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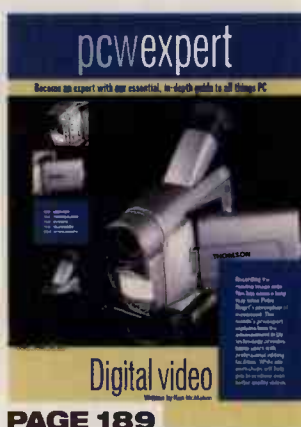
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Riyad Emeran, Editor in Chief

All work and no play

A bit of surfing doesn't do any harm and could even raise morale, says Riyadh Emeran

Many companies think the Internet is a major distraction for office workers and limit employee Internet use during work time. For example my wife's company only allows employees to use the Internet for personal reasons outside work hours, and anyone who doesn't need access for their job doesn't get it.

However, most companies tend to enforce Internet policies that combat misuse, such as downloading pornography, or excessive use of file sharing utilities like Napster. These kinds of policies are understandable both for legal and practical reasons, after all, even a T1 connection is going to get pretty slow with hundreds of workers downloading the latest Stereophonics album.

Employers generally consider time to be money – every hour not spent working is an hour that an employer is paying employees money for nothing.

There's no denying that the Internet can be a huge waste of time. I can sometimes spend hours on end surfing from one website to the next without really accomplishing anything, although this tends to be at home rather than in the office – honestly. But occasionally random surfing will turn up something that is of particular relevance even though I wasn't specifically looking for it at the time.

Now, the odd random find aside, most of us will find little that's relevant to our work when we're idly wandering around the web during office hours, but contentious as it may be, I'm not entirely convinced that it's such a bad thing.

A full day sitting in front of a computer in an office can be a mind-numbing experience, quite literally. Most people will tell you that the longer they spend working at a set task, the less focused they become and ultimately productivity

will suffer as a result. That's not to suggest that spending hours surfing the Internet is good for productivity, because it quite obviously isn't. But, taking a few minutes break from the grind to cast your eye over your favourite website may stop you getting bogged down and make you more productive when you fire up that spreadsheet or word processor again.

Online shopping could also be more of a blessing than a curse for companies. Whether it's ordering the latest DVD on your list or booking your holiday, you may waste less time doing it from your computer than trying to squeeze in a visit to the shops during your lunch hour and coming back to work late as a result.

But there's one thing that a bit of personal web surfing can do better than anything else, and that's raise team morale. Believe it or not, we're pretty busy here at PCW and getting the magazine out every month can be a difficult and stressful experience.

With a heavy workload and tight deadlines it's easy to get snowed under and

We're not robots and even the most dedicated worker can get bored

sometimes a bit of a break and some light relief is exactly what we need to get back on track. This kind of distraction usually comes in the form of an amusing website one of the team has stumbled across.

It's common to see most of the PCW team huddled around a single computer watching the latest bit of humorous web wizardry. We'll watch, laugh about it, chat for a few minutes and then go back to our respective desks feeling a bit better and throw ourselves back into our work.

The office favourite at the moment seems to be www.eugenemirman.com. This is a truly bizarre site where you'll find a very strange-looking child singing (and I use the word very broadly) various well-known songs. It doesn't seem to matter how stressed or down anyone on the team is, after a few verses from Eugene the laughter starts to flow.

Another one that brings a smile to the team is www.thepolosofdeath.com, a downloadable movie starring Boba Fett and some rather dangerous Polos.

Of course, I'm willing to accept that Internet access is open to abuse, but then so is almost anything else in an office. Telephones, stationery and even time keeping can all be abused by employees and result in relative loss of revenue to the company. But I think being too strict with Internet access could do more harm than good. After all, being able to fire off a quick email to a friend in work time is preferable to phoning him for half an hour.

We're not robots and even the most dedicated worker can get bored and become less productive, and the Internet can inject a bit of relief and some team bonding into an average day in the office.

So, strange as it may sound, a few wasted hours a week could in fact equate to a more rather than less productive workforce.





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EDITORIAL

TEL 020 7316 9315 FAX 020 7316 9313 www.pcw.vnunet.com

Riyad Emeran **EDITOR IN CHIEF** riyad_emeran@vnu.co.uk

Nik Rawlinson **DEPUTY EDITOR** nik_rawlinson@vnu.co.uk

Clive Akass **ASSOCIATE EDITOR (NEWS)** clive_akass@vnu.co.uk

Niall Magennis **FEATURES EDITOR** niall_magennis@vnu.co.uk

Jason Jenkins **REVIEWS EDITOR** jason_jenkins@vnu.co.uk

Jalal Werfalli **STAFF WRITER** jalal_werfalli@vnu.co.uk

Lars-Goran Nilsson **STAFF WRITER** lars_nilsson@vnu.co.uk

Janet Heil **EDITORIAL ASSISTANT** janet_heil@vnu.co.uk

EDITORIAL CONTRIBUTORS Tim Anderson, Mick Andon, Tim Bajarin, Chris Bidmead, Dominic Bucknall, Julie Fairless, Barry Fox, Roger Gann, Terence Green, Tim Green, Toby Howard, Cliff Joseph, Gordon Laing, Ken McMahon, David Nathan, Tim Nott, Simon Rockman, Ian Waugh, Stephen Wells, Mark Whitehorn, Nigel Whitfield, Simon Williams, Benjamin Woolley, Ken Young

PRODUCTION

Debbie Oliver **PRODUCTION EDITOR** deborah_oliver@vnu.co.uk

Andy Stewart **DEPUTY PRODUCTION EDITOR** andrew_stewart@vnu.co.uk

Laura Eagleton **SENIOR SUB-EDITOR** laura_eagleton@vnu.co.uk

ART

Sean Johnston **ART EDITOR** sean_johnston@vnu.co.uk

Chris Dias **ASSISTANT ART EDITOR** chris_dias@vnu.co.uk

ART & PRODUCTION CONTRIBUTORS Max Baker, Sean Barnes-Murphy, Carlton Hutchinson, Patrick Llewelyn-Davies, Karl Grant, Magictorch, Richard Plastow, PSC Photography, RD2_Media, David Semple

PUBLISHING

Sean Ferris **PUBLISHER** sean_ferris@vnu.co.uk

Juliet Parker **PUBLISHING DIRECTOR** juliet_parker@vnu.co.uk

Ruud Bakker **CHIEF EXECUTIVE**

Brin Bucknor **MANAGING DIRECTOR**

Tosh Bruce-Morgan **FINANCIAL DIRECTOR**

Angelo Zgorelec **FOUNDER**

Marketing & Circulation

Mark Judd **SUBSCRIPTIONS MANAGER** mark_judd@vnu.co.uk

Zoe Rouch **BRAND MARKETING MANAGER** zoe_rouch@vnu.co.uk

Lucy Nebel **MARKETING EXECUTIVE** lucy_nebel@vnu.co.uk

Helen Muchmore **MARKETING CO-ORDINATOR** helen_muchmore@vnu.co.uk

Jonathan Hardy **NEWSTRADE CIRCULATION MANAGER** jonathan_hardy@vnu.co.uk

ADVERTISING

Matthew Tasker **HEAD OF SALES** 020 7316 9727

Adam Foord **SALES MANAGER** 020 7316 9594

James Perry **ACCOUNT MANAGER** 020 7316 9827

Anis Qizilbash **ACCOUNT HANDLER** 020 7316 9306

Damiti Ward **ACCOUNT HANDLER** 020 7316 9304

Jim McGinty **ACCOUNT HANDLER** 020 7316 9295

Eugene Kerrigan **SALES EXECUTIVE** 020 7316 9623

Emma Eslava **CLASSIFIED SALES EXECUTIVE** 020 7316 9834

Samantha Lizen **ISSUE MANAGER** 020 7316 9305

US SALES REPRESENTATION Global Media USA LLC, 565 Commercial Street, 4th floor, San Francisco,

CA 94111-3031, USA Tel: 001 415 249 1620 Fax: 001 415 249 1630 www.globalreps.com

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London W1A 2HG Tel 020 7316 9638 Fax: 020 7316 9774 www.globalreps.com

TAIWAN SALES REPRESENTATIVES Grace Chu/Kent Lai 001 886 2717 7663

CENTRAL PRODUCTION

Joanne Hurst **PRODUCTION DIRECTOR** 020 7316 9227

Richard Briggs **PRODUCTION MANAGER** 020 7316 9483

Cathy Mahoney **PRODUCTION CONTROLLER** 020 7316 9486

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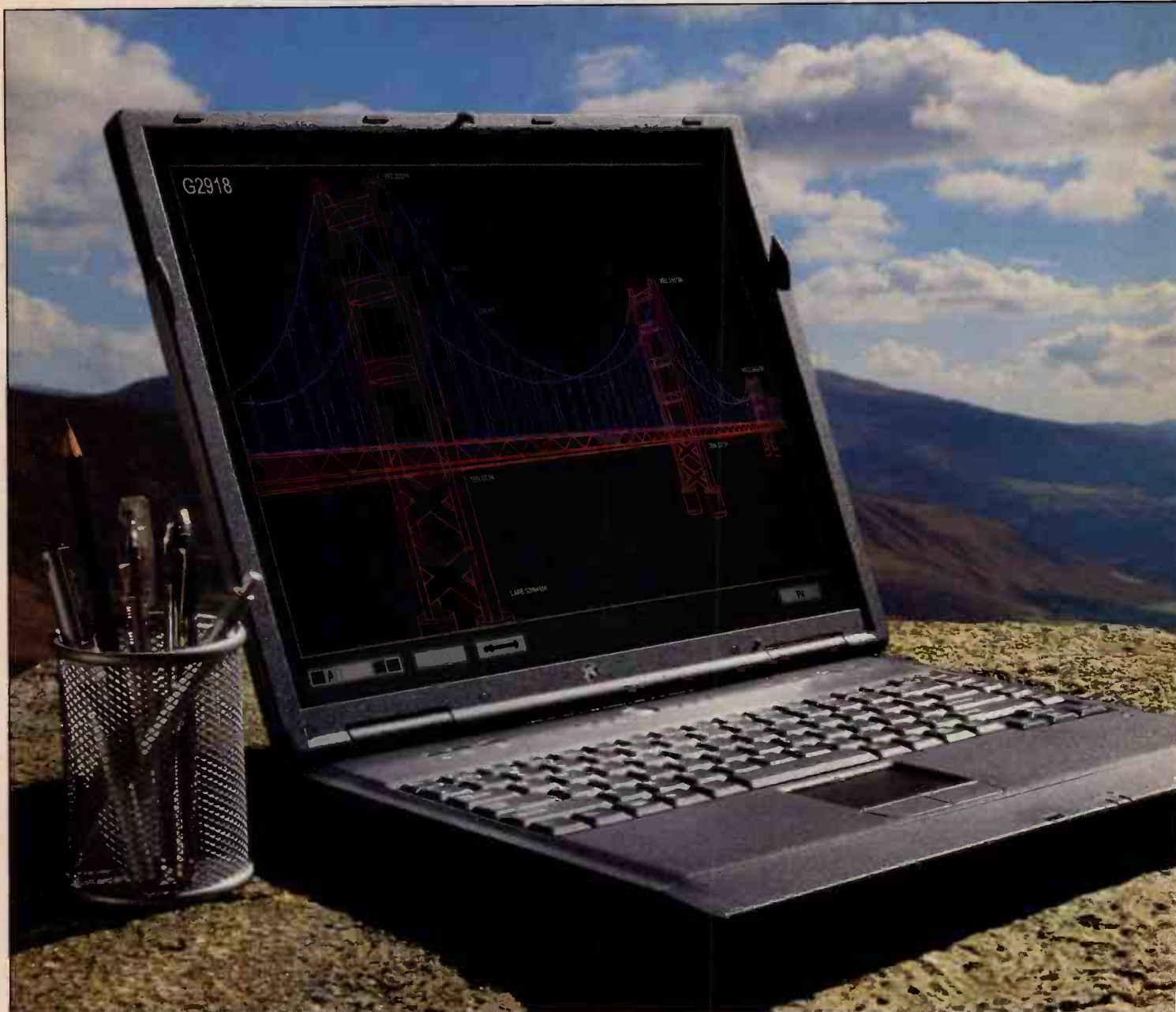
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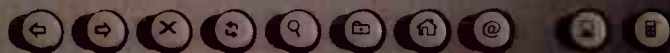
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NEWS

EDITED BY CLIVE AKASS

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First GPRS devices arrive



Trium Mondo...
is this the shape
of the new
mobile phone?



Digicams get a docking station

A PDA-style docking station for Kodak's DX series digital cameras is part of a new EasyShare system aimed at making it simpler to use images. The dock, which also recharges the batteries, will come initially with the DX3500 and DX3600.

www.kodak.com

BT Cellnet was set to launch Britain's first general use always-on GPRS service on May 18 despite an embarrassing press demo where the handsets failed to work. The move coincided with the launch of the Trium Mondo (above), the first full-sized organiser to ship in Britain with native voice and wireless links, presenting a challenge to the traditional phone format.

GPRS take-up will be closely monitored by vendors of mobile phones and other handhelds for signs that the 2.5 generation service will boost sales, which are flagging as the market nears saturation. GPRS cannot be accessed on existing GSM phones.

WAP providers are also banking on GPRS to boost the use of their services, which has been disappointing. GPRS should speed up WAP delivery. Web access via GPRS will not be available until later this year, BT Cellnet says.

Cost alone will make GPRS users wary of surfing the Internet. Cellnet has announced two tariffs: a flat £3.99 per month plus 2p per kilobyte; or £7.99 per month with up to 1MB 'free', plus £3.99 per extra MB. Voice calls and monthly tariffs are additional. These charges are tolerable for email or WAP, with data typically of the order

of 1KB, but they could quickly mount up on web pages. BT Cellnet will initially be selling the service using the Motorola Timeport 260 phone, which costs £199 inc VAT. Other models will follow shortly.

PCW got its paws on a Trium Mondo just as we went to press. It packed only GSM but GPRS support is imminent. It can double as a phone, using a hands-free kit.

A big question is whether Mondo-style devices will become the new mobile phone, or whether organisers and phones will develop separately. In the middle are organisers in the form of mobile phones, like Nokia's Communicator or Ericsson's R380. In any case GPRS is bound to increase the use of wireless links by handhelds.

The Mondo, which uses Microsoft's Pocket PC operating system, seems a little clunky for a phone, obliging you to fiddle with the wires of a hands-free kit. Bluetooth, when it gets to be affordable, could make this more viable. Mitsubishi 'has not ruled out' the use of Symbian's operating system on future models.

But the bigger screen, and two sets of radio links mean the battery drain on organisers will be far greater than that of mobile phones.

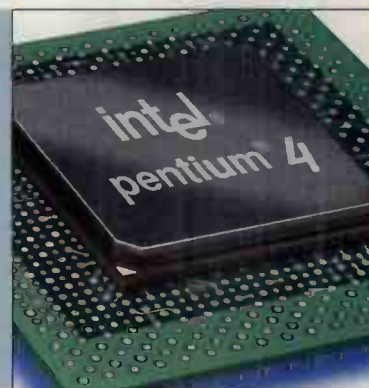
Clive Akass

INTEL LAUNCHES PRICES WAR WITH CHEAP 1.7GHZ PENTIUM 4

Intel launched a price war with its latest 1.7GHz Pentium 4 by charging just \$352 (£235) per chip to bulk buyers – two to four times cheaper than is usual for new processors. It is nearly \$1,000 (£667) cheaper than the 1GHz P4 was at launch a year ago. Prices of other Intel chips are expected to fall accordingly.

The cuts are clearly aimed at AMD, which increased its market share from 17 per cent to 21 per cent in the first three months of 2001. AMD

1.3GHz Athlons have been selling just below \$200 (£133) and a 1.2GHz Athlon can be bought at almost half its official \$294 (£196) price tag. New production processes have enabled Intel to cut its own costs by up to 30 per cent. And the P4 will now fall square into the mainstream consumer market, where Intel has been trying to push it, with the PIII being phased out. Falling RAMBUS prices (see page 27) will also help boost sales of PC systems.



Short stories

PIRACY GOES ON

Chinese street traders are making a mockery of Government claims that it has stamped out software piracy, the *South China Morning Post* reported.

Shops in areas of South China and Hong Kong are openly selling illicit copies of Office 2000, Windows Me and other applications for £3.50 or less, according to the region's Business Software Alliance (BSA) office.

The BSA predicted that Windows XP will be available from pirates almost immediately after its official release.

XP SERIAL SNUBS

FireWire (1394) links have got a boost with news that Windows XP will support it but not, initially at least, the new fast USB 2.0 port which has been seen as an Intel bid to sideline the technology in favour of its own. But XP, which will offer a common Windows platform and driver set for the first time, will also not include support for Bluetooth.

NOT SO FUNNY

Microsoft itself sent out files infected with the FunLove virus in April in update files posted to users of its Premier Support and Gold Certified Partners services. The virus infects exe, scr and oxc files and copies itself to networked machines, allowing all users administrator access on NT4 machines.

THANKS A BILLION

Unix will be a billion (seconds) on 9 September, counting as the operating system's internal clock does from January 1 1970.

MOBILE LINK-UP

Ericsson, which has been badly hit by the slump in mobile sales, has teamed up with Sony to form a new London-based mobile phone venture. The group will focus on design, branding, marketing and research and development but not production.



POCKET POWER

Trimble has launched a pocket Global Positioning System (GPS) receiver for use with Pocket PCs and Palm handhelds. The 5oz (142g) device has the power and capabilities of much larger units, according to Alan Townsend, general manager of Trimble's Mapping and GIS Division.

Satellite positioning signals are received on an antenna that can be fitted to a specially designed cap, carried on a backpack or mounted on the roof of a vehicle.

Microsoft braced for eXasPeration

Microsoft is bracing itself for a backlash over the new anti-piracy measures in the latest XP generation of Windows and Office.

Users of Office XP and Windows XP will have to apply to Microsoft, on the Internet or by phone, for an activation code that will tie their copy to their particular machine.

Office XP users will also be allowed to install a second copy on a laptop, provided their software was not sold bundled with a PC. But a second activation code will be needed. Microsoft swears that it will not collect personal details when it checks out your PC's hardware: registration is a separate process. So the company will not be able to

identify private users of rogue copies – measures to circumvent activation are already circulating the Internet.

Company licensees will be known, however, and one of Microsoft's aims with code activation has been to curb the number of small firms who use more copies of its products than they have paid for.

There are risks to this strategy, as some Microsoftees admit privately. It could encourage small, cash-strapped firms to take a closer look at Linux, and suites like Star Office, WordPerfect and Smartsuite – all of which can be file compatible with Microsoft Office.

Low-level piracy can be a form of promotion. Start-ups that bend the licence rules in their early days can

grow to be massive legitimate customers; and many private users of pirated code end up buying legitimate copies.

Most of all Microsoft risks angering legitimate XP users. They may object to the company keeping tabs on them, especially as it is never slow to exploit any connection for plugging its services. And activation could entail considerable hassles: users will have to reapply each time they upgrade their PC, particularly if they swap a motherboard or hard disk. And what happens when a PC gets stolen?

XP could turn out to be less a question of 'Are you eXperienced?' than of 'Am I eXasPerated?'.

■ See the feature on page 130.

Office XP Outlook strips files for inaction

The new Outlook in Office XP strips out any attached executable, whether the user wants it to or not. Only company licensees will have the option of switching the filter off.

The measure was actually introduced as a security update to Outlook 98 and Outlook 2000 SR-1 in the wake of the LoveBug virus, which was an executable VB Script file. But users had the option of not installing.

A Microsoft spokesman said the feature had been added to XP as standard 'at the request of users'.

Other attachments filtered out by

XP will be exe, bat and Java files; graphics files will be unaffected unless zipped into a self-extracting executable.

But email hacks are not going to go away. Microsoft has released a patch to block a new vulnerability by which Outlook can execute rogue code from an HTML email even if the victim does not open it (see www.microsoft.com/technet/security/bulletin/ms01-020.asp).

The weakness lies in an HTML content tag known as IFrame, which is used to embed another frame, according to security firm GFI.

A novel way to curb LoveBug-style viruses, which mail themselves to anyone in a victim's address file, has been developed by the Government's Defence Evaluation and Research Agency (DERA). The utility, called ::Mail, pops up an alert note if a PC tries to send email.

File Edit View Insert Format Tools Actions Help

Outlook blocked access to the following potentially unsafe attachments: ARP.EXE.

Hackers bite Pitbull to scoop £35,000 prize

US security company Argus had egg on its face after offering a £35,000 prize at a London show to anyone who could get past its Pitbull security system. A team of four Polish crackers, known as the Last Stage of Delirium (LSD), won the money by getting into a test server and defacing some target web pages.

But the team did not actually crack Pitbull; instead it discovered a flaw in the underlying Solaris operating system, which was running on an Intel platform.

LSD spent four days on the project and succeeded the day before the opening of the InfoSec security show at Olympia, London.

The show was intended to have been the fourth and final showcase for the competition, which was also held at CeBIT and shows in the US.

Argus president Randy Sandone was adamant that there were still no known flaws in Pitbull itself and that LSD's success proved the point that systems will remain vulnerable without operating-system level security.

Paying the prize money to LSD for exposing a flaw was better than the alternative scenario of live systems getting hacked when 'customers suffer huge losses and, out of fear of bad press, the whole thing gets covered up and no-one learns from it', he said.

■ Carko, a variant of the distributed denial of service (DDoS) tool that swamped many major businesses into shutdown last year, is currently circulating on the web, the security organisation Computer Emergency Response has warned.

Dead Cow cultists target censors

A peer-to-peer application aimed at defeating censorship is being developed by The Cult of the Dead Cow (cDc), best known for its Back Orifice tool for gaining entry to vulnerable systems.

The tool, known as Peekabooty, could be used to circumvent corporate or government censorship, but it could be used by criminals such as paedophiles. It works like the Gnutella P2P system, which has increased in popularity since the law jumped on Napster.

Gnutella is harder to police because it does not use a central server like Napster; each client sends and receives information directly. But Peekabooty will be used to access web pages rather than swap MP3 files and it will use encryption to shield data. cDc claims the software is targeted at people living in countries such as China, where certain content is filtered out.

However, it would also put an end to the number of court cases brought against ISPs for hosting controversial content.

cDc is expected to release the tool at the July Defcon convention in Las Vegas.

James Middleton, vnunet.com

Short stories



FLAT RATE

CTX is charging £235 (ex VAT) for this 19in (18in viewing area) EX950F monitor which it says is a step towards bringing flat-screen displays down to entry-level prices. It includes a correction panel that is said to eliminate distortion. Details at www.ctxeurope.com

MINI DUBYA

A portable parody of George 'Dubya' Bush is a big hit with the Chinese. The bumbling Bush is the latest in a line of PortaPets, downloadable to a Palm Pilot – giving you the chance to look after the most powerful man in the world. Creators Eruptor claim Bush gets downloaded 2,000 times a day by the Chinese alone. You can download Bush at www.vnunet.com/Download/1120811.

SORRY TALE

Japanese scientists are developing a computer system that apologises if you shout at it.

HP SETS THE TONE

HP has launched a range of smart cartridges for its LaserJet 4100 workgroup printer that will alert you when the toner is running low. Later this year it will even be capable of ordering a replacement over the web.

How a marriage went up the creak



8.5 on the Prisca scale! It's either the vicar at it again, or a small earthquake in China!

A cuckolded husband's hi-tech way of checking up on his wife could be a boon for private eyes seeking evidence of infidelity.

Romanian Vasile Prisca installed pressure sensors in his mattress and connected them to a wireless network so he got a text message if the weight went over a certain limit. It worked first time and he caught his wife *in flagrante*.

Prisca used the computer record to obtain a divorce but is wondering if he could sell the idea to other suspicious partners or private detectives.

Speech in hand

InHand claims this 70mm-square module (right), which is sold to manufacturers as a basis for a fully fledged PDA, is the smallest of its kind on the market. It incorporates a StrongARM processor and a Compact Flash slot, and can drive a 320 x 240 touch screen. Now the company is teaming up with Conversa to bundle speech recognition, enabling its handhelds to be voice driven. www.inhandelectronics.com



Is chicken wire the new silicon?

A breakthrough in making a form of carbon could revolutionise computing. Clive Akass reports

Scientists at Cambridge have found a new way of creating carbon 'nanotubes' with properties that promise to revolutionise the design and manufacture of processors and micro-mechanical devices. The breakthrough has been hailed as a way of extending the life of Moore's Law, the prediction that computing power will double every 18 months. In fact, it makes the law look curiously dated.

Carbon is unique in the variety and uses of its forms, which include graphite, diamonds and 'bucky balls', so called because of their structural similarity to the geodesic domes invented by maverick engineer Buckminster Fuller. Nanotubes look like a tube of chicken wire patterned in hexagons or pentagons – except that the tubes are as small as 1.6nanometres in diameter.

By contrast, the latest Extreme Ultraviolet Light technique (see page 27) for making silicon chips can draw features 'only' down to 30nanometers.

The discovery of nanotubes 10 years ago caused a lot of excitement because they can act as semiconductors, conductors and superconductors, or be formed into immensely strong structures for use in nano-robotics. The snag was that they could be made only as a tangled mat of tubes of varying characteristics.

Scientists from IBM in the US published a paper in *Science* describing a way of separating out semiconductor nanotubes by burning off the conducting variety with a suitable current. This rather overshadowed news of the breakthrough by a team led by Mark Welland at Cambridge's Nanoscale Science Laboratory, whose paper was posted at the *Science* site (www.sciencemag.org/scienceexpress/recent.shtml) at much the same time. Even more confusing, one of Professor Welland's co-workers, credited on the paper, is Maria Seo of IBM Zurich. But the project is not connected with the US IBM work and it seems to have much greater potential.

It grew out of a discussion between the team leader Welland and Jim Gimzewski of California's UCLA, who also worked on the project. 'We were just talking over a beer and began to discuss the possibility of filling a nanotube with a conductor. Then we started looking at ways it could be done.'

Using well-established procedures they vapourised bucky-ball carbon, and then nickel, several times in succession through a mask of 300nanometer holes onto a molybdenum substrate to form a grid of tiny piles consisting of alternate carbon and nickel layers. These were then heated within a strong magnetic field with the idea of trying to get the carbon to wrap round

the nickel. To their astonishment the nickel disappeared and they got an array of perfectly formed nanotubes. 'We spent the next six months making sure we had done what we thought we had done,' said Welland.

Their excitement is understandable: here was a new way of creating processors. The magnetic field can be replaced by a local electric field and the position of the mask altered to nanometer accuracy during vaporisation to create tubes of any required shape or orientation; electronic characteristics can also be precisely controlled.

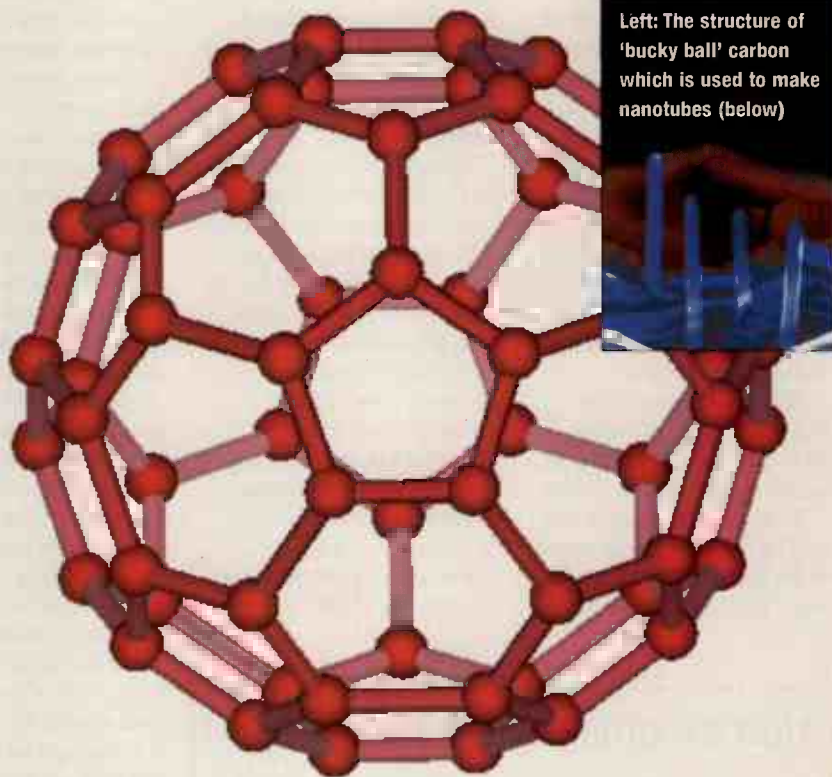
The nanotube's dimensions are not the only aid to miniaturisation, and thus to the amount of computing power you can pack on a chip. Nanotube chips, unlike silicon ones, do not require dopants, the correct concentrations of which are hard to sustain when the total number of molecules gets very small.

Moore's Law in this context seems like a measure of an antique technology, reflecting the early priorities of Intel. Processing power is no longer the be-all-and-end-all of chip design, as Intel itself has been discovering. The company has its work cut out to persuade people to pay a premium even for today's fastest processors, and it is hard to see what the average user is going to do with the 10GHz chips (see page 27) projected

for the fairly near future. Welland sees a need for very low-cost chips using a minimum of power – something, he says, of the capacity of today's PCs that will run for two years on a couple of AA batteries. Screens also drain a lot of power, and even here nanotubes can help: they may be used for electrodes in emerging organic screens.

Nanotubes are causing a rethink in the logical structure of processors, as well as their physical design. The very tasks for which more computing power may well be needed, such as photorealistic 3D graphics, or handwriting and speech recognition, are those for which classic silicon architecture is least likely to provide the best solution. And, as Welland points out, if Intel engineers were to start from scratch to design a processor for today's mainstream tasks, they would not come up with the P4. Computers do not need to be purely binary, he said. 'You could use four or five or six levels. You don't need to stick to two. You can even use analog computers.'

Welland predicted: 'The x86 design won't go away. It has too much momentum. There is no doubt that people will use nanotube processors to run x86 code because manufacturers will seize on anything that will make money. But all technology has its optimal uses and it might be that some other architecture will be optimal for nanotubes.'



Left: The structure of 'bucky ball' carbon which is used to make nanotubes (below)

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PHOTONICS

Tripping the light fantastic

Optics can shove all Europe down one line. Clive Akass reports on the building blocks of the future

Alcatel has claimed a world record by transmitting 10.2 Terabit (10.2 thousand gigabits) of data per second down a single optical fibre – equivalent to passing 160 million voice calls, or the entire phone traffic of Europe, down something the size of a kid's fishing line. In a second world best, Alcatel hit 3 Terabits/sec on a submarine fibre.

The records show how optical capacities are being boosted to meet the demand for bandwidth and that whatever constraints there are on the expansion of the Internet,

they do not include the size of the data pipes.

Data rates have moved from the tens of megabits to the thousands of gigabits within the space of a few years, thanks partly to better fibres, widening the available bandwidth, but mostly to the development of what is called Dense Wave Division Multiplexing (DWDM). This simply means sending several data streams down the same line using different wavelengths (or colours) of light.

Implementing DWDM has been far from simple, however. That world land-speed record was set using 256 channels (that is, colours), each carrying 40Gbits/sec. Each channel has to be generated and modulated separately, directed down the same fibre and separated out at the other end.

Much of this is done with versions of the gratings, mirrors and prisms familiar from optical experiments in school labs, but this is the least of it. Signal losses on fibre are low but significant, so boosters called repeaters are needed on long lines (see pictures right). Early repeaters converted the optical signal to an electronic one, amplified it, and then retransmitted



Fibre in the making... glass material is vapourised onto a former to build up a rod the size of a baseball bat. This is again heated into a plastic state in which fibre can be drawn off rather like the strands you get on your feet if you step on some discarded chewing gum. A single rod can be extruded into as much as 300km of fibre – or 180km of the more complex multi-mode fibre. Each stage of the process has to be carefully controlled to produce material of precisely the right characteristics. Alcatel rejects about 50 per cent of its fibre output.

it as light. This method, apart from being inefficient, hit a problem that dogs optical transmission: electronic systems are orders of magnitude slower.

To overcome this disparity there has been a focus on developing optical equivalents of familiar electronic components. Optical

fibre amplifiers in modern repeaters use a weak light signal to control the output of a laser in much the same way as a weak radio signal can control a comparatively large current through a transistor amplifier.

The parallels can only go so far. Bernard Le Mouél, chief technology

INTEL BUYS INTO OPTICAL NETS

Intel clearly sees the future in optical networks. It has just bought three California-based companies, Cognet, nSerial and LightLogic, that make optical components. The move is part of a strategy of broadening Intel's product portfolio amid uncertainties in the electronic chip market.

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officer of Alcatel's optics group, said: 'No-one has yet come up with the optical equivalent of a capacitor. You can't hold light.'

Optical switches are another matter. Researchers at Cambridge have created a holographic switch (see *PCW*, December 1999, page 34), and Alcatel is bringing one out next year based on micro-mirrors. Both these designs are sluggish in optical terms and used for cross-connect switches at major network hubs which direct the traffic on data superhighways.

Bear in mind that optical switches may have to cope with more than solid, physical paths: each fibre is using channels of many different colours. The network has to avoid trying to pass two signals of the same colour down the same fibre at the same instant, while making minimal use of wasteful colour conversions (which are, of course, an optical equivalent of another well-honed electronic process, the frequency change).

Another layer of complexity comes with other ways of parcelling up signals, such as time slicing and code-division multiplexing.

There remains, according to Alcatel strategist Tim Krause, a shortage of new-generation optical products, such as switches and tunable lasers. End-to-end optical links will be needed if demand for bandwidth rises as much as Alcatel expects (and it will certainly happen

at some point, give or take a recession or two). This will entail the development of optical packet switchers operating at unimaginable speeds, which in turn will call for very large-scale optical integrated circuits acting as gate arrays.

The manufacture of some of today's components recall the days when electronics equipment was hand soldered with irons the size of a poker. A fairly simple OFA (optical fibre amplifier) device can take a skilled worker a day to assemble.

What is needed is a way of mass-producing switches, as in silicon electronic chips which can have many millions of gates. Hence the development, still at an early stage, of the Silicon Optical Amplifier (SOA), which includes a microscopic waveguide on a silicon substrate and can be the building block of very large gate arrays.

(Use of the word amplifier in this context seems a little odd if you are used to transistors, which use different operating modes to act as amplifiers or switches, so that the two terms tend to be used as mutually exclusive; an SOA device offers signal gain and switching at the same time).

Le Mouët believes optical packet-switchers are three to four years away and he stressed that the technology, impressive though it is, is a long way from being mature. 'If you look back in 20 years' time at what we have now it will seem nothing - nothing,' he said.



Boosting underwater signals

Alcatel workers put together a repeater for boosting signals on a submarine cable (above). Pictured right is the completed device being lowered into the sea.

Submarine links have to be far more robust than land links because of the cost of repair and maintenance. They need to last for 25 years, forcing a more conservative design with lower data rates.

Early repeaters needed a lot of energy input, typically around 1amp at 10,000v delivered via expensive copper cladding. This could be deadly if the cable was ruptured. New models require less energy and less copper.

Repeaters are not always necessary. Alcatel has installed a 12,000km link between China and the US which uses no signal regeneration.



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Sun has jumped on the peer-to-peer bandwagon with a project called Jxta, short for juxtapose, which it claims will help you share information stored on your PC with other connected devices.

The idea is to enable applications to follow you across different network access points, so the information remains literally at your fingertips.

Jxta code will be needed on each client device. The code will be free but Sun will retain licensing authority.

Bill Joy, Sun's chief scientist, said that Jxta will deliver access to a much broader, deeper web. 'The goal is to provide a common method for any node on the network to

access any data, any content or another node.'

The effect will be an expansion of the reach and 'pervasiveness' of the web itself, as well as the depth of content that is available.

Distributed search technology from InfraSearch, which Sun bought in March, will be incorporated into Jxta, which will be a Java-compatible object-oriented language and is expected to use XML.

Gartner analyst Dave Smith said Sun had not made clear how close it is to delivering Jxta, and lacked an implementation strategy. 'Jxta is not an element of Sun ONE, the company's web services initiative, which continues to lag behind its Microsoft counterpart .Net. This is

largely because of the absence of a Sun vision for the technology. Until it presents a clearer view, Jxta will likely remain nothing more than another piece of interesting Sun technology,' he said.

Meanwhile, movie moguls are trying to get US ISPs to clamp down on people who 'share' movies using the Gnutella peer-to-peer file-swapping system. Gnutella, unlike Napster, does not use a central server, making copyright infringements difficult to track.

The Motion Picture Association of America (MPAA) has already persuaded some service providers, including Excite@Home, to threaten Gnutella users with disconnection. **vnunet.com**



Cashing in on the web

Pre-paid cash cards are being sold through Texaco garages across the UK in a bid to kick-start micro-spending on the web. World Online launched pre-paid Jald cards last year that would allow you to spend as little as 10p on the web.

Global Internet Billing (GIB) set up its Interactivcash cards at the same time, but neither has taken off. Now GIB is selling cards for specific services at Texaco in a pilot scheme.

£1 a day for school laptop

School pupils can hire notebooks for £1 a day under a Government-backed scheme launched by Education Rewards, a consortium including HP and Toshiba.

The machines will have a 13.1in screen, 64MB of RAM, Windows Me, MS Works 2000 software, and web access.

The consortium, led by rental firm ABK, is developing a virtual school where students will be able to access educational resources and links to websites, with a 24-hour helpline staffed by teachers.

IBM buys Informix

IBM is buying database giant Informix for \$1b (£666m) in the second biggest deal of its history – it bought Lotus for \$3b (£2m) in 1995. The deal, if approved, will make IBM overall market leader, taking into account its DB2 user base.

The company has dominated mainframe databases but the new deal will give it a bigger slice of the larger Unix and NT mid-range market, which Oracle commands with an estimated 52 per cent share.

IBM says it will support and update Informix's current products, though 'selected technologies' would be integrated into DB2 applications.

Toys for work and play

The best executive toys are always those you can pass off to your board and the taxman as absolutely indispensable to your business. The PictureTel 600 falls into that category as it claims to make video-conferencing, and the sharing of documents, as easy as making a phone call. It also looks a lot of fun.

The PictureTel 600 consists of two parts: a smart system box which houses a 566MHz Celeron-based PC, and a detachable front with speakers, mics and a swivel camera.

The system can sense who is speaking within a room and points and zooms the camera accordingly, just as a human TV director might do. It also pulls back for a group shot during conversations. Prices start at around £5,000.

www.picturetel.com



Intel faces EC 'bully' probe

Claims that Intel has bullied PC vendors into not using rival processors are being investigated by the European Commission (EC).

It has asked Intel for comments on two complaints that it has engaged in 'abusive marketing practices'. Intel has confirmed it has supplied the EC with information on its licensing agreement for bus technology. A company spokeswoman said that Intel

believed its business practices were 'both fair and lawful'.

The two complaints came from Intel rivals AMD and VIA, according to a report in the US publication *Electronics Buyers News*.

Intel is understood to be accused of punishing PC makers that did not exclusively use its chips by limiting supplies, slashing marketing subsidies and withholding information.

An EC spokeswoman said the Commission had asked several PC manufacturers and retailers for information. 'The investigation is at a very early stage,' she said.

But Brian Gammage, principal PC analyst at Gartner's Dataquest unit, believes that EC findings, whatever they are, will be outdated because Intel is no longer the dominant force it was.

Additional reporting vnunet.com

P4 takes cheap RAMBUS to success

RAMBUS memory prices are dropping faster than expected. Last year 128MB modules were listed at \$180 (£120) are selling as low as \$100 (£67) wholesale and could reach \$80 (£53) by the end of the summer, according to one Intel executive.

'People were thinking RDRAM was going to be much more expensive than double data rate (DDR) memory,' said Wai Szeto, vice-president of product marketing at US-based Kingston Technology.

He predicted: 'As Intel continues to push Pentium 4, the volume of RDRAM is picking up. Within two to three

months, the price difference between RDRAM and DDR will probably be less than five per cent.'

The price drop could boost stakes of fast P4 systems following Intel's aggressive pricing of its latest 1.7GHz chip (see page 17) and price cuts on other processors.

'Despite the seeming advantage DDR has over RDRAM, Samsung has gone public with its belief that RDRAM will be the dominant technology,' said Grant Johnson, manager of the Knowledge Marketplace Group at

Converge, an online marketplace that tracks pricing trends.

'It is clear that Samsung would not take such a stance without good reason. Perhaps it is much closer to offering a low-cost RDRAM solution than we realise,' he added.

Intel, which has come under heavy flak for supporting RDRAM, is hedging its bets by preparing a P4 and chipset that will support rival DDR RAM.

vnunet.com



The cost of RAMBUS memory is dropping dramatically

Chip frier points the way to 10GHz

A prototype chip-making machine promising the production of 10GHz chips within five years has been demonstrated by a consortium of leading vendors. It uses Extreme Ultraviolet (EUV) lithography to trace circuit features as small as 0.03microns.

This is less than a quarter of the size of features produced by today's chip fabs, which are shifting from 0.18microns to 0.13microns for mainstream processors. The demonstration came only days

after Intel announced that it had produced its first 0.13micron processors using 300mm wafers – the circular slabs from which individual chips are cut.

These have more than twice the surface area of the previously used 200mm wafers, yielding more than twice the number of processors and cutting costs by 30 per cent, according to Intel. Processors made using the process should ship at the start of next year.

The 0.3micron technology stems

from a joint venture, called the EUV Limited Liability Company, by leading chip vendors including Intel, Motorola, AMD, Micron Technology, Infineon Technologies and IBM. It also involved a collaboration between the Lawrence Berkeley, Lawrence Livermore and Sandia National Laboratories.

Manager Chuck Gwyn said: 'Our next step is to transfer the technology to lithography equipment manufacturers to develop beta and production tools.'

Warning over 'bargains' site

Customers who made payments to an ecommerce website called electradirect.co.uk are unlikely to get their money back, trading standards officers have warned.

The site offered mobile phones, computer equipment and other goods 'from bankrupt stock' at bargain prices. Customers were required to pay with cash, cheque or bank transfer – and some did not receive goods they had paid for.

The site has been taken offline and host company Ision Internet said the Data Protection Act prevents the release of information about it.

Newsgroup postings reported that the site carried only a mobile phone number and email address as contact details, and that logos for ecommerce authentication schemes did not link to the correct site.

Customers who demanded a physical address were given one in Kings Lynn, Norfolk. Trading standards officer Tim Dodes said:

'The address is a series of postal boxes that can be used by companies based anywhere in the country, some of which are not as reputable as they should be.'

'We are trying to trace the person behind the company. But it would appear that the chances of anybody getting their money back are slim.'

Ian Lynch, vnunet.com

Pirates jailed

Three people at the centre of a multi-million-pound software piracy ring case have been jailed for a total of nearly 10 years.

Sikander Qureshi, 55, received four and a half years for conspiracy to defraud Microsoft; Zafar Ahmed, 40, got two and a half years, half of which was suspended; Shaheen Parveen, 42, was sentenced to four years.

They were caught after a Heathrow customs officer intercepted a package from Thailand that contained hundreds of counterfeit Microsoft CDs, destined for Qureshi's Shoreditch office.

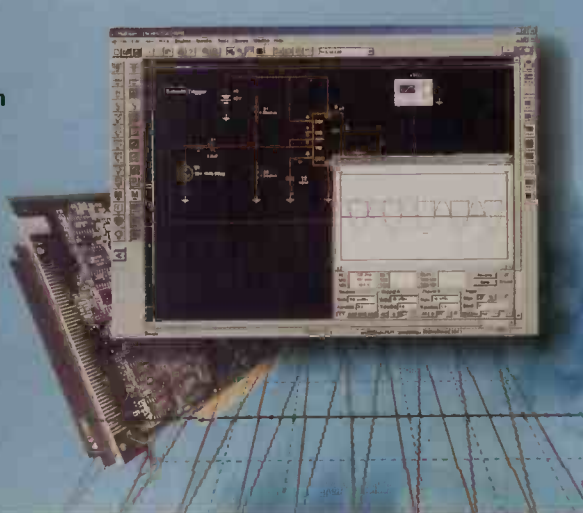
Sentencing, Judge Pearlman said the gang had been involved in a 'careful and sophisticated fraud... that struck at the root of commercial trust and probity'.

SOFT ROUTE TO HARDWARE

A new circuit design and simulation software package offers features to match those of workstation products several times its price, according to distributors Adept Scientific.

MultiSim 2001 gives you access to a database of 12 million components and developer Electronics WorkBench regularly posts more.

The entry-level hobbyist package costs £275, the professional is £695, and the power professional, which includes support for the simulation languages VHDL and Verilog, costs £5,100 (all prices are ex VAT). www.adeptstore.co.uk





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Graphics	32MB nVIDIA GeForce2 MX with TV-out	32MB nVIDIA GeForce2 MX with TV-out	32MB nVIDIA GeForce2 MX with TV-out
Monitor	17" (16" vis) evesham 0.27mm dot pitch	17" (16" vis) Mitsubishi Diamond Plus 73 NF - 0.25 dot pitch, 70KHz	17" (16" vis) Mitsubishi Diamond Pro 730 NF - 0.25 dot pitch, 96KHz
Multimedia	8x DVD-ROM	DVD-ROM/CD-RW (combined drive)	12x DVD-ROM
Modem	56k v90	56k v90	56k v90
Storage	Cost Option	CD-RW (as part of combined drive)	CD-RW (8x&32)
Sound Card	Sound Blaster compatible	Sound Blaster compatible	Sound Blaster Live! 1024 (OEM)
Speakers	Soundworks SBS15	Soundworks SBS52	FourPointSurround
Standard Features	2xUSB ports, 3.5" floppy disk drive, Mini-tower case (195x440x420) - except Axis D800MX that has Mid-tower case (180x350x405), Ultratouch keyboard, Logitech wheel mouse, DVD movie playback software, CD creation & copy software (models with CD-RW drives), Windows ME and BigFix installed.		
Support	3 year warranty package, Lifetime local rate technical support, 24x7 on-line technical support and e-restor Intelligent recovery software.		
Price	£649 (£762.58)	£819 (£962.33)	£949 (£1115.08)



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	Axis 1333SK	Axis 1333DDU	Axis 1333DDR-G3
Processor	AMD Athlon 1.333GHz 266MHz DDR	AMD Athlon 1.333GHz 266MHz DDR	AMD Athlon 1.333GHz 266MHz DDR
Motherboard	Asus A7-266	Asus A7-266	Asus A7-266
Memory	256MB 266MHz DDR (PC2100 spec)	256MB 266MHz DDR (PC2100 spec)	256MB 266MHz DDR (PC2100 spec)
Hard Disk	40GB high speed 7200rpm UDMA100 with 2MB buffer	40GB high speed 7200rpm UDMA100 with 2MB buffer	60GB Maxtor 7200rpm UDMA100 with 2MB buffer
Graphics	64MB nVIDIA GeForce2 MX with TV-out	64MB nVIDIA GeForce2 Ultra with TV-out	64MB nVIDIA GeForce3 with TV-out
Monitor	17" (16" vis) LG Flatron 795+ - 0.24 dot pitch, 96KHz	19" (18" vis) NEC M595F Ultra Flat - 0.25 dot pitch, 96KHz	19" (18" vis) Mitsubishi Diamond Plus 92 NF - 0.25 dot pitch, 96KHz
Multimedia	12x DVD-ROM	16x DVD-ROM	16x DVD-ROM
Modem	56k v90	56k v90	56k v90
Storage	CD-RW (12x&32)	CD-RW (12x&32)	Teac CD-RW (12x10x32) BURN-Proof
Sound Card	Sound Blaster Live! 1024 (OEM)	Sound Blaster Live! 1024 (OEM)	Sound Blaster 5.1 with Dolby Surround (OEM)
Speakers	FourPointSurround	FourPointSurround	Creative 5.1 DT2200
Standard Features	2xUSB ports, 3.5" floppy disk drive, Mini-tower case (195x440x420), Ultratouch keyboard, Logitech wheel mouse, DVD movie playback software, CD creation & copy software, Windows ME and BigFix installed.		
Support	3 year warranty package, Lifetime local rate technical support, 24x7 on-line technical support and e-restor Intelligent recovery software.		
Price	£999 (£1173.83)	£1269 (£1491.08)	£1499 (£1761.33)



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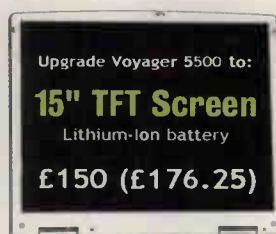
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Multimedia	8x DVD-ROM	8x DVD-ROM
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Modem	56k v90	56k v90
PCMCIA	2 x Type II or 1 x Type III	2 x Type II or 1 x Type III
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How to shift that Caps Lock

The loss of production caused by people inadvertently hitting the Caps Lock key probably costs something like the gross national product of a small country. The key is positioned where it is because on old typewriters it mechanically toggled the Shift key. That it has survived the electronic keyboard is one of the enduring mysteries of IT evolution, though there are utilities that allow you to remap keys.

One of these, sMaRTCaPs, has just come out with a new version 4.0, which also allows you to control use of the Insert and NumLock keys. It installs a configurable delay before the keys operate, together with an optional verbal warning. A fully functional 30-day trial version can be downloaded from www.phoebusnet.com. A single user licence costs just \$10 (£7).

L&H pair in jail

Jo Lernout and Pol Hauspie, founders of speech recognition company Lernout & Hauspie (L&H), were in a Belgian prison as we went to press, facing allegations of stock manipulation and falsification of documents.

L&H has been granted bankruptcy protection by a Belgian court, which said that it faces claims totalling almost £350m. Both founders resigned from the company last year after it was revealed that revenue projections had been inflated, although they remain major shareholders.

L&H stock has been suspended from trading on the both the US and European Nasdaq exchanges.

Unicode support

SoftQuad's upgraded XML authoring tool, XMetaL 2.1, supports Unicode 3.0, the international standard for encoding most of the world's languages, which means it can cope with all left-to-right scripts.

It supports all fonts supplied with Microsoft Windows NT and 2000, and Unicode fonts created by other vendors.

Wi-Fi gives fast neighbourhood access

Europe may lead America with its continent-wide cellular network but local mobile access is available in many places in the US at speeds much faster than GPRS – and even greater than the full-blown 3G systems due to be deployed here in a couple of years (see page 38).

A company called Luxul Corp is using Wi-Fi (802.11b) networking to offer multi-megabit access over a 25 square-kilometre area of Salt Lake City in Utah. Wi-Fi has a theoretical range limit of about 400m from an external base station, but Luxul has developed low-cost aerials that it reckons can boost this to as much as 3.5km line of sight or 1.5km through concrete.

One version of the aerial is fitted to buildings and another plugs into any Wi-Fi PC Card that provides a socket for the purpose – the stub aerial on some makes is removable, allowing the use of an exterior antenna.

But this aerial is not essential. I



Luxul aerials at Salt Lake – no local blind spots

saw several files being downloaded simultaneously at speeds well above 100Kbytes/sec to a laptop fitted with a standard Wi-Fi PC Card. Also, several web pages were downloaded at this kind of speed to a laptop in a moving car.

Antennae on houses up to 2km from the base station could connect at up to 3Mbits/sec, a rate limited

by the Internet pipe rather than Wi-Fi, which can hit 6Mbits/sec (as with wired Ethernet, the rated speed is some 40 per cent higher than you can achieve in practice).

A similar system can be used for a company that has several locations in the same town and needs access to the same network. It is a much more cost-effective than using a wired network.

The range can be increased by using a second base station that acts like a repeater. Alternatively, two point-to-point antennae can be used where a line-of-sight link is possible.

Luxul says a special feature of its aerials is that they do not have blind spots in the immediate area, so that you can get a signal even when you are standing underneath them. Aerial prices range from \$199 (about £142) for a PC Card model to \$499 (about £356) for a point-to-point. www.luxul.net

Lars-Goran Nilsson

Death of HomeRF networks 'exaggerated'

Proxim moved fast last month to talk up the prospects of HomeRF networking following an announcement that Intel will not support the technology at speeds beyond 1Mbits/sec. David Kind, chairman of the company which has been one of the prime movers of the technology, pointed out that Intel will remain part of the HomeRF Working Group and will continue to sell and support version 1.0 devices.

Proxim has demonstrated HomeRF 2.0 devices operating at 11Mbits/sec, the rated speed of rival Wi-Fi. King said he believed this is still the best choice for homes because it offers 'superior



HomeRF 2.0 Compact Flash adaptor from Proxim

interference immunity and security, while enabling toll-quality voice and streaming media services at an affordable price.'

HomeRF is indeed less susceptible to interference from

Bluetooth as both use similar spread-spectrum radio; it also has built-in voice channels, but it lacks Wi-Fi's ability to allow roaming across different access points.

Anthony Gulgoni, UK sales manager of Proxim, said that Siemens will bring out a HomeRF-compatible DECT phone later this year, that will allow you to use the same wireless network for untethered phones and data.

But Wi-Fi is much more widely established and future versions are expected to build in quality-of-service features providing better voice and multimedia support. Intel's announcement was widely seen as a death knell for HomeRF.

DIY installs will speed ADSL rollout

Do-it-yourself ADSL, with an open choice of access devices, will be available by the end of the year if current trials are successful. The move should speed up installations and bring prices down because it will avoid the need for an engineer to call at a customer's home or office.

Access devices to date have come exclusively from Alcatel and Fujitsu, and customers have had little or no choice about which they can use.

There has been some excuse for this, as BT Openworld product manager Andy Michalef points out. ADSL is a complex, immature technology and teething problems have by no means been confined to Britain. An open market in access devices would have added another layer of uncertainty, introducing the interoperability issues that dog almost all nascent technologies – as with today's Bluetooth. 'We wanted to use equipment that we knew for sure would work,' Michalef said.

Each new ADSL link needs some work at the local exchange but, using new equipment, the rest could be done by the customer, said Karsten Verhaegen, business

development director of Alcatel.

ADSL piggy-backs onto your plain old phoneline, emitting a high-frequency data signal which is filtered out much as a radio tunes in to a station. The filter also scrubs the voice signal of any ADSL-induced noise; under the current system, it is installed at the main phone jack, so that all extensions reap the benefit.

This is not a task likely to daunt the

to encourage competition even at this level).

Also on trial is what is known as G Series Digital Multi-Tone (G.DMT), which amounts to an open ADSL interface. This means any G.DMT-compliant equipment can be plugged in, just as you can use any BABT-approved modem with a standard phoneline.

There is no firm date for the arrival of either of these technologies. But BT Ignite's broadband product manager David Goldsworth said: 'We aim to get them out as quickly as possible. It could be before the end of the year.'

An open market in devices is sure to push down prices. But you will get options (some might say essentials) on built-in wireless or wired networking to spread access round the house; a modem can even include a mini-web server to maintain a link even when your PCs are turned off.

BT is offering facilities to vendors for interoperability tests but there will be no formal approval mechanism because it would be too difficult to police, Goldsworth said. Most equipment is, in any case, likely to be provided via a service provider, who will have tested all products on offer.

average PCW reader, but it does involve messing with BT equipment and the company not unreasonably insists on the work being carried out by trained staff. However, you can now get low-cost filters that simply plug into each extension, a brain-free operation. 'This is done in Belgium with no problems whatsoever,' explained Verhaegen.

The system is being tested by BT Ignite, the division responsible for installing ADSL for virtually all the UK providers that offer it (though unbundling the local loop, which allows non-BT equipment into local exchanges, is intended

RADSL gives wider access

ADSL access will become more widespread thanks to another technology undergoing trials. Currently, you have to live within 4km of an exchange (less if line quality is poor) to get ADSL, but the technology actually works at much longer distances if you are prepared to put up with slower data rates.

Rate-Adaptive DSL (RADSL) will extend this range to become available to up to 93 per cent of the catchment area of an exchange. Downstream speeds will be much the same, even on 500K-plus connections, but data flow upstream (towards the exchange) is likely to be below the rated 250Kbits/sec.

RADSL is expected to be in place by the end of this year.

BT offers free security scan

BT Openworld is offering its users a free 90-day trial of the Online Scanner service from Internet Security Systems (ISS). It will identify any potential security weaknesses in your system and recommend possible solutions.

The scanner will work with systems whether or not they use Network Address Translation (NAT). Openworld has just started offering non-NAT connections, which are less secure because they use fixed IP addresses, but are far more flexible in use.

Small access providers are beautiful

The idea that small independent service providers will give way to a few large operators are off the mark, according to Peter Radley, UK head of communications giant Alcatel.

The recent Flat Rate Internet Access Call Origination (FRIACO) agreement is designed to provide a more viable pricing structure for ISPs, following the failure of a number of unmetered schemes.

And BT Ignite has just launched a new FRIACO-based scheme called WebPort24 which it says will allow operators to set up with as few as 10 ports with no need to invest in or manage their own network.

Yet ISPs questioned by the messaging company Outrage

predicted that 40 per cent of providers would go out of business by 2003.

But Radley forecast at a press briefing that the industry will split between mega-large infrastructure owners and thousands of service providers reselling capacity.

He also believed competition from cable companies would speed the rollout of broadband. 'We have found there is a direct relationship between competition and rate of deployment,' he said.

A recent study by performance monitor Site Confidence concluded that smaller, business-focused providers give a better service.



Any colour so long as it is blue – the Alcatel USB modem (left) supplied to home ADSL subscribers. Pictured with the main story above is one of Alcatel's Speed Touch range, various models of which offer options on firewalls and networking. These and other makes should be more readily available for use on BT lines later this year

CALL CENTRES

Combating 'helpdesk rage'

Moves are afoot to make helpdesks more helpful. Ken Young reports

You've bought a brand new PC with all the trimmings. You get it out of the box, connect the bits and pieces, switch it on, and hey presto... nothing happens. You leaf through the documentation for the number of the customer helpdesk. Your real problems have just begun.

While some firms offer superb support it is common to hear tales of woe and concern over the high price of calling such services.

One buyer told me: 'I phoned Tiny because my power supply was not working. They said they couldn't help me because they didn't support or even provide power supplies to PCs over one year old. 'You'll have to buy one from someone else,' I was told. I don't think many people are aware of things like that. Wouldn't it be better if we were told in advance instead of having to phone a helpdesk which costs you money?'

Not surprisingly 'helpdesk rage' is common, with many buyers putting a helpdesk call on a par with having a tooth out: painful, protracted and you end up feeling worse afterwards.

Part of the problem is one of expectation. We believe we've paid for quality backup but the firm we are dealing with may have outsourced the service cheaply or is making do with a skeleton staff to cut costs. Meanwhile, most helpdesk staff are measured on speed of service, total number of calls per day, and total number dropped when a caller tires of waiting. No wonder they seem unwilling to dwell on your problems.

At the less skilled end of the market things are dire. A recent TUC report on call centres gave them a distinctly downbeat bill of health. The TUC set up a helpline to take calls from call centre workers. Common complaints included being over-supervised, having toilet breaks timed, having pay docked for arriving a few minutes late, and fear of 'acoustic shock' from the telephone system.

Around 400,000 people are employed in call centres and helpdesk services in the UK and that number is expected to rise to 650,000 by 2008. Many of these workers are paid at or near the minimum wage.

IT support is generally more skilled but faces the same problems of having to handle hundreds of calls quickly. Most companies are now looking at ways of automating the process. One of the problems in the UK is that there are no set standards for quality control. Fortunately, there are moves to improve the situation.

For firms wishing to go beyond their own training and quality control procedures there is the catch-all of ISO 9004-2 from the International Standards Organisation, the Standards of Best

Practice of the Call Centre Association, and the certification from US-based Service Strategies Corporation (SSC), which is the most closely targeted on IT helpdesk services. The benefit of the latter is that it has been formulated in association with leading software firms in the US including Xerox, Oracle and Silicon Graphics. Stream International, which handles support for parts of Microsoft, is also a sponsor.

SSC president John Hamilton, who runs a support desk certification programme, believes IT vendors need to clean up their act. He said: 'IT firms need to be able to benchmark themselves against others to see what they are doing well and what they are doing badly.' Hamilton says certification helps companies make sure that helpdesk staff know what they are talking about and know how to deal with a customer quickly and effectively.

Some firms are hoping that customers will solve more of their problems by reading web-based help sites. Richmond Systems calls it 'Eself Healing'. 'Customer support is a dangerous beast,' said Laurence Coady, managing director of Richmond Systems. 'Good support is expected and goes unnoticed by customers, whereas bad support can do untold damage to your reputation.' Richmond is one of a growing list of firms that help vendors provide a searchable knowledge base which saves customers from having to call.

IT support specialist Stream International, which handles customer telephone support for the likes of Microsoft and Hewlett-Packard, has been adding online services for over a year. Its Emediate Suite of electronic support services includes email, web-chat support, and web-based self-help modules. Not surprisingly, cost is a big factor behind this shift to the web. 'Providing online support is between 50 and 60 per cent cheaper than telephone support,' said Joop Heijenrath, European president for Stream.

Market research firm IDC predicts that electronic customer support will grow at a rate of 48 per cent a year until 2002. But web support and computer telephony integration (CTI, which allows your details to appear on-screen when your call is taken) are only in their infancy in the helpdesk industry.

'Of a survey of 80 companies we found that only 10 per cent had CTI or other customer management systems,' said John Hamilton of SSC. He hopes his Support Centre Practices certification will become a stamp of approval that buyers will look out for. Vendors are looking at ways of improving support all the time, but it remains to be seen whether their efforts are reflected in customer satisfaction.

This film of an irate worker smashing up his PC has been doing the rounds on the web for years. It was set up, but it does express the frustration known to all users



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MOBILE

Who needs PlayStation if you have Snake?

The screens are small, the market could be huge. Tim Green investigates the mobile gaming world

Small screen entertainment used to mean the telly. Not any more. Thanks to GSM, WAP and the inability of humans to sit in bus queues and do nothing, the small screen now measures about 1in square and usually has Nokia or Motorola written above it.

Almost without warning the mobile phone has become a *bona fide* games medium. As little as two years ago no-one considered it. Now, everyone's fiddling with their handsets and it's just possible that Nokia's Snake is the most played game in the world. That's right: Snake, bigger than Quake.

The problem with Nokia's slithery puzzler, of course, is that no-one makes any money from it. Games embedded in a handset are a welcome time waster for users but they generate no network traffic. They do, however, prove that people are prepared to use their phones for play.

And that's got the games industry really excited. If 'products' can be created that are played online or generate text messages to the operator, you're quids in. After all, everyone uses the phone, including many women and over 40s for whom the PlayStation and PC hold no appeal. Overall, industry estimates suggest the world will chirrup to the sound of one billion mobiles by 2003. It puts Game Boy's 10-year-old installed base of 100 million in perspective.

The wireless games industry may be new but it already has its own exhibition. April's Mobile Entertainment 2001 in Paris was a showcase for the latest developments and a chance for players to argue about which direction to head.

Most of what was on show was text-based or offered raw graphical animation. Scottish company Digital Bridges, one of the world leaders in mobile entertainment, creates and

hosts games on www.wirelessgames.com, a portal that can be accessed via WAP-enabled phones or from the games menu of any of its 21 network partners.

Its line-up includes simple staples such as parlour games (draughts, tic tac toe), quizzes (top trumps) and tamogatchis (wireless pets). Digital Bridges is also preparing to launch a Star Trek game and a version of hit PlayStation game LMA Manager.

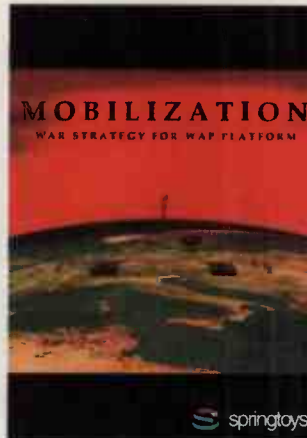
However, the games aren't rudimentary just because the memory and screen resolution are so poor. Even when phones can handle full-colour video, they will stay simple because phones will never be used in the same way as

consoles. Chris Wright, Digital Bridges' business development director, said: 'Wireless games should be competing with the crossword, not Quake. People will never sit for hours playing a game on a phone. They'll dip in for five minutes several times a day.'

Wright believes



Star Trek comes to the mobile small screen, courtesy of Digital Bridges



War on WAP: Mobilization is a realtime strategy game

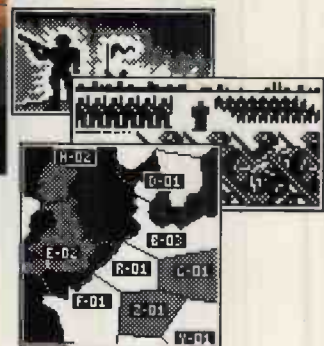
the mobile can bring gaming back to its social roots. 'Just about every game that's ever been created, from noughts and crosses to tennis, has been for more than one player. The era of playing games alone against a computer was a quirk. Mobile gaming can restore the community element. And even when the game is played solo you can have league tables, ladders and messaging, creating a community.'

Needless to say, community equals calls equals cash. And games can also stimulate waning interest in replacement handsets. This explains why masses of time, cash and energy are now being thrown at mobile gaming. Motorola and Nokia are bending over backwards to court the many new games development studios that have sprung up in the past 18 months. And, after years of sloth, the network operators are also waking up to the potential of entertainment. Orange, Vizzavi and Genie have all employed former games industry people to build bridges with this new community.

Media companies are testing their brands in this new water. Finland's Codeonline, one of many Nordic developers attending Mobile 2001, previewed wireless versions of Who

Wants To Be A Millionaire? and Trivial Pursuit. Millionaire has already been launched in Finland and will appear on a small screen near you later in the year. Meanwhile Riot-E, another Nordic studio, has signed the mobile rights to Marvel and even Bridget Jones's Diary.

For all the talk of keeping things



simple, everyone is looking forward to new mobile technologies. By the end of this year the first Java-enabled handsets will be launched to bring improved graphics and animation (and a familiar programming environment). Then there's GPRS (or 2.5G). Not as fast as hyped but allowing players to be permanently connected to a game, paying only when they make a move.

These new developments could bring into being concepts such as the location-based game (play online but find real-world clues). They may also hasten the arrival of console-type gaming on handsets. At Mobile 2001 Ericsson previewed Driver playing on a prototype 3G handset (actually running on a notebook linked by Bluetooth).

Overall, though, new developments are being played down. Everyone is too aware of the 3G time bomb to peg the future of wireless gaming on its questionable bandwidth and coverage.

Anyway, there's plenty of evidence that people like the simple, greyscale games we have now. Digital Bridges logged one of its users as having played hangman 14,040 times in a month.

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INTERNET

Online study or a smart lesson in PR?

Cynics have their doubts, but free courses for the poor could turn the web into a great leveller

The Open University, launched in 1969 in one of the last gasps of post-war idealism, pioneered the idea of using new media to make further education available to all. Some put it on a par with the National Health Service as one of the great British social experiments of the century.

Now, at first sight at least, it seems to have been trumped by the prestigious Massachusetts Institute of Technology (MIT), which announced that it will make all of its undergraduate coursework available free online for the benefit of poor students in undeveloped countries. MIT has set up a new faculty called OpenCourseWare, which will post the material over the next 10 years in a project that runs counter to the current trend of charging for online material as a way of compensating for disappointing advertising revenues.

Sceptics were quick to paint the project as a loss leader, a cunning plot to capture a global audience with free titbits. They point out that MIT could actually increase its revenues as a result of the scheme, by selling course work and textbooks off the back of the free content.

Robin Mason, distance-learning specialist at the Open University's Institute of Education, dismissed it scathingly as 'an extremely clever PR exercise'. She doubted very much if MIT would post more than limited content. 'They will retain copyright so that there will be no question of being able to copy material from the site,' she said.

The OU itself makes some material available to needy countries, but Mason stressed that education is about much more than providing study texts. 'You need interaction between the students and the teachers.' But she agreed that millions worldwide lack the luxury of having either course materials or teachers.

It is hard to doubt the sincerity of MIT president Charles M Vest, who said at the launch of the



project: 'MIT [staff] have a deeply ingrained sense of service and mission – they like to work on big problems and, frankly, they like to influence the world. There's an incredible idealism in this faculty.'

But that kind of idealism can look like cultural imperialism in target countries. And, as Mason points out, the very people likely to benefit most from free online learning are those least likely to have access to the Internet.

This echoes the common fear that the Internet is creating a new underclass of unwired people – a view that, while it may have some truth in the short term, has been much overblown. The same could have been said of the washing machine, the telephone, radio and TV, all of which have

transformed the lives of the poor. A TV, in the western world at least, is now regarded officially as a necessity only one step removed from clothes, food and shelter.

Far from being a luxury, TV provides company, news and entertainment to people who can't afford anything else. In that sense it has actually done more for the poor than for the rich, who could always afford to pay for diversion, and the same will surely be true of the Internet. There are already signs that the web will have a greater immediate impact on developing countries than in the wired west.

Internet cafés have become the new post offices in places where snail-mail is unreliable. New ideas coming in with the new media are having a far greater effect in countries that are not accustomed to easy access to a wide range of information and views.

Satellites capable of delivering web content at low cost to inhabited regions are already in place; access points in schools and villages could be provided on the same kind of mutually beneficial 'aid' that, disastrously, has helped maintain the arms trade to poor countries.

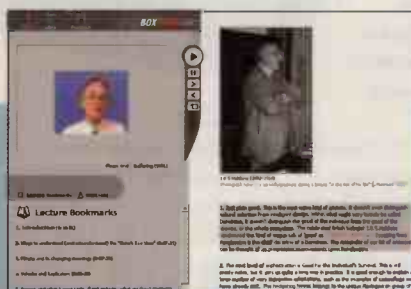
Human teachers will indeed always be needed, but mostly by less able pupils. Bright kids in any country will be able to seek out knowledge, some of which may actually be best expressed using the graphical possibilities of new media – which MIT, with its famous media lab, is in an ideal position to pioneer. So the Internet, far from being a privilege of the rich, could turn out to be a great leveller, with incalculable results.

Clive Akass

LEADING LECTURERS

Online learning is seen as a huge potential earner, as well as a way of spreading and improving higher learning. A new UK site, www.boxmind.com, which was launched just a month before the MIT initiative, aims to make lectures from leading academics, including evolutionary biologist Richard Dawkins and historian Niall Ferguson, available to any university on a commercial basis.

Media giant Pearson has announced a joint deal with IBM to deliver interactive learning services to the home. The companies are setting up a series of lectures in the US and selected countries in Europe and Asia as part of a scheme to teach 'any time and anywhere'. It will include content from Pearson-owned companies such as Dorling Kindersley and Penguin.



CHIP WARS

All powered up and nowhere to go

Intel struggles to find buyers for its powerful processors, as the market eyes up the low-drain chip

It must be tough being Intel these days. The PC market is clearly in a slump and demand will stay flat in 2001, according to market researchers. And while Intel continues to push processor speeds, users and company buyers are hard pressed to find any application that needs a faster PC.

Unless someone comes up with a killer application that requires this processing power, Intel will continue to struggle and demand could even decline in the year ahead.

At the same time, Intel has been pushed by AMD on speed and price – up to 25 per cent cheaper for chips of equivalent speeds. Hence Intel's latest move on prices (see page 17).

This advances Intel's strategy of having the Pentium 4 to displace the Pentium III on desktops by the end of the year, a move also aimed at countering AMD.

Intel is being challenged on another front by upstart Transmeta Corporation, whose Crusoe processor is starting to garner big wins, especially by laptop vendors in Japan. Sony has already created a laptop that uses its low-drain chip, and NEC announced two new Versa notebooks based on 600MHz Crusoe TM 5600s. In addition, Fujitsu is making 12,000 Crusoe-based notebooks for a Japanese corporate.

By choosing Transmeta, NEC has bucked tradition. The new Versa is targeted at US corporate customers, to whom vendors have traditionally been reluctant to offer non-Intel chips. The new slimline NECs, weighing about 1.5kg, come with a 10.4in display, 128MB of RAM and a 20GB hard drive.

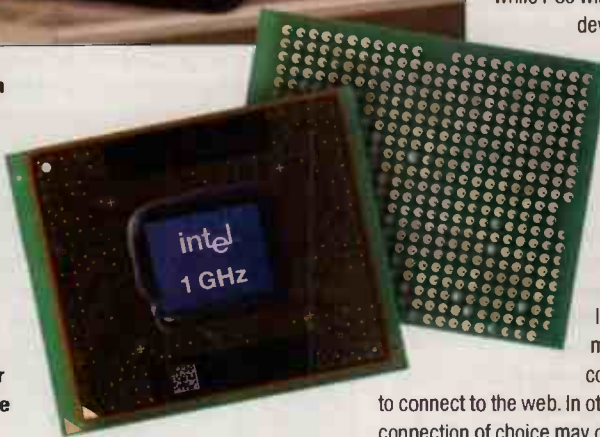
And there are rumours in Silicon Valley that Toshiba may also be going with Transmeta's Crusoe for some of its notebooks later this year.

To be fair to Intel, it has apparently seen the light and after two years of waffling on this segment of the market, is working hard to catch up with Transmeta. It has some low-drain high-speed processors of its own, with more in the works.



Above: Intel Dot.stations web appliance, as sold to the US service provider SagePort. When the appliance market takes off, Intel rival NatSemi may reap the rewards

Right: Intel's 1GHz mobile PIII – but power drain is becoming more important than power



Of course, the reason for the interest in low-drain chips is that people want longer battery life and no major breakthrough in battery technology is on the horizon. Personally, I love the fact that a company like Transmeta is pushing Intel and AMD into addressing this problem. One of the new NECs is supposed to allow eight hours' work non-stop on laptops, pretty much getting you through a working day without needing a recharge.

The additional battery drain caused by wireless links are making this issue even more pressing. I can use the Metricom Wireless network to connect to the Internet at 128Kbits/sec anywhere I go throughout Silicon Valley, and 802.11-based

wireless campus networks are becoming more widely available.

Later this year, Verizon and Sprint, two major national US telecom providers, will make 156Kbits/sec wireless networks available to about 80 per cent of the US. These could boost the market in Internet appliances (IA), another area in which Intel has been challenged. Chipmaker National Semiconductor has scooped about 85 per cent of this market today, while Intel concentrated on creating ever more powerful desktop chips.

But again Intel has started to push designs at this market, and even won a big contract to provide 240,000 Internet terminals to AOL in Spain. The IA market has been slow to take off, but most analysts believe that eventually these devices could outsell PCs as much as five to one. The key reason is that while PCs will continue to be the device of choice for

connecting to the Internet in the US and in some industrialised nations, they are just too hard to use and too expensive for many other users.

In some places Internet terminals or modified web phones could be the primary way

to connect to the web. In others, the Internet connection of choice may only come through some type of handheld computer or mobile phone.

By that reckoning National Semiconductor, whose chips are already in most of the Internet appliances and mobile phones around the world, could emerge as the big microprocessor powerhouse in the future. Although Intel does not completely buy into the idea that Internet appliances will eventually rule the world, its recent ventures into this space suggest at least that it will not hand the market to National Semiconductor or any other players without a fight.

Intel is clearly at a time in its lifecycle where maintaining its world dominance on the chip market is no longer a breeze. Staying on top may be harder than it ever imagined. **Tim Bajarin**

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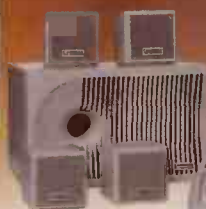
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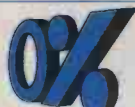


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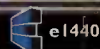
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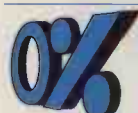


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● Monitor	17" SONY E215 NF .25mm TCO99 (15.9" VIS)	17" Mitsubishi DPRO 730 NF .25mm (15.9" VIS)	19" Mitsubishi DPRO 920 NF .24mm (17.9" VIS)
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Memory	128MB RDRAM	128MB RDRAM	128MB RDRAM
Hard Drive	40GB UDMA-100 with buffer	40GB UDMA-100 with buffer	40GB ATA-100 (7200rpm) with 2MB buffer
Monitor	17" Digital FST .27mm TCO99 (15.9" VIS)	17" Mitsubishi DPRO 730 NF .25mm TCO99 (15.9" VIS)	19" Mitsubishi DPRO 920 .24mm NF TCO99 (17.9" VIS)
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Modem	56Kbps V90 voice/fax/data	56Kbps V90 voice/fax/data	56Kbps V90 voice/fax/data
Warranty	MESH 3 Year Warranty [†] including: Total Care - Lifetime technical support, 24x7 on-line support and intelligent recovery software.		
Standard features	Tower Case with tool free access, 2 USB Ports, 1.44MB 3 1/2" floppy disk drive, Microsoft internet keyboard and Intellimouse with mouse pad, FREE Virgin.net Unlimited Internet & E-mail, Microsoft Windows ME (Recovery CD), Microsoft Internet Explorer (v.5.0), DVD includes decoding software, CD-RW includes burning software.		
Standard	£899 £1056.33 inc.VAT	£1199 £1408.83 inc.VAT	£1699 £1996.33 inc.VAT
WorksSuite	£939 £1103.33 inc.VAT	£1239 £1455.83 inc.VAT	£1739 £2043.33 inc.VAT

*Microsoft WorksSuite 2001 includes Word 2000, Works 6.0, Money 2001, Picture It! Publishing 2001, Encarta® World Atlas 2001, AutoRoute 2001, Outlook Express 2000

Great value upgrade options

Upgrade the Elite P4-1400	exc.	inc.VAT	Upgrade the Elite P4-1500	exc.	inc.VAT	Upgrade the Elite P4-1700	exc.	inc.VAT
● Pentium® 4 1.5GHz	£40	£47.00	● Pentium® 4 1.7GHz	£80	£94.00	● 256MB RDRAM	£100	£117.50
● 17" Mitsubishi DPRO 730	£75	£88.13	● 40GB ATA-100 (7200rpm)	£25	£29.38	● 60GB ATA-100 (7200rpm)	£45	£52.88
● 64MB GeForce2 MX400-TV	£30	£35.25	● 19" Mitsubishi DPRO 920	£175	£205.63	● CD Re-Writable (16x10x40)	£45	£52.88
● CD Re-Writable (12x10x32)	£95	£111.63	● 64MB nVIDIA GeForce3-TV	£170	£199.75	● Upgrade to 15" NEC 1530VFTT	£49	£57.58
● Live! 1024 & 4 Point Surround	£60	£70.50	● Creative Labs Live! 5.1 & DTT 5.1	£50	£58.75	● Upgrade to 18" NEC 1800 TFT	£499	£586.33



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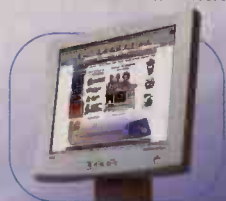
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"the Next Generation of PC's"

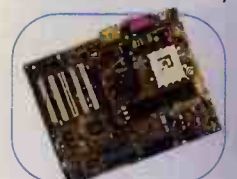
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AMD DDR Processors
& PC2100 DDR Memory



15" & 18" TFT Flat panels



ASUS DDR FSB 266
Motherboard



nVIDIA GeForce3 graphics



MESH NexGen Range

MESH Information,
Special Offers and
Discovery Range



NexGen 1200-MX

£1710

NexGen 1333-GF3

£1720

Processor	AMD Athlon™ 1.2GHz DDR	AMD Athlon™ 1.33GHz DDR
Memory	256MB 266MHz High Performance PC2100 DDR	256MB 266MHz High Performance PC2100 DDR
Hard Drive	40GB UDMA-100 with buffer	40GB ATA-100 (7200rpm) with 2MB buffer
Monitor	15" NEC Multisync 1530V TFT Flat Panel	18" NEC Multisync 1800 TFT Flat Panel
Graphics	64MB nVIDIA GeForce2 MX400 - TV out	64MB nVIDIA GeForce3 - TV out
Multimedia	16x DVD-ROM (40x CD-ROM)	16x DVD-ROM (40x CD-ROM)
Storage	CD Re-Writable (12x10x32)	CD Re-Writable (12x10x32)
Sound Card	Creative SoundBlaster Live! 1024 (OEM)	Creative SoundBlaster Live! 1024 (OEM)
Speakers	Creative Labs Four Point Surround	Creative Labs Four Point Surround
Modem	56Kbps V90 voice/fax/data	56Kbps V90 voice/fax/data
MESH Warranty	MESH 3 Year Warranty [†] including: Total Care - Lifetime technical support, 24x7 on-line support and intelligent recovery software.	
Standard features	Tower Case with tool free access, 4 USB Ports, 1.44MB 3 1/2" floppy disk drive, Microsoft internet keyboard and Intellimouse with mouse pad, FREE Virgin.net Unlimited Internet & E-mail, Microsoft Windows ME (Recovery CD), Microsoft Internet Explorer (v.5.0), DVD includes decoding software, CD-RW includes burning software.	

Standard £1299 £1526.33 inc.VAT

£1969 £2313.58 inc.VAT

WorksSuite £1339 £1573.33 inc.VAT

£2009 £2360.58 inc.VAT

*Microsoft WorksSuite 2001 (see opposite for software Included)

Great value
upgrade options

Upgrade the NexGen 1200-MX	exc.	inc.VAT	Upgrade the NexGen 1333DDR	exc.	inc.VAT
● AMD Athlon™ 1.333GHz DDR	£25	£29.38	● 60GB ATA-100 (7200rpm)	£45	£52.88
● 40GB ATA-100 (7200rpm)	£25	£29.38	● CD Re-Writable (16x10x40)	£45	£52.88
● 18" NEC Multisync 1800 TFT	£450	£528.75	● Creative Labs Live! 5.1 & DTT 5.1	£50	£58.75
● 64MB nVIDIA GeForce3 -TV out	£170	£199.75	● Logitech cordless kb & mouse	£55	£64.63

The Next Generation of PC's

The NexGen Range combines the very latest components from cutting edge manufacturers and the excellent MESH build quality to produce these advanced PC's for the next generation of computing.



Viewing area of a 15" and 18" TFT is equivalent to the viewing area of a typical 17" and 19" CRT monitor respectively.

Specification for the 15" NEC Multisync 1530V TFT Flat panel

- Display type: 38cm (15.1")
- Active display area: 307 x 230mm
- Pixel Pitch: 0.30 x 0.30mm
- Viewing angle: 120° horizontal, 90° vertical
- Display Colours: 16.19 Mill.
- Optimum Resolutions: 1024 x 768 @ 75Hz



Specification for the 18" NEC Multisync 1800 TFT Flat panel

- Display type: Wide angle TFT 46cm (18.1")
- Active display area: 359 x 287mm
- Pixel Pitch: 0.28 x 0.28mm
- Viewing angle: 160° horizontal, 160° vertical
- Display Colours: 16.77 Mill.
- Optimum Resolutions: 1280 x 1024 @ 75Hz



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Offer of the Month

The Future...NOW!

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Featuring Intel® Pentium® 4 1.5GHz processor technology, bringing the future to you.

Processor	Intel® Pentium® 4 1.5GHz
Memory	128MB RDRAM
Hard Drive	40GB ATA-100 with buffer
Monitor	17" Digital FST .27mm TCO99 (15.9" VIS)
Graphics	32MB nVIDIA GeForce2 MX200 - TV out
Multimedia	16x DVD-ROM (40x CD-ROM)
Storage	CD Re-Writable (8x8x32)
Sound Card	Onboard SoundBlaster compatible
Speakers	Stereo amplified 80W (PMPO)
Modem	56Kbps V90 voice/fax/data
Warranty	MESH 3 Year Warranty† - including Total Care
Standard features	Tower Case, 2 USB Ports, 1.44MB 3 1/2" floppy disk drive, Microsoft internet keyboard & Intellimouse with mouse pad, FREE Virgin.net Unlimited Internet & E-mail, Microsoft Windows ME (Recovery CD), Microsoft Internet Explorer (v.5.0), DVD inc. decoding software, CD-RW inc. burning software

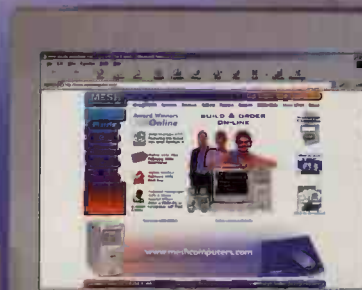
Standard WorksSuite

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PENTIUM® 4128MB
RDRAM40GB
HARD DRIVE17" FST
MONITOR32MB
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CDRW

For illustration purposes only

Value upgrade options for the Elite 1500GT

Pentium® 4 1.7GHz	£80	£94.00 inc.VAT
256MB RDRAM	£100	£117.50 inc.VAT

19" IIYAMA S900 .26mm	£75	£88.13 inc.VAT
64MB GeForce2 MX400 -TV	£30	£35.25 inc.VAT
Live! 1024 & 4 Point Surrounds	£60	£70.50 inc.VAT



"MESH's notebook offering is a winner"

Discovery 14.1 - PC Advisor, June 2001

MESH Discovery 14.1V



Power and versatility at your finger tips with 14.1" TFT and Intel Pentium 933

Based on the Award winning Discovery 14.1 comes this unbeatable offer

- Intel® Pentium® III 933MHz Processor
- 14.1" TFT XGA (1024x768) colour screen
- 256MB SDRAM
- 20GB HDD ATA-66 EIDE
- 8x DVD ROM
- 56Kbps voice/fax/data modem
- 10/100 Ethernet Adaptor
- Up to 32MB Shared Video Memory
- 1 x PCMCIA Type II slot, supports zoomed video
- 3-D stereo sound with internal speakers and microphone
- Dimensions: 308mm(W) x 254mm(D) x 37.5mm(H), Weight 3.2Kg
- IEEE 1394 Firewire 400Mbps (for digital video)
- Ports: 2xUSB, IrDA, TV-Out, Parallel, Monitor, PS/2
- 3.5" Floppy Disk Drive
- Smart Li-ion Battery
- Carry Case
- AC/DC PSU
- 12 months RTB Warranty
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- Microsoft Works 2000
- Voice Dictation software with Headset
- McAfee Antivirus V.5x with CD



includes carry case

Discovery 14.1V only

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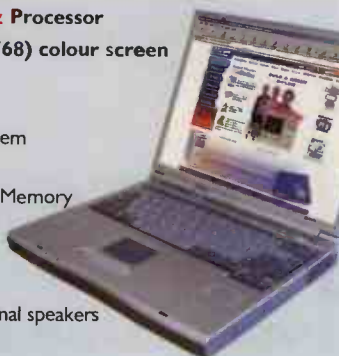
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- Up to 32MB Shared Video Memory
- 24x CD ROM
- 1 x PCMCIA Type II slot, supports zoomed video
- 3-D stereo sound with internal speakers and microphone
- Dimensions: 308mm(W) x 254mm(D) x 37.5mm(H)
- Weight 3.2Kg



MESH Discovery 15.1 e1670

Amazing power and leading spec with 15.1" TFT and Intel Pentium III 1GHz

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- 15.1" TFT SXGA+ (1400x1050) colour screen
- 256MB SDRAM
- 20GB HDD ATA-66 EIDE
- 56Kbps voice/fax/data modem
- 10/100 Ethernet Adaptor
- 16MB ATI 3D Rage PRO
- 24x CD ROM
- 2x PCMCIA Type II slots, supports zoomed video
- 3-D stereo sound with internal speakers & microphone
- Full Size 102 key keyboard with separate numeric keypad
- Dimensions: 358mm(W) x 280mm (D) x 50mm (H)
- Weight 4.2Kg



Standard features: IEEE 1394 Firewire 400Mbps (for digital video), Ports: 2xUSB, IrDA, TV-Out, Parallel, Monitor, PS/2, 3.5" FDD, Smart Li-ion Battery, Carry Case, AC/DC PSU, 12 months RTB Warranty, Windows ME, Microsoft Works 2000, Voice Dictation software with Headset, McAfee Antivirus V.5x with CD.

£999 £1173.83 inc.VAT

Great value upgrade options for the Discovery 13.3

- | | | |
|------------------------------------|------------|----------------|
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| ● Upgrade to 256MB SDRAM | £75 | £88.13 inc VAT |
| ● Upgrade HDD from 10GB to 20GB | £75 | £88.13 inc VAT |
| ● Upgrade CD ROM to DVD | £75 | £88.13 inc VAT |

£1549 £1820.08 inc.VAT

Great value upgrade options for Discovery 15.1

- | | | |
|---------------------------------|-------------|------------------|
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| ● Upgrade CD ROM to DVD | £75 | £88.13 inc. VAT |
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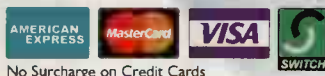
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- FREE 24x7 On-line Technical Support
- FREE Lifetime Telephone Support
- FREE Upgrade Service

MESH gives you extra support at NO extra cost and the peace of mind you expect from a multi-award winning company. (†MESH Warranty is subject to Terms and Conditions, UK mainland only).

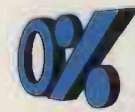


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Accounts for Business customers maybe available subject to status. For Government funded organisations, an official purchase order will be accepted.



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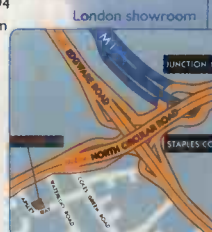
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Snap happy

Gordon Laing goes shopping for the best value prints from his digital camera

gordonl@pcw.co.uk

Every so often, something comes along that hits the nail right on the head. I guarantee this one will change the way you use digital cameras and could see your inkjet becoming severely neglected. I'll tell you more but first, a little background.

I've long believed that digital cameras are not for everyone because you're normally responsible for creating your own prints, which in turn requires a fair amount of personal cost and effort – and as anyone who's carefully cut up a large sheet of photos knows, you also need a nearby guillotine or a steady hand with the old scissors. I know this sounds a bit mean, but the problem only gets worse, and more expensive, when your friends start asking for copies.

Fortunately, an increasing number of websites let you upload digital photos into private galleries to share with your nearest and dearest. They can view the photos and order copies, crucially with their own credit card. While trying out the first crop of UK services however, I found a few things that weren't quite as I hoped.

After visiting Kodak PhotoNet, I was shocked to see that it charges you £3 per month just for some space to upload your digital pictures. I also noted that should you request PhotoNet to scan and upload your conventional films at the time of processing, it would charge you 50p to later download each so-called 'high-resolution' 1,536 x 1,024 file.

I left hastily and created free accounts with Fotango (www.fotango.co.uk) and PhotoBox (www.photobox.co.uk). Fotango claims to offer unlimited space, while PhotoBox limits each user to 50MB. Since most modern digital cameras create image file sizes of at least 1MB, a fast Internet connection for uploading pictures is clearly desirable; PhotoBox

does, however, accept files on CD or ZIP through the post. I uploaded 10 pictures and selected prints of each.

I was impressed when my prints from PhotoBox arrived the next morning, and those from Fotango turned up three days later. The quality from both was superb, with the prints looking and feeling like conventional photos.

So far so good, but even with a 50 per cent discount for more than 20 prints at a time, both services worked out rather expensive for a set of holiday snaps – just over £10 or £18 for a set of 36 6 x 4in or 5 x 7in prints respectively, not to mention the cost of uploading them. What I wanted was someone who could quickly output large sets at the same price as conventional film processing, especially with the larger print sizes. Little did I know that I'd find it on the traditionally uncompetitive high street.

To cut a long story short, Jessops now offers 'Diamond Laser' digital printing at exactly the same price as its film-based services, and it uses the same Fujifilm FDI

Within an hour I was thumbing through more prints than I've personally made in the past year

MiniLab to output them. Individual 6 x 4in prints are still going to cost you 50p a throw but, uniquely, it'll do a set of 40 6 x 4in or 7 x 5in prints for just £5.99 or £7.99 respectively. It also offers cheap second sets and larger prints – how about 40 9 x 6in prints for £9.99? I'd like to see you match that on your inkjet, and for two quid extra you can have them in an hour.

I tried them out by taking in a 64MB memory card packed with 40 digital shots from my Sony S70. Jessops did stumble at the first block by not yet accepting Memory Stick media – fortunately I had my own PC Card adaptor, as should Jessops by the time you read this. The user-operated kiosk software also didn't automatically apply the bulk discount to my set of 5 x 7in prints, and worryingly asked for £40 but the assistant corrected it to the quoted £7.99. Finally, you'll notice that the print sizes are the 3:2 aspect ratio of 35mm film, and not the 4:3 shape of most digital cameras, so expect a bit of cropping; many cameras now offer a 3:2 recording setting though, and some online services alternatively offer 4:3 aspect prints. That said, within an hour I was thumbing through more prints from my digital camera than I've personally made in the past year, and it was cheap too.

If this sounds like an advert for Jessops, then I've done my job, and frankly the sooner everyone on the Internet and high street follows suit, the better. After all, while it's still economical and fun to output a few large prints at home, most people just want a cheap set of 36 small pictures, regardless of what technology was behind them. I'm confident I've seen the future of mass-market digital photography and, unless there's a cost and convenience revolution with inkjets, it's not going to involve having a printer at home.

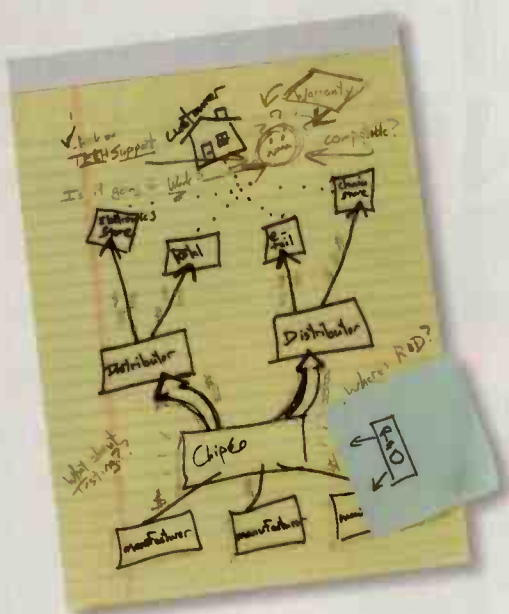
PCW



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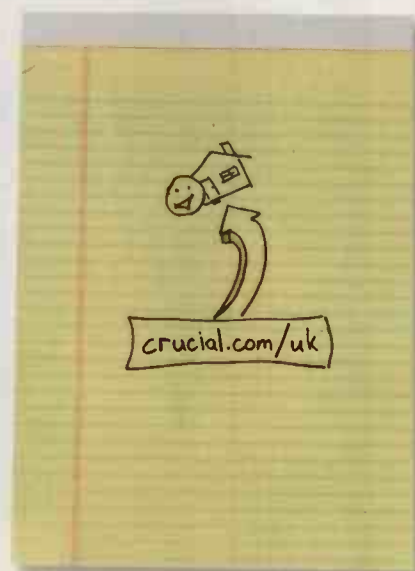
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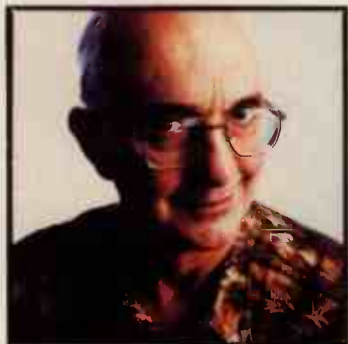
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Setting the standard

Barry Fox prepares for a bumpy ride in the recordable DVD battle

barryf@pcw.co.uk

Claims, counter-claims, foolishness, fibs and fakery. That's what we can expect over the coming months, as the three rival DVD recordable formats fight to create a *de facto* standard. As in all standards battles, consumers are the cannon fodder. We risk being stuck with the DVD equivalent of eight-track cartridges, Betamax, V2000 VCRs and digital compact cassettes.

Here's something you should know, but no-one may tell you: there is only one rock solid, permanent standard for recordable DVD, and that is write-once DVD-R. A DVD-R recording will play back on any existing DVD player or ROM drive.

DVD-R relies on the same chemistry as write-once CD-R. A clear pre-grooved disc is coated with chemical dye, over a silver or gold reflective layer. The laser in the recorder heats the dye to create marks. As with CD-R, the pre-groove has a wobble that times the recording and guides the laser, and it is also used to distinguish between two different types of blank – DVD-R General (consumer) and DVD-R Authoring (professional).

But DVD-R copy control will be a whole lot tighter than with blank CDs. Whereas PC burners can easily be persuaded to copy music onto CD-R data blanks, DVD-R uses encryption and disc identity codes pre-recorded in the groove lead-in.

As with CD-R there are three types of disc, distinguishable by the colour of the dyes used. The least expensive discs use a metal azo dye, which looks blue, and is the least stable – when exposed to heat or sunlight the recording can disappear. Cyanine discs look green and are more stable. The latest discs use phthalocyanine, which is most stable and has a goldish colour. Mitsui claims patent rights on phthalocyanine.

DVD-R drives will not run at anything

like CD-R speeds, which should soon reach 24-speed. The faster the disc spins, the more difficult it is for the laser to create clear heat marks. Phthalocyanine will mark fast with a 25mw (milliwatt) laser, whereas azo and cyanine need the full 30mw. The raw data rate from a CD is 1.44Mbits/sec, and the DVD rate 11.08Mbits/sec. So one-speed DVD-R is equivalent to eight-speed CD-R, and three-speed looks like being the practical limit for DVD-Rs.

In the future, though, DVD blanks can be double-sided, with two layers on each side (the main layer stores 4.7GB, the second layer 3.8GB). The laser switches focus between them, just as the readout laser in a DVD player near-seamlessly switches focus between the dual layers of pressed movie discs. So total capacity for a DVD-R blank will eventually be 17GB. Unfortunately, first-generation drives are unlikely to handle dual-layer blanks.

All three erasable formats – DVD-RAM from Panasonic, DVD-RW from Pioneer and DVD+RW from Philips – use phase-

DVD-R drives will not run at anything like CD-R speeds, which should soon reach 24-speed

change chemistry, similar to that used for CD-RW. But the RAM coating can be overwritten 100,000 times, whereas the RW coatings are only good for 1,000 erase cycles. On first casual thought, this does not matter. Who needs to erase a thousand times?

But if the table of contents on the disc is rewritten every time data is changed or a video sequence edited, the Table of Contents (TOC) area will soon notch up a thousand hits. If the TOC fails, all data is lost. Radio stations that use MiniDiscs for edited interviews know this to their cost, and play safe by replacing their working MiniDisc blanks every few months.

Look more closely at the RW formats and the thousand-hit limit may not matter, after all. Temporary edits are stored in the recorder, not on the disc, and the location of the TOC on the disc can be varied. But this may affect the key issue of backwards compatibility. Although Panasonic still ducks and dives, it is a fact that existing DVD players and ROM drives will not read DVD-RAM data and video recordings. But both Philips and Pioneer, and the companies lining up behind their DVD+RW and DVD-RW formats, claim around 90 per cent compatibility, so nine out of 10 existing drives will play RW recordings. The first RW drives are now going out for review, so we should soon know.

We already know that Philips and the companies behind DVD+RW have made a policy decision. Whereas DVD-RW drives will also burn write-once DVD-Rs, and future DVD-RAM drives will do the same, DVD+RW drives will not be able to use DVD-R blanks.

This lost chance to build a compatibility bridge between formats could prove a disastrous tactical error for DVD+RW. Let's hope it never comes about. **PCW**





rogerg@pcw.co.uk

The cost of surfing

Roger Gann explores the financial effect of employees surfing the web at the office

The Internet is a constant source of fascinating information, and surveys are a particular favourite of mine – I find them endlessly interesting. But I have a column to write, so I'd better get on with it. However, I can't leave the Internet without sharing some revealing information about how much use workers make of the web for personal matters, during work time.

If you're an employer, check out the Websense site at www.websense.com. This US vendor of web monitoring software has some absorbing statistics on Internet usage. It found that, during the nine-to-five work day 70 per cent of all Internet porn traffic occurs, 30 to 40 per cent of Internet surfing is not business-related, and more than 60 per cent of online purchases are made.

'Haven't these workers got something better to do, like, err, work?' I hear you say. Well to be fair, the same source revealed that about a third of US companies had disciplined staff for Internet misuse in the past year, with most incidents related to porn surfing.

Meanwhile, yet another survey, this time from FAST Corporate Services, estimated that 'recreational use' of the Internet at work cost British industry around £350m in lost productivity per year. Every day, UK workers send about 4.5 million emails but not all are strictly work related, and roughly half of all workers say they receive pornographic, racist, sexist or other inappropriate email at work. This sounds pretty serious, but it seems that most email is a waste of bandwidth. A recent survey from Gartner classified no less than 34 per cent of internal business mail as 'useless'.

But I haven't quite finished with my survey of surveys of workers' online habits. Even more hair-raising stuff is to be found

at the Vault website, www.vault.com/surveys/internetuse2000/index2000.jsp. Its survey reveals that 15 per cent confess to surfing constantly, 22 per cent spend an hour a day surfing, and half send or receive up to five non-work related emails daily. Almost three-quarters looked at news sites, just under half planned their holidays, and about a third looked for jobs. Curiously, only four per cent owned up to looking at porn sites, which sounds a few orders of magnitude light to me.

But at least the staff realised the errors of their ways – over a third admitted that web surfing and sending private emails reduced productivity. Unsurprisingly, employers took a less liberal attitude to private web surfing – 15 per cent thought that staff shouldn't be allowed any web access, but 25 per cent would tolerate half an hour to an hour per day. They were split on the issue of reduced productivity.

A US Treasury Department report revealed that more than half the time that Internal Revenue Service employees spend on the Internet is for personal purposes. The report went on to say that

Only four per cent owned up to looking at porn sites, which sounds a bit light to me

one individual attempted to access more than 172,000 Internet web objects, with more than 120 hours of Internet access transmission time during a 21-day period.

Sounds pretty depressing, doesn't it? On the basis of figures like these, I reckon there's a pretty good case to be made for removing web access from the vast majority of workstations – this could seriously impact productivity for the better. After all, we don't let staff watch TV while they're at work, so why should we put entertainment channels on their desktops?

But there's another side to this coin. As well as paying a visit to the Websense site, employers should visit the TUC presence at www.tuc.org.uk. Last summer, it conducted a poll, its Labour Force Survey, on unpaid overtime and concluded that employers save some £23b in respect of unpaid overtime, equivalent to £4,000 for the average long-hours worker. In fact, further research conducted by the TUC reveals that these figures might actually be an underestimate.

UK employees work longer hours than any of their EU counterparts and this has resulted in an epidemic of workplace stress. Curiously, a staggering 85 per cent said that they found their work enjoyable and fulfilling, yet slightly more than half said they also found it hard to cope with the pressure. As you'd expect, the amount of unpaid overtime varies with position, with managers working the most. But even clerical staff work, on average, an extra 3.8 hours every week.

I reckon there's a *quid pro quo* here – maybe it's not unreasonable for staff to use the web for things they'd normally do in their own time, in return for a bit of unpaid overtime. I mean, £350m in lost productivity in return for £23b knocked off the wages bill sounds like a good deal for employers, no?

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nik_rawlinson@vnu.co.uk

Mr Wint and Mr Kidd

Two PCs and a broadband connection give Nik Rawlinson a headache

Those broadband guys are either very cheeky or very clever. After discussions with fellow *PCW*er Gordon Laing, I was finally convinced it was time I built a second PC, with cooling and 24-hour operation planned out from the start. Why? Quite simply that during the eight or so months since I joined the always-on generation, my PC had been... pretty much... always on. Day and night, week after week. But no matter what the manufacturers tell you, a PC will enjoy a shorter life when left in this state, and a quick peep at my BIOS revealed some rather hot chips.

So, a new PC was built, the two were plugged into a hub and christened Mr Wint and Mr Kidd for easy identification. Mr Kidd, my workhorse, would be turned on and off as needed. Mr Wint, who had consumed so many fans he already sounded like the flight deck of an aircraft carrier, was to be left on 24-7, performing menial redirection tasks and pushing out images to a website.

So if Mr Kidd was to be put into semi-retirement for his own safety, he would also have to lose the privilege of having his own, dedicated broadband connection. In a simple ceremony, attended by only Mr Wint and myself, Mr Kidd was disconnected and put to sleep. The cable modem was plugged into the hub, switches were thrown and everything sprang to life. Everything, that is, except the Internet connection, which had failed to even illuminate an activity light on the front of my hub. It was, to all intents and purposes, invisible.

Mr Wint and Mr Kidd suddenly felt very alone and cut off, and it took me a good deal of time, and fiddling with logon settings on the two PCs, to realise that nothing I did with either of them was going to help the hub see the modem.

Turning to the cable company's installation guide I read the words I didn't want to see: it would not work with a hub or a PC with more than one network card.

It looked like I was going to have to make a choice – Mr Wint or Mr Kidd. Only one of them could have the connection. If the modem could not be plugged into the hub, it would have to be connected direct to a PC, and without two network cards in that machine there was no way Mr Wint and Mr Kidd could play happily together.

But, I had one last weapon at my disposal – a vacant USB port and something the cable company had evidently overlooked: an external Ethernet connection. I connected Mr Wint to the modem, booted up and checked I could browse the web. All systems go!

Mr Kidd hooked up to the hub, and then the USB Ethernet connector was plugged into one of Mr Wint's ports. Windows detected it, installed the driver,

Mr Wint had consumed so many fans that he already sounded like the flight deck of an aircraft carrier

and the Internet connection was cut dead. Without rebooting, I ran Windows Me's Internet Connection Sharing Wizard, and defined the external Ethernet port as the channel for connecting to Mr Kidd.

Somehow, at that point, my cable modem lost the ability to count, and it once again assumed that there was only one NIC in my machine. Technically there was – the second connection was external. But whatever the reason, I was now running Mr Wint with two Ethernet connections, linked by means of a hub to Mr Kidd who, once I'd downgraded Mr Wint's ZoneAlarm setting for an internal connection, could see the Internet just as easily as his younger compatriot.

Now I have to admit to never having been that impressed by my broadband connection. It's spent much of its time being outperformed by the connection here at *PCW*, which supports around 600 users. Since introducing Mr Wint to Mr Kidd, though, things seem to have improved no end. Not only do web pages appear more quickly, but downloads seem to arrive on my hard drive almost as soon as I've chosen a destination.

Is this just me, or should I be expecting this kind of a performance boost? If you have connected more than one PC to a broadband link, I'd like to hear your experiences, how you went about it and whether you have found the Internet Connection Sharing Wizard to improve your performance.

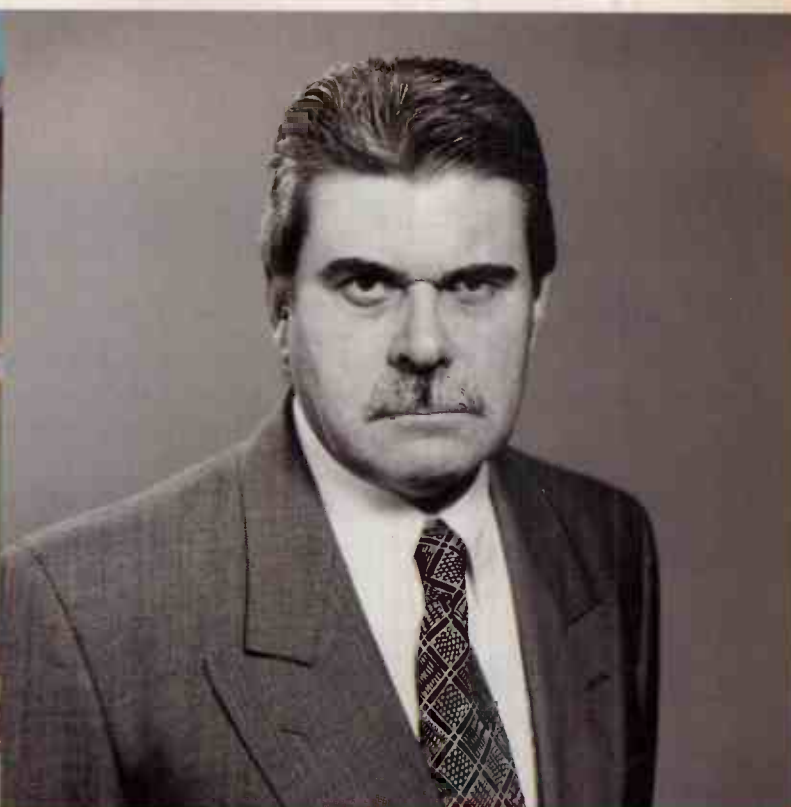
Mr Wint and Mr Kidd would like to hear from you too. They're always on the lookout for things to try on their speedy new Internet connection.

And the moral of the story? Well, as the two persistent assassins said in *Diamonds are forever*:

'If at first you don't succeed, Mr Kidd...' 'Try, try again, Mr Wint.'

PCW





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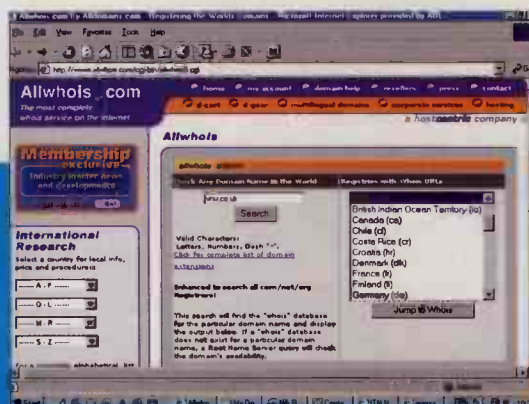
Automated response – no thanks! >

I recently had a simple query about the compatibility of two products, one of which has only recently been released. Unfortunately, on the company's website I could not email anyone directly but instead I had to fill out an online form. When the response came back I found that an automated support system had performed a search based on what I had asked. It had produced the same outdated document that I had found earlier, though I was given a link to submit my request to an online technical support representative. The result of my inquiry was a referral to the same document.

Although the automated system was quick and easy to use, being forced down these frustrating, patronising routes before getting to a real person did not impress me and I've noticed this practice is becoming increasingly common. I understand that this process can save companies lots of money on technical support staff, though I am not sure if the number of incoming queries is reduced because the automated responses answer their questions or because people give up and take their business elsewhere.

Stephen Newberry

Nik Rawlinson replies > It's a shame companies think they can get away with this kind of response when they would not dream of simply playing you a recorded message if you phoned for technical support rather than emailed. Sadly, the only thing you can do is take your business elsewhere, which is not much consolation if you really want the product. As a last resort, you could always try mailing postmaster@domain and asking them to direct your query as appropriate, making it clear what it is you were considering buying, and what you'll buy instead if you get no satisfaction.



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alone is not sufficient.

Don't return to sender > Having recently downloaded a sizeable number of junk emails, I have been trying to decide whether to waste my own time sending back 'unsubscribe' messages or to just delete the junk mails. It struck me that if it became common practice to 'reject' junk emails rather than just delete them, these bulk junk mailers would end up receiving as many emails as they send out. Those who send out the most emails would be the worst affected. They couldn't possibly deal with such an influx and might take more care in building and maintaining their mailing lists.

Andrew Connor

Nik Rawlinson replies > No no no no! Please, whatever you do don't send back an unsubscribe message or you'll only be confirming that your address really works and you'll probably end up with more junk mail than ever. More sensible is to look at the header of the email (right-click it in the message list in Outlook and select 'options') to find out whose server it was sent through, and inform the postmaster at that address. If enough people complain, as is likely for junk mail, the spammer's account will probably be canned.

Playing with passwords > I often see written records of password changes taped to monitors – it is often the only way to communicate them reliably to all who need to know. What is needed is a unified password agreement so that within a very broad range of acceptable choices, individuals may use one or two 'words' to access most of their services. If all password authentication devices allowed long

passwords, special characters and numbers then an individual could develop a password that would do for everything.

Robert Seddon-Smith

Nik Rawlinson replies > As far as remembering passwords goes, things could be a lot worse than they are. Many systems now have a unified password system such that logging on once unlocks all your applications. One example is Microsoft Passport. Many sites now implement this security device, so when you've logged into one, any other compliant sites that you visit between then and closing your browser will skip the password request and you'll be in with a single click.

Drowning in shipping costs > If there is ever going to be any progress in ecommerce, suppliers will have to wake up to the fact that buyers will not accept excessive shipping costs. Many suppliers will waive these costs for orders placed over the web. Others still seem to think that the customer can be milked. When I wanted to buy Go Back 2.2 from Adaptec UK, its website showed that the software was available for a cost of £31.39. However, the shipping costs were £10.82 – more than a third of the price of the software. Roxio [which has taken over Adaptec's software business] didn't get my order and I shall just have to manage without this utility.

I don't mind paying a fair price for other people's intellectual rights. What I object to is being rooked when it comes to ancillary charges. Adaptec and other companies with similar policies must understand that if they want to sell their products they must look at all the aspects of their marketing operation and not just the quality of their products.

Pip Elton

Roxio replies > As Roxio has taken over Adaptec's software, we felt it was our place to respond. Roxio values feedback from its customers and takes any complaint extremely seriously. Roxio agrees that the current shipping costs are too high and has recently been working to redress this situation. The increased cost to which you refer in your letter is not something that Roxio controls or imposes. It is actually levied by the third-party fulfilment centres that distribute products on Roxio's behalf in different countries throughout Europe.

Roxio recommends that customers buy their products through high-street retailers as a first choice. However, in order to address this unsatisfactory situation 'head on', Roxio has been working to create its own online stores and is also currently renegotiating its contract with the third-party fulfilment centres to get a fairer price. The benefits of the renegotiated costs will then be passed on directly to the customer – meaning that the cost of ordering Roxio products online will be vastly reduced. These changes should be put into effect by mid-May and although Roxio cannot give any definite figures at this date, the new pricing scheme should make a significant difference.

Where are the wireless DECT modems? > I've been looking into wireless connections for home. I would like to roam freely about my home with a laptop connected to the Internet over a wireless connection. 33-56K modem speed or equivalent would be fine.

I've found plenty of wireless Ethernet solutions. However these seem overkill and expensive for what I need. I just want to connect one computer to the Internet. Digital cordless phones are inexpensive. Does not-one make DECT-based modems or am I missing something?

One nice side effect of a DECT modem is that you would have direct control from Windows dial-up networking, so you could easily disconnect if you wanted to use the telephone. Telnetting to a wireless router sounds too much like hard work, especially at home.

David Lee

Simon Rockman replies > Siemens demonstrated a system that does just this over a year ago, a DECT modem system. Unfortunately, all of Siemens' domestic DECT products were sold in the UK by BT and BT didn't take the modem arrangement. This is a shame as at the time it was claiming huge ranges for the system – something over a mile. I suspect that when they went on sale in Germany they would have been the standard DECT 300m units (and then only in ideal conditions). The DECT standard does allow for cells and boosters but the only one of these, made by Dancall when it was owned by Amstrad, went out of production. DECT is a hugely under-used standard, particularly for data. Many of the things touted as making Bluetooth special could have been done with DECT. You might still find the Siemens Gigaset system available in Germany but it's hard to track down information as the Siemens alternative is the 802.11-based Fujitsu-Siemens system where the access points – that link to ISDN or DSL – cost over £600 and the PC Cards come in at over £200.

Can they sell our good names? > I have recently read about the alarming action by dot-com companies that go out of business and sell client databases. These databases become the only assets dot coms have left when they fold and generate vast amounts of money.

I wonder what, if any, protection we have in this country from this practice. It does have rather sinister ramifications as the person who would purchase such a database could sell it on to a third party and so forth.

Graeme Clarke

Clive Akass replies > The Data Protection Registrar's office tells me this is not illegal. Any operating company that sells on data is 'advised' to tell the customers involved. But if a company goes bankrupt the receiver is obliged by law to recoup as much money as possible from the assets, including customer data. Again, the company that buys the data is advised to inform the customers involved, and particularly to honour any commitment made by the original company not to give the data to a third party for marketing. This would be 'contrary to the principle' of data protection but is not against the law. However, from October you will be able to get a court order for your name to be removed from a database.

A touch of digital purity > With all the hype surrounding ADSL, you might well think that digital technology is the solution to fast access to the Internet. However, there are two problems associated with ADSL.

The first problem is that ADSL is asymmetrical. It is of little use for video-conferencing, where symmetrical links are required. The second problem is that the hype obscures the low downlink speeds that you can get on even a 56K modem. The speed of the server is often more of a limiting factor than the speed of the modem and you may end up paying for something that you won't get.

A simpler way of increasing the speed of the modems we use would be to increase the analog bandwidth of the telephones for dial-up access. The technology is well understood and so it should be easier and cheaper to implement. The performance would be symmetrical and could lead to better-quality telephone speech.

LETTERS

There may be good reasons to go this way, but I wonder if those reasons do not contain a certain amount of 'digital purity'.

Francis King

Clive Akass replies > The asymmetry in ADSL is there only because BT believes you need more speed downstream than up. I would be very surprised if this view does not change as web traffic develops. Symmetrical DSL is perfectly possible – indeed I believe it is available in some business services.



Claude Shannon's Law calculates the amount of information that can be carried on a channel with a given bandwidth

However much you boost the audio bandwidth (and I doubt if it would be as cheap as you imply) dial-up modems could not reach ADSL's 'slow' upstream 256Kbits/sec. Check out Shannon's Law.

And remember we are in the first phase of DSL. It can be pushed to 8Mbits/sec and probably beyond. No audio-based technology would have that headroom.

Wot a lotta yotta > In Clive Akass' reply to James Stormont's letter in the May issue of *PCW* (p63), he referred to IBM's predicted holographic storage capacities of '1yottabyte = 2^{80} MB'. The yotta prefix = 10^{24} which is about 2^{80} . On the other hand, 2^{80} is approximately 10^{21} whose prefix is zetta. So, it's 1yottabyte = 2^{80} bytes or 1 zettabyte = 2^{70} bytes. Please excuse the pedantry – what's a factor of 1,000 to IBM?!

Andrew Elliott

Clive Akass replies > I don't think you can be too pedantic about the meaning of a number (which I suppose the prefix yotta is). I am afraid this is a case of archivitis, the disease by which mistakes are perpetuated by journalists getting uncorrected information from old articles. Perhaps when electronic searches mature we will be given both the original references and the corrections.

Indispensable clones > When I reformat my hard disk and complete the reinstallation I make sure that, during the reformat process, I partition my hard disk to have at least two partitions. When I have installed all my essential software, I clone the first

partition to an image file on the second partition, using a level of compression that gives a reasonable cloning time. I then write this file to a CD-R, making it bootable in order to create an installation CD tailored to my needs. In three months' time when I feel the need for a complete revamp, I only have to set the BIOS to reboot from the CD drive. In less than 10 minutes I am back to exactly where I started, without the need to go through the complete reinstallation. If I add or remove new hardware or essential software, it doesn't take long to reset the PC to its default state, make my changes and then burn a new CD-R. With the cost of a CD-R at less than £1, this saves a lot of time and effort. I could not do without it. Of course, Microsoft might discover a way of doing this automatically and cleaning up the Registry so that a reinstallation becomes unnecessary. Until then I will stick by Norton and my aging, but essential, CD writer.

Darren Galea

Jalal Werfalli replies > You raise a good point. This method of taking a snapshot of your PC's configuration is something *PCW* has been doing for a while, especially in PC group tests. By doing so we can install and perform our benchmarks, then restore each PC's original setup before the system is sent back to the manufacturer. For PC enthusiasts and especially those who enjoy installing our cover disc trial programs, it is always a satisfying feeling to see your PC return to a clean, freshly installed state. You don't always need a CD-R drive though, as this type of software usually allows you to create bootable floppy disks so that you can take the snapshot, and then store that to a partition on your hard drive.

Windows Me already comes with a system restore facility built in, but this does not quite offer the complete solution you describe. Furthermore, it remains to be seen how a PC running Windows XP and/or Office XP featuring Product Activation will affect the cloning process.

Virtual romances > World War 2 was probably one of the most romantic periods of the last century. Letters were usually the only way to communicate between soldiers who went off to war and their wives and girlfriends waiting back home for them.

Today romance is alive and well on the Internet. Chat rooms have thousands of people looking for their possible soul mates. A man in Scunthorpe, for example, may spend every evening online tapping out sweet nothings to a Sheila in Shark Bay. A woman in Macclesfield may let her feelings gush through cyberspace to a Monsieur in Marseilles. Some people are so desperate for romance that they pack their bags and fly off to the other side of the world based on the strength of electronic love letters and an exchange of photos.

Alan Aitchison

Janet Heil replies > We're confused. You seem to be wistful for the days of romantic letter writing, yet you scorn those who are now keeping up that tradition using the Internet, on a much broader scale. Who is to say that people who find romance on the Internet are desperate when the same might be said about a person who goes home with someone they just met that evening in a pub or a club after consuming many drinks? The Internet is constantly making the world smaller, metaphorically speaking, and we think it is wise to keep an open mind about it being one of the many 'places' that two people might meet and make a connection. As the number of people online in the UK grows it may very well soon be common for everyone to know someone who met their partner online.

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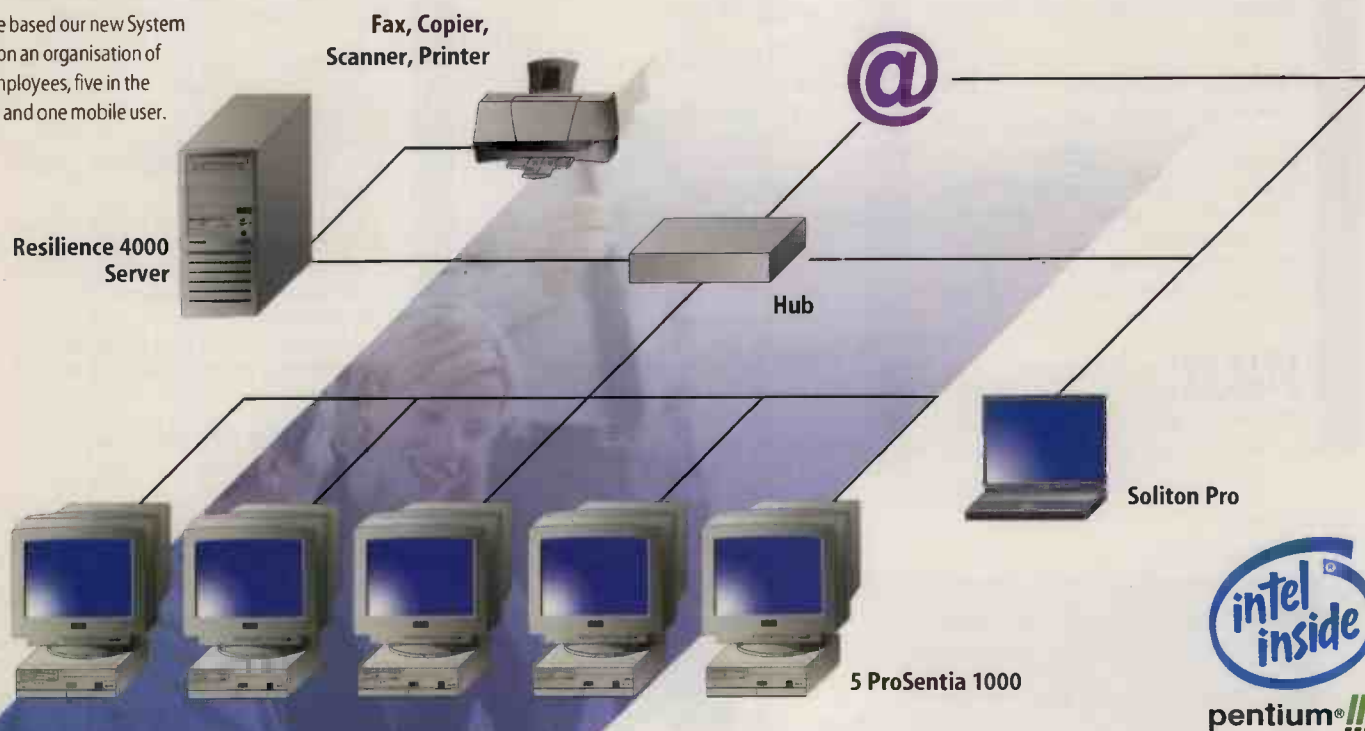
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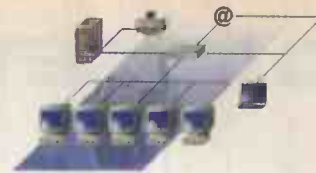
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Toshiba **SD900E**

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CONTACT Toshiba 01932 828 828

www.toshiba.co.uk

DVD Audio is a new digital audio format that can support digital sampling rates far above that of normal compact discs. The SD900E is both a video DVD and an audio player, and can play back DVD audio discs recorded at sample rates of up to 192KHz in full 5.1 surround sound. It also supports both standard CDs and CD-R discs.



Music to

Philips **SACD 1000**

PRICE £1,300 (£1,106 ex VAT)

CONTACT Philips 020 8665 6350

www.philips.co.uk

The Super Audio Compact Disc (SACD) standard was developed by Philips and Sony, and uses an audio recording technique called Direct Stream Digital (DSD). But what's really special about this player is that it can play back multi-channel recordings. With multi-channel-enabled discs the audio will surround you as if you are in the midst of the music.



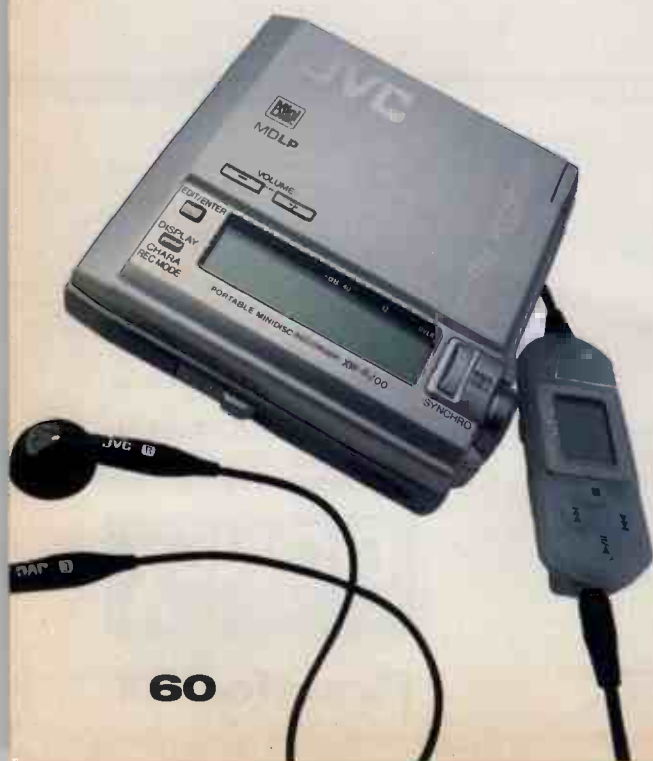
JVC **XM R700SL**

PRICE £249.99 (£213 ex VAT)

CONTACT JVC 0870 330 5000

www.jvc-europe.com

We may not have taken MiniDisc to heart like the Japanese, but there's no doubting it's a great format for music on the move. The JVC XM R700SL offers both recording and playback, and there's also an optical input for making digital recordings from CDs. It even has a 40-second Anti Shock to guard against nasty skips during your morning jog.



Terratec **M3PO**

PRICE £349 (£297 ex VAT)

CONTACT SCV 020 7923 1892

www.terratec.net/ttuk

With many people's collection of MP3s equalling (or exceeding) their CD collections, it would be a sound idea to have an MP3 playback unit to sit in your hifi rack. Terratec has come to the rescue with the M3PO, which plays both standard CDs and MP3 tracks burnt on recordable CDs. It can be fitted with a hard disk for those long-playing mixes.

your ears

MUST-HAVES FROM THE CUTTING EDGE OF MUSIC TECHNOLOGY



Sony **MZ-E900**

PRICE £249 (£211.91 ex VAT)

CONTACT Sony 08705 424 424

www.sony.co.uk

This MiniDisc Walkman is so tiny it's only just larger than the disc itself. The player also supports long-play MiniDisc recordings so if you have a compatible recording deck you can squeeze up to four times the amount of music on a single disc. Add to this the fact that it weighs only 83g including battery and you've got one desirable piece of kit.

Samsung **Yepp NDU 64**

PRICE £229.99 (£196 ex VAT)

CONTACT Samsung 0800 521 652

www.samsungelectronics.co.uk

Samsung was one of the first to produce a portable MP3 player with its original Yepp model. The latest incarnation is the Yepp NDU 64 including, as its name suggests, an impressive 64MB of built-in memory. The rounded LCD display, cool silver and blue curvy design, phone book and ability to record voice memos all adds up to a likeable and fun tool for those on the move.



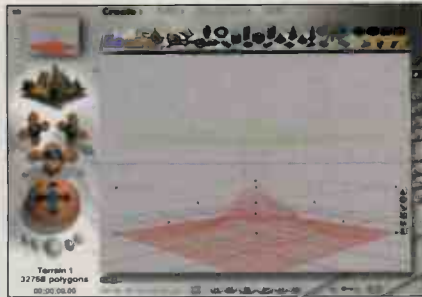
HOW WE TEST

RESULTS EXPLAINED

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



3DMark 2000 tests DirectX performance



Bryce 4 manipulates a wire frame scene



OpenGL performance is tested via Quake III

SYSmark 2000

SYSmark 2000 is made up of 12 applications, which are divided into two categories: office productivity and Internet content creation. A pre-defined script is run on each application. This is timed and assigned a performance score. The score is based on a comparison between the system being tested and a reference PC. The PC is based on a 450MHz Pentium III processor, an Intel 440BX chipset motherboard, 128MB of SDRAM, a 32MB Diamond Viper V770 Ultra graphics card, an IBM DJNA 371800 hard disk and Windows 98 SE.

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. SYSmark 2000 then calculates a score for each category, which is a geometric mean of the application scores, and an overall score, which is a weighted geometric mean of the two category scores.

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

Office productivity

Corel CorelDraw 9.0
Corel Paradox 9.0
Microsoft Word 2000
Microsoft Excel 2000
Microsoft PowerPoint 2000
Dragon NaturallySpeaking Preferred 4.0
Netscape Communicator 4.61

Internet content creation

Adobe Premiere 5.1
Adobe Photoshop 5.5
Avid Elastic Reality 3.1
MetaCreations Bryce 4
Windows Media Encoder 4.0

3DMark 2000

Remedy Entertainment's MAX-FX is used to test the DirectX performance of a system. It runs two specially coded games at low, medium and high detail levels. We run the benchmark at 1,280 x 1,024 in 32bit colour, with each game set to loop three times. The 3DMark result is calculated by adding together the average frames per second (fps) for each game and multiplying the result by 12.

3DMark 2001

The updated version of the DirectX test runs three new, specially coded games at low and high detail. There is also a fourth test, which only runs on cards that are fully compliant with DirectX 8 (currently only the GeForce3). This results in higher scores being given to these cards than 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 then added together and multiplied by 20. Finally, the two scores are added together to produce the final result.

Quake III

We test OpenGL performance with Quake III: Arena (version 1.11). 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.

At the command prompt we type:

```
time demo 1  
demo demo001
```

This runs demo 1 and records the frames per second.

Seti@home

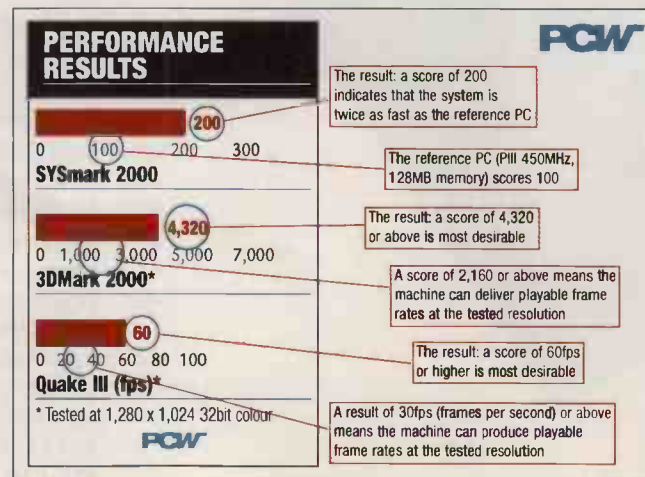
We occasionally use this test to give us a feel for the performance of a system. The test is very CPU intensive. We time the amount of time it takes the Seti@home program to process the same one per cent of the same work unit. As a reference, a PC with a 1GHz Pentium III and 512MB of PC133 memory takes nine minutes 40 seconds to complete the test. Another PC with two 933MHz Pentium IIIs, 256MB of PC800 RAMBUS takes four minutes.

3D Studio Max

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 whole process is self-timing, with the running time recorded to disk every 30 seconds until the battery power diminishes.





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Jason Jenkins Reviews Editor

Reviews

PCs are bigger than home entertainment

Can a PC also be a home entertainment system? That's the question we ask this month in our review of the Tiny Takami. Takami means 'excellent idea' in Japanese, but to find out if it is you'll have to read the review overleaf. The Takami uses PC technology to achieve DVD playback, time-shifting facilities and games playing. Its existence highlights the changing role PCs have developed in the past couple of years or so.

In the past, the PC has been marketed as the ultimate business tool. If you've wanted to increase your productivity, a PC was the piece of equipment that you needed. Spreadsheets, word processors and presentation tools were the only things the humble PC was good for.

But look at it now. It is rare for us to see a PC with a CD drive in it – DVD drives come as standard these days. Processors are now so fast that you no longer need specialised hardware to watch the latest Hollywood movies on your computer: it can all be done in software, which is also a standard part of most new packages. Dolby Digital systems were once the sole preserve of up-market cinemas. Now you can add a Dolby Digital surround-sound system for as little as £130. Displays have crashed in price, with the quality of the image and the size of the screens better and larger than ever.

The operating system that most PCs use on a day-to-day basis, Windows, reflects these hardware

changes. There's a video-editing facility with the latest edition, Windows Millennium, and the Windows Media Player can play back sounds and images of amazing size and quality.

These developments, and more, have resulted in PCs being repositioned by companies as family home entertainment centres, rather than productivity tools. This has made the PC the most versatile piece of technology there is today – there's very little a modern PC can't do that a dedicated box can.

The problem comes when you try to focus it on a couple of tasks. The Takami is intended to be a DVD-playing, time-shifting games console, and that's it. As Tiny makes PCs, it is natural for the company to employ the technology it is used to churning out to meet the task at hand. This is where the concept comes slightly unstuck. It is the PC's very versatility that makes it unsuitable for a closed consumer electronic box. You end up with a machine that is capable of doing more than it is being used for, but you have to pay for all that extra functionality and power. Even the lowest-specified PC still costs a fair bit to produce – you need a reasonably sized hard drive, a lot of memory, a separate graphics card and so on. When you add Windows to the equation – an operating system that was never designed with this kind of use in mind – then you also end up with a pretty clunky, bloated interface.

PCs are best at doing lots of different tasks reasonably well, rather than one or two specialised tasks badly, and this is where the future should lie.

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RATINGS

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

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Videologic



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Tiny Takami Plasma

Tiny's new entertainment centre and plasma screen brings the power of a PC to your living room

DETAILS

PRICE £6,999 (£5,956.60 ex VAT) with plasma screen; £999 (£850.21 ex VAT) Takami without screen

CONTACT 0800 783 9812
www.tiny.com/uk

PROS Tiny-branded applications work well

CONS Performance could be better; cheaper to buy a plasma screen separately

OVERALL It's a shame that Tiny didn't choose to use a custom operating system for the Takami as the concept of the unit is very good, but Windows is just too clunky to use on this type of device. There's definitely a hole in the market for this type of product, but unfortunately the Takami is not the device to fill it

SCORE ■■■■

PERFORMANCE RESULTS

134
0 100 200 300
SYSmark 2000

2,668
0 1,000 3,000 5,000 7,000
3DMark 2000*

1,038
0 1,000 3,000 5,000 7,000
3DMark 2001*

13.4
0 20 40 60 80 100
Quake III* (fps)

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

PCW

Have you ever looked at your collection of home entertainment boxes and wished they were all integrated in to one space-saving device? Or maybe you've wondered why you need separate DVD players, game consoles, CD players and the like when much of the electronics in each overlaps? Well, Tiny thinks it has the answer in the Takami. It's pretty obvious from using the Takami that it is really a PC in different clothing, but Tiny is keen for the unit to be viewed as just another piece of consumer electronics. But for this to happen, the box has to be as simple to use as your hi-fi.

The Takami's styling reflects Tiny's desire to pitch the product as a piece of consumer electronics. It wouldn't look out of place next to your DVD player or hi-fi with its smooth curves and fake aluminium casing. However, even your granny would recognise this as not much more than a PC in a stylish box. The system we reviewed comprised the Takami PC unit, a massive 42in NEC Plasma screen and a set of VideoLogic 5.1 DTS surround-sound speakers. You also get a cordless keyboard and a TV-style remote control.

We couldn't resist opening up the PC case to have a peak inside and it's surprising how much Tiny has managed to stuff in there, considering the small mini-ATX form factor. There's a half-height GeForce2 MX fitted in the AGP slot alongside a PCI TV tuner card in the adjacent slot and a PCI software modem next to it. A 40GB Maxtor drive is also present.

An AMD 800MHz Duron processor is the powerhouse of the system backed up by 128MB of PC100 SDRAM. Creative's onboard SoundBlaster AudioPCI 128 chip is used for the audio capabilities, but this feeds gold-plated phono connectors for analog audio in/out on the rear of the Takami, rather than the usual mini-jack connectors. There's also a coax digital out that

connects to the VideoLogic speakers so you can blow the cobwebs from your ears with surround sound. The VideoLogic decoder supports not just Dolby Digital and Pro-Logic but also DTS, which supplies slightly better-quality sound.

The Takami connects to the 42in plasma screen via the standard D-SUB monitor connector. The screen is impressive, supporting a maximum resolution of 1,280 x 1,024, although it's actually cheaper to buy the Takami with DTS speakers and the screen separately.

When you turn on the unit it boots into Windows Millennium, but Tiny has hidden all the usual icons such as My Computer and the Recycle Bin so it looks slightly odd. To navigate your way around folders and installed programs you have to use the Windows Start bar.

However, the TV-style remote control has three large buttons marked DVD, TV and Music that launch the three Tiny-customised Intervideo applications. Hit the TV button and the unit loads up DVR, a TV application that allows you to watch TV, pause live TV, or record whole programs to disc. The DVD button launches WinDVD, while pressing the Music button starts Intervideo's WinRip, a music playing and encoding application.

These applications work well with the remote as many of the on-screen buttons are mapped to buttons on the remote. However, when you load up games or other applications, things become a little tricky as the circular pressure pad used to control the mouse on both the wireless keyboard and the remote makes it fiddly to select smaller icons or navigate dropdown menus. We would have preferred to see a mini-trackball used instead, and a gamepad bundled as standard.

Although the physical layout of the machine makes it appear that the Takami would be good for games – the two USB ports mounted at the front are ideal for connecting gamepads – the

low 3DMark and Quake scores dictate otherwise. The machine also produced a lacklustre SYSmark result.

Essentially the Takami is a good idea that doesn't quite come off. This is mostly due to the fact that Windows is not really a suitable platform to use for this kind of device. It just feels clunky and awkward. Perhaps if Tiny had used an embedded OS or even Linux with customised applications, it would have developed a killer device. As it is, we're going to stick with our separate devices.

Niall Magennis





Round the back
there is a
multitude of ports





Sitting on the right-hand side of the MicroPC are AV video, S-Video, PS/2 keyboard and PS/2 mouse ports



An array of ports can link the MicroPC up to a monitor, modem, printer, telephone and PDAs



Jadetec MicroPC

You won't find a smaller PC than this pint-sized XP-866, but it's no pushover

DETAILS

PRICE £938.83 (£799 ex VAT)

CONTACT Jadetec

0113 281 7788

www.jadetec.co.uk

PROS Packs a lot into a small form factor

CONS Limited expansion

OVERALL If you work in several fixed locations at once and want to be able to access the same data everywhere, but don't need the additional facilities of a notebook, the MicroPC could be just the ticket. But as a straight desktop PC replacement, it is a relatively pricey solution

SCORE ■■■■

PERFORMANCE RESULTS



The concept of the tiny computer has been revived by new company, Jadetec, with its MicroPC range of desktop PCs, which it bills as 'the smallest PC in the world'. The MicroPC, which measures 157 x 146 x 45mm, is undoubtedly tiny – imagine something the size of a CD-ROM drive, cut one-third of it off, and you have a rough idea of its form factor.

As a by-product of its small size, the MicroPC is also undeniably portable – weighing a shade under a kilo, it's small enough to fit in a briefcase without stretching your arms. The unit comes complete with a keyboard and mouse, but a monitor and external floppy disk drive are optional extras.

A variety of operating systems can be pre-installed, including Linux, and the review sample came correctly configured with Windows Millennium. The MicroPC is available as an 866MHz Pentium III or an 800MHz Celeron, which is about £60 cheaper. Both plug into a motherboard based on the Intel 815e chipset, with integrated video and sound. Jadetec sees a market for the MicroPC in people who want a simple system unit upgrade and for business users who have limited space.

The MicroPC achieves its ultra-compact form factor by borrowing heavily from the notebook parts bin.

So, the CD-ROM drive with the non-motorised tray is identical to that found on many notebooks, while the motherboard uses SODIMM memory modules rather than common or garden DIMMs. In fact, in many ways, the MicroPC can be viewed as a screen-less, keyboard-less notebook.

The grey plastic case is fairly attractive with just a soft power switch, a pair of status LEDs and a circular vent gracing the top of the unit. All four sides are festooned with I/O ports of one sort or another. The front has an infra-red port plus volume control thumbwheel, the right side features mouse and keyboard PS/2 ports and an S-Video port, while the left side hosts the 10/100 network port, microphone and speaker jacks and power supply sockets. You need to use the supplied transformer to power the unit.

Bringing up the rear are a clutch of legacy ports – VGA, serial and parallel, plus a pair of USB ports and the modem phone socket. Although virtually no desktop PCs sport them, the infra-red port is a very useful feature as it greatly simplifies communication with PDAs and mobile phones.

The MicroPC certainly manages to cram a lot of functionality into a tight space, but what's missing? On the I/O front it's hard to fault, although it will be

difficult to expand or upgrade. On the removable media front, the floppy disk drive is an optional extra. Unfortunately, this is a parallel port job, and not a USB device, which is a pity. We'd probably skip this and plump for a USB Zip drive or similar. The CD-ROM drive clips into place, just like on a notebook, and so is upgradable – a DVD-ROM is available, priced at £111.63 inc VAT.

The MicroPC has one SODIMM slot which is filled with a 128MB SODIMM, so if you harbour thoughts of fitting more memory, do this when you buy it as you won't be able to re-use the now redundant 128MB module, unless you have a suitable notebook PC, that is. The SODIMM slot is easily accessed – you simply unclip the CD-ROM drive and slide it out to expose the slot.

The MicroPC isn't really intended to be opened up, but, if you remove a couple of screws, the top cover lifts off, giving you access to the CPU and hard disk. The CPU is mounted in a conventional Socket 370 socket and so is upgradable. A 20GB 2.5in EIDE hard disk is the standard fixed-storage option, but presumably this, too, could be swapped for something larger in due course. But apart from the aforementioned SODIMM, these are the only two internal upgrades possible.

Roger Gann

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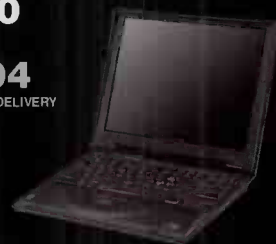
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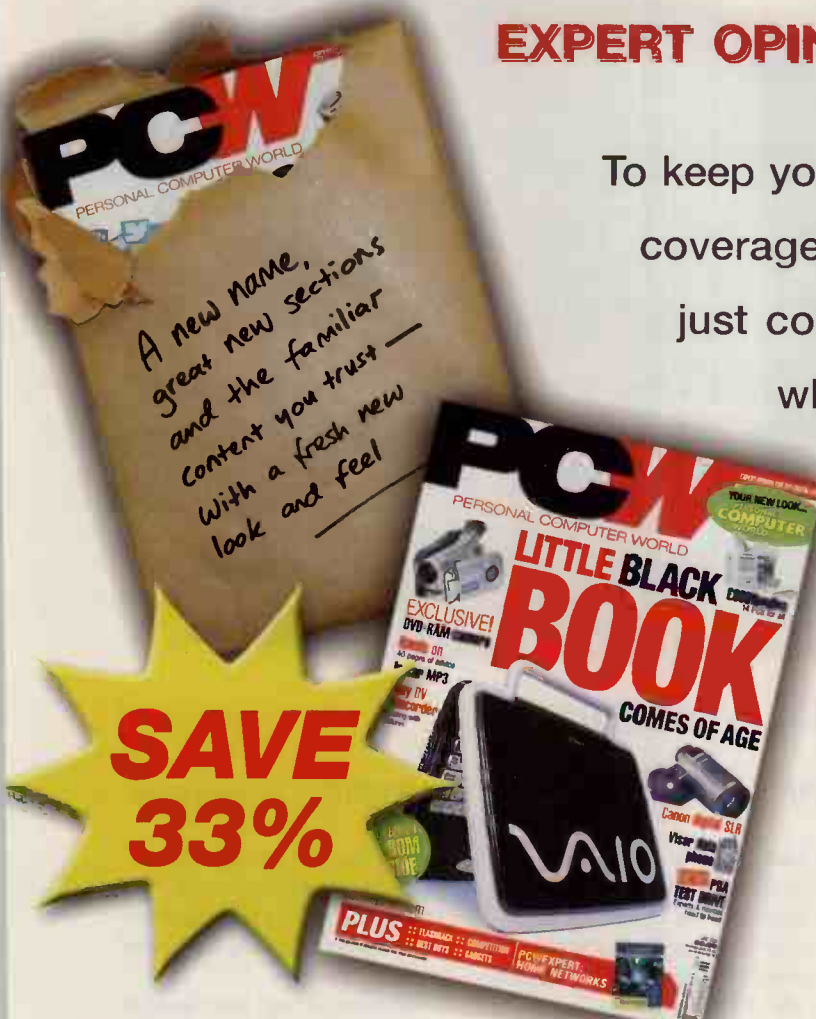


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DETAILS

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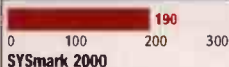
PROS Ultra160 SCSI; UltraDMA100; good choice of hardware specifications

CONS Limited FireWire compatibility; outdated software and capture card

OVERALL The Precision 330 is really a 3D workstation masquerading as a video-editing machine. Add a second hard drive, a more suitable graphics card, a properly functioning DV capture and editing board, and you're almost there

SCORE

PERFORMANCE RESULTS



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

PCW

The Precision 330 is the new boy in Dell's Workstation range which is aimed at just about everyone. Dell hopes the 330's price/performance ratio will make it an attractive option to all comers from home and corporate video makers to 3D applications developers. As the machine was kitted out with the Pinnacle DV500 video-editing package, we assessed its suitability for this function.

The 330 certainly looks the part, with its sculpted all-black case, system monitor and keyboard. The only ugly and dysfunctional thing about it is the three-button moulded mouse, for which left-handed users will need to find a replacement.

Inside, the motherboard houses a 1.4GHz Pentium 4 with Intel's 850 chipset featuring a 400MHz front-side bus. There is space for a maximum 2GB of PC800 RDRAM in four RIMM slots using 512MB RIMMS. Our review machine has 256MB.

Both SCSI and EIDE drives are supported, the former via an Adaptec AIC-7892 Ultra 160 PCI SCSI card and the latter via onboard dual-channel UltraDMA100 ports. While this provides plenty of storage options, the fitted 18GB Seagate drive is just not big enough for video work.

The only other drive fitted in the

review machine, a Sony CD-RW with 32-speed read and 12/8 write speeds, occupies one of the three full-height bays. This leaves you free to make your own choices about a DVD-ROM, DVD-RAM or DVD-R drive.

The AGP slot is occupied by nVidia's highly respected Quadro Pro 2 64MB four-speed AGP card. With DirectX and OpenGL optimisation, second-generation T&L (Transform and Lighting) engines and nVidia's Shading Rasteriser (NSR), the performance of this card would make it the obvious choice for anyone working with 3D applications such as 3D Studio Max, Maya and even Photoshop. It has VGA and DVI connectors and supports TwinView. Aside from that it has no specific video-editing benefits that justify its choice over a cheaper card.

FireWire ports provide a third option for connecting additional drives, as well as the all-important high speed conduit for DV camcorders and VCRs. We were initially puzzled by the inclusion of a Texas Instruments OHCI PCI FireWire card in addition to the Pinnacle Systems DV500 – which itself has three FireWire ports. This seemed to be overkill, particularly as the Turtle Beach Santa Cruz PCI sound card leaves only one PCI slot available. But, in fact, it's fitted

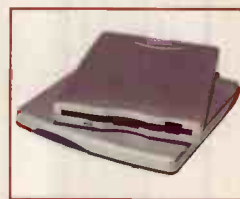
because you can't connect FireWire hard drives to the DV500 and it's incompatible with the two camcorders we tested and quite probably a number of others.

Fortunately, virtually every aspect of this machine can be user-specified. In use the machine performed satisfactorily as an editing platform, but capture was less than straightforward, largely due to the shortcomings of the DV500. We were eventually able to batch capture DV clips from a Sony PC110E camcorder using DV Tools. First Premiere crashed on start-up until we disconnected the camcorder from the DV500's FireWire port. Then, having plugged the camcorder back in after launching Premiere, it wasn't recognised until we plugged it into the TI card rather than the DV500.

The 330 has plenty of muscle. The 400MHz system bus and faster RAM is very welcome, as is the choice of Ultra160 SCSI and UltraDMA100. However, there are few applications that take full advantage of the P4's features.

The 330 could provide the basis of a good video-editing system, but not with this specification. At this level you'd at least expect the FireWire ports on the DV card to function properly.

Ken McMahon



USB CD and floppy drives are part of the standard package

NEC Ultra-portable Crusoe notebook

The diminutive Versa UltraLite gives long battery life and runs Windows 2000

NEC's Versa UltraLite poses an interesting conundrum. It's a 3lb notebook with a 600MHz Transmeta Crusoe processor, 10.4in backlit TFT screen, and three-hour battery life. But is it too big or too small?

The UltraLite slides into the ultra-portable class by virtue of size and weight, but aspires to run with the big boys thanks to battery life and the ability to run Windows 2000 at 1,024 x 768. It weighs 3lb (*sans* USB CD and floppy), is slightly over 1in thick, and has a footprint marginally smaller than A4.

NEC UK says the UltraLite provides 'all day computing'. It's a bold claim. The five hours claimed by NEC US for average use – word processing, email, browsing – is closer to the mark.

The Crusoe chip's 'code morphing' software layer translates Intel x86 code into Crusoe VLIW code, a hardware/software combination that reduces the power-hungry transistor count of the Crusoe to a quarter of that needed by an equivalent-speed Intel CPU. Crusoe's LongRun technology further enhances battery life by dynamically altering CPU speed and voltage. On paper, the UltraLite should outlast an equivalent-speed Intel-based laptop. Outside the lab, real life intrudes. Although good, the resulting 198-minute battery life of the 600MHz

UltraLite, as measured by the *PCW* battery test, is not dramatically greater than the 155 minutes achieved by the 600MHz Intel-powered Toshiba Portégé 3480CT in *PCW*'s May notebook round-up. Processor power is also a little under par. SYSmark returned a score of 66 on this machine, against 50 for a Sony C1VE with an indential processor, and 97 for a 600MHz Pentium III Toshiba 3480CT. That said, the UltraLite doesn't feel slow in use.

Theory says the Crusoe should run faster for longer, but the processor is only part of the package. It's early days for Crusoe and its design allows for software tweaks to performance and battery life. The UltraLite takes NEC battery technology to the next level by including two batteries, a conventional, removable, lithium-ion battery and an internal lithium-polymer battery that employs plastic rather than electrolyte. Lithium-polymer technology is not yet sufficiently advanced to power a laptop on its own so supplements the main lithium-ion battery. The design benefit of lithium polymer is that it can be used to fill internal cavities that would otherwise be unused.

The rest of the UltraLite is par for the course. The 600MHz TM5600 CPU is supported by 128MB of RAM (maximum 192MB), a 10GB hard disk,

and an ATI Mobility-M chip with 4MB of SDRAM that can power a 1,600 x 1,200 external display. Space-saving connectors for an external display and for the integrated Intel Pro/100 10/100 network interface dictate the use of adaptor cables. Other extras include the USB floppy and CD-ROM (both can be boot enabled) and a lightweight AC adaptor. Modem and fax communications are provided by an RJ-11 socket for the internal V.90 Xircom modem. For expansion a single Type II PC Card socket complements the two USB ports. There's no FireWire port but it does have Infra-red on the front edge. Mic and headphone connectors for the ESS Solo sound chip complete the trip around the periphery. The keyboard follows standard UltraNote-style with 86 compressed keys having a very short travel. It's not the typist's friend but NEC deserves a pat on the back for providing full-sized Return key and Windows keys.

All ultra-portables trade performance against longevity. The NEC Versa UltraLite is a very credible contender, almost small enough to carry everywhere, almost big enough to serve as a Windows 2000 desktop alternative. In this category it comes closer than most to being just right.

Terence Green



DETAILS

PRICE £ 1,643.83

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CONTACT NEC UK

0870 010 6328

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PROS Well specified; reasonable expansion; great price

CONS Cramped keyboard; slower than an equivalent Intel/AMD

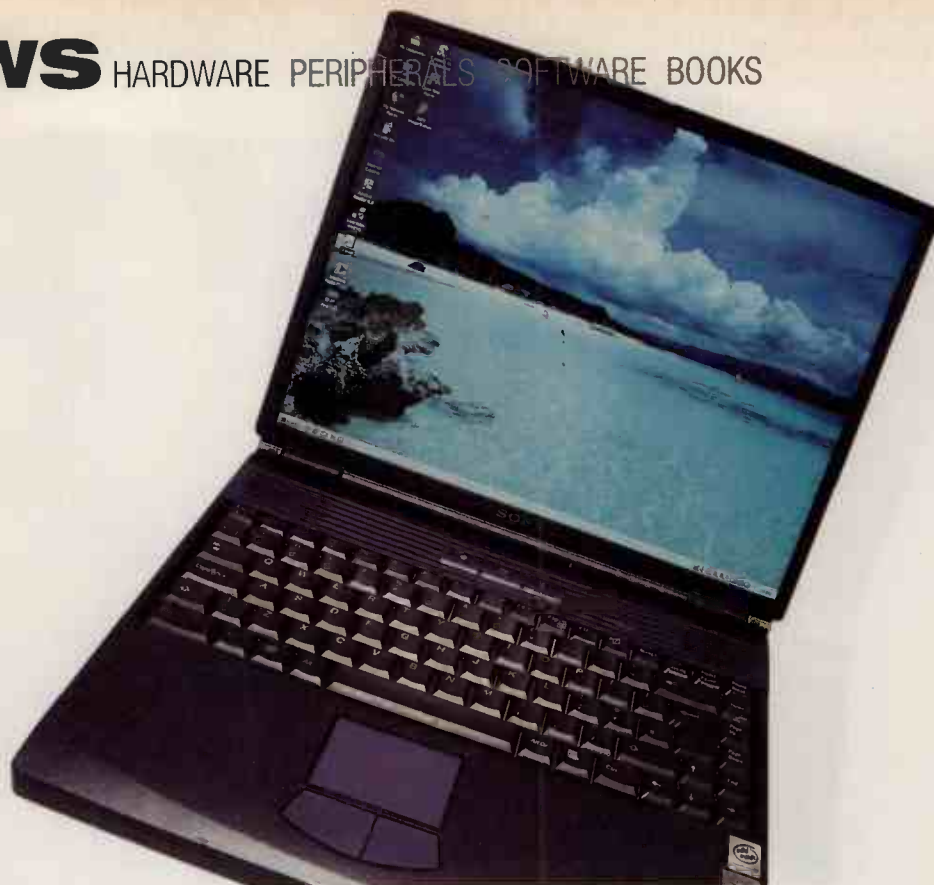
OVERALL If you need Windows 2000 but don't like bricks, the UltraLite is as good as it gets today. It's not as fast as Intel-powered equivalents and its battery life may soon be challenged by low-power Intel/AMD designs, but it's considerably cheaper than equivalent configurations from Toshiba, HP, and IBM

SCORE ■■■■■■

PERFORMANCE RESULTS

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PROS Good screen; FireWire port; CD-RW/DVD combo drive; good keyboard

CONS No infra-red port; high price

OVERALL If you own a DV camera and want video editing then the inclusion of the FireWire port and editing applications may appeal. Otherwise, you'll find the FX109K a capable desktop replacement, that lacks that extra spark

SCORE 

PERFORMANCE RESULTS



Notebooks have always been more desirable than their desktop cousins, and it's more so now mobile processor performance is approaching that of desktop chips. It's little wonder then that most of the major laptop manufacturers are producing fully featured machines with specifications that would make any desktop machine blush. Sony is no different, and the latest machine in its FX100 range will not leave you wanting when it comes to features.

While the PCG-FX109K doesn't use the latest processor technology, its mobile Pentium III 850MHz chip is no slouch. This is set by default to fall back to 700MHz when not connected to the mains, but you can change this to operate at full speed if you need the extra grunt while mobile. There's 128MB of RAM, which is normal on a notebook nowadays. The memory-hungry Windows 2000 professional is pre-loaded, but, unfortunately, no office applications are included.

Interestingly, Sony has opted for a combined Panasonic DVD/CD-RW drive, which gets our vote for versatility. The drive writes at eight speed for CD-Rs or four-speed for CD-RWs. It reads DVDs at eight-speed or CDs at 24-speed. Sony has also thrown in a copy of Roxio's Easy CD Creator and Direct CD,

and WinDVD. As well as the CD-RW/DVD combo drive there's a removable floppy unit that can be used to house a second optional battery.

There's plenty of room on the 30GB hard drive, which will come in useful if you've got a DV camcorder, as the laptop is kitted out with a mini FireWire port, or i.LINK. Sony is obviously aiming this machine at movie-making fans and there's the usual Sony suite of DV capturing and editing applications.

The notebook uses Intel's 815EM mobile chipset so the sound is taken care of by the SoundMax software solution. Ideally, we would prefer to see a hardware chip being used as the software option taxes the processor. The built-in speakers are standard laptop affairs and generally lack any kind of significant bass response.

The second small disappointment is the graphics chipset. The 815 chipset uses anything from 1MB to 11MB of main system memory, so a separate chip with its own memory would have been preferable. That said, you can use both the composite-out and D-SUB connectors at the same time.

The notebook is well endowed when it comes to external connections. It has both an integrated 10/100 Ethernet and a 56K modem. There are also two USB ports, a serial connector and a parallel

port. On the left-hand side of the laptop you'll find a stacked pair of PC Card sockets supporting a single Type III card or two Type II cards.

There's also a D-SUB connector on the rear of the unit for attaching the laptop to an external monitor. Not that you'd necessarily want to, as the 15in screen is excellent, with an impressive native resolution of 1,400 x 1,050 without a dead pixel in sight.

The machine scored below average in our battery test lasting just one hour 50 minutes using the single lithium-ion battery. With this battery installed and no floppy in the multi-purpose bay, the unit weighs in at 3.5kg, which is no featherweight, but still reasonably light for a fully featured notebook.

The keyboard is excellent with good travel and response to the touch. It's comfortable to type on for long periods and doesn't flex when you're hammering away at the keys. There are also tilt stands on the bottom of the machine to help you set up a good typing position. And, as is usual on Sony laptops, there's a touchpad for navigating your way around Windows.

Overall, the PCG-FX109K is a good, functional desktop replacement, but there's not much to set it apart from the other laptops in its class.

Niall Magennis

"Blinding performance"

PC Advisor, June 2001, AS8400-1000

"Good solid performance in a tried and tested chassis" PCW, May 2001

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AS8400-800

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Intel® 440BX-100

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STANDARD ULTINOTE AS8400 FEATURES

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(support zoom video mode) • ports: fast serial, enhanced
parallel, PS/2 keyboard/mouse, FIR port (4Mbps), TV
out (NTSC/PAL), headphone/speaker out, mic-in, line-in,
line-out, VGA for external monitor, docking for PortBar,
USB • full feature power management, stand-by, suspend-
to-disk and suspend-to-RAM • dimensions: 310mm x
256mm x 35mm, weight: 3kg • Windows® ME (optional
Windows® 2000 Pro) • Microsoft Worksuite® 2001
• McAfee Anti-virus Defence software • carry case • 1 year
collect and return warranty • optional limited international
warranty @ £20+VAT.

LATEST AWARDS

UltiNote AS8400-1000
Personal Computer World
Recommended
May 2001

UltiNote 8400-850F
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UltiNote AS8400-1000
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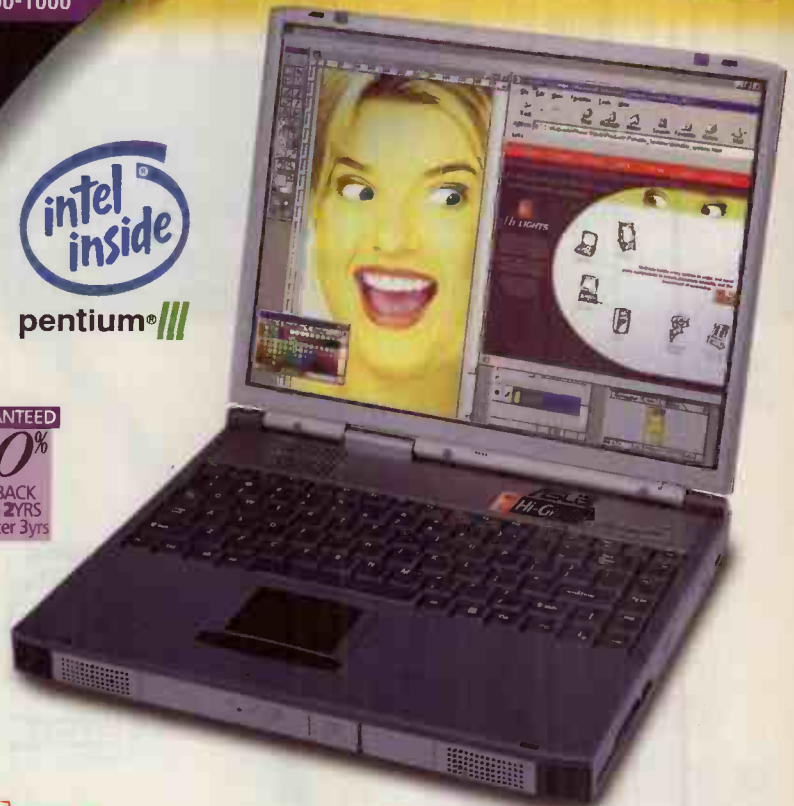
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Computer Shopper, May 2001, A1300

"A stylish notebook packed full of features"

What PC, April 2001, A1300

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"This is a very high value notebook, up with most of the desktop replacement machines costing anything up to £800 more. It's nicely styled and, with DVD-ROM, Ethernet and a 20Gb hard drive built in, it has to be a winner" PC Direct, June 2001, A1300B

LATEST AWARDS

Notino A1300	Notino A1300	Notino A1300
What PC?	Computer Shopper	PC Direct
Best Buy	Best Buy	Direct Hit
April 2001	May 2001	June 2001

Finance options Personal Finance 9 months interest free option. Typical example: Total cash price £1095.00, Deposit Nil. Amount of credit £1095.00. Repayments: Either 8 monthly repayments of £43.95 and one final repayment of £743.40. Total amount repayable £1095.00 INTEREST FREE. Or continue making a further 28 payments of £43.95. Total amount payable £1582.20 APR 28.9%. Credit is available to persons aged 18 or over, subject to status. Written quotations are available on request. **Business Finance** Typical example: Total cash price £2000 + VAT. Deposit £204.80 + VAT followed by 11 quarterly payments of £204.80 + VAT. **Buy back guarantee** Applies to the period for which extended warranty is purchased (see options below), and applies when the new product value is equal to or greater than the original product. The original product must be returned to Hi-Grade in working order. **Warranty options** 2 year World collect & deliver warranty including accidental damage for UK residents £85 + VAT. 3 year World collect & deliver warranty including accidental damage £160 + VAT. **Terms & conditions** Prices valid from 15/05/01. **Delivery charge** for all orders within the UK is £29 + VAT. **Hard drive:** 6b means 1,000,000,000 bytes; total accessible capacity varies depending on operating environment. **Modems:** Maximum data transfer rate is dependant on certain factors including telephone lines, communication software and communication protocol. **LCD screens:** Warranty covers 5 dead pixels or more than 2 pairs of adjacent pixels. **On-site service** is not available in certain areas. Response times may vary in remote or difficult to reach locations. Technician will be despatched if necessary following phone-based troubleshooting with technical support personnel. Hi-Grade and Notino are registered trademarks of Hi-Grade Computers plc. Intel, the Intel Inside Logo and Pentium are registered trademarks and Celeron is a trademarks of Intel Corporation. Windows and Windows ME are registered trademarks of the Microsoft Corporation. Prices and specification may be changed without notice.

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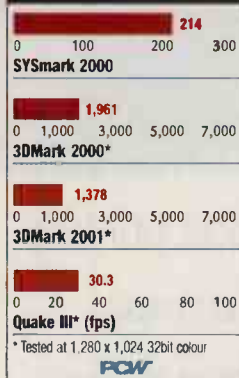
PROS Excellent all-rounder

CONS Star Office may not appeal

OVERALL Great value for a top-notch Athlon DDR machine

SCORE ■■■■■

PERFORMANCE RESULTS



Bargain is the keyword for this DDR PC. For £999 ex VAT not only do you get the latest 1.33GHz Athlon processor from AMD, but also a full 256MB of PC2100 DDR SDRAM. The latter resides on a single DIMM module, leaving one more space on the Asus A7M266 motherboard for another stick of memory. Performance, as you might expect, is excellent, with an overall score of 214 in SYSmark 2000 that stacks up well against this month's PC group test competition.

Lurking in the AGP slot is a 64MB LeadTek WinFast GeForce2 MX SH MAX graphics card based on nVidia's new GeForce2 MX 400 chipset. This offers the same features as the original MX chip (now renamed MX 100). The clock speeds are faster, though – the GPU is clocked at 200MHz and the memory at 166MHz. The 17in LG Flatron 795FT Plus monitor has an excellent crisp display, as well as touch-sensitive OSD controls, and a USB hub with one upstream and four downstream ports.



The uppermost 5.25in bay sports a 12-speed DVD from BTC. If you ever want to copy CDs, or back up data from the spacious 40GB UltraDMA100 Maxtor, a BurnProof 12x 10x 32x Teac CD-RW sits below it.

There's scope for expansion too. One 5.25in and two 3.5in vacant bays wait to be filled, and the motherboard has three empty PCI slots. In addition, if you own a selection of USB-enabled devices at home then the two extra USB ports at the front of the case will come in handy.

The rest of the system consists of a

PCI Diamond SupraSST V.90 modem and a Creative SoundBlaster Live! 1024 sound card offering four-point surround sound through the Cambridge Soundworks speakers.

It's not often we see a system that can boast excellent value for money, but this PC certainly comes into that category. Windows Millennium and Sun's Star Office are bundled. Although Star Office is free to download, it is actually quite a good package, making this a powerful and able DDR system for those on tighter budgets.

Jalal Werfalli

VideoLogic

Kyro II graphics card

The Vivid! XS enters the fast 3D rendering arena

DETAILS

PRICE £99.88 (£85 ex VAT)

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01923 260 511

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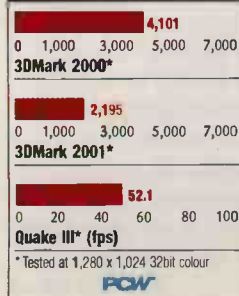
PROS Price/performance ratio

CONS No T&L

OVERALL Those on a tight budget will get a capable card

SCORE ■■■■■

PERFORMANCE RESULTS



Last issue we took a look at the 3D Prophet 4500 from Hercules, the first in a small range of new cards based on the Kyro II chip from ST Microelectronics. Hercules isn't the only board maker with the chip, however – VideoLogic also has a Kyro II product, the Vivid! XS. The Kyro II chip uses a technique called tile-based rendering to process 3D scenes quickly. This works out what will be visible when the 3D scene is drawn, and doesn't bother rendering the parts that will be invisible.

There are three main differences between this and the Hercules 3D Prophet 4500. The Vivid! XS only has 32MB of memory, compared to the 64MB in the Hercules. This doesn't appear to have had much of an impact on performance, however. The card doesn't look as impressive as the 3D Prophet 4500, as it is based on a



standard green PCB and it doesn't have a fan on the heatsink. This is not a problem, as the Vivid! XS only gets warm to the touch, but somehow this makes it look slightly less impressive. On the other hand, VideoLogic has fitted the Vivid! XS with an S-Video out connector so you can plug it in to appropriate TVs should you feel the need.

Overall, the Vivid! XS is only 192 3DMark 2001 points slower than the

3D Prophet 4500 at 1,280 x 1,024 resolution in 32bit colour. It is the same story in 3DMark 2000, where the Vivid! XS manages 4,101 3DMarks, compared to 4,135 3DMarks for the 3D Prophet 4500. In Quake III the Vivid! XS is slightly faster than the 3D Prophet 4500, managing 52.1fps compared to the latter's 51.3fps. Ultimately, the Vivid! XS is an excellent product at a low price.

Lars-Goran Nilsson



Brother & Xerox Multifunction printers

DETAILS

BROTHER MFC-860

PRICE £680 (£579 ex VAT)

CONTACT Brother
0845 60 60 626

www.brother.co.uk

PROS PC-independent faxing; larger print and fax/copier/scanner feed tray capacities than the Xerox

CONS General print quality could be better; scan quality needs improvement

SCORE ■■■■

XEROX WORKCENTRE M950

PRICE £352.48 (£299.99 ex VAT)

CONTACT Xerox 0800 787 787
www.xerox.com

PROS Excellent overall print quality; fairly fast photo-quality printing

CONS Price per page is a little high; only 150-sheet capacity for printer feed tray

SCORE ■■■■

OVERALL Both the Brother and the Xerox are impressive demonstrations of how much can be squeezed into a box about the size of an old LaserJet 4, but despite having several worthwhile features, such as integrated faxing and higher feed tray capacities, the Xerox's winning combination of output quality and surprisingly low price give it the edge

The MFC-860 from Brother and Xerox' WorkCentre M950 go head to head

The Xerox WorkCentre and the Brother MultiFunction Centre (MFC) are aimed at the SoHo market where there is most need for compact combination devices that put printer, copier, scanner and fax functionality in the same box. Both machines offer broadly similar features, but the Xerox is cheaper at £299.99 ex VAT compared to £579 ex VAT for the Brother.

You do get more features on the MFC, but it's debatable whether they will justify the price difference. Probably the most useful advantage the MFC has over the Xerox is its fully integrated fax function, which operates independently of a host PC, and offers up to 8MB of onboard storage for unprinted incoming faxes. The ability to send and receive faxes without switching on a PC is a plus, but not a decisive advantage on its own.

The other thing the Brother can do which the Xerox cannot is print stills or capture video frames from digital cameras or camcorders. There are slots for Compact Flash and SmartMedia cards so no host PC is necessary. This is fine as far as it goes, but you may get better results after a little polishing with some picture-editing software on a PC.

The two printers follow a similar design, with a hinged lid containing a document feeder, which closes over the glass platen for flatbed scanning,

copying and faxing. The Brother's feeder holds up to 50 pages while the Xerox's can only take 20.

In both cases the scanner element offers the usual basic 24bit colour, 600dpi (dots per inch) (unenhanced) resolution, but there was no doubt in our tests that the Xerox had the edge in terms of clarity of text reproduction, and it captured colour, contrast and detail in scanned photos better than the Brother. Unsurprisingly, this was also evident in the quality of photocopying, especially colour copies, which the Xerox managed creditably.

The platen/document feeder assembly hinges up to reveal the innards of the printer, so changing cartridges is easy. The Brother uses Piezo crystal technology to propel the ink droplets out of the nozzles, while the Xerox relies on the normal thermal approach. Both offer 1,200dpi resolution and individual cyan, magenta, yellow and black cartridges.

If you stick to the manufacturers' prices and figures for number of pages printed at five per cent coverage, the Brother averages a cost of 1.6p a page black ink only and 1.9p a page in CMY. The Xerox costs 2.5p a page in CMY and 3.9p or 3p a page in black, depending on whether you buy the standard or the high-capacity black cartridge.

The Brother was also faster for text-intensive printing, averaging a respectable 4.5 pages per minute (ppm) in our tests, while the Xerox clocked up 3.6ppm. This was reversed when we switched to high-quality colour photo printing, when the Xerox output a page in five minutes compared to the Brother's seven minutes.

Quality is arguably the most important factor, and here the Xerox was the clear leader, with much crisper plain text, even on cheap laser paper, and visibly superior fine detail and colour reproduction for business graphics and particularly for photos.

One other factor that might make a difference is that Xerox offers a network adaptor option, whereas Brother does not. There were things that we liked better about the Xerox, such as its software control and utilities suite, which we found slightly more intuitive than the Brother's, but the Brother scored for having a bigger main feed tray (as well as its top feeder), offering 250 sheets to the Xerox's 150.

On balance we'd go for the Xerox, which is both affordable and capable of excellent output quality for its price. If PC-independent faxing is a must, the money you save by opting for the Xerox should cover a standalone fax machine.

Dominic Bucknall

"Blistering turn of speed"

PC Advisor, June 2001, S8200-850

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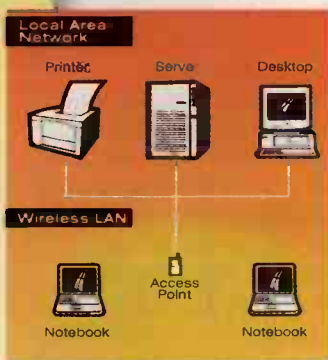
STANDARD NOTINO S8200 FEATURES

Li-Ion 6 cells 31.4Wh smart battery (1.5-2hrs) • two PC-Cards slots (supports Zoomed video mode) • ports: VGA for external monitor, 2 USB ports, Infrared, Speaker out, Mic, AiBox connector • dimensions: 296x230x26mm • weight: 1.8Kg • Windows ME (Optional Windows 2000 Pro) • Microsoft Worksuite® 2001 • McAfee Anti-virus Defence software • carry case • 1 year collect & deliver warranty, optional limited International warranty @ £20 + VAT

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MONTHS
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"This 850MHz system is a great buy. You'll have no problem carrying around this slim device, wherever you go. The 1024 x 768 screen makes good use of the full 12.1in. This machine truly falls into the ultraportable category, weighing a paltry 1.7kg." PC Direct, May 2001, S8200-850.

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The detachable Springboard slot provides easy access to hardware and software add-on modules



The Visor Edge measures a slimline 11mm in depth

Handspring Visor Edge

This slender handheld organiser boasts an all-new Springboard slot

Handspring has been putting Palm under serious pressure in the budget handheld arena with its cheap but innovative Visor range, which runs Palm's OS. In fact, it was this pressure that forced Palm into releasing its low-cost M100 range. However, there's been nothing to really challenge Palm's super-slim Vx model, but that's all about to change with the launch of the Handspring Visor Edge. The Edge is being pitched directly against Palm's flagship product, but also offers some of the distinctive features that made the early Visor models so popular.

The Visor is definitely a lot slimmer and lighter than Handspring's previous offerings, but at 119 x 79 x 11mm (h x w x d) it's ever so slightly larger than the Palm Vx and just under an ounce heavier, although you wouldn't really notice it when holding it in your hand.

Where the two do differ is in looks. Whereas the Palm has smooth curves and an expensive looking metallic finish, the Edge is more angular, with a drab metallic grey casing. There is an option of a more eye-catching blue casing and a red cover for those who buy from Handspring's UK website, but the Palm is still more of a looker.

However, the Visor does use the latest 33MHz version of the Dragonball

VZ processor that is faster than any of Palm's current devices. Unfortunately, while the Edge uses the latest Palm OS, V3.5.2H2.0, Palm is soon to release V4.0. As the Edge doesn't have any Flash memory, you won't be able to upgrade to the new OS.

What's really special about Handspring products is the Springboard expansion slot. The slot featured on earlier Visor products is too large for the Edge's slim form factor, so this time Handspring has supplied the Springboard slot as an add-on module that slides into a smaller connector on the top of the device. When connected, it is rather inelegant. Nevertheless, if you already own Visor add-on modules, you'll be able to use them.

In most other respects the Edge matches or surpasses the Palm Vx. It's got 8MB of RAM for data storage and 2MB of ROM to house the usual array of Palm applications, some of which have been enhanced slightly by Handspring. The backlit black and white screen has the same resolution as the Vx at 160 x 160 pixels with 16 shades of grey. You'll find an infra-red port on the left-hand side, and the Visor also comes supplied with a USB docking bay.

There are a couple of niggles that slightly spoil the experience. The stylus

resembles an 18th Century medical instrument rather than something you would actually want to use with a pen-driven device. Also, rather than having it slot into the side of the case, it sits on an external clip on the right-hand side of the PDA. This means that it can't be replaced with another third-party stylus.

We weren't particularly keen on the metal protective flip cover, either. Bizarrely, Handspring has chosen to make the hinge out of plastic, which feels very flimsy for something that is going to have to endure a lot of wear and tear. Also, the cover doesn't fold all the way back, but instead sits at an angle to the rear of the unit. When closed, it obscures the view of the LED, which is used for silent alarms.

When judged against the other handhelds currently available, the Edge is a winner. However, Palm's M500, which will have a similar feature set and price to the Edge, is just around the corner. Unless you already have add-ons for a Visor, our advice would be to wait and compare the two when the Palm M500 arrives. Overall, the Edge feels much more like a 'me-too' product and lacks the ground-breaking innovation that was the calling card of the previous Visor models.

Niall Magennis

DETAILS

PRICE £329 (£280 ex VAT)

CONTACT Handspring

020 7309 0134

www.handspring.co.uk

PROS Slim; expandable; uses latest OS; built-in rechargeable battery; connects via USB

CONS Not as attractive as the Palm Vx; can't upgrade OS; bulky Springboard add-on

OVERALL If this product had been released a year ago it may have been more exciting, but with the Palm M500 on the way, it's now a lot less appealing. Nevertheless, it may be a sensible upgrade for Visor owners who have already invested in some add-on modules

SCORE ■■■■■

**EXCLUSIVE**

Nintendo Game Boy Advance

We had a sneak preview of a Japanese import and were mightily impressed

Anyone who has even a passing interest in video games will be aware of the Japanese giant Nintendo. The company has been at the forefront of the video game industry for a long time and pretty much owns the handheld gaming market with its Game Boy products.

The Game Boy has been around for over 10 years and has gone through a few changes. It started life as a rather large, monochrome device that needed four AA batteries to get it going. It was then shrunk down into what was called the Game Boy Pocket, drawing its juice from two AAA batteries. Finally, it evolved into the Game Boy Color, which, as its name suggests, is a colour version of the Game Boy Pocket.

Now, however, Nintendo is finally putting the original Game Boy out to pasture, and replacing it with the Game Boy Advance (GBA). This represents a complete redesign from Nintendo. Previous Game Boy units had a vertical orientation with all the controls located below the screen. The Advance is horizontally orientated with the controls on either side of the screen. To the left of the screen is the eight-way digital direction pad along with the Start and Select buttons. To the right of the screen are the A and B buttons, power light and mono speaker. Left and right

shoulder buttons sit at the top of the unit, and at the bottom you'll find the on/off switch, headphone socket and volume control.

Even though the exterior styling is impressive, it's the technical specification that's really important. At the centre of the GBA is a 32bit RISC CPU running at 16MHz. There's 32KB of on-die memory along with 96KB of VRAM and a further 256KB of WRAM.

After the processing power, the next most important thing is the screen and this is where the GBA scores big points. The screen measures 62 x 41mm and sports a resolution of 240 x 160 pixels. There is no backlight to the screen so you'll need an external light source to see it. The image produced by the display is excellent and you can use it in most lighting conditions.

The GBA's graphics are incredible for a handheld device, rivalling what you would have expected from a home console a few years ago. Although it has no true 3D acceleration, the Advance does support the rotation and scaling effects that were pioneered by the 16bit Super Nintendo console.

The built-in mono speaker produces reasonable sound, but you need to use headphones to get the full aural effect. The stereo sound and music help to immerse you in the gaming action.

The game cartridges slip into a slot at the rear and are about half the size of previous Game Boy packs. The Advance is also completely backward-compatible with original Game Boy games, so you'll still be able to play all your favourites. Unfortunately, these games protrude from the top of the unit spoiling the aesthetics slightly. Because the original Game Boy had a smaller screen, the older games don't fill the GBA's screen by default, although a press of the left shoulder button will expand the image to fill the screen. Sometimes the expansion looks fine, but at other times it looks stretched.

Located above the screen is the link cable port. On the original Game Boy this enabled two people to link their machines to play together as long as both units had the game cartridge inserted. Things have improved considerably and now up to four machines can be connected together. But what's really impressive is that with some games, only one machine has to have the cartridge installed.

So, has the handheld market caught up with the home console arena? Well not quite. There's still a pretty wide gap between them, but on the whole the Game Boy Advance gives mobile gaming a welcome new lease of life.

Riyad Emeran



The new cartridges are half the size of the old ones

DETAILS

PRICE Approximately £150 for Japanese import

CONTACT The Computer Exchange 020 7636 2666
www.cex.co.uk

PROS Superb portable gaming device; great design; compatible with old games

CONS A bit expensive on import, may be worth waiting for official release in the summer

OVERALL Even though it's only available on Japanese import the GBA is already selling well and it will play the UK games when it's officially released. Some of the release titles are disappointing, but once Mario Kart and Zelda hit the streets the GBA will be an essential purchase for any video game fan

SCORE ★★★★★

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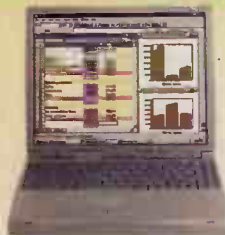
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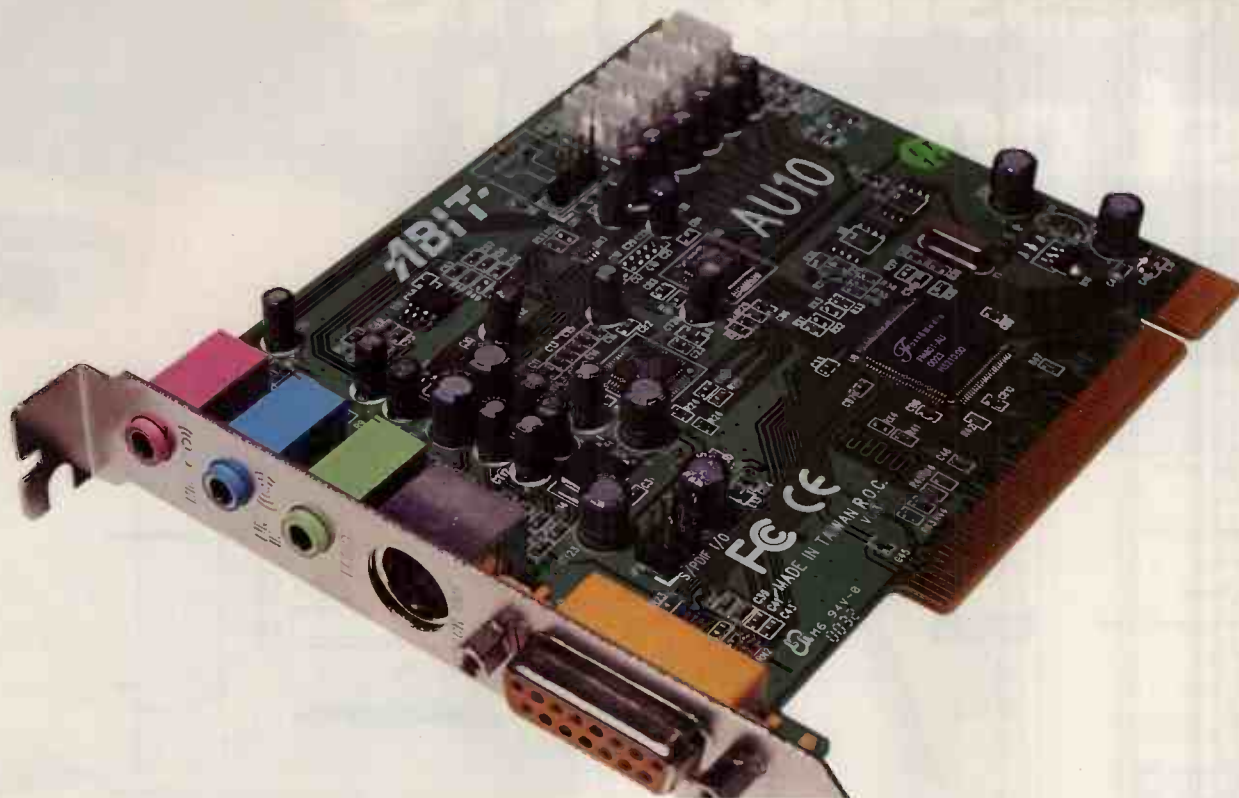
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Abit Dolby Digital sound card

If you want full Dolby Digital audio on your PC, the Arcadia AU10 is worth a look

While best known for its increasingly lauded motherboard range, Abit has other strings to its corporate bow, including speaker systems and sound cards. The Arcadia AU10 is an audio card aimed squarely at users wishing to use their PC as a DVD player with full Dolby Digital credentials.

The chipset that powers Arcadia is the ForteMedia FM801. It's a deceptively small chip, offering accelerated 3D audio features for gamers using QSound's Q3D 2.0 engine and full 5.1 audio support – there are six line outs, for front right and left, rear right and left, centre and sub-woofer output. This is primarily of interest to home cinema enthusiasts with appropriate 5.1 amplified speaker setups, though a number of other configurations are viable. Crucially, Abit bundles InterVideo's WinDVD 2000 (version 2.2), a software DVD player that includes full Dolby Digital 5.1 decoding in software. Without this the six-channel output would be of little use.

The physical bundle consists of the sound card itself, a short breakout cable for additional audio connections and an infra-red sensor unit paired with a rather dinky remote control. Abit has taken steps to remove the last real drawback of computer-based DVD –

the lack of control while stretched out on your sofa. The sensor connects to the PS/2 keyboard port on your PC, with a pass-through connection for your keyboard. The remote simply sends key presses to WinDVD.

Audio connections use stereo mini-jacks. The card spine carries the main front stereo output, along with a line level stereo input and mono microphone input for recording. The breakout cable splits out to three mini-jacks: one duplicating the front output, a second carrying the rear stereo output and a third carrying the mono centre and sub-woofer channels. Internally, the card has inputs for the analog audio stream from a CD or DVD-ROM drive, plus connections for 'Video', 'AUX' and 'TAD' (for a modem).

Installation is painless. The card was tested under Win98 SE with no problems whatsoever, allocating resources happily in a PC stuffed with other peripherals. WDM drivers are available for Windows 2000 users.

Sound quality is generally good, especially in conjunction with WinDVD. The Arcadia diverts all low-frequency sounds from the main four channels' output from WinDVD (front and rear) to the sub-woofer channel, producing a far better bass response than many other 5.1 sound cards.

Gaming performance is more of a mixed bag. In benchmarking, the card's performance comes close to the SoundBlaster Live!, requiring little CPU overhead running games with high audio demands. However, the QSound engine only supports EAX 1.0 (Environmental Audio eXtensions), with no sign of EAX 2.0 support in the pipeline. Additionally, the EAX reverb algorithms used by QSound sound less realistic than those provided by the SoundBlaster Live!.

On the MIDI (Musical Instrument Digital Interface) side, the FM801 chipset is extremely poor out of the box, offering only an FM (Frequency Modulation) synthesis engine that went out with the ark. Fortunately, Abit has bundled a licensed copy of Yamaha's S-YXG50 software WaveTable synthesiser. This has support for the extended MIDI specification known as XG, allowing richer tonality to be drawn from otherwise standard sounds. However, Arcadia is no musician's card by any stretch of the imagination.

Overall, Arcadia is the ideal 5.1 solution for soft DVD users. The asking price is little more than the DVD software itself, and as such is a relative bargain when twinned with the right speaker set.

David Nathan

DETAILS

PRICE £43.48 (£37 ex VAT)

CONTACT Abit 01438 228 888

www.abit.nl

PROS Excellent 5.1 bass response; remote control for DVD; great value

CONS Game performance slightly below par; poor music credentials

OVERALL For users looking to upgrade to soft DVD with Dolby Digital decoding, the Arcadia is an ideal solution, provided gaming performance is not vital. The software works well and the bundled remote control is worth its weight in gold. A good product at an excellent price

SCORE ■■■■

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PC Direct, May 2001, Ultis PV4 1300

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EXCLUSIVE

InFocus Micro projector

The LP130 DLP projector is lightweight, beautifully designed and easy to set up

The InFocus LP130 is one of a new breed of DLP micro projectors that manage to provide most of the benefits of their larger predecessors without the bulk. DLP is a competing technology to LCD. Developed by Texas Instruments, the consensus is that it provides superior image quality for video display, but lacks the clarity of LCD for data presentations.

According to an IDC report, the market for projectors is set to triple over the next three years and what's driving this growth is the demand for lightweight portables. If you spend a lot of time lugging presentation equipment from venue to venue, a lighter projector can be a welcome relief.

The LP130 is small, light, quiet and beautifully designed. Simplicity is what the InFocus engineers have aimed for and they've succeeded. There are very few inputs on the back panel which makes setup very straightforward. The M1DA connector can be hooked up to a digital or RGB analog output. An analog cable with an integrated USB cable is supplied, allowing you to use the remote for limited mouse functions.

The only other connector is a video-out port, which can be used with the composite and S-Video cables supplied to connect a VCR, DVD or HDTV source. So it really is simply a question of

plugging in the power and data cables and switching on. The LP130 auto senses the input signal and automatically adjusts to it.

The LP130 has a manual zoom lens with a 1.2x zoom, which means that at a distance of 5ft the image is between three and three-and-a-half feet diagonally. At this distance the picture is bright enough to be viewed in a well-lit room. The quoted output is 1,100 ANSI lumens, which is about as high as it gets, and the lamp life is 2,000 hours. Both figures are higher than the norm for projectors in this category.

Because the LP130 is so small, you can put it just about anywhere, though the usual setup tends to be a meeting room table. Unlike some projectors, the exhaust fan is at the front, so the audience won't be subjected to a continuous blast of hot air.

Digital keystone adjustment is also very easy and provides a wide degree of latitude – we were able to produce a square image with the projector tilted at an angle of almost 45 degrees. An extendable foot at the front tilts the projector upwards to a maximum angle of about 25 degrees, providing a clear view for a seated audience. There's no way of raising the back, however, so if the projector is on a stand you need to stick a CD jewel case under its rear end to angle the picture downward.

Picture quality was excellent when viewing data and just as good as the LP350, which we reviewed in January, though text was a little heavy, even at the native XGA 1,024 x 768 resolution.

Watching DVDs on the LP130 is a delight with rich saturated colours and excellent contrast, despite the 400:1 contrast rating which, on paper at least, is below that offered by competing DLP projectors.

The only problem we experienced with the InFocus was, ironically enough, the focus which was incorrectly calibrated. The quoted projector to screen range is 5-30ft, giving a minimum picture size of just under three feet and a maximum of nearly 22ft, using the zoom lens. We found it impossible, however, to produce a sharp image beyond 12ft – the focus ring having reached the limit of its movement.

In terms of features the LP130 has got it where it counts. Portability, zoom lens, 1,100 ANSI lumens light output, easy setup and simple uncluttered design. It's a shame about the price, which will gain it no converts from LCD users who will pay half the £4,475 InFocus is asking for the LP130. For those with the cash, however, it really is the lightest projector on the market at the moment.

Ken McMahon

DETAILS

PRICE £5,258.13
(£4,475 ex VAT)

CONTACT InFocus
0800 028 6470
www.infocus.com

PROS Very compact and light; 1,100 ANSI Lumen output; superb video reproduction; easy to set up

CONS Expensive; no rear adjustable feet; miscalibrated focus ring

OVERALL Small, lightweight and elegant, cool, quiet and easy to set up, the LP130 is an ideal projector for presenters on the move. But at the price, the NEC LT150, which can run presentations from a Compact Flash card, looks a better bet, even though it has no zoom

SCORE ■■■■■



NEC Ultra-portable projector

Compact and cool, the MultiSync LT150 uses DLP technology for a brighter image

NEC's MultiSync LT150 is the latest in a new breed of lightweight projectors to use Texas Instruments' DLP technology in place of an LCD to produce a clearer, brighter image. The LT150 is tiny – the size of a large textbook – and weighs only 1.5kg. It has a native resolution of 1,024 x 768, but makes a good effort at other resolutions up to 1,600 x 1,200 using NEC's AccuBlend technology.

There's no zoom lens, which is a bit of a disappointment, but the projector is so small it can be positioned more or less anywhere and, at a distance of 2m from the screen, the image size is more than 1.2m across – large enough for a presentation to a small group.

Installation and setup is quick. All the connectors are at the rear including RGB, S-Video, composite video, USB mouse port and a mini DIN 8pin PC control port. With an optional cable, you can use the port to control the projector from your PC. A Type II Compact Flash (CF) slot takes CF cards for standalone presentations without a PC connected.

The air ducts are on the left side of the projector. The fan is fairly quiet and the exhaust is a warm waft, rather than a hot gust.

The card-style remote control offers fairly limited options. In addition to the

power, menu, source and auto adjust functions that can be accessed from the projector, there's a software pointer, help button, picture mute and magnify buttons that zoom in on the centre of the screen or the pointer location. For most occasions this is all you're likely to need, but an optional presentation remote has dedicated buttons for the PC Card functions.

Although you can't connect PC Cards – only CF cards in an adaptor – this is one of the LT150's most useful features. You can store a presentation on the card and replay it automatically, or use the remote to advance slides without a PC connected. This means you only have to carry one bag.

As the PC software wasn't provided we were unable to test it, but it appears to work by converting PowerPoint files to jpegs.

The LT150's picture quality is among the best we've seen from a mini-DLP projector. At 800 ansi lumens the 130w lamp provides the same level of illumination as other mini-DLP models including the Philips UGO X-Lite reviewed in the February 2001 issue.

The two projectors use the same Plus light engine, but the NEC projector's picture quality is markedly superior. Every pixel is pin sharp and rock solid from the centre right into the corners,

and colours are sharp and reasonably well saturated. The contrast is a little flat and shadow detail is quite poorly resolved, though this is a criticism you could make of any DLP projector. In general use for text display the LT150 provides one of the crispest most readable images you're likely to find.

The LT150 also does well with video images. NEC puts this down to its proprietary Vortex technology that involves improved gamma correction, and low-level detail enhancement to improve shadow detail and produce more intense blacks. While there was little evidence of this when we viewed the DisplayMate test screens, the LT150 turned in an excellent performance playing DVDs in a darkened room with a screen to projector distance of more than 6m.

For anyone who spends a lot of time on the road, the LT150 is a godsend. Being able to leave your PC behind and travel, set up and present with just the projector makes the whole process much simpler, and knocks a couple of kilos off the baggage tally. Its compact size and cool running also make it a good choice where space is limited or for impromptu demonstrations in the classroom, IT suite, or as part of a home theatre system.

Ken McMahon

DETAILS

PRICE £4,811.62

(£4,095 ex VAT)

CONTACT NEC 0645 404 020

www.nec.co.uk

PROS Small; light; cool; superb image quality

CONS No zoom; limited remote functions

OVERALL This is one of the best portable projectors we've seen. The compromises – no zoom and limited remote features – can be lived with. In every other respect – size, weight, noise level, portability, image quality and ease of use – it delivers

SCORE ■■■■■

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"A master of all trades at a remarkable price" Computer Buyer, March 2001, D850

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"This month, Atlas has achieved the highest WorldBench 2000 score ever seen in the Test Centre and has stolen the number one spot. The Meridian A1330 PVM delivered a whopping 209, placing it 17 points ahead of the competition" PC Advisor, May 2001, A1330

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"Atlas has opted for a different route...instead of investing its entire budget in a performance-enhancing processor, such as the Athlon, it has instead chosen AMD's budget option - the Duron - and built an all-round, good-quality PC." PC Advisor, May 2001, D850



Atlas



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Intel MP3 player

The Pocket Concert sounds as good as it looks

EXCLUSIVE

DETAILS

PRICE UK price TBA

CONTACT Intel 01793 403 000

www.intel.com/home/audio/

PROS Great design; simple to use; loads of memory; FM radio

CONS UK cost unknown; tacky plastic headphone strap

OVERALL The Pocket Concert is easy to use, looks good and has a large amount of memory. The UK price is an unknown quantity, but if it can hit the right price point Intel will be on to a winner

SCORE ■■■■

Intel's Pocket Concert is a fine match of form and function: smaller than a cigarette packet, loud enough to irritate fellow passengers, and with an FM radio for variety, it surpasses most of the competition.

Unlike many it isn't scarred by button blight. The front panel sports play/pause, forward and reverse buttons, plus a small display for track lists, titles and settings. The remaining controls are discreetly positioned around the rim along with a USB port for transferring music from a computer into the 128MB of Flash memory – twice as much as most MP3 players.

You can pack in two hours of 128Kbits/sec quality MP3 or four hours of 64Kbits/sec Windows Media Audio. Intel includes an Audio Manager for piping music into the player, and MusicMatch Jukebox Plus. They're Windows versions but free Mac and Linux versions of MusicMatch Basic are available. Our standard PCW tests posed no problems for the Pocket



Concert. It played all the tunes including WMA and variable bit rate examples; file transfer times were not the quickest but were in the top 10.

Intel claims up to 10 hours of continuous digital audio play or 16 hours of FM radio. We managed seven hours on a new set of alkaline AAAs. The player accepts rechargeables but they're only supplied when you stump up for the accessory pack with charger dock, through which the player can also be connected to speakers or an

amplifier. The Pocket Concert is 97 x 62 x 24mm in size and weighs 97g without batteries. It's on sale in the US now at \$299 (£199) for the player and \$50 for the accessory pack. The UK version is due at the end of the year.

The Pocket Concert is an ergonomic and aesthetic delight. You can't upgrade the memory but it has twice as much as most. The main problem is price. In dollars it looks good against rivals, but around £100 all-in would be perfect.

Terence Green

Bush Internet TV

Take a surf with this 28in widescreen telly

We last looked at Bush's Internet TV in September (p85). The original Internet TV was a 14in portable and we were impressed with its extra functionality. Bush has shown its commitment to the idea of an Internet TV by releasing 21in, 28in and 28in widescreen versions. We couldn't resist having a look at the latter.

The TV has the same browser and remote control as its 14in cousin. You can use it to access a fairly broad range of websites, although there are limitations. You can't, for example, look at Shockwave or Flash movies, or play MP3 files. There's no way to upgrade the browser, so if you need to download a plug-in to view a site, forget it.

Pages that have been optimised for a TV screen's resolution look best. Bush has developed its own portal for this purpose. The BBC also has a low-graphics version of its new site, both of which look much better on the 28in screen than on the 14in. The browser supports SSL, so you can shop online



knowing that your credit card details will be secure. You can also use the TV for email – the foot-long remote control also contains a keyboard.

As a budget widescreen TV, it is fairly good. The picture isn't up to pricier alternatives, but will be of sufficient quality for most. Two SCART sockets are at the rear and two sets of integrated speakers provide stereo sound.

Bush doesn't think that people will be abandoning their PCs in favour of its Internet tellys – it sees the products as

complementary. The company is trying to position its TVs in the same price bracket as comparable budget TVs – the theory being that if you see two similar TVs but one has net capability, you'll opt for the Internet. It seems like a sound plan to us. If you're looking for a widescreen TV, then you might as well buy one that can offer casual surfing facilities. You'll even be able to send a few emails and buy the odd pizza without leaving your chair.

Jason Jenkins

DETAILS

PRICE £499 (£424.86 ex VAT)

CONTACT Bush 01923 859 777

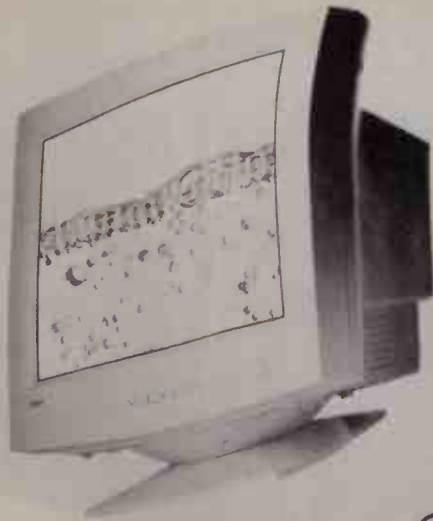
www.bush-internet.co.uk

PROS Easy to use; good budget TV

CONS Large remote; some web pages won't work

OVERALL If you're in the market for a new TV, why not get one with Internet access as well?

SCORE ■■■■



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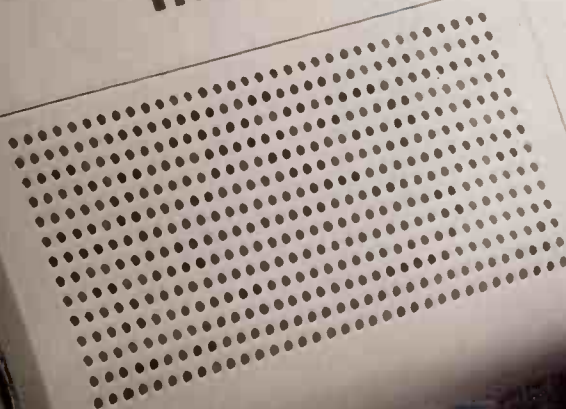
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700F
TFT

The 700F from Hansol is something of a rarity, combining fabulous image quality, stylish design and great sound. The 17" viewable screen area and resolution of 1280 x 1024 give a bright, sharp, panoramic viewing area and being a TFT you finally

get to reclaim that vital desk space. With integrated stereo speakers, the 700F really is worth a listen. Complete with ultra low emissions and power consumption and a long list of safety standards the Hansol 700F is as practical as it is desirable.

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Wireless camera

BabyCam helps you keep a watchful eye

DETAILS

PRICE £139.99

(£119.14 ex VAT)

CONTACT Traxdata

01494 571 010

www.traxdata.com

PROS Easy to set up

CONS Slight image quality degradation; no webcam-like drivers

OVERALL It doesn't look as good in real life as it does in photos, but the BabyCam is still a very desirable product. It's a refreshing twist on the now rather bland webcam, even if that wasn't what its designers had in mind

SCORE ■■■■■

There are some places a USB cable just won't reach, and in this case it's from one end of a flat to the other, which means some parts of your abode are most likely off limits to your webcam. Clearly the only solution is a wireless camera, but while X10 has been doing a healthy trade in such things on the other side of the Atlantic, few of its European resellers seem to be carrying that particular product line.

Now, there's an alternative. Traxvision is a brand of the better-known Traxdata, and its new wireless BabyCam looks not unlike a model of a baddy's submarine from the Bond films. Unfortunately, it is rather plastic, but the images it produces are first class and put your average webcam to shame.

A short aerial, about as thick and wide as a lolly stick, screws into the back of the mains- or battery-

operated BabyCam, and a small blue tripod lets you get just the angle you need. The camera uses the 2.4-2.48GHz band – the same area as Bluetooth, DECT and HomeRF – to transmit pictures and sound up to 45m (150ft) to a mains-powered receiver. The remote receiver, which plugs into a composite video port on your TV or graphics card, can handle four cameras and either focus all its attention on one, or cycle between the four in turn. Extra cameras can be bought as separate items.

In our tests, conducted in a flat, the

image quality degraded a little when the units were not in the same room, and when they were two rooms apart the picture showed slight interference. Still, if you wanted to shrink the image down from TV size to the webcam norm of 320 x 240 and upload the output to a website, you'd hardly ever notice.

Of course, it's designed for keeping an eye on baby while you're in another room, but it seems a shame to devote such a cool piece of kit to watching over someone who won't appreciate it.

Nik Rawlinson



Amax MP3 CD player

Introducing the versatile, affordable Napa DAV310

DETAILS

PRICE £99 (£84.26 ex VAT)

CONTACT Renaissance

Computer Company

01323 849 995

www.amaxhk.com

PROS Supports MP3 tracks stored on CD-RW and CD-R; video out display; remote control

CONS Buttons don't always work first time; erratic anti-shock; audible click when first starts playing audio CDs

OVERALL Build quality leaves a bit to be desired, but if you want something that's cheap and works relatively well then this is the unit for you

SCORE ■■■■■

We've previously reviewed MP3 CD players in PCW but generally found that they were a touch bulky and ridiculously overpriced. The Napa caught our eye not just because it's affordable, but also because it can play MP3 files stored on CD-RWs as well as the usual CD-Rs. On top of this, it also plays Video CDs.

Open the box and the first thing that you'll notice is the garish orange and white colour scheme. It's certainly not to our taste and the plastic casing feels a bit flimsy to the touch.

When playing a standard audio CD the Napa sounds quite pleasing to the ear, although we did notice a slight amount of hiss at lower volume levels. There's also an audible click as it starts playback of an audio CD.

The player has a 512KB buffer for the anti-shock that translates into 10 seconds for standard audio CDs and 30 seconds when playing MP3 CDs. Unfortunately, the anti-shock mode is a touch erratic. Sometimes it works



extremely well and stands up to a good rattling, but at other times it just skips to the next track.

In MP3 mode, the Napa had no problems with any of the files we tried playing. It doesn't support constant bit-rate files encoded at less than 96Kbits/sec, but this isn't really an issue. However, the Napa does suffer from the same problems as many other MP3 CD players in that it's tricky to navigate the different directories on a CD due to the lack of text display.

In the box you also get a car adaptor kit and phono leads to connect to a hi-fi or TV, plus a credit card-sized remote control, which is handy if you've got the Napa hooked up to your stereo system.

The Napa is certainly an interestingly, quirky device. It's a touch fragile, and the colour scheme may not appeal to everyone, but at this price and with these features we can't help feeling the Napa is a bit of a bargain.

Niall Magennis

HP Deskjet printer

The 980Cxi is ideal for the smaller office setup

The appearance of an HP printer has changed very little over the years – each simply runs a bit faster or boasts extra functions. To all intents and purposes, though, this is a cut-down 990Cxi (reviewed in November 2000), so you might think it's a bit of a backwards step.

HP claims the 980 can push out 15 mono pages per minute (ppm), dropping to 12 if you're using colour. Quality settings are draft, best and normal, so we opted for the latter and sent 50 text pages out to photocopy paper. The job completed in 14 minutes 29 seconds, which equates to just 3.45ppm. Quality was fair, but there was slight feathering in places. We only managed to up the output to 10ppm by dropping to five per cent coverage, opting for draft mode and ignoring the spool time.

Rendering of our standard test photo was near perfect on HP Photo Paper. Colours, in particular those difficult to print skin tones, were well reproduced.



Graduated blends from one shade to another were smooth, and sharp edges were clearly defined. It was quick, too, dropping the page into the output tray after four minutes 44 seconds.

The input tray can handle 150 sheets of office paper, and an extendable lip on the output tray catches the finished product if you're using draft mode. Duplexing is automatic, so you don't have to work out how to restack your pages. Automatic paper sensing passes an optical sensor over the page before printing and tweaks the driver as

appropriate. This is also used to align the print head when you install a new cartridge.

In terms of finishing touches, an indicator on the Windows task bar warns you when you're running low on ink, as does an LED on the unit itself. Self-diagnosis means that when you lift the lid the head will now align itself with one of five markers inside the body to indicate where problems might lie.

All in all, it's a smart package for the more straightforward small-office user.

Nik Rawlinson

DETAILS

PRICE £229 (£194.89 ex VAT)

CONTACT HP 08705 47 47 47

www.hp.co.uk

PROS Quiet; self-diagnosis; good paper handling

CONS Slight feathering on photocopy paper; HP's speed claims are a little optimistic

OVERALL Not a ground-breaking product, but the sensible next step in an evolving product line. Output is generally above

average, but if you want more features opt for the 990Cxi, with its front-mounted infra-red port

SCORE ■■■■■

Abit Socket A motherboard

The KT7A-RAID is the best buy for SDRAM users

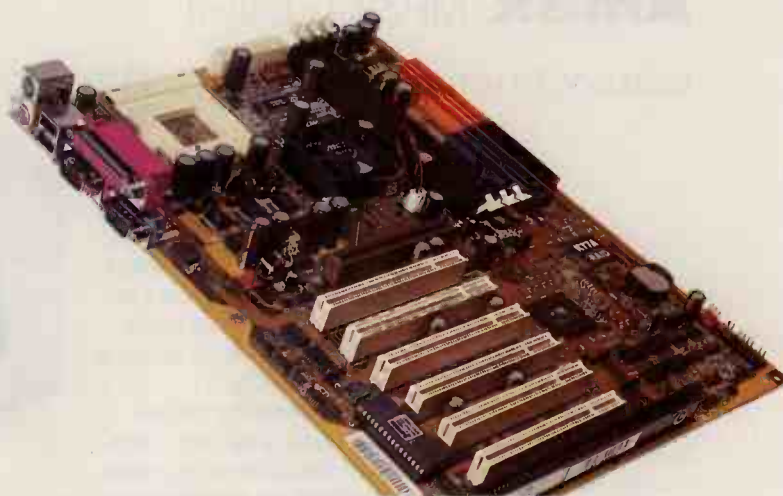


Abit's KT7A-RAID is an updated version of the KT7-RAID, that's been our *Best Buy* motherboard for AMD CPUs since last December. As before, Abit sells two versions, with and without RAID, the former allowing multiple drives to act as one volume.

The HighPoint HPT370 RAID controller offers a pair of additional EIDE channels, supporting UltraDMA33, 66 or 100 drives. Its easy-to-use BIOS offers RAID 0 (striping), which accesses two or four drives in parallel to boost

performance, and RAID 1 (mirroring), which uses a second drive to back up the first, increasing reliability. There's also a RAID 0+1 mode, which stripes two disks and uses a second pair to mirror them, for the best of both worlds.

The RAID and non-RAID versions of the KT7A are otherwise identical, featuring one AGP 4X, one ISA and six PCI slots. There are three memory slots, accepting up to 1.5GB of conventional SDRAM. There's also one floppy, one parallel, two serial, two



PS/2, two USB, and an onboard header for two extra USB channels.

The KT7A features VIA's Apollo KT133A chipset, which supports the far superior 266MHz bus Athlons. It also features the VT82C686B southbridge, supporting UltraDMA33, 66 and 100 drives. Since the HighPoint controller also operates as a normal EIDE controller, the KT7A-RAID can support eight UltraDMA100 drives.

We tested the KT7A-RAID with one, two and four striped Seagate Barracuda

ATAIII 40GB UltraDMA100 hard disks (64KB block size). In SYSmark 2000, the overall scores were within one per cent of each other, but the disk-intensive Paradox database test ran five per cent faster in each configuration.

The KT7A-RAID is a superb Socket A motherboard, but it doesn't support new DDR memory. However, it is a good prospect for Socket A users with SDRAM – just don't expect miracles from RAID.

Gordon Laing

DETAILS

PRICE £114 (£133.94 ex VAT)

CONTACT dabs.com

0870 429 3120

www.dabs.com

PROS EIDE RAID; great over-clocking features; ISA slot

CONS Doesn't take DDR memory; RAID only offers small performance boost

OVERALL If you're not bothered about DDR, this is the best Socket A motherboard

SCORE ■■■■■



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Data in your pocket. "You may have tried removable drives and high-capacity floppies before, but nothing comes close to LaCie's ultimate portable storage device....We reviewed the latest version in last month's issue and loved it." **PC Direct** March 2001

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Samsung 17in monitor

The SyncMaster 753DF will suit a tight budget

After setting up the 17in 753DF, we got a distinct sense of *déjà vu*. This is because this monitor uses the same Samsung DynaFlat tube as the CTX EX710F (May issue p74).

This shadow-mask CRT has a flat face that bodes well for minimising reflections. However, if you look closely, the inner surface of the CRT curves. Thanks to the clever use of optics, Samsung fools the eye into believing the image is flat. A downside to this is the occurrence of internal reflections.

At a resolution of 1,024 x 768, text is sharp with only the extreme corners of the display showing a slight drop in focus. Video bandwidth also affects resolution. Here, the 753DF gets full marks at refresh rates of 75Hz and 85Hz, indicating that the video circuitry and signal amplifiers do a fine job of switching the pixels on and off. Having said that, power supply regulation is not the best we've seen as the display expands and contracts when switching between light and dark images. You can

achieve a maximum resolution of 1,280 x 1,024 at a flickery 60Hz, but this will quickly tire your eyes

Moving on to geometry, there is a distinct horizontal pincushioning to the uppermost edge of the picture. Whether or not this is peculiar to this DynaFlat tube is difficult to say without reviewing a larger sample. In its favour, the 753DF's picture is well centred and horizontal colour registration is spot on. Vertical registration was only marginally out, so it is a shame that the necessary adjustment was not available. Colour

purity is rich and even, while streaking and ghosting is virtually non-existent.

The fascia is clean and the simple four-button OSD controls lead you intuitively to the usual set of geometrical and picture controls, including zoom, moiré correction and vertical linearity. At the back is a captive D-SUB cable.

This is a good looking, low-cost monitor with a visually flat picture. Not many 17in screens can boast the 753DF's specs, but it is slightly let down by the geometry issue.

Jalal Werfalli



DETAILS

PRICE £222.08 (£189 ex VAT)

CONTACT Samsung

020 8391 0168

www.samsung.co.uk

electronics.co.uk

PROS Cheap; good resolution; rich colours; visually flat; simple OSD

CONS Pincushioning; double reflections; captive D-SUB

OVERALL A good-value 17in monitor, with a small geometrical setback

SCORE ■■■■

Relisys 19in monitor

The TE997 is a well-priced flat-screen display

Flat-screen CRT tubes are now commonplace and none more so than the Diamondtron Natural Flat displays made by Mitsubishi. These tubes produce excellent pictures, and one monitor that uses this technology is Teco's Relisys-branded TE997.

Encased in the rather boxy chassis is the 19in Diamondtron NF tube. This has a dot pitch of 0.25mm that bodes well for screen detail, and a maximum resolution of 1,600 x 1,200 at 75Hz. At the rear, there's only a captive D-SUB cable and an on/off switch.

In the image quality tests, the TE997 performs well. Geometry is commendable with no signs of geometric linearity distortion, while the flat screen keeps reflections down to a minimum. Horizontal and vertical resolution is also praiseworthy and contributes to the high scores in our text representation and focus tests. Colour reproduction is rich and vibrant. In addition, both horizontal and vertical colour registration are acceptable.



The only real area of concern is in power regulation. Local regulation was reasonably stable but our issue was with the overall regulation. When maximising and minimising windows, the whole screen expanded in bright areas and contracted in dim areas, indicating that the electron guns are untamed by the TE997's internal electronics.

The fascia comes complete with a narrow and shallow bezel that shows off the tube's flatness. It's also the home of five buttons that operate the

OSD. The range of adjustments is comprehensive and includes top and bottom pincushion, individual RGB colour temperature, and a colour purity function for the entire screen or its four corners. There is even a 'tea time' setting where a little cuppa scrolls across the display after a user-defined time, suggesting you should rest your eyes.

This is an admirable monitor for the price – it is a shame that the power regulation lets it down.

Jalal Werfalli

DETAILS

PRICE £328.99

(£279.99 ex VAT)

CONTACT Insight

0870 700 7350

www.teco-info.co.uk

PROS Flat screen; decent price; good range of adjustments

CONS Power regulation issue

OVERALL A well-priced 19in monitor with a good display, but poor power regulation keeps it from getting the complete row of stars

SCORE ■■■■

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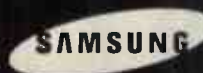


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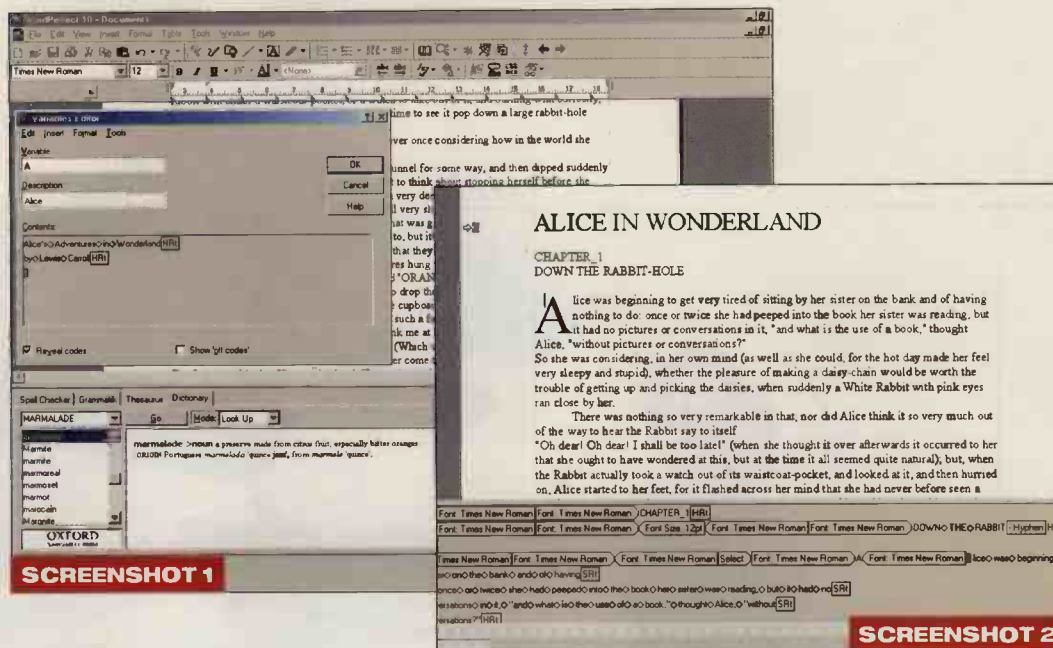
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Screenshot 1: The Oxford Dictionary pane is modeless, so can be left on while working

Screenshot 2: The 'reveal codes' feature is an old favourite, and can be the quickest way to edit layouts



Corel WordPerfect Office 2002

Packed with features, this integrated suite has something for everyone

DETAILS

PRICE WordPerfect Office 2002 Professional, £489.98 (£417 ex VAT); WordPerfect Office 2002 Professional Upgrade, £250.28 (£213 ex VAT); WordPerfect Office 2002 Standard, £390.10 (£332 ex VAT); WordPerfect Office 2002 Standard Upgrade, £150.40 (£128 ex VAT)

CONTACT Corel 0800 581 028 www.corel.com

PROS Applications recovery for improved data security; extended quick formatting preview in WordPerfect and Quattro Pro; improved web document support (pdf, HTML); definition dictionary included

CONS Dragon Naturally Speaking is only available with Paradox in Pro Edition; confusing number of choices in some areas, such as database reporting; Corel Central structure rather bitty

OVERALL Corel has concentrated on areas of the WordPerfect Suite where improvements were needed and appears to have listened well to user comments. While Central can still seem a bit fragmented, WordPerfect, Quattro Pro and Presentations are flexible and worthy rivals for their equivalents in Office XP. Paradox and Dragon Naturally Speaking distinguish the Professional version well

SCORE ■■■■■

WordPerfect is still one of the three most popular integrated suites in the world, so any new release is an event. WordPerfect Office 2002, launched at the beginning of May, is the latest iteration aimed at markets such as the legal profession.

Corel also hopes to continue making inroads into SmartSuite's product share. IBM maintains its second position over Corel by offering very competitive prices on SmartSuite to OEM PC makers, but Corel has recently had some success in selling its suite in this way, too. The UK system builder Mesh, for example, now supplies WordPerfect with some of its direct market PCs.

WordPerfect has had a varied career since it started life with the WordPerfect Corporation in Orem, Utah in the mid-1980s. Rapidly developing a following, it stole the most popular word processor slot from WordStar at the end of the decade. The start of its fall from favour coincided with the purchase of WordPerfect by Novell in 1993. The company, best known for its operating and networking products, held on to it for a couple of years before selling the product to Corel.

Since then, Corel has rationalised both the product and the staff that develop and support it and the latest version gets back to the program's

basics. There are five core modules, although only four are included in the Standard Edition of the product: WordPerfect 10 the word processor, the spreadsheet Quattro Pro 10, Presentations 10 business graphics and Corel Central 10, a personal information manager (PIM).

The Professional Edition, includes all that's in the Standard Edition, plus the heavyweight relational database Paradox 10 and Dragon Naturally Speaking speech recognition software.

With an eye on the competition, particularly Office XP, Corel has introduced an Application Recovery Manager, which applies to all modules in the suite. It attempts to safeguard your work, should there be an application failure and, like Microsoft's code, it can send details of the error straight to technical support across the Internet. Corel goes further, though, in having a Location Manager that monitors where essential WordPerfect Suite components are, so you should always be able to start the program.

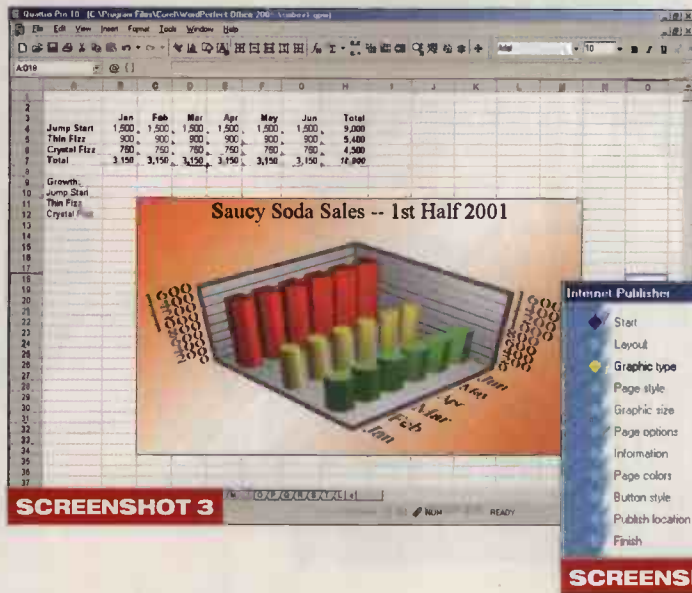
Compatibility is a strong feature of the new suite, too, with special attention being paid to file types like XML, HTML and pdf. WordPerfect's own formats are the same as in previous versions, all the way back to 6, so you can exchange documents without having to convert files.

WordPerfect 10

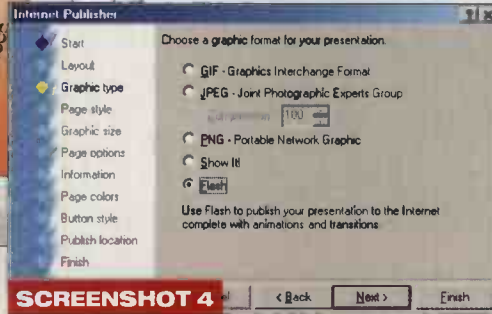
WordPerfect has always been a heavyweight word processor, so functions such as multiple documents, tables, columns, frames, graphics import, spelling and grammar checkers can all be taken for granted. The program works by default in page view, like Word's page layout view, although with WordPerfect there's also a two-page view – for those of you with big screens – and a draft one too.

If you're used to WordPerfect, you'll know how flexible its 'reveal codes' function can be. It shows not only spaces and paragraph marks, but formatting codes for all kinds of text and layout attributes. Having direct control over these normally invisible codes can be a quick way to make formatting changes. Version 10 enables the reveal codes pane to be displayed in all views, including two-page.

The single biggest new feature of WordPerfect 10 is the introduction of variables. These are rather like a shorthand function, where you can insert a named marker into your document, as many times and in as many places as you like, then replace the shorthand with formatted text later on. The replacements are still 'live' though, so if you change the definition of a variable, it will be reflected in all instances in your document.



Screenshot 3: The advanced rendering of 3D charts in Quattro Pro 10 can produce high-quality graphics, but not without some effort



Screenshot 4: Choose Publish to Internet in Presentations 10 and you now get Flash and Show It format options

The implementation isn't quite as straightforward as the idea, particularly for simple variables, as you have to use a separate dialog to define the variable's name and content, but it can still be a big time saver.

RealTime Preview, one of the big successes of WordPerfect 9, has been extended to cover extra formatting, such as font changes, columns, drop caps, bullets and numbering. You can now see all these changes in preview, simply by hovering your cursor over the relevant selector option, before committing yourself to them.

If you're using WordPerfect to create or maintain web documents, enhanced support for HTML and direct pdf output will be a popular feature. You can now add watermarks to your pages and include hyperlinks in documents. The HTML provision supports cascading style sheets, which makes creating pages in a house style much easier.

Improved format support for Microsoft Word documents should also mean that you can open them directly, through a transparent conversion process. However, the sample document we tested – admittedly a fairly complex text and graphics page – showed a number of conversion errors.

There's an electronic copy of the *Pocket Oxford Dictionary* built into the suite and although it's available in several of the WordPerfect suite modules, it's most appropriate to the word processor. This is a proper definition dictionary and the definitions you call up can be copied directly into your text.

Quattro Pro 10

The new version of Corel's spreadsheet builds on the substantial calculation engine available in earlier versions. Specific areas of the program, which can already handle multiple worksheets and produce sophisticated graphs and charts, have been identified for enhancement. These include charting, worksheet size and the introduction of Dynamic CrossTab Reports.

With the charting engine you can render bars in a 3D chart semi-transparently. This is useful if you have data risers from one series that would otherwise be obscured by others from a series in front.

The size of a worksheet has been greatly increased, up to a maximum of one million rows. You might think this excessive, but it does mean you can import large amounts of data without having to massage it into smaller, more palatable chunks.

At last there are Dynamic CrossTab Reports, Corel's equivalent to Excel's PivotTables (though not as snappily named). With these reports, you can move column and row data around to present your results in the most immediate way, or use them for easier analysis of multidimensional data.

There are plenty of other minor improvements, such as prompting when

The implementation isn't quite as straightforward as the idea, particularly for simple variables

On a more cosmetic level, you can render the data items in a chart using quite complex sets of lighting, to produce graphics that wouldn't look out of place in a BBC newsroom. The data risers don't have to be rectangular columns – you can choose from a variety of shapes. In the same way you can use different symbols for data points in a 2D graph, you can use 3D objects in a rendered bar chart.

In simpler charts, you can now add error bars that show the level of uncertainty of any data point – this is an easy way of showing confidence limits in a statistical graph, for instance. It would be useful to be able to specify the numerical limits of these error bars in the chart's legend, though.

entering formulas (as in Excel 2002) and the ChartExpert for beginners, which acts like a charting wizard.

Corel Presentations 10

The title rather gives away Corel Presentations' purpose. As a main competitor to PowerPoint and Freelance, it's a business-centred presentation graphics application with all the bells and whistles. With the usual slide editor, slide sorter, outliner and presentation player, the basic tools are all in place.

Taking a leaf from the consumer end of its product range, Corel has grafted on the kind of wizard-based guidance available in programs like PrintHouse. When you create a new presentation

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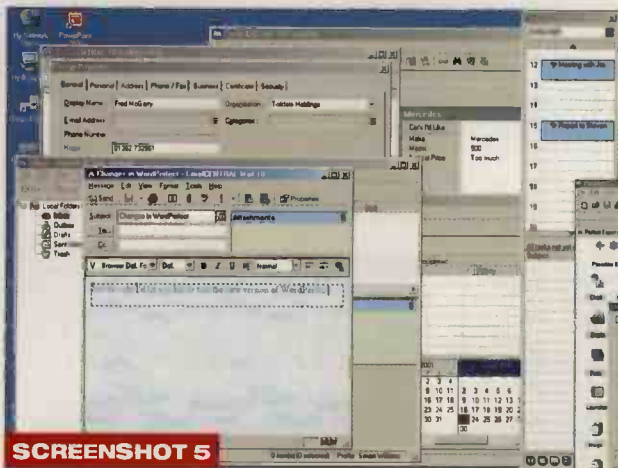
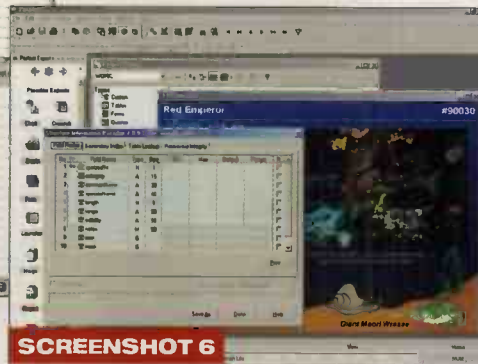
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**SCREENSHOT 5****SCREENSHOT 6**

Screenshot 5: All the separate parts of Corel Central present a different way of managing your information – we like the more integrated approach

Screenshot 6: Paradox now supports graphics files in record fields, opening up the possibility of visual databases. The structure of any table is readily viewable

from scratch, you can choose to be led through the various stages of selecting a colour scheme, slide subjects and effects like transitions. This is a minimal-pain approach, but if you're more experienced at creating presentations, you can work from first principles, too.

Presentations 10 offers several useful innovations, many connected with preparing presentations for the web, an increasingly common use of the program. You can now add MP3 and wma sounds to a presentation, saving massively on file size compared with wav. Animated gifs can be included in presentations and, again, sounds can be added to animations to make them more dynamic.

Once complete, Corel's Internet Publisher can lead you through the process of publishing your slide show to the web, though again there are several options for the experienced. For example, you can save your presentation as a Macromedia Flash file, or as HTML using the Show It utility. It's a shame the Show It plug-in, which is needed to view files in this format, has to be downloaded separately from Corel's site.

If none of these options suit you, you can still save a presentation as a Show On The Go file, which will run on any Windows-based PC. With all these presentation options, Corel Presentations 10 is one of the most versatile slide makers going.

Corel Central 10

Corel's take on the PIM is a bit different from Microsoft's Outlook or Lotus' Organizer. It's a loosely connected mini-suite of applications rather than a single, manage-all organiser. It means you can run just the elements of the

package you want, but it's inherently more fiddly, too. Central seems determined to define databases and address files every time you fire up any of its applets for the first time – more defaults would be an improvement.

The reason Central operates like this is that it's aimed at network users, who may want to make appointments with others in an organisation. The program acts as groupware to accomplish this, by scanning all user diaries for free dates that coincide.

A new module provides full email functionality, including attachments and coloured stationery. It's more exciting to work with than Outlook's email functions, with subtle tones defining different panes, but not quite as straightforward. Even beginning a new email requires some forethought.

Corel Central 10 maintains compatibility with Outlook, offering data exchange on all its modules. It also continues to work with Palm-based handhelds, so you can take schedules, to do lists, addresses and memos with you, synchronising them again on your return.

Paradox 10

Included only with the Professional Edition of WordPerfect Office 2002, Paradox 10 tries to be the database for Everyman. Although its underlying core is a big relational, multi-user database, Corel has come up with enough predefined templates and design experts to make it usable for anything from a simple flat-file card index up. Something of a paradox, you might say.

Queries and reporting are two strengths of the program. Both tasks have Experts, Corel's equivalent of Wizards, to help you set them up, but

for reports there's also QuickReport and the Visual Form and Report Designer, which enables you to place fields, text and graphics freely on the pane and tailor the output.

Apart from the Query Expert, you can query a Paradox 10 database by example, or using the Visual Query Builder. This is an SQL-based query tool, where you can bring together fields from one or more databases – Corel calls them tables. If you need more control, you can use ObjectPAL, Paradox's programming language, to create structures and reports, or the copy of Microsoft Visual Basic for Applications, included with the suite.

Image support has been strengthened and you can now import a graphics file in any format WordPerfect supports, such as jpg, gif and wmf, or even scan directly into a field from a TWAIN-compatible scanner. This opens up opportunities for visual databases for estate agents, traders or collectors.

The rest

As usual, there are a lot of extras included in the WordPerfect suite. There is Visual Basic for Applications, as mentioned above, (though the legacy macro language PerfectScript is supported, too), the WordPerfect SDK, QuickView Plus and a selection of fonts, clipart and photos.

Dragon Naturally Speaking, the speech recognition software is only available in the Professional Edition. Since the program works only with WordPerfect and the email module of Corel Central, however, it seems perverse to tie its purchase to the Paradox version of the suite.

Simon Williams

BETA

You can create and edit master pages, but not master page elements on document pages

Gradient fills add depth to flat artwork, without the hassle of blends



DETAILS

PRICE £327.83 (£279 ex VAT)

CONTACT Macromedia

0870 600 1041

www.macromedia.com/uk

SYSTEM REQUIREMENTS

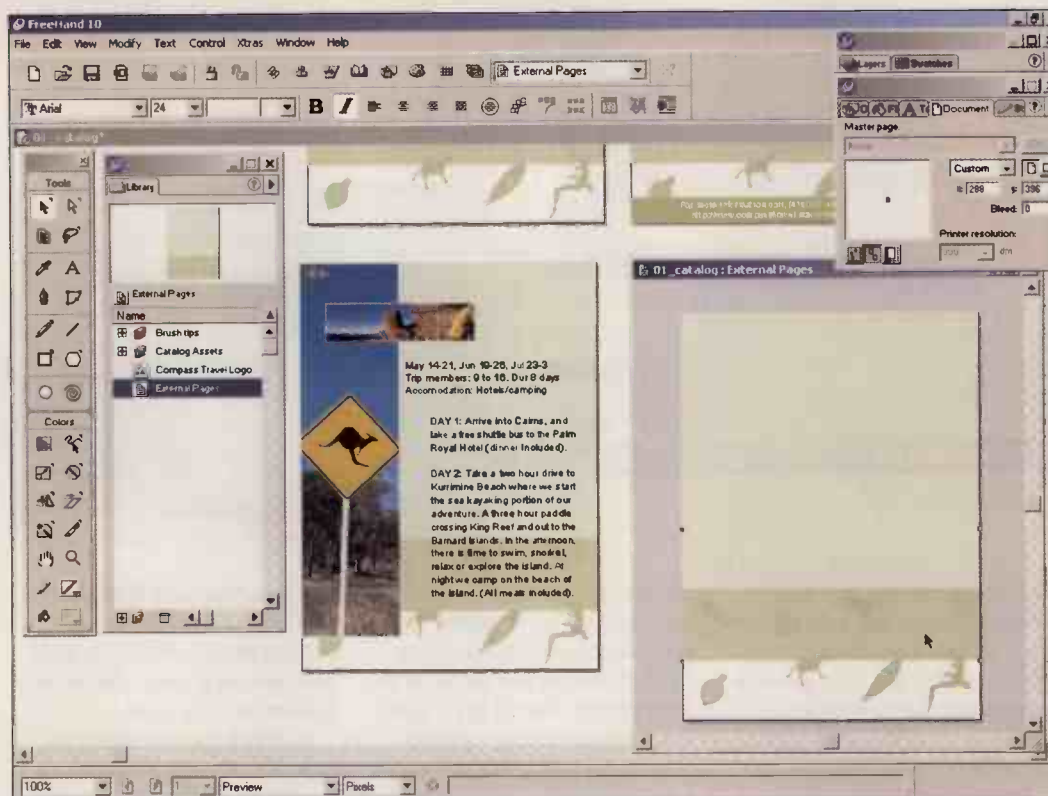
Pentium or equivalent, Windows 98, Me, 2000, NT4, 64MB of RAM, 70MB free hard drive space

PROS Multiple and master pages; contour gradients; Flash features

CONS Cluttered interface; inadequate previews

OVERALL For existing FreeHand users an upgrade is definitely in order. Also, if you see yourself doing a lot of web work and are attracted by Flash, or you need multi-page features, FreeHand 10 is for you. But Illustrator users will still rank FreeHand as a less able imitator

SCORE



Macromedia FreeHand 10

New features include spray and brush strokes, plus Flash and Fireworks integration

A new perspective grid, live envelope distortions, improved layer management and the first moves towards integration with Flash were all part of the package when Macromedia last upgraded FreeHand just over a year ago. This latest beta of version 10 promises a similar balance of new graphics tools, productivity bonuses and further intertwining with Macromedia's web graphics powerhouses Flash and Fireworks.

New features this time around include symbol-based spray and brush strokes, contour gradients, master pages, and the ability to apply Flash actions directly to FreeHand graphics, as well as test and export movies using an integral Flash player.

Innovation's all very well, but a big part of the upgrade process is, and probably always will be, about stealing the competition's clothes. So it's no surprise to see FreeHand 10 introduce spray and brush strokes.

The equivalent of Illustrator's artistic and scatter brushes and CorelDraw's image hose, spray and brush strokes paint with a vector image, but in FreeHand's case it's a symbol instance. Spray strokes repeat multiple instances

of a symbol along a path, and brush strokes stretch a single symbol instance to follow the path contours.

Because they are symbol-based, FreeHand's spray and brush strokes are simpler to create and easier to modify than Illustrator's art and scatter brushes. The edit brush panel has a pulldown menu from which you can add any existing symbol. You can create complex strokes using several symbols, and controls similar to, though slightly less sophisticated than, Illustrator's are provided for spacing, angle, path offset and orientation.

Disappointingly, there's no live update in the document window when you make changes to the brush in the edit panel, so you can't see the overall effect of changes until you press the OK button. There is a small brush preview window within the edit panel but this doesn't tell you how changes will impact the paths in your illustration. This leads to the time-consuming cycle of edit, OK, view and re-edit, which has no place in an application of FreeHand's maturity.

On a more positive note, symbol editing changes are previewed. This means that you can make changes to a

symbol on which a spray or brush stroke is based and immediately see the changes to the document.

FreeHand's new contour gradient tool makes the creation of 'organic' gradients much less involved than in previous versions. Producing highlight and shadow detail on regular objects, for example putting a radial tint on a circle to give it the appearance of a sphere, is easy enough, but to produce realistic shading on irregular shapes you need to create and blend highlight and shadow objects. This is not only unpredictable, but blends generate hundreds of intermediate shapes that make for complex documents that are slow to work with.

Contour gradients can be applied to closed paths from the fill panel in pretty much the same way as linear and radial gradient fills. A third button provides the contour options.

The gradient bar shows the start and finish colour swatches and a taper slider controls the point at which the colour transition starts. You can further control the gradient by positioning additional colour swatches along the gradient bar, and these can be the same as the start and finish swatches,

or entirely new colours. You can also modify the centre point of the contour fill by dragging a button within a square panel in the contour gradient fill inspector. The results of this depend very much on the shape of the object, but it's possible to produce realistic looking areas of highlight and shade on 'non-flat' surfaces.

Contour fills certainly preview a lot faster than blends, but they're by no means instantaneous. If you make frequent use of symbols employing contour fills, be prepared to switch to the fast preview mode that displays a posterised version of the gradient, which is perfectly adequate for work in progress.

The introduction of a library palette providing access to symbols and master pages makes it much easier to manage and edit both these elements. Master pages are a predictable, but nonetheless necessary addition to an application that supports multipage documents and will make life even easier for anyone using FreeHand to develop initial designs for websites.

With some limitations, FreeHand's master pages work in much the same way as they do in layout packages such as QuarkXpress and Adobe InDesign. Master pages can be applied to document pages in the document inspector or by drag and drop, and changes made to master pages immediately affect all the document pages to which they apply.

One thing you can't do, though, is edit master page items on a document page. This is a bit of a drawback because it means you can't tweak individual pages that don't quite fit the master page template, though you could, of course, define the problem page as a new master page and edit that. Another common master page function that FreeHand 10 doesn't support is automatic page numbering.

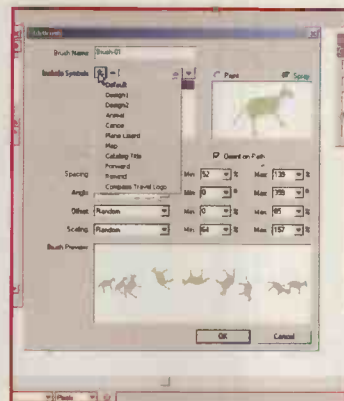
The library works in a similar fashion to FreeHand 9's symbols palette, allowing you to organise symbols into structured groups. In FreeHand 9, if you wanted to edit a symbol you first had to drag and drop it onto the page, release the instance, edit it and drag it back to the symbols palette to replace the original. In the library, if you double-click on a symbol name or its preview, it opens in a separate document window for editing. This arrangement will be familiar to anyone who has worked with Flash and you get an immediate preview in the main

document window of changes as you make them to the symbol. However, despite Macromedia's attempts to streamline and harmonise the FreeHand interface, things can very quickly become impossibly cluttered.

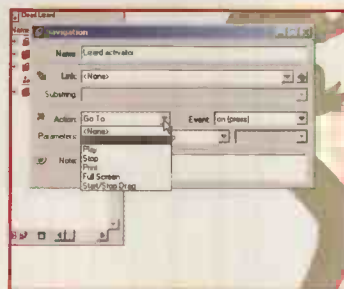
For one thing, when you open a symbol for editing, the window fills the work area, obscuring the main document beneath. So if you want to see what's going on you zoom in on the symbol, resize the window and relocate it in a convenient corner. This applies equally to editing master pages.

It wouldn't be a huge problem were it not for the fact that things are already quite crowded. With the undocked default toolbar (containing 22 tools), the library, one palette containing the swatches, layers and styles panels and another with the object, stroke, fill, text and document inspectors, there's not much room left for working.

Macromedia could improve things considerably by making a lot of the



Turn symbols into paint and scatter brushes, but no preview of changes in the main document



The Flash navigation panel lets you assign actions directly to FreeHand 10 graphics

Thankfully, FreeHand provides ample opportunity for customisation of the interface

icons, tools and palettes smaller – at a screen size set to 1,028 x 764 they are very large compared with other applications and the Mac version of FreeHand. Unless you're working on a 21in CRT or, probably better still two smaller monitors – one for tools and palettes and another for the work area – you'll need to think carefully about how you organise things.

Thankfully, FreeHand provides ample opportunity for customisation of the interface. You can make your own choice of buttons to display on toolbars, as well as turning toolbars on and off and docking or floating them. You can also drag and drop tabbed panels within container palettes so you can, say, combine the layers, swatches and strokes panels within the same palette.

Macromedia has introduced a number of other enhancements that improve integration with Flash and Fireworks. The pen tool has been standardised and now works identically in all three applications (as well as more closely resembling Illustrator's). You can continue, retract and join paths with one click and the 'smart' cursor changes appearance when you hover over an endpoint to indicate this.

Two new checkboxes in the tool options panel – 'show pen path' and 'show solid points' – move yet closer to the Illustrator way of doing things. And, as if to show that you can't have too many of the competition's features, Macromedia has added a subselect tool next to the pointer, which works in a similar fashion to Illustrator's direct selection tool.

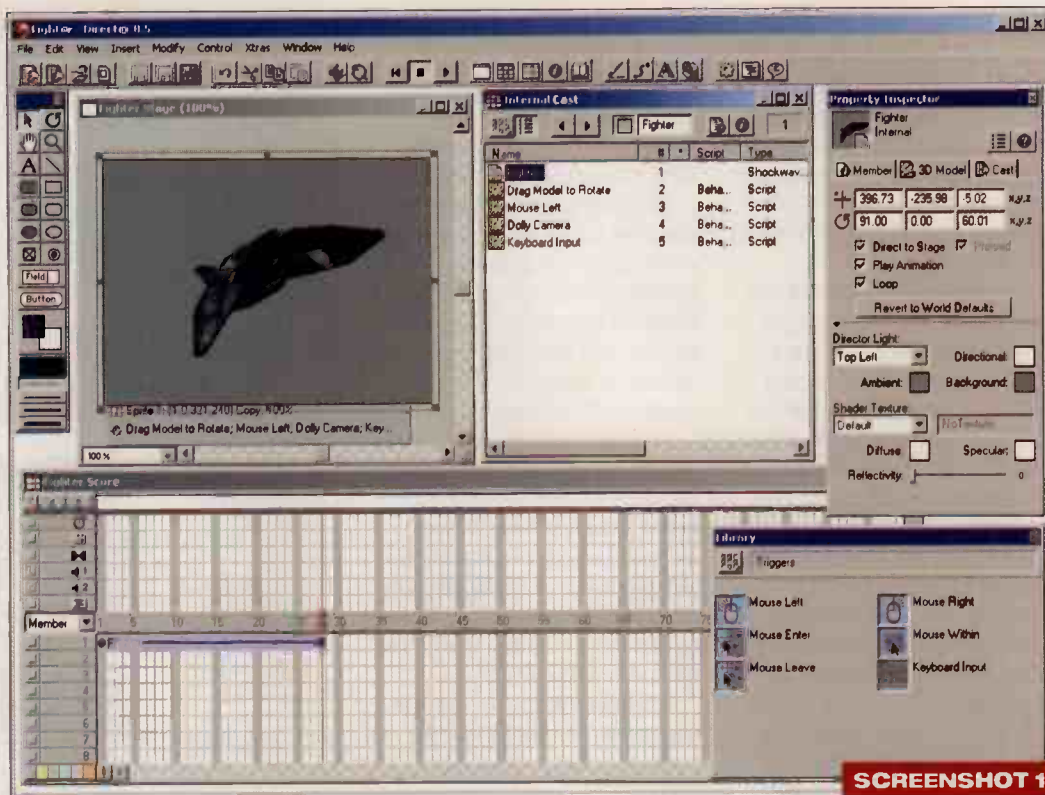
A Flash navigation panel and integrated Flash player window make FreeHand a more likely starting point for Flash projects. The Navigation panel is used to apply links and actions to graphics and text and the player allows you to test and export .swf files.

This is a solid upgrade that will make FreeHand even more attractive for designers who spend most of their time developing for the web, particularly if they already live in the Dreamweaver/Fireworks/Flash world. While spray and brush strokes and contour gradients are a move in the right direction, FreeHand 10 isn't going to win any converts from the Illustrator camp without streamlining its interfacing and finding a better way to provide interactive previews.

Ken McMahon

BETA

The Director interface, with a 3D model of a fighter plane created using 3D Studio MAX on the 'stage'



Macromedia Director 8.5

This upgrade enables you to send 3D graphics over the Internet

DETAILS

PRICE £1,115 (£949 ex VAT), £175 (£149 ex VAT) to upgrade from version 8

CONTACT Macromedia
0870 660 1041
www.macromedia.com/uk

SYSTEM REQUIREMENTS

64MB of RAM, 100MB of hard disk space;
PC 266MHz Pentium II, Windows 95, 98, Me, NT4, 2000
Mac 233MHz PowerPC, OS 8.1 or later

PROS Adds 3D to the web's most popular multimedia publishing platform

CONS Requires programming skills to be exploited to the full; poor online help in this build

OVERALL The best platform for delivering multimedia over the web

SCORE ■■■■

There have been numerous attempts to find a way of delivering 3D graphics over the Internet, all of which have so far failed to have much of an impact. In contrast, 2D animation and other media have spread like wildfire, principally thanks to the hugely successful Shockwave from Macromedia.

The company claims that over 200 million users have the Shockwave player installed in their system, and that it is pre-installed in all new Windows 98/Me and Mac OS systems. This means an immense user base can now view 'Shocked' multimedia content in their web browsers. Now, those users – or rather those who bother to upgrade to the latest version of the Shockwave player – will be able to view Shockwave 'movies' that include not only sound, animations, text and 2D graphics, but 3D graphics as well.

All this has been made possible by Director Shockwave Studio version 8.5, the latest release of Macromedia's authoring package for producing Shockwave content. It includes an entire new module (or 'Xtra') that

supports the creation and editing of 3D objects and scenes.

The main Director interface hasn't changed since the last version. In the workspace a series of windows contain information about the movie being created. Using a theatrical metaphor, the window displaying the movie is called the 'stage' (see screenshot 1). Another features the 'cast', not of characters, but of media 'assets' featured in the movie, such as bitmaps, vector shapes, text, sounds, movies (in any number of formats, including QuickTime and avi) and objects.

The cast also includes scripts that control the behaviour of other cast members. These scripts are written in Lingo, a language developed by Macromedia for Shockwave. Lingo is a high-level language that programmers familiar with C and similar programs will no doubt find a doddle to learn, but artists and designers are likely to find more of a struggle. Thankfully, Director comes with a wide array of pre-written scripts that can be accessed through another window, the Library (see screenshot 2 overleaf).

It is when you start building up your cast list that the new facilities in

Director 8.5 start to make themselves apparent. The most obvious new cast member you can call upon is a 3D object or scene. In theory you can generate objects using Lingo, but most users will import them from 3D authoring packages. Currently, few such packages support Shockwave's proprietary 'W3D' format. There is a plug-in for 3D Studio MAX, which in beta form worked well enough, though only a limited range of MAX features can be converted.

The W3D specification, a 'scalable' format developed in collaboration with Intel's Architecture Labs, includes a number of facilities that allow 3D content to be streamed over the web. These include Multi-Resolution Meshes (MRM), Subdivision Surfaces and Bones. MRM are meshes (ie object geometry) that automatically adjust their complexity depending on the resources available to download and display them. Subdivision surfaces are the opposite of MRM, adding levels of detail (for example, by turning an angular join between two faces into a continuous curve) to the geometry once it has been downloaded, thus reducing the size of the model sent in the first

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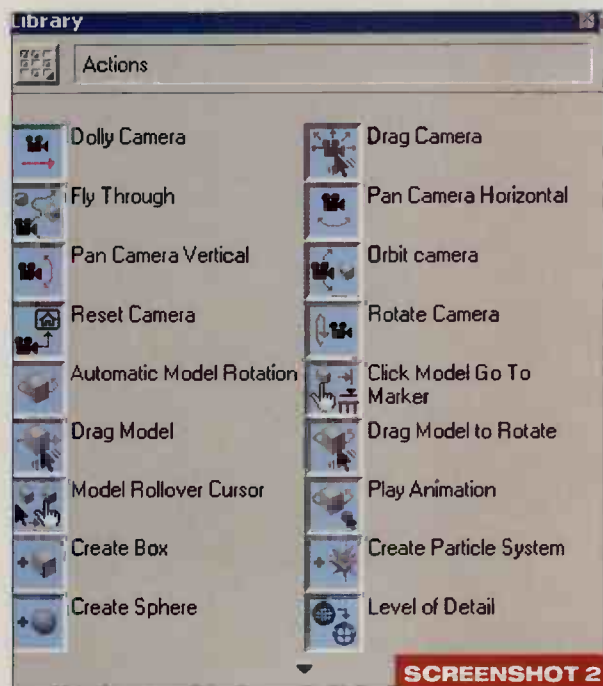
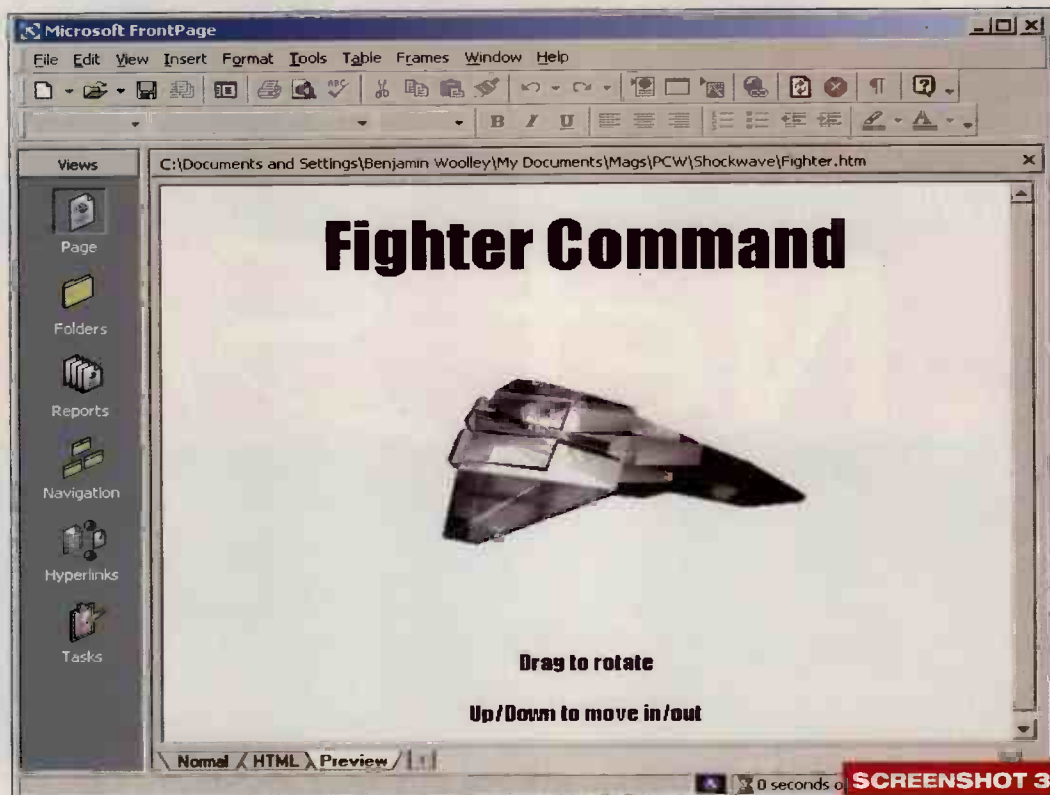
Driver downloads

Secure ordering

NetShop Limited
Grays Place, Slough, Berks, SL2 5AF
Telephone: 01753 691661
Fax: 01753 691037
email: sales@netshop.co.uk

Right: HTML page generated by Director being edited in Frontpage, with titles and instructions added

Below: Detail showing Library window, with icons for behaviours that can be applied to 3D objects



place. 'Bones' cut down on the amount of data that needs to be sent to animate complex 3D characters by giving them virtual skeletons.

Director's 3D models can be given collision-detection parameters (so they behave more like physical objects) and act as particle emitters (for recreating effects such as fire).

Many 3D authoring packages already support these kinds of features (for example, MRM is an adaptive

version of what in the 3D community is known as Level of Detail or LOD). Nevertheless, the way some are implemented in Director will be unfamiliar to many 3D artists. For example, those who have mastered particle emitters on packages such as 3D Studio MAX or Truespace will recognise some of the parameters that need to be set when using an emitter in

Beyond the improvements in scalable graphics and 3D rendering, the Multiuser Server has been upgraded to handle up to 2,000 users interacting on your site simultaneously – double that of the previous release. There is also full support for Flash 5, which Macromedia claims 60 per cent of Shockwave users also use throughout their workflow. Technological alliances with Intel

When things go wrong, the problem can often only be solved by debugging a Lingo script

Director, but may find the controls confusing. Furthermore, when things go wrong, the problem can often only be solved by debugging a Lingo script. 3D artists hoping to use Director's 3D capabilities to publish complex scenes and animations will not be able to avoid climbing yet another steep learning curve. Similarly, 2D designers will have to learn a host of 3D concepts.

In contrast to the complexities of adding 3D, publishing a Shockwave movie is simplicity itself. Director places it in one of a choice of simple HTML templates, which can then be edited using a web page editor (see screenshot 3 above).

promise faster downloads, with rendering taking place on the local PC, so the only information that needs to be passed from the server to the client machine is a simple wireframe.

The beta version of Director 8.5 that we tested was extremely robust – running under Windows 2000, it didn't crash once. This obviously bodes well for the final release.

As an environment for developing multimedia movies, Director must be one of the most powerful tools around, and the addition of 3D makes it virtually unbeatable. This really could send a shockwave through the industry.

Benjamin Woolley

Connectix Virtual PC 4

Turn your Mac into a PC in one easy lesson

DETAILS

PRICE £159 (£135.32 ex VAT)

CONTACT Connectix

00 312 0581 4385

www.connectix.com

PROS Easy to use; fast; ability to have more than one virtual machine running at once; support for Apple Scripting

CONS Can crash while printing if using OS 8.5 or 8.6

OVERALL Worthwhile upgrade for existing users. Worth the initial investment for Mac users who need to use the PC environment for the odd application and can't justify the expense of a totally new machine

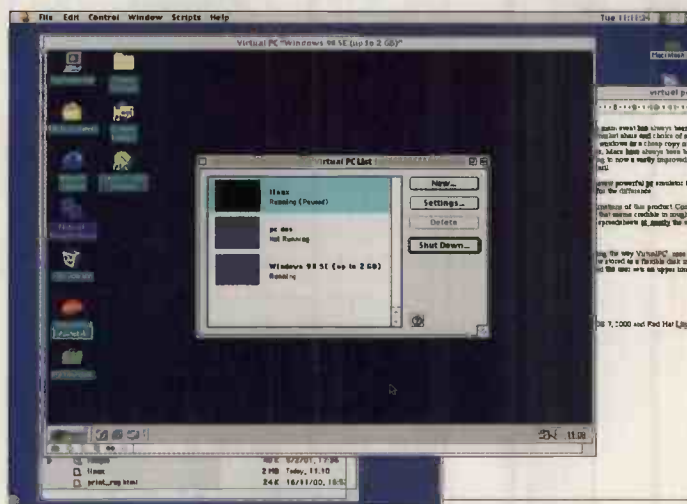
SCORE ■■■■■

In the ongoing operating systems war, the main event has always been Macintosh v Windows. PC users, by the sheer volume of machines and choice of software, claim the upper hand, while Mac aficionados sneer at Windows, saying it's just a cheap copy of the Mac OS.

By installing Virtual PC on any G3 or G4 (older Macs will have to stick to version 3) you can run Windows applications while leaving Mac OS running in the background. The clipboard function is supported, and text and bitmap images can even be copied between environments.

Virtual PC works by creating a drive image file and customisable settings. The drive image is an expandable file that contains the OS and any apps and saved data. From there you can control the specifications of the virtual machine and allocate RAM while assigning functionality to the COM ports.

But it is not limited to just one virtual machine, you can run several virtual



machines at the same time using the Virtual PC list window. For example, one virtual machine could be running Excel in Windows 98 and another word processing in Linux, while a third is running Solitaire in DOS.

The list dialog box shows a thumbnail of each machine's current state, and you can save or pause a state and return to it later. Virtual PC supports Windows 95, 98, 2000 and Me, DOS 7 and Red Hat Linux.

Connectix is claiming a 100 per cent

speed improvement over Virtual PC 3. Installation is quick and easy with a walk-through setup assistant and a fully searchable Mac-style help system.

This is a very powerful PC emulator for the Mac, whose quality would leave the average PC user looking for the difference. But this software will come into its own for creatives who use a Mac for web design and want to test cross-platform compatibility with tools that are only available on PCs.

Julie Fairless

21 days to take your skills to the next level

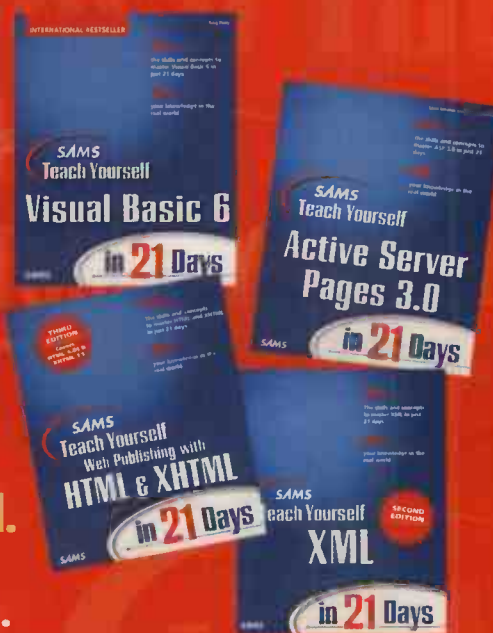
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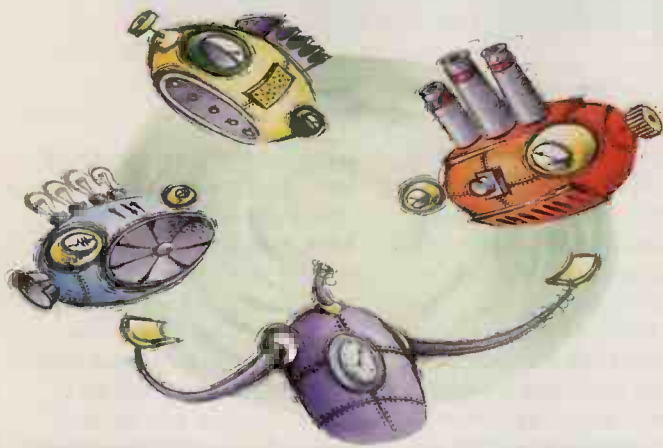


SAMS

Let us do the juggling

Are you beginning to find your computers unmanageable,

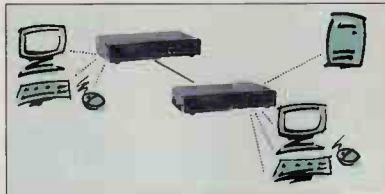
with excess keyboards, monitors and mice taking up too much desk space and generating excess heat? Well, let Dakota help find your solution. We're in business to meet all your computer switching and sharing needs with award-winning products, accurate information and a highly trained, expert staff.



Keyboard, monitor and mouse extender

Voyager UTP™ Extender

The **Voyager UTP Extender** enables you to extend the keyboard, monitor and mouse up to 300m on a single CAT 5 cable from your computer without the loss of signal. Ideal for banks, trading rooms, exhibitions and other high-risk locations where extra distance is required between the computer and the keyboard, monitor and mouse.



Compact classroom control system

TeachView™ and TeachView Plus™



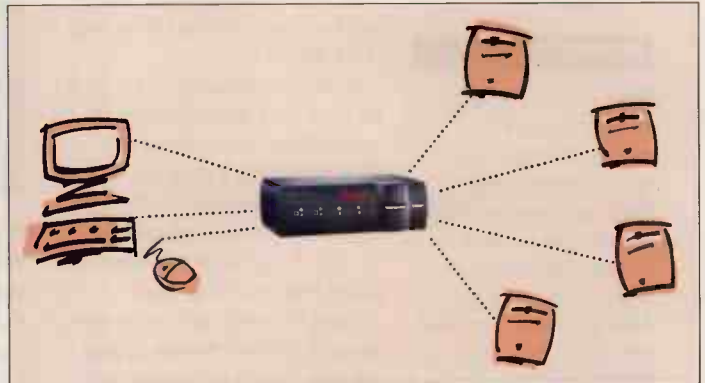
The **TeachView** system allows an instructor to display his monitor image to up to 50 students, allowing the students to see what the instructor does on his PC. The **TeachView Plus** version also allows the students to control

when they wish to view the instructors screen. Inexpensive and user-friendly, the TeachView system provides a highly cost-effective solution for computer-based training.

Compact low cost automatic kvm switch

FROM
£99

Scout KVM Switch™



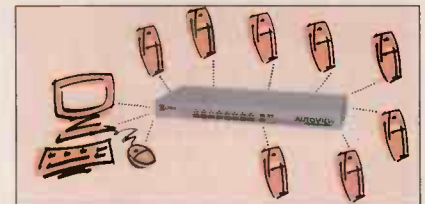
The **Dakota Scout kvm** switch has been specifically designed as an inexpensive and extremely compact keyboard, monitor and mouse switch. Ideal for users who need access to two or more different computers on a regular basis. Available with both two port and four port options, the switch is PC compatible and does not require a power supply.



Automatic keyboard, video and mouse (kvm) switch with on-screen display

AutoView Commander™

The **AutoView Commander™** series allows you to control a number of computers from one or two keyboards, monitors and mice. Built-in scanning features allow you to scan through the computers in



your system sequentially, without user intervention. The keyboard remains operational during the scan process, scanning will pause while you work, then resume with the next computer in sequence. Options featuring four, eight and 16 ports are available for the single user version (**AutoView Commander**). Options of four ports and eight ports, with one local and one remote user, are available for the dual user version (**AutoView Commander 200**) Rack mount kits are also available for both versions.

Visit our website for more details: www.dakota-euro.com

Tel: 020 8452 8400

Fax: 020 8452 2400

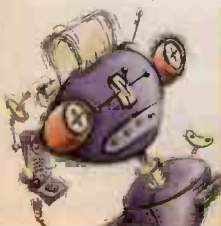
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info-uk@dakota-euro.com www.dakota-euro.com

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Dakota

The brains behind KVM switching and sharing



BEST BUYS

YOUR GUIDE TO TODAY'S TOP PRODUCTS >>>>

Multivision VISION CHOICE MX PLUS

REVIEW May 2001, p152 **PRICE** £938.83
(£799 ex VAT) **CONTACT** Multivision 0121 550 8000
www.multivision.co.uk

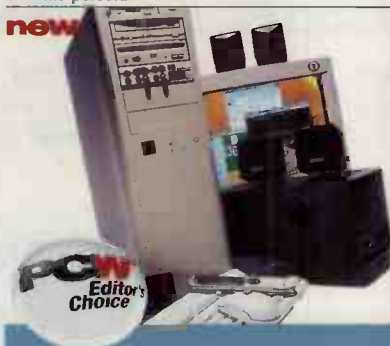


Equipped with an EPoX 8KTA2 motherboard, a 1GHz AMD Athlon processor with 128MB of PC133 SDRAM and a Hercules 3D Prophet II MX with 32MB of graphics memory, this Multivision PC is an excellent system for the price. A 17in LG Flatron monitor offers a decent picture, while optical storage is catered for by a Pioneer DVD-ROM and Samsung CD-RW.

ENTRY-LEVEL PC

Compute IT INFINITY PRO-R

REVIEW July 2001, p156 **PRICE** £1,761.33
(£1,449 ex VAT) **CONTACT** Compute IT 08707 487 487
www.it-pc.co.uk



This has two 128MB sticks of PC133 SDRAM on its Epox EP-8KTA3+ motherboard, plus a 1.33GHz Athlon chip. Two 30.7GB IBM drives are configured using a HighPoint RAID controller for high I/O rates. There's a 16-speed Plextor BurnProof CD-RW, 16-speed Pioneer DVD-ROM, Leadtek's 64MB nVidia GeForce3 graphics card, a Creative Live! Platinum 5.1 sound card and Cambridge Soundworks speakers.

MID-RANGE PC

evesham.com **AXIS 1.33 G3**

REVIEW June 2001, p80 **PRICE** £1,937.58
(£1,649 ex VAT) **CONTACT** evesham.com
08707 287 070 www.evesham.com



Using AMD's 1.33GHz Athlon in an Asus A7M266 motherboard, with 256MB of PC2100 DDR memory and an nVidia GeForce3 graphics card, this system packs a punch. It also comes with Mitsubishi's 19in Diamond Pro 920 monitor and a 61.4GB Maxtor hard drive. Dolby Digital surround sound is provided by Creative's Live 5.1 PCI card and Desktop Theater 5.1 DTT2200 speakers.

HIGH-END PC

Elonex **PIRANHA PRO**

REVIEW May 2001, p170 **PRICE** £3,049.13
(£2,595 ex VAT) **CONTACT** Elonex 0800 037 4466
www.elonex.co.uk



With two docking bays, this notebook could be seen as an ultra-portable, but its 13.3in TFT display and features bump it up to fully featured. It is powered by an 850MHz mobile SpeedStep Pentium III, backed by 192MB of RAM and a 20GB hard drive. Also included are a floppy drive, a CD-RW and mini- and full-size FireWire ports. A DVD-ROM drive is also included.

FULLY FEATURED NOTEBOOK

HP **OMNIBOOK 500**

REVIEW May 2001, p176 **PRICE** £2,051.55
(£1,746 ex VAT) **CONTACT** HP 08705 474 747
www.hp.com/uk



This notebook comes with a mobile 600MHz Pentium III, 128MB of RAM and a 10GB hard drive, which can be upped to 20GB. HP has also equipped the Omnibook with two USB ports, a D-SUB connector, a built-in V.90 modem and 10/100 Ethernet. It also has an expansion base capable of handling any combination of floppy, DVD, CD-ROM or CD-RW drives.

ULTRA-PORTABLE NOTEBOOK

Pision Series **5MX**

REVIEW December 2000, p220 **PRICE** £347.49
(£295.99 ex VAT) **CONTACT** Pision 0990 143 050
www.expansys.com



The Pision 5mx is a quality PDA weighing 354g. It has a screen resolution of 640 x 240, a serial connector so that you can sync it with your PC. There's also space for upgrading with Compact Flash memory. The keyboard is excellent and responsive, ideal for its word processing capabilities. With 16MB of RAM and 16MB of Flash memory this is an ideal handheld computer.

HANDHELD

BEST BUYS YOUR GUIDE TO TODAY'S TOP PRODUCTS

Handspring **VISOR PLATINUM**

REVIEW January 2001, p90 **PRICE** £249.10
(£212 ex VAT) **CONTACT** Handspring 020 7309 0134
www.handspring.com/uk



A 33MHz Motorola Dragonball VZ processor makes the Platinum about 50 per cent faster than its predecessor. The address book functions have single tap duplications.

PALMTOP

Creative **WEBCAM GO PLUS**

REVIEW October 2000, p96 **PRICE** £104.57 (£89 ex VAT)
CONTACT dabs.com 0800 138 5240
www.europe.creative.com



With 8MB of memory and a built-in mic, this can be used as a low-res handheld snapper or video camera. It gives excellent image quality and you can snap up to 150 pictures in 32bit colour.

WEBCAM

Hercules **GAME THEATER XP**

REVIEW July 2001, p93 **PRICE** £129.99
(£107.24 ex VAT) **CONTACT** Hercules 020 8686 5600
www.hercules-uk.com



This PCI card cuts out the ugly problem of a knot of leads hanging from the back of your PC. It has amazing functionality and an attractive blue box to take care of external connections.

SOUND CARD

Epson **PERFECTION 640U**

REVIEW February 2001, p188 **PRICE** £119
(£101.28 ex VAT) **CONTACT** Epson 0800 220 546
www.epson.co.uk



This well-rounded 36bit TWAIN-compliant scanner has a maximum optical resolution of 600 x 2,400dpi, is easy to set up and is bundled with Adobe PhotoDeluxe Home Edition.

SCANNER

Brother **HL-1250**

REVIEW March 2001, p174 **PRICE** £245.57
(£209 ex VAT) **CONTACT** dabs.com 0800 138 5240
www.brother.co.uk



Offering better than average resolution of 600 x 1,200dpi, this reasonably priced printer has the low running cost of 1.2p per page and comes with 4MB of RAM, expandable to 36MB.

BUDGET LASER PRINTER

Epson **STYLUS PHOTO 870**

REVIEW July 2000, p206 **PRICE** £156.27 (£133 ex VAT)
CONTACT dabs.com 0800 138 5240
www.epson.co.uk



Aimed at the professional imaging user, our test photo was beautifully rendered, there was no evidence of undesirable banding and skin tones were accurately reproduced.

COLOUR PHOTO PRINTER

Creative **DT3500 DIGITAL SPEAKERS**

REVIEW January 2001 p102 **PRICE** £249
(£211.91 ex VAT) **CONTACT** Creative 0800 973 069
www.europe.creative.com

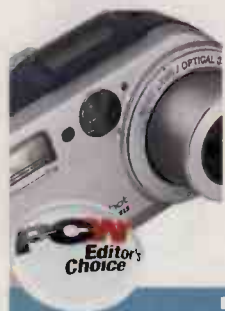


This is the best audio solution we've seen. It's got its own Dolby Digital processor, great sound reproduction and all the cabling you need to get a home entertainment system up and running.

SPEAKERS

Sony **CYBER-SHOT DSC-P1**

REVIEW January 2001, p202 **PRICE** £699
(£594.89 ex VAT) **CONTACT** Sony 0990 111 999
www.sony.co.uk



Squeezing in a 3x optical zoom this compact boasts 3.3megapixels. It can capture up to 15secs of video at 320 x 240 or 60secs at 160 x 120. There's also a built-in speaker.

DIGITAL CAMERA

Hercules **3D PROPHET 4500**

REVIEW June 2001, p90 **PRICE** £129
(£109.70 ex VAT) **CONTACT** Hercules 020 8685 5600
www.hercules.com



The 4500 proves that a good 3D accelerator doesn't have to cost the earth. With a solid feature set, strong performance and a great price, this is the best graphics card we've seen for a while.

GRAPHICS CARD

Nokia **6210**

REVIEW December 2000, p87 **PRICE** £129.99
(£110.63 ex VAT) **CONTACT** Nokia 0990 003 110
www.nokia.com



Weighing 114g, this lightweight WAP phone has a larger memory than its predecessors and supports HSCSD (High-Speed Circuit Switched Data). It uses Nokia's WAP 1.1 browser, which is the most intuitive around.

MOBILE PHONE

IBM **DESKSTAR 75GXP**

REVIEW September 2000, p109 **PRICE** £262.02
(£223 ex VAT) **CONTACT** dabs.com 020 8523 4020
www.dabs.com



This is a 75GB drive with an areal density of 11Gbits/sq in. It has a spindle speed of 7,200rpm, a 2MB data buffer and an average seek time of 8.5ms. The Deskstar packs in a lot of storage for the money.

IDE HARD DRIVE

Quantum **ATLAS V**

REVIEW July 2000, p100 **PRICE** £528.75 (£450 ex VAT)
CONTACT Quantum 01344 353 500
www.quantum.com



Increased areal density makes this 36GB drive impressive. It may not be as fast as 10,000rpm drives, but with seek times around 6.3ms and a spin rate of 7,200rpm, it's good value for money.

SCSI HARD DRIVE

Abit **KT7A-RAID**

REVIEW July 2001, p90 **PRICE** £133.94

(£114 ex VAT) **CONTACT** dabs.com 0800 138 5240
www.dabs.com

new



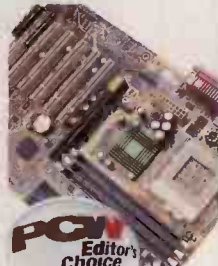
An updated version of the KT7-RAID that now features VIA's Apollo KT133A chipset which can support 266MHz bus Athlons. It can also support up to eight UltraDMA 100 drives.

PCW Editor's Choice
SOCKET A MOTHERBOARD

Asus **CUSL2**

REVIEW November 2000, p219 **PRICE** £113.98

(£97 ex VAT) **CONTACT** Watford Electronics
www.watford.co.uk



A well laid out 815E motherboard with six PCI slots, two CNR slots and an AGP Pro slot. Documentation is first rate and the board is simple to set up. Quite expensive, but worth the money.

PCW Editor's Choice
FC-PGA MOTHERBOARD

Ask **M3**

REVIEW December 2000, p101 **PRICE** £4,688

(£3,990 ex VAT) **CONTACT** Ask-Proxima 01628 666 622
www.askproxima.com



This is 60 x 175 x 210 (h x w x d) and weighs in at 1.7kg. It produces a very bright 1,000 ANSI lumen image, up to 230in diagonal that is easy to read. With DVI and USB at the rear, it is versatile too.

PCW Editor's Choice
PROJECTOR

Iiyama **VISIONMASTER PRO 410**

REVIEW September 2000, p192 **PRICE** £276.12

(£235 ex VAT) **CONTACT** Iiyama 01438 314 417
www.iiyama.co.uk



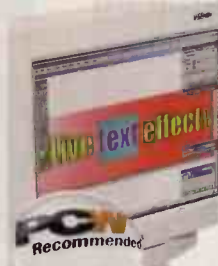
This monitor has excellent image quality and vibrant colours. With resolutions on the Natural Flat aperture-grille tube up to 1,600 x 1,200 at 75Hz this unit is an ideal 17in solution.

PCW Editor's Choice
17IN MONITOR

CTX **PR960F**

REVIEW June 2000, p91 **PRICE** £374.83 (£319 ex VAT)

CONTACT dabs.com 0800 138 5240
www.dabs.com



Equipped with an FD Trinitron tube this monitor has a constant 0.24mm slot pitch across the screen. Additional BNC inputs and a built-in USB hub come as standard.

PCW Editor's Choice
19IN MONITOR

Sony **MULTISCAN G500**

REVIEW May 2000, p226 **PRICE** £911 (£775 ex VAT)

CONTACT Sony 0990 424 424
www.sony-cp.com



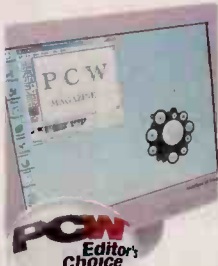
The name Sony is synonymous with high-quality displays and this 21in FD Trinitron monitor is no exception. It has dual-input connectors and remains crisp even up to 1,800 x 1,440 at 75Hz.

PCW Editor's Choice
21IN MONITOR

ADI **MICROSCAN A610**

REVIEW April 2001, p162 **PRICE** £739.07 (£629 ex VAT)

CONTACT ADI 020 8327 1900
www.adimicroscan.com



Displaying all of the 64 grey intensity levels with excellent linearity, this panel has astonishingly good display quality, with horizontal and vertical viewing angles both at 160 degrees.

PCW Editor's Choice
LCD MONITOR

Sony **DCR-PC110E**

REVIEW June 2001 p107 **PRICE** £1,700

(£1,446.81 ex VAT) **CONTACT** Sony 0990 111 999
www.sony.co.uk



The DCR-PC10E is a small, solid camera, with a 4MB memory stick and a highest resolution of 1,152 x 864. A dual-function button enables you to switch between manual and auto-focus mode.

PCW Editor's Choice
DIGITAL VIDEO CAMERA

Plextor **PLEXWRITER 16/10/40A**

REVIEW May 2001, p84 **PRICE** £226.76

(£192.99 ex VAT) **CONTACT** Simply Computers
08707 297 366 www.simply.co.uk



With 10-speed rewrite and 16-speed write, plus BurnProof technology, this surpasses its predecessors as the fastest around. It's pricy, but CD copying speed makes it worth the cash.

PCW Editor's Choice
CD-RW

Panasonic **LF-D201 DVD-RAM**

REVIEW October 2000, p98 **PRICE** £351.33

(£299 ex VAT) **CONTACT** dabs.com 0800 138 5240
www.panasonic.co.uk



With a disc capacity of 4.7GB per side, compatibility with existing 2.6GB and new 4.7GB per side discs, and a versatile software bundle, this is a great product for storing large amounts of data.

PCW Editor's Choice
REMOVABLE STORAGE

OnStream **SC30**

REVIEW September 1999, p102 **PRICE** £370.13

(£315 ex VAT) **CONTACT** dabs.com 0800 138 5240
www.onstream.com



The SC30 has a 30GB compressed data capacity and using Backup Exec it achieved over 70Mbytes/min. Echo software provides drive-letter access so you can treat it like a hard drive.

PCW Editor's Choice
BACKUP

AOpen **DVD 1640 PRO**

REVIEW August 2000, p196 **PRICE** £101.05

(£86 ex VAT) **CONTACT** dabs.com 0800 138 5240
www.aopen.nl



An impressive 16-speed DVD reader from AOpen that includes Cyberlink's Power DVD movie player. The 1640 Pro is a first-class unit that marries excellent performance with solid build quality.

PCW Highly Commended
DVD DRIVE

telephone 0870 129 3654

e-mail sales@dabs.com

www.dabs.com

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Portables

quicklink	ACER	ex VAT	inc VAT
TCMPW	202T Celeron 650 64/5GB 12.1" TFT	765	898.87
VJBPW	351TE PIII700 128/10GB CD	1389	1632.07
Compaq Armada			
V8LPW	100S AMD K6-2 550 65/5GB CD 12.1"	695	816.62
WSBPW	110S Celeron 700 64/10GB CD 14.1" Me	915	1075.12
HEWLETT PACKARD XE3			
W5FPW	Celeron 650 64/7 5GB CD M 13.1" HPA	699	521.32
V7WPW	PIII700 64/10GB CD M 13.3" TFT	995	1169.12
HEWLETT PACKARD Omnibook 6000			
QD5PW	PII650 64/6GB CD M 14.1" TFT	1179	1385.32
T41PW	PII850 128/20GB DVD M 15" TFT	1799	2113.82

PC Systems

quicklink	TOSHIBA Equium	ex VAT	inc VAT
S2TPW	3300M Celeron 633 64/10GB Tower	414	486.45
RQ1PW	3300M PIII733 64/10GB M Tower	479	562.82

Handhelds

quicklink	HEWLETT PACKARD	ex VAT	inc VAT
WONPW	Jornada 525 16MB Colour	245	287.87
UKKPW	Jornada 548 32MB Colour	329	386.57
PNKPW	Jornada 720 32MB Colour	565	663.87
PALM			
VDPPW	Palm M105 8MB	139	163.32
LF4PW	Palm IIC	219	257.32
KRLPW	Palm Vx 8MB	248	291.40
PSION			
4YQPW	Series 5MX 16MB+PsiWin	309	363.07

Processors

quicklink	AMD	ex VAT	inc VAT
QYYPW	Duron 800MHz	Socket A	54 63.45
SWVPW	Duron 850MHz	Socket A	65 76.37
NWCPW	Athlon™ 900MHz	Socket A	105 121.02
NWHPW	Athlon™ 950MHz	Socket A	118 138.65
NWJWP	Athlon™ 1GHz	Socket A	125 146.87
Q6XPW	Athlon™ 1.1GHz	Socket A	140 164.50
R24PW	Athlon™ 1.2GHz	Socket A	167 196.22
V8BPW	Athlon™ 1.3GHz	Socket A	186 218.55
INTEL			
RDWPW	Celeron 766	FC-PGA	64 75.20
V6MPW	Celeron 800	FC-PGA	78 91.65
LGHPW	Pentium III 933EB	FC-PGA	164 192.70
Q95PW	Pentium III 1GHz	FC-PGA	191 224.42

IDE Hard Disc Drives

quicklink	IBM Deskstar	ex VAT	inc VAT
M47PW	750XP 30.7GB 7200rpm	97	113.97
WQJWP	60XP 41.2GB 7200rpm	125	146.87
MAXTOR 531DX			
V5SPW	531DX 10.2GB 5400rpm	60	70.50
V5TPW	531DX 15.0GB 5400rpm	62	72.85
MAXTOR DiamondMax			
PLJPW	80 61.4GB 5400rpm	145	170.37
SPVPW	Plus 60 20.4GB 7200rpm	80	94.00
SPZPW	Plus 60 30.7GB 7200rpm	99	116.32
SEAGATE			
QDYPW	US 10211 10.0GB 5400rpm	61	71.67
QFDPW	US 20413 20.0GB 5400rpm	63	74.02
SQ5PW	Barracuda ATA III 20.4GB 7200rpm	80	94.00
SQ6PW	Barracuda ATA III 30.6GB 7200rpm	101	118.67

Scanners

quicklink	AGFA	ex VAT	inc VAT
7XCPW	SnapScan Touch	85	99.87
MNJPW	SnapScan e50	149	175.07
EPSON			
PHQPW	Perfection 640U USB	75	88.12
PHPPW	Perfection 1240U USB	127	149.22
Q5WPW	Perfection 1240U Photo	172	202.10
HEWLETT PACKARD			
N75PW	ScanJet 3400C USB	57	66.97
QTCPW	ScanJet 4300C & DeskJet 840C	125	146.87
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SQRPW	McAfee Office 3	55	64.62
Q80PW	Microsoft Money 2001 Financial Suite	35	41.12
R3BPW	Power Quest Partition Magic v6.0	39	45.82
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TEST DRIVE DIGITAL CAMERAS

THE VICTIMS



Niamh Neville works in marketing and is an experienced photographer. However, this was her first time using a digital camera



Hugh Threlfall is a professional photographer. He's familiar with digital cameras, but still prefers non-digital kit

Point & shoot

This month our intrepid duo of testers take some digital cameras out and about to see how they compare to their SLR counterparts. Cliff Joseph reports

Digