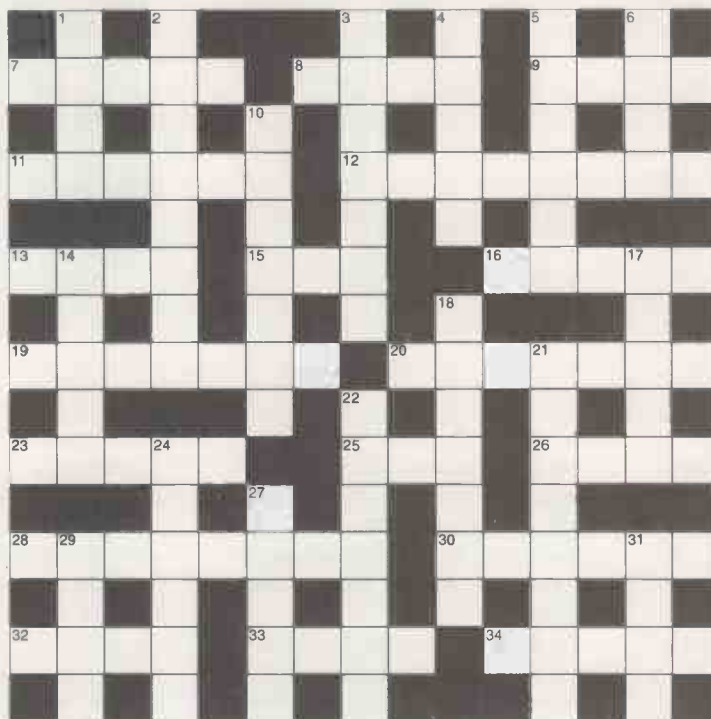
## Stretch your mind...

Got five minutes to spare? Then put your little grey cells to the test and try out our crossword and brainteaser. Send in your entries for a chance to win a dictionary or Encarta Reference Suite 2001

## prize crossword

### ACROSS

- 7 Text that runs into the gutter! (5)
- 8 Search for a file (4)
- 9 Uppermost hierarchy level (4)
- 11 Programs performing background tasks (6)
- 12 The movement of information through the system (4, 4)
- 13 \_\_\_ frequency, CPU's clock speed (4)
- 15 \_\_\_ resolution, poor-quality appearance (3)
- 16 Internet search engine (5)
- 19 Areal \_\_\_, bits per sq inch of surface (7)
- 20 Erased a file (7)
- 23 Operating (5)
- 25 Internet access provider (acronym) (3)
- 26 Locked up, frozen (4)
- 28 Lowering of power voltage (8)
- 30 Out-of-date Internet page (6)
- 32 Title \_\_\_, Windows nameplates (4)
- 33 Organise data (4)
- 34 Listed particulars (5)



### DOWN

- 1 Obstruct (4)
- 2 Goes in again (8)
- 3 Rest your feet (3, 4)
- 4 Supervises publication (5)
- 5 Sly (6)
- 6 Proverbially dead bird! (4)
- 10 Put in quarantine (7)
- 14 Cookers (5)
- 17 Sea (5)
- 18 Imitation (7)
- 21 Items on display (8)
- 22 Set of large guns (7)
- 24 Fairly recent (6)
- 27 Show off (5)
- 29 \_\_\_ Giggs, footballer (4)
- 31 Jane Austen novel (4)

## Latin square

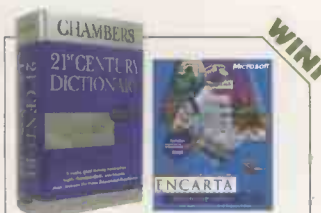
A misprint in the June issue meant the brainteaser was all but impossible to solve. We're repeating the puzzle with the correct information here, to give you another chance to win a copy of Encarta Reference Suite 2001. Apologies to readers who were confused.

Each cell of the square on the right contains one of the digits from 1 to 7. Each row and each column has exactly one of each digit. The clues below give the total of two, three or four cells. Can you figure out what number is in each cell?

See right for details of how to enter.

- |            |            |
|------------|------------|
| A1234 = 13 | D123 = 10  |
| ABC4 = 7   | DE3 = 11   |
| ABCD1 = 10 | E567 = 6   |
| B567 = 15  | EFG2 = 10  |
| BCD6 = 17  | FG5 = 13   |
| C12 = 7    | F3456 = 10 |
| CDEF7 = 14 | G123 = 11  |

7							
6							
5							
4							
3							
2							
1							
	A	B	C	D	E	F	G



Each month, one PCW Crossword entrant will win a copy of Chambers' 21st Century Dictionary, and the brainteaser winner gets a copy of Encarta Reference Suite 2001. Send your completed crossword to: 'PCW July - Prize Crossword', VNU House, 32-34 Broadwick Street, London W1A 2HG, to arrive no later than **17 June 2002**.

Send the answers to the brainteaser to: 'PCW July - Prize Puzzle', at the address above, to arrive no later than **28 June 2002**.

Please state clearly on your entry if you DO NOT wish to receive information about other products and services from VNU Business Publications Ltd. Please state if you DO NOT wish your details to be passed on to other carefully selected companies for marketing purposes. No purchase of the magazine is necessary to enter the competition.

### May winners

Tim Boume from Horsham got May's crossword right and Tony Bajan from Kilmarnock is the winner of May's brainteaser. Congratulations to you both.

## SOLUTIONS

### June crossword

- ACROSS** 7 Wheel 8 Font  
 9 Redo 11 Tweaks 12 Linefeed  
 13 Deci 15 Art 16 Using 19 Using  
 20 Hewlett 23 Merit 25 Ami  
 26 Most 28 Cookbook 30 Output  
 32 Kern 33 Near 34 Inner  
**DOWN** 1 Thaw 2 Sedative  
 3 Pollute 4 Stank 5 Crufts 6 Adie  
 10 Escapee 14 Ernie 17 Notes  
 18 Venison 21 Limiting 22  
 Walkway 24 Irking 27 Hound  
 29 Owen 31 Used

### May brainteaser

The solution to May's brainteaser appears below:

	Nick	Steve	Eddie	Willie
	No	Hons	No	Hons
Clubs	2	2	KQ	5
Diamonds	5	KQJ	5	2
Hearts	4	A	3	KQ
Spades	2	3	A	5

## monitors

### PHILIPS

Model	Size	Ex VAT	Inc VAT
1055Z1	15"	£82	£96.35
107E	17"	£94	£110.45
107521	17"	£127	£149.23
107721	17"	£126	£148.05
109520	19"	£156	£183.30
109820	19"	£205	£240.88
109P20	19"	£249	£292.58
201810	21"	£415	£487.63
150S	15" TFT	£267	£313.73
15082	15" TFT	£312	£366.60
150P2	15.1" TFT	£365	£428.88
150X	15" TFT	£459	£539.33
170528	17" TFT	£489	£574.58
17082M	17" TFT	£535	£628.63
180P	18" TFT	£749	£880.08

### LG ELECTRONICS

Model	Size	Ex VAT	Inc VAT
SW563N	15"	£75	£88.13
SW775E	17"	£97	£113.98
SW9008	19"	£159	£186.83
SW221U	21"	£419	£492.33
563LE	15"	£272	£319.60
577LM	15" TFT	£359	£421.83
882LE	18" TFT	£719	£844.83

### TAXAN

Model	Size	Ex VAT	Inc VAT
V735	17"	£135	£158.63
V977	19"	£187	£221.73
V2285T	22"	£545	£640.38
680T	15" TFT	£343	£403.03

### MITSUBISHI

Model	Size	Ex VAT	Inc VAT
Plus 73	17"	£147	£172.73
PRO740	17"	£167	£196.33
Plus 92	19"	£244	£286.70
PRO2060U	22"	£519	£609.83

### IYAMA

Model	Size	Ex VAT	Inc VAT
Vision 1352	15"	£91	£106.93
Vision Master 1402	17"	£119	£139.83
Vision Master 407	17"	£167	£196.58
Vision Master Pro 1411	17"	£135	£158.63
Vision Master Pro 413	17"	£169	£198.58
Vision Master 1451	19"	£165	£193.88
Vision Master 452	19"	£230	£270.25
Vision Master Pro 454	19"	£285	£334.88
Vision Master 505	21"	£480	£564.00
Vision Master Pro 511	22"	£475	£558.13
AX3817U	15" LCD	£319	£374.83
AS4314UT	17" TFT	£459	£539.33
AS4611UT	18" TFT	£599	£703.83

### SAMSUNG

Model	Size	Ex VAT	Inc VAT
Synmaster 551S	15"	£76	£89.30
Synmaster 753S	17"	£100	£117.50
Synmaster 753DF	17"	£109	£128.08
Synmaster 955B	19"	£165	£193.88
Synmaster 957P	19"	£179	£210.33
Synmaster 1100P	21"	£415	£487.63
Synmaster 151S	15"	£285	£334.88
Synmaster 171S	17" TFT	£469	£551.08
Synmaster 181T	18" TFT	£639	£750.83
Synmaster 191T	19" LCD	£919	£1079.83

### SONY

Model	Size	Ex VAT	Inc VAT
E230	17"	£235	£282.63
A230	17"	£216	£253.80
A430	19"	£289	£339.58
G420	19"	£379	£445.33
G520	21"	£582	£683.85
M51D	15" TFT	£359	£421.83
M61	16" TFT	£545	£640.38
M81	18" TFT	£809	£950.58
FW 900	18" TFT	£1159	£1361.83

### NEC

Model	Size	Ex VAT	Inc VAT
FE700	17"	£140	£171.55
FE700M	17"	£165	£193.38
FE950	19"	£255	£299.63
FP1375	22"	£599	£703.83
1550V	15" TFT	£305	£358.38
LCD1700V	17" TFT	£509	£598.08
LCD1830	18" TFT	£679	£797.83

### ADI

Model	Size	Ex VAT	Inc VAT
Provista M500	15"	£89	£104.58
Microscan M700	17"	£122	£143.35
Microscan F720	17"	£155	£182.13
Microscan E66	19"	£188	£220.90
Microscan G910	19"	£329	£386.58
Microscan G1000	21"	£459	£539.33
Microscan A600	15" TFT	£369	£433.58
Microscan L912	18" TFT	£929	£1091.58

### CTX

Model	Size	Ex VAT	Inc VAT
VL500	15"	£74	£86.95
VL700	17"	£96	£112.80
EX700F	17"	£125	£146.88
VL1300	21"	£389	£457.08
PV 505	15"	£270	£317.25
PV 720	17" TFT	£475	£558.13
PV880 TFT	18" TFT	£649	£762.58

## notebooks

### SONY

Model	Pro.	Speed	HD	Ram	Ex VAT	Inc VAT
Vaio PCG-C1MGP TFT	CRUSOE	733MHz	20Gb	128Mb	£1439	£1690.83
Vaio PCG-R60HFPD TFT	PIII	1000MHz	30Gb	256Mb	£1439	£1690.83
Vaio PCG-NV105 TFT/DVD	P4	1.6Ghz	30Gb	256Mb	Call	Call
Vaio PCG-NV109M TFT/CDRW	P4	1.6Ghz	30Gb	256Mb	Call	Call
Vaio PCG-SRX41P TFT	PIII	800MHz	30Gb	256Mb	£1479	£1737.83
Vaio PCG-F601 TFT/DVD	AMD	1.1Mhz	20Gb	256Mb	£889	£1044.58
Vaio PCG-SR415MPTFT/DVD	P4	1.6Ghz	30Gb	256Mb	Call	Call
Vaio PCG-GM165PTT CDRW/DVD P4		1.8Ghz	40Gb	512Mb	Call	Call

### SAMSUNG

Model	Pro.	Speed	HD	Ram	Ex VAT	Inc VAT
A100DXTX CD TFT	AMD	1.0Mhz	10Gb	128Mb	£725	£856.58
A100DXTD DVD TFT	AMD	1.1Mhz	10Gb	128Mb	£859	£1009.33
A100DXTC DVD/CDW	AMD	1.1Mhz	20Gb	128Mb	£949	£1115.08
CT910DXTC CDRW/TFT	PIII	1000MHz	20Gb	128Mb	£1129	£1326.53
CT910DXTX CDRW/TFT	PIII	866MHz	30Gb	256Mb	£1719	£2019.83
T10XVC DVD/RW TFT	P4	1.6Ghz	30Gb	256Mb	£1719	£2019.83
T10XVC DVD/RW TFT	P4	1.7Mhz	40Gb	256Mb	£1899	£2231.33

### TOSHIBA

Model	Pro.	Speed	HD	Ram	Ex VAT	Inc VAT
Sat 1800 CD TFT	CP	1100MHz	15Gb	128Mb	£699	£821.33
Sat 1800DVD TFT	CP	1000MHz	20Gb	128Mb	£999	£1173.83
Sat Pro 6000 CD TFT	CP	1066MHz	20Gb	128Mb	£945	£1110.38
Sat Pro 6000 CDTFT	PIII	1000MHz	20Gb	128Mb	£1049	£1232.58
Sat Pro 6000 DVD TFT	PIII	1066MHz	20Gb	256Mb	£1369	£1608.58
Sat Pro 6000 DVD TFT	PIII	1200MHz	40Gb	256Mb	£1799	£2113.83
Portege 4000 CT TFT	PIII	750MHz	20Gb	128Mb	£1529	£1796.58
Tecra 9000 CDTFT	PIII	933MHz	10Gb	128Mb	£1249	£1467.58
Tecra 9000 DVD TFT	PIII	1000MHz	20Gb	256Mb	£1575	£1850.63
Tecra 9000 DVD TFT	PIII	1200MHz	30Gb	256Mb	£1925	£2261.88

## cd drives

### YAMAHA

Model	Ex VAT	Inc VAT
CRW 164040 SCSI Internal	£95	£111.63
CRW 201040 IDE CD Writer	£130	£152.75
CRW 161040 SCSI CD Writer Ext	£135	£158.63

### FREECOM

Model	Ex VAT	Inc VAT
Burnproof IDE 16x10x32	£60	£70.50
CD Writer USB Ext. 4x4x24	£109	£128.08
CD Writer/DVD Combo 6x4x24x4	£125	£146.88

### HEWLETT PACKARD

Model	Ex VAT	Inc VAT
CD 12x1 32x12x10 IDE Drive	£99	£116.33
CD 9710x 40x16x10 IDE Drive	£122	£143.35
CD 8230x 6x4x4 Ext USB Drive	£135	£158.63
CD 9600SI 32x12x8 Int SCSI	£155	£182.13

## tape drives

### HEWLETT PACKARD

Model	Ex VAT	Inc VAT
SureStore DAT 8Gb Int Kit	£449	£527.58
SureStore DAT 8Gb Ext Kit	£509	£598.08
SureStore DAT 24Gb Int Kit	£599	£703.83
SureStore DAT 24Gb Ext Kit	£669	£786.08

### IOMEGA

Model	Ex VAT	Inc VAT
Zip 100 Mb USB External	£50	£58.75
Zip 100 USB Starter Kit	£61	£71.68
Zip 250 Mb External SCSI	£110	£129.25
Zip 250 Pro Kit Parallel	£111	£130.43
Zip 250 Mb External USB	£115	£135.13
Click PC Card Drive	£75	£88.13

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- Multimedia: External Speakers
- I-Link (IEEE1394) Port
- V90 56K Flex Modem
- Sony VAIO World Software
- Dimensions Main Unit (W x H x D): 203 x 366 x 371mm
- Microsoft Windows XP Home
- Warranty: 1 Year
- Monitor sold separately

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£969.00 Inc VAT

### PCV RX203

SONY

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- Memory Stick Slot
- DVD & CDRW CD Rom Drive
- Multimedia: External Speakers
- I-Link (IEEE1394) Port
- V90 56K Flex Modem
- Sony VAIO World Software
- Dimensions Main Unit (W x H x D): 203 x 366 x 371mm
- Microsoft Windows XP Home
- Warranty: 1 Year
- Monitor sold separately

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- High Colour inks
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The high quality colour printer for the home

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- Suitable for all popular computer platforms - easy connection via USB

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- 2440 x 1220 dpi resolution
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- Advanced Microfine Droplet Technology
- Single Ink technology providing superb cost efficiency
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- Vivid Photo allows the printer to produce a wider range of colours, ensuring optimum colour reproduction
- USB and Parallel connectivity
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- Borderless printing

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- Single Ink technology providing superb cost efficiency
- High Colour inks: greater colour range & high optical density
- Precision Colour Distribution Technology delivering faster colour print speeds at extremely high quality levels
- Vivid Photo ensures optimum colour reproduction
- USB and Parallel connectivity
- Borderless printing
- Ink Low/Ink out detection

**£147.00**  
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**S820D**

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- High Colour inks: greater colour range & high optical density
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- Borderless printing
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- Easy connection via USB

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- Single Ink technology provides superb cost efficiency
- High Colour inks: greater colour range & high optical density
- 1/6 density photo inks
- Vivid Photo ensures optimum colour reproduction
- Borderless printing
- Ink Low/Ink out detection
- Easy connection via USB

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**S9000**

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- Print speeds up to 6ppm in mono and 6ppm in colour
- Advanced Microfine Droplet Technology
- Single Ink technology provides superb cost efficiency
- High Colour inks: greater colour range & high optical density
- 1/6 density photo inks
- Vivid Photo ensures optimum colour reproduction
- Borderless printing
- Ink Low/Ink out detection
- Easy connection via USB

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high quality digital imaging made simple

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- 48 bit internal colour depth for superb colour accuracy

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1200 x 2400dpi for high image quality

- 48 bit internal colour depth for accurate colour recognition
- Dual USB 1.1 and USB 2.0 interface
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- Movie capture mode
- Operates on AA batteries



**POWERSHOT A40**

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- 3 x optical zoom (35-105mm equivalent)
- 2.5 x digital zoom
- 3 point AIAF, single centre point

- Optical & LCD viewfinder
- Selectable metering modes, exposure controls and white balancing modes
- Movie capture mode with sound
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- Compact Flash Type I & II
- Wide range of dedicated PowerShot lenses
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- 2.5 Digital Zoom
- Movie mode with sound capture

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## cameras

<b>MINOLTA</b>		VAT	Inc VAT	<b>EPSON</b>		VAT	Inc VAT	<b>KODAK</b>		VAT	Inc VAT
Image E201		£145	£170.38	PhotoPC 2100Z		£272	£319.60	DX3215		£139	£163.33
Image S304		£295	£346.63	PhotoPC 3100Z		£416	£488.80	DX 3500		£140	£164.50
Image S		£469	£551.08					DX 3600		£179	£210.33
<b>CANON</b>		VAT	Inc VAT	<b>FUJI</b>		VAT	Inc VAT	<b>SONY</b>		VAT	Inc VAT
Powershot A30		£185	£217.38	FinePix A101		£121	£142.18	MVC FD75		£287	£337.23
Powershot A40		£225	£264.38	FinePix A201		£155	£182.13	MVC FD200		£365	£428.88
Digital IXUS V2		£295	£346.63	FinePix 2600Z		£199	£233.83	Cybershot P31		£169	£198.58
Digital IXUS 330		£335	£393.63	FinePix 301		£232	£272.60	Cybershot P51		£209	£245.58
Powershot S30		£399	£468.83	FinePix 6800		£389	£457.08	Cybershot P71		£259	£304.33
MY5001		£465	£546.88	FinePix 4800		£425	£504.08	Cybershot DSC-S75		£440	£517.00
MY5501		£599	£703.83	FinePix F601		£429	£504.08	Cybershot DSC-S85		£515	£605.13
<b>OLYMPUS</b>		VAT	Inc VAT	<b>NIKON</b>		VAT	Inc VAT				
C-100		£115	£135.13	FinePix 6900		£459	£539.33	DCR-PC9		£845	£992.88
C-120		£120	£141.58	FinePix S602		Call	Call	Cybershot DSC-S85		£1135	£1333.63
C-220		£155	£182.13	Coolpix 2500		£229	£312.55	DCR-IP7			
C-700		£330	£387.75	Coolpix 885		£309	£363.08				
C-3020		£369	£433.58	Coolpix 995		£459	£539.33				
C-40		£449	£527.58	Coolpix 995 Premier		£520	£621.58				

## printers

HEWLETT PACKARD		Ex VAT	Inc VAT	EPSON		Ex VAT	Inc VAT
Deskjet 350C		£137	£160.98	LX300+		£97	£113.98
Deskjet 350CBI		£156	£183.30	FX880		£281	£336.88
Deskjet 656C		£48	£56.40	FX980		£314	£368.95
Deskjet 845C		£64	£75.20	FX1170		£202	£237.35
Deskjet 920		£70	£82.25	FX1180		£314	£368.95
Deskjet 940		£80	£94.00	FX2180		£386	£453.55
Deskjet 960C		£115	£135.13	LQ300		£112	£131.60
Deskjet 990CXI		£153	£179.78	LQ580		£216	£253.80
Deskjet 1125C		£180	£211.50	LQ680		£224	£263.20
Deskjet CP1160		£202	£237.35	LQ780		£366	£430.05
Deskjet CP1700		£255	£299.63	LQ2080		£336	£394.80
Deskjet 1220C		£207	£243.23	LQ2180		£479	£562.83
Business 2200XI		£264	£310.20	DLQ3000+		£850	£998.75
Business 2250		£399	£468.83	DFX5000+		£1259	£1479.33
PhotoSmart P1215		£139	£163.33	DFX8500		£1854	£2178.45
PhotoSmart P1215		£175	£205.63	Stylus Color C20SX		£44	£51.70
PhotoSmart P1315		£227	£266.73	Stylus Color C40SX		£52	£61.10
Laserjet 1000		£178	£209.15	Stylus Color C60		£59	£69.33
Laserjet 1200		£230	£270.25	Stylus Color C70		£89	£104.58
Laserjet 1200N		£349	£410.08	Stylus Color C80		£116	£136.30
Laserjet 2200D		£525	£616.88	Stylus Photo 810		£74	£86.95
Laserjet 2200DT		£624	£730.85	Stylus Photo 890		£126	£148.05
Laserjet 4100		£767	£901.25	Stylus Photo 895		£133	£156.28
Laserjet 4100N		£975	£1145.63	Stylus Photo 950		£281	£330.18
Laserjet 4100TN		£1043	£1225.53	Stylus Photo 1290		£259	£304.33
Laserjet 4100DTN		£1239	£1455.83	Stylus Photo 2000P		£444	£521.70
Laserjet 5000		£965	£1133.88	Stylus Color 1160		£192	£225.60
Laserjet 5000N		£1399	£1643.83	Stylus Colour 1520		£315	£370.13
Laserjet 5000GN		£1729	£2031.58	Stylus Colour 3000		£744	£874.20
Laserjet 8150		£1519	£1784.83	Stylus Pro 5000		£957	£1124.48
Laserjet 8150N		£1779	£2090.33	EPL-5900L		£159	£186.83
Laserjet 8150DN		£2159	£2536.83	EPL-5900		£199	£233.83
PSC 750		£161	£189.18	EPL-5900 PS		£269	£316.08
Officejet V40		£160	£188.00	EPL-N2050		£579	£680.33
PSC 950		£232	£272.60	EPL-N2750		£1156	£1358.30
Officejet K80		£199	£233.83	AcuLaser-C1000		£765	£898.88
Laserjet 3200		£410	£481.75	AcuLaser-C1000N		£849	£997.58
BROTHER		Ex VAT	Inc VAT	OKI		Ex VAT	Inc VAT
HL1230		£155	£182.13	ML280		£192	£225.60
HL1450		£219	£257.33	ML320		£321	£377.18
HL1470N		£322	£378.35	ML321		£384	£451.20
HL1650		£399	£468.83	ML380		£225	£264.38
HL1850		£499	£586.33	ML390F		£579	£680.33
HL1870N		£599	£703.83	ML3320		£289	£339.58
HL2460		£629	£739.08	Okipage 8P Plus Laser Printer		£199	£233.08
HL2460N		£799	£938.83	Okipage 14ex LED Printer		£215	£252.63
HL3260N		£1379	£1620.33	Okipage 14ex LED Printer		£249	£292.58
HL3260ND		£1699	£1996.33	Okipage 14i/n LED Printer		£332	£390.10
HL2400 Ce Laser		£1129	£1326.58	Okipage 20+ LED Printer		£569	£668.58
HL2400 CeN Laser		£1325	£1556.88				
HL 3450CN Laser		£2179	£2560.33	QMS		Ex VAT	Inc VAT
KYOCERA		Ex VAT	Inc VAT	PagePro 1100L		£169	£198.58
FS1000		£229	£269.08	PagePro 1100		£210	£246.75
FS1800		£559	£656.83	PagePro 9100		£1029	£1209.08
FS3800		£729	£856.58	Magicolor 2200		£729	£856.58
FS6700		£955	£1122.13	Magicolor 2210GN		£69	£81.68
FS7000+		£1679	£1972.83	Magicolor 2200GN		£1599	£1878.83
FS9000		£1899	£2231.33	Magicolor 61000L		£1549	£1820.08
CANON		Ex VAT	Inc VAT	TEKTRONIX		Ex VAT	Inc VAT
BJC 55 Colour		£202	£237.35	Phaser 750N		£1246	£1464.05
BJC 85 Col		£169	£198.58	Phaser 750P		£1439	£1690.83
S100		£46	£54.05	Phaser 860N		£1679	£1972.83
S300		£77	£90.48	Phaser 860DP		£2649	£3112.58
S520		£116	£136.30	Phaser 2135N		£2979	£3500.33
S750		£147	£172.73	Phaser 2135DT		£4099	£4816.33
S6300		£294	£345.45	LEXMARK		Ex VAT	Inc VAT
S900		£255	£299.63	Jetprinter 223		£30	£35.75
S9000		£349	£410.08	Jetprinter 233		£38	£44.45
S820		£170	£199.75	Jetprinter X73		£119	£139.83
CD300 Dye-Sub		£329	£386.58	Jetprinter X83		£145	£170.38
BJC5500 Inkjet		£433	£508.78	Optra E320		£181	£212.68
EBP810 Laser		£162	£190.35	Optra T620		£769	£903.58
				Optra T622		£1299	£1444.08
				Optra W810		£1519	£1784.83
				Optra C720		£1029	£1209.08
				Optra C910		£2540	£2984.50

## scanners

HEWLETT PACKARD		Ex VAT	Inc VAT	EPSON		Ex VAT	Inc VAT
Scanjet 3400C		£59	£69.33	Perfection 1250U		£67	£78.73
Scanjet 4400		£75	£88.13	Perfection 1250U Photo		£90	£105.75
Scanjet 5400C		£120	£141.00	Perfection 1640SU		£187	£219.73
Scanjet 5470C		£159	£186.83	Perfection 1650U Scanner		£132	£153.60
Scanjet 7400C		£295	£346.63	Perfection 1650U Photo		£134	£157.45
Scanjet 7450C		£359	£421.83	Perfection 2450 Photo		£224	£263.20
Scanjet 7490C		£519	£609.83	Expression 1600 Scanner		£495	£581.63
UMAX		Ex VAT	Inc VAT	Expression 1600 Pro		£650	£763.75
Astra 3400U		£51	£59.98	MICROTEK		Ex VAT	Inc VAT
Astra 3450U		£76	£89.99	ScanMaker 3800		£57	£66.98
Astra 5400U		£85	£99.88	ScanMaker 4800U		£85	£99.88
Astra 5450U		£127	£149.23	ScanMaker 5600		£149	£175.08
Astra 6400F		£170	£199.75	ScanMaker 5700		£279	£327.83
Powerlook 1100 Graphic		£749	£880.08	ScanMaker X120SL		£175	£205.63
Powerlook 1100 Pro		£809	£956.33	Filmscan 35		£121	£142.18
Powerlook 2100XL Pro		£2199	£2583.83	ScanMaker 8700		£539	£633.33
AGFA		Ex VAT	Inc VAT	ScanMaker 9600XL		£799	£938.83
Snapscan e20		£59	£69.33	CANON		Ex VAT	Inc VAT
Snapscan e25		£77	£90.48	Canon N640Pex		£54	£63.45
Snapscan e40		£126	£148.05	Canon N670U		£54	£63.45
Snapscan e50		£145	£170.38	Canon N1250U2F		£93	£109.28
Arcus 1200		£455	£534.63	CanonScan D2400UF		£132	£153.10
				CanonScan D2400UF		£294	£346.63
				CanonScan FS2710		£349	£410.08
				CanonScan FS4000		£543	£638.03

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# LEISURE LINES FLASHBACK



**JULY 1982**  
PCW went BBC Micro mad in July 1982, with a series of articles covering every aspect of one of Britain's best-loved computers, from its core components to the Basic operating system. Back then, the Micro was still a new machine, and our readers were interested to see just how far it could be pushed. With this in mind, PCW examined the various software options and its expansion capabilities.

If you've forgotten how impressive the Micro was, a

**JULY 1987**  
Browsing through old Issues is always a pleasant experience, and if you're not careful you may find yourself harking back to the old days and droning on about how things were better then. That's until you see the prices. Back in 1987, a 3.5in floppy drive could set you back a terrifying £250.

The main feature of the July issue back in 1987 was a review of a desktop publishing outfit from Atari. More associated with games, it had produced a software and printer

**JULY 1992**  
Many strange pieces of hardware pass through the PCW offices, some of the strangest being the Philips CD-I and the CDTV from Amiga. These CD-based home computers, forerunners to modern-day games consoles, were reviewed head-to-head by Chris Cain.

After rigorous testing and careful consideration, he concluded that the CD-I was the better of the two, being the 'best piece of hardware' that he had seen in the whole of his five years as a PCW writer. He was convinced it would be yet another five years at least before the market could produce anything to top it. However, neither format managed to gain mass popularity due to their limited functionality and expensive hardware.

From computers to components: this was the month that ATI released the VGAStereo F/X, a combined Super VGA graphics card, sound card and mouse controller.

With 1MB of graphics memory it had to be imported from across the Atlantic and would have set you back a staggering \$399. For a similar price today you can get your hands on a top of the range Geforce4 Ti4600.

A 25-machine PC group test by Mat Beard covered the recently introduced 486SX processor, with a manufacturer for every letter of the alphabet – with the exception of Y.

A less technically sophisticated product also appeared in the news pages: programmers' favourite Jolt Cola finally reached the UK, priced at £1.10 and sold in specialist outlets. An informal poll in the PCW office, however, showed that most of the team didn't really care all that much for the latest drink fad.

**JULY 1997**  
The mass-market rollout of ADSL may only be happening now, but back in July 1997, PCW was already discussing it in the news pages. We explained how this new technology, soon to be released by BT, was to be a medium for delivering TV pictures. While some services – notably Home Choice – are indeed doing this, most of us now use it for Internet access.

At the same time there was talk of 56K modems and how their uptake had been slow. At the time only two UK ISPs supported such technology.

Windows 98 was still some way off at the time, but PCW took a look at an early beta copy in the July 1997 issue, alongside covering the new USB standard, and the products that would eventually take advantage of this fast interface.

July 1997 saw the presentation of the annual PCW awards, in which DVD was declared 'most innovative technology'. Reviews of interest included the Matrox Millennium II and Videologic Apocalypse 3D, the latter being the first real competitor to 3Dfx's Voodoo range.

Also on test were four tape backup drives, with Seagate coming out as the winner for its good price-to-performance ratio. Back then, a 4GB tape would be enough to back up your entire hard drive twice over – or perhaps even more. If only the same could be said today. The software section ran a head-to-head comparison of Dragon Dictate Solo and Voice Type Simply Speaking, both the first generation of voice recognition packages. They may not have been as sophisticated as more recent versions but were still very functional – as long as you had a powerful PC to run them on.

Lars-Goran Nilsson



**The HP-28C was one of the most advanced calculators on the market in 1987, although by today's standards it would be considered very low tech**

quick look back over the specs reveals that it had support for networking, modems and dual-processor operation. A workshop on making sounds with your Micro and an in-depth look at the Basic Rom, complete with a comprehensive list of useful commands and routines rounded everything off well.

Other products to grace the PCW office included the Newbrain, a portable computer with a built-in 16-character display. Sadly, it wasn't battery powered, so couldn't be used on the move. Dick Pountain, meanwhile, was lucky enough to bag a trip to Nice to look at Texas Instruments' latest programmable calculator. These pocket-sized beasts were the PDAs of their day, with prices to match, this one tipping the scales at £289.95.

combo that you connected to an Atari Mega ST4. This was still a prototype, but it marked Atari's first major move into the business market.

Yet again, PCW took a look at calculators – this time the HP-28C, one of the most advanced on the market. Many of its functions were preprogrammed, which was quite uncommon for a piece of 1987 kit, and if you wanted a hard copy of your calculations you could also invest in an infra-red thermal printer.

It seems unbelievable that Dell, now arguably the dominant player in the PC market, only made its PCW debut in 1987 when it submitted the Dell 286-12. Robert Schifreen put it through its paces and came to the conclusion that £2,400 inc VAT was a little pricey for a 286 chip running at 12MHz.



# High-street legend

We trace the beginnings of the Tandy TRS-80, the first mass-marketed computer

**A**hh, Tandy! There can be few readers of *PCW* without fond memories of perusing electronics components in this high-street legend.

Most regulars also knew that Tandy stores were called Radioshack in the US, but few could explain why, or what happened to Tandy in the end. We'll now reveal all in the story of the TRS-80: the first mass-marketed personal computer.

The TRS-80 story starts with friends Norton Hinkley and Dave L Tandy who met by chance in Fort Worth, Texas during 1919, and decided to start the Hinkley-Tandy Leather Company.

Two years later, brothers Theodore and Milton Deutschmann opened a store in Boston, supplying equipment to ship radio operators and ham enthusiasts. The brothers christened the store Radioshack, after the nautical term for the room above the ship's bridge, traditionally housing the radio equipment.

Back to Hinkley-Tandy, which was doing well, despite the great depression and World War II. After serving in the Navy, Charles D Tandy (Dave's son) returned to Fort Worth but clashed with Hinkley. The company split with Dave and Charles forming the Tandy Leather Company in 1950.

Over to Radioshack, which, in the early 1960s, was established but had fallen on hard times. Chairman Charles D Tandy, now interested in electronics, saw the Radioshack chain as an opportunity for growth and snapped it up in 1963.

During the early 1970s, the CB radio craze saw Radioshack enjoying enormous growth and, by 1975, the Tandy Corporation dealt exclusively with electronics. But just a year later the CB market collapsed, leaving Tandy/Radioshack on the search for a new profitable electronics venture.

At this time, the first personal computers had just arrived, but they were far from consumer styled or priced. The MITS Altair was little more than a DIY box with lights and switches, while the Apple I was financially out of reach for Tandy's customer base. Like most companies of the day, Tandy also suspected personal computers were just another fad.

Don French, a buyer for Tandy and dedicated computer hobbyist, was convinced otherwise. He and Tandy executive John Roach persuaded the company in 1976 to develop a personal computer for Radioshack. French then got to work with Steve Leininger, who had previously been head of the legendary Homebrew Computer Association.

The Tandy Radioshack, or TRS-80, was announced on 3 August 1977 and priced at just \$599. It featured a 1.77MHz Z80 processor, 4KB of Ram, Basic in a 4KB Rom, and employed a modified 12in RCA mono TV for a screen.

The TRS-80 may have been cheap for a personal computer, but it was Radioshack's most expensive item, and the company initially feared it may be stranded with 3,000 unsold units. Swamped with orders, Radioshack ended up selling almost 55,000 TRS-80s in its first year and 200,000 during the Model-I's four-year lifespan.

In 1979, the Model-II arrived, with a faster CPU and 8in disk drives. The Model-III followed in 1980 along with a Colour Computer, affectionately known as the Coco. While the TRS-80 product line sold far better than expected, Tandy was also producing increasingly popular Intel-based alternatives. In 1984, the almost 100 per cent IBM PC-compatible Model-1000 became Tandy's best selling computer, signalling the end for the proprietary TRS-80. After building MS-Dos machines for some years afterwards, the Tandy computer division was bought by AST in 1993.

But what happened to the Tandy stores in the UK and why were they never known as Radioshack? Allegedly Tandy was never allowed to use the name Radioshack in the UK because it was already owned by an electronics shop on London's Finchley Road, which refused to sell it.

As far as Tandy's UK high-street presence was concerned, Carphone Warehouse bought all 270 outlets in 1999. Since then, the stores have gradually turned into either Carphone Warehouses, or a subsidiary such as Tecno Camera, itself later acquired by Jessops.

In 2000, the Tandy Corporation was renamed Radioshack Corporation, and it remains a dominant force in the US: an estimated 94 per cent of all Americans live or work within five minutes of a Radioshack store or dealer, while 99 per cent of American households visit one of the stores at least once every three years. At least we still have Maplin.

Gordon Laing





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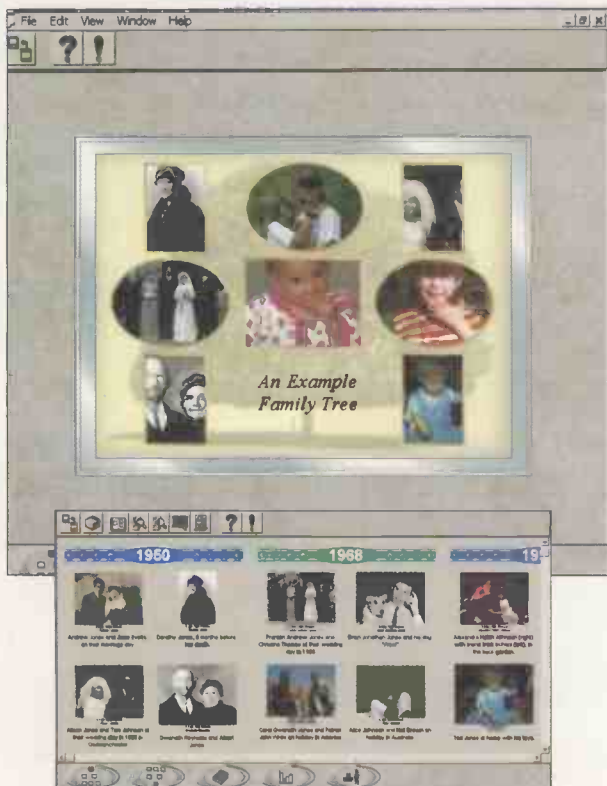
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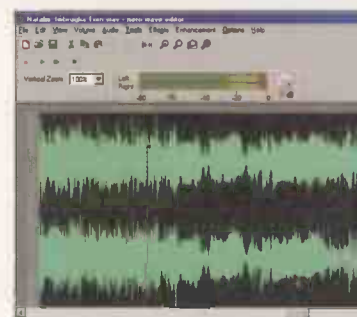
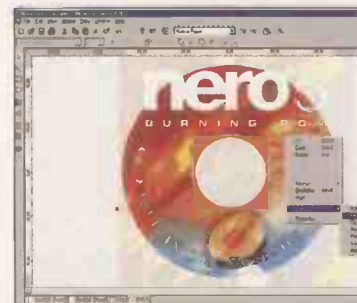
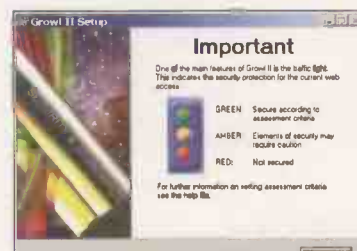
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## Top to bottom:

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Nero 5.5

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This primer explains how and why projects can be planned more effectively and how these skills relate to Microsoft Project specifically. The remaining 18 topics apply best-practice project planning to Microsoft Project. They provide step-by-step guidance on how features can be implemented, or how information can be interpreted.

# COVER DISC NOTES



## Trial versions

### Ahead Software Nero 5.5

**CONTACT** [www.nero.com/en/nero55.htm](http://www.nero.com/en/nero55.htm)

If you're into CD recording, version 5.5 of Nero gives you full support to produce both data and video DVDs. Whether you want to back up your hard drive or compile music, Nero will do it. You can even design and print a disc cover and label using the Cover Editor.

### Pure Motion Edit Studio 3

**CONTACT** [www.puremotion.com](http://www.puremotion.com)

Edit Studio is suitable for any type of editing task, with support for both digital and analogue video. Edit Studio's video capture supports both Firewire and analogue cards. The program uses a standard Windows interface. The main window shows all the program's features in a 'flat' interface. All the main editing operations can be done using drag and drop technology.

Simply add, move and resize items by dragging with the mouse. If you require precision, editing can be performed using the more pop-up menus and dialogue boxes. The program has 99 levels of undo/redo. You can use Edit Studio's Media Explorer to manage your source media files.

Media Explorer also allows you to store preset effects and transitions. This makes it easy to maintain a similar style throughout. The program preview is available at all times to give a preview of any part of the movie. There's no need to pre-render a preview before you can see it. Edit Studio is built around the

new Windows video technologies, removing the old 2GB maximum file size. For Windows 95 and 98 this means that 4GB files can be used and for Windows NT4 and 2000 there is no limit. Under Windows 98SE or ME, DV capture allows you to capture as a number of 4GB files.

See also our review on page 77.

### Roxio WinOn CD 5

**CONTACT** [www.roxio.de/english](http://www.roxio.de/english)

This is a comprehensive multimedia software tool for creating your own projects with music, video and photos. This version combines new optimised features with a friendlier interface. Edit music and create video CDs, DVDs and make backups and copies of CDs. WinOn CD 5 Power Edition includes Roxio DirectCD, CD Emulator, CheckCD, Video CD Player, VCD Photo Album, VCD Music Album, MP3 Project and more. Features include:

- Create audio CDs from Wav, MP3 and WMA files
- Internet support
- Support of CD text
- Blend between audio titles
- Sound editor with effects
- VCD music albums — reproduction on PC/DVD; 99 albums per CD
- MP3 encoding and creation of MP3 CDs
- Add pictures or text to MP3 files
- MP3 project with Playlist-Editor
- Video CD and Super VCD
- Creation of interactive films
- Add 99 video titles on one menu
- Create the VCD navigator simply
- Automatic encoding of files as mpeg-1 for VCD
- Video CD player

- CD-Rom/DVD-Rom emulator for playing on PC
- VCD photo album — high-resolution slide shows on TV

### Entech Powerstrip

**CONTACT** [www.entechtaiwan.com/ps.htm](http://www.entechtaiwan.com/ps.htm)

Powerstrip 3.15 provides advanced, multi-monitor, programmable hardware support to a wide range of graphics cards — from the Matrox Millennium I to the latest Radeon 8500DV and Geforce4 Ti4600. It is the only utility of its type to support multiple graphics cards from multiple chipset vendors simultaneously, under every Windows OS.

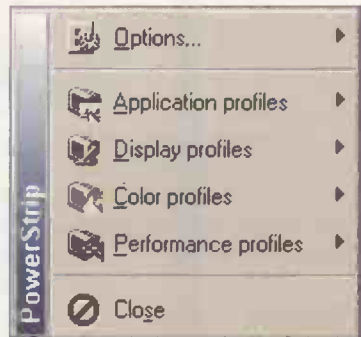
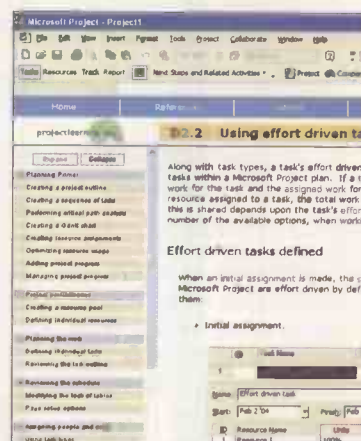
A menu that pops up from the system tray provides access to 500 controls over your display hardware, including colour correction tools, period level adjustments over screen geometry, and driver independent clock controls.

An application profiler can detect when programs are launched and activate specific display settings, gamma adjustments, performance switches and clock speeds — returning everything to normal when the program closes. In-game gamma hotkeys let you light up the darkest hallways during game play, while hardware control over refresh rates ensure you're never stuck at 60Hz no matter what OS you're using.

A quick setup wizard gets you up and running with minimal fuss, extensive context-sensitive help is available for controls, and live updates are supported to ensure you're running the latest release.

Check out our feature on page 94 for more tips on how to get the most of your graphics cards.

### Project Companion Edit Studio 3 Powerstrip menu Powerstrip monitor management





# COVER DISC NOTES



## What's on the DVD

If you've bought the DVD-Rom edition of *PCW*, you'll find everything from the CD edition plus the extra goodies described below

### Full versions

#### Qarbon Viewlet Bullder 2

[www.productivity4you.com](http://www.productivity4you.com)

Viewlet Bullder is the powerful, yet ingeniously simple tool for creating Viewlets – visually rich, yet extremely compact movie files. The enhanced features of this Freeware Edition make it a great introduction to Viewlet technology.

Viewlets can transform static text help files into something more appealing. Each Viewlet opens in its own unique Java-enabled browser window (requiring no plug-ins). Since Viewlet files are small, any dial-up user with a 56K modem can watch the demo. You can fill your site with compelling multimedia demos, in any language, in a matter of hours.

To get you started, you'll find a large number of example/tutorial Viewlets in the folder `\software\viewlets_example\`.

As long as a browser is Java enabled, it should be able to play Viewlets. The following PC browsers are compatible: Netscape 4.06 (or later), Internet Explorer 4.0 (or later), AOL 4.0, and Opera 5.x. Mac browsers include Internet Explorer 4, Netscape 6.x, and AOL 4.0 or later.

#### Mandrake Linux 8.2

[www.linux-mandrake.com/en](http://www.linux-mandrake.com/en)

Mandrake Linux is a complete preconfigured graphical Linux operating system. It's easy to install, use and is stable. We included Mandrake on last month's DVD-Rom. Unfortunately, there was a problem with the ISO disc image for disc 3 (Mandrake extensions).

So, here it is again with a new disc 3 ISO file. To create your installation disc set use a CD-R burner and software such as Easy CD Creator or Nero (Nero 5.5 is included on this month's CD and DVD-Rom).

The three image files can be found in `\software\mandrake\`.

### VIEWLET BUILDER SPECIAL OFFER

Productivity4you is offering *PCW* readers the opportunity to upgrade to Viewlet Builder Pro with a discount of £25. Please contact Penny Parker on 01202 821 002 or email on [pparker@productivity4you.com](mailto:pparker@productivity4you.com) or [offers@productivity4you.com](mailto:offers@productivity4you.com). Alternatively go to [www.productivity4you.com](http://www.productivity4you.com) to take advantage of the offer.

### Playable games demos

#### 2002 FIFA World Cup

Take your country to 2002 FIFA World Cup victory. This EA Sports game features officially licensed uniforms, teams, players, and commentators. Stadiums are complete with crowd celebrations and special effects.

#### Universal Monsters

Headed by Dracula & Frankenstein, the monsters have got it in their heads to stand in the next Monsterville elections. Other characters include Quasimodo and the Phantom of the Opera. The 3D cartoon-style game, a blend of humour and strategy, was developed by Intelligent Game.

### Beam Breakers

Giants of steel, concrete, and glass dwarf buildings that once dominated the skyline. Rush hour traffic isn't what it used to be either. Anti-gravity technology means the skies are filled with high-tech automobiles. Among the commuters, rival gangs run illegal sky races... the 'beam breakers'.

### Plus...

The Secret of Nautilus, Blood Omen 2 (trailer), New Dominoes 1.1, Six Trix; Cycleman, Freedom Force, Space Horse, and Starships Unlimited: Divided Galaxies.

### Essentials

#### 50 top utilities and add-ins

`\software\essentials\`

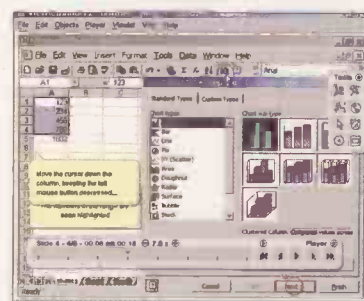
More than 50 of the top programs and add-ins, sorted into five categories – Internet, Office, Creative, Utilities, and Others.

### Editorial

#### PCW product group tests

Two years of product tests from the pages of *PCW*, including desktop PCs, anti-virus software, CD writers, databases, digital cameras, DTP software, hard drives, image editors, monitors, motherboards, notebooks, PDAs, printers, visual programming software, webcams, DVD-Rom drives, scanners and more – up to and including the May 2001 issue. You'll also find a selection of workshops, from ecommerce to upgrading your motherboard. These are all presented as Adobe Acrobat files. You can browse or search each feature, copy text directly from the documents, or print them.

Top to bottom:  
Universal Monsters  
Secret of Nautilus  
Mandrake Linux 8.2  
ViewletBuilder 2



# READER PANEL

## We need you!

Help us keep *Personal Computer World* the magazine you want to read

**WIN**  
a mystery  
prize!

In order to keep your magazine up to date, we need regular feedback to help us tailor *Personal Computer World* to the changing needs of you, our readers. The best way of doing this is by talking to readers directly, so we're setting up a panel of *Personal Computer World* readers who we can contact every now and then to find out what they think. As an incentive, all panel members will be entered into a draw to win a mystery prize.

### How it works

At various times during the next 12 months, we will select a random cross-section of panel members to take part in a survey. If you are selected, we will send you a copy of the latest issue (unless you are already a subscriber, of course). A week or so later, when you've had an opportunity

to read it, we will either email you and direct you to an online survey where we'll ask you about various aspects of the magazine, or telephone you with a short questionnaire. It really is as simple as that and we promise not to contact you more than three times in any 12-month period.

During the year, we will select at random one lucky panel member who will win the mystery prize.

If you are interested in becoming one of our panel members, you need to have access to the Internet. To apply just fill in the form below and return it to us free of charge. If you don't want to cut this page, you can download the form from [www.pcw.co.uk/News/1131632](http://www.pcw.co.uk/News/1131632). Alternatively you can email your answers to [readerpanel@pcw.co.uk](mailto:readerpanel@pcw.co.uk) and register that way.

Thanks for joining in and good luck in the prize draw!

## Reader panel

Please return from to: *Personal Computer World* Reader Panel, VNU Business Publications Ltd, Freepost 25, Lon 1414, London W1E 1RN

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Which of the following magazines do you read and how often?

	Every issue	Fairly frequently	Occasionally	Never
Computeractive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Computer Buyer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Computer Shopper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Computer Weekly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Computing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IT Week	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MacUser	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Micro Mart	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
.net	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Network News	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PC Advisor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PC Answers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PC Format	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PC Guide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PC Know How	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PC Magazine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PC Plus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PC Pro	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PC Zone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Webactive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Web User	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
What PC?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How often do you read *Personal Computer World*?

I have a subscription ☐

I buy every issue/almost every issue ☐

I buy most issues (around three out of four) ☐

I buy it once every three or four issues ☐

I only buy it occasionally (around twice a year or less) ☐

This is the first time I have bought it ☐

How long have you been reading *Personal Computer World*?

Less than 1 year ☐ 5-7 years ☐ 11+ years ☐

2-4 years ☐ 8-10 years ☐

Do you have Internet access?

Yes, at home ☐

Yes, at work ☐

Yes, at home and work ☐

No ☐

Have you ever visited [www.pcw.co.uk](http://www.pcw.co.uk) and how often do you visit?

Yes - Regularly ☐

Yes - Fairly frequently ☐

Yes - Occasionally ☐

No - Never ☐



# PERSONAL COMPUTER WORLD

## next month...

### 75 Office tips and tricks

Almost everyone knows how to use a word processing program or spreadsheet, but can you do more than just type in words and numbers? We've rounded up 75 top hints, tips and tricks to help you make full use of Microsoft Office.

### Computer noise

As PCs have become faster and more powerful, they have also become more noisy. *PCW* puts an ear to the ground and tells you how you can diminish the din of your PC.

### High-street computers

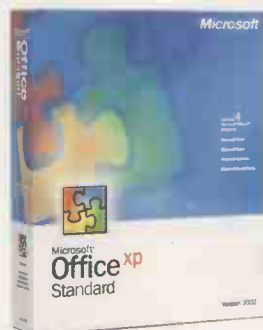
There are many ways to buy a PC, but one the most popular and convenient ways is to pop down to your high street and pick one up. We take a look at the latest models on offer and give you some solid buying advice along the way.

### Graphics cards

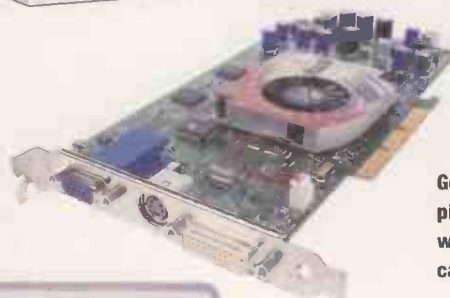
We round up over 30 of the latest graphics cards available, tell you about the chip technology behind them and put them through our rigorous testing. Find out who comes out on top.

### pcwexpert Instant messaging

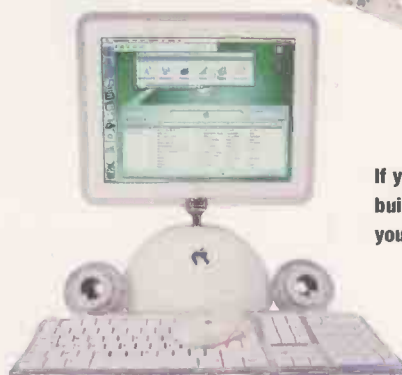
Everyone's at it, but what makes it tick? We dig deep into instant messaging and explain what it's all about



Find out some of the tricks of the trade and learn how to use Office better



Get the best picture possible with our graphics card group test



If you don't want to custom-build a system, find out what you can buy off the shelf

### Reserve your copy now! Newsagent Order Form

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☐ Please reserve me a copy of *Personal Computer World* every month

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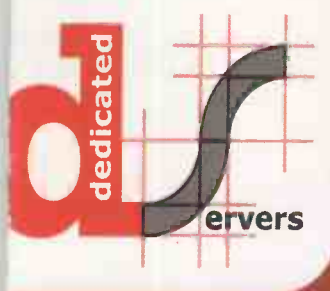
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**PERSONAL  
COMPUTER  
WORLD**

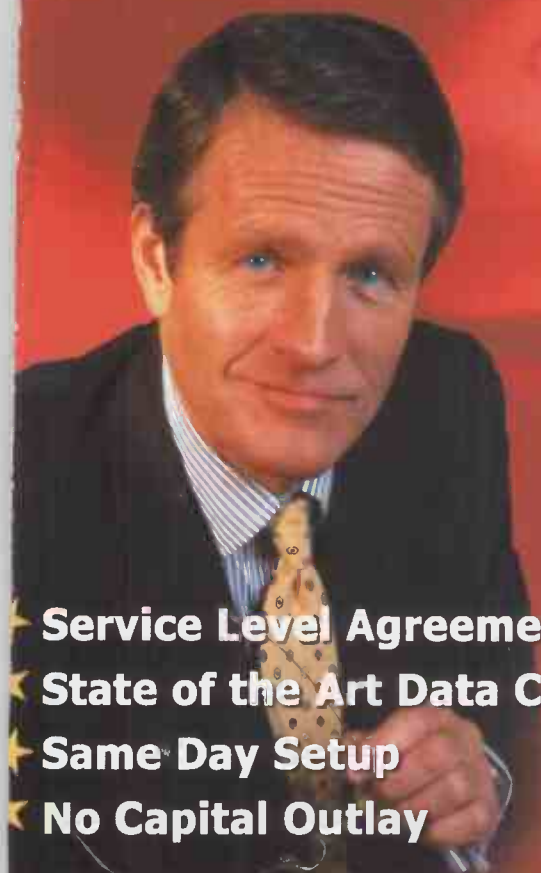
**There's lots  
more in August's  
*PCW*, on sale  
Thursday  
27 June 2002,  
don't miss it...**

Contents subject to change



# dedicated servers

## A Commitment to Success



- ★ Service Level Agreement
- ★ State of the Art Data Centre
- ★ Same Day Setup
- ★ No Capital Outlay

Are you outgrowing virtual hosting? Running into extra costs for high bandwidth use, more domains and email? Does the server itself seem slow and inflexible? Does your web designer keep saying there are so many things you could be doing if only you had more speed and space, and access to the 'workings' of the server? Your accountant won't let you spend a fortune on leased lines and computers. Maybe you don't have the technical staff to maintain your own network anyway. Well, you have no choice but to put up with virtual hosting, right?

Wrong. The serious solution to web hosting is a dedicated server, and it's within your reach now. You can benefit from high value Service Level Agreements just like the biggest players in your industry. You can enjoy the speed and flexibility of your own server in one of the country's leading data centres. You can even choose a server that's as technically simple to operate as virtual hosting, but without the restrictions. Your web designer will be happy.

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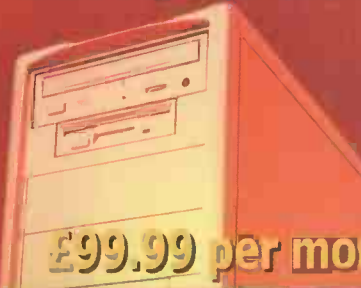
### WINDOWS SERVERS



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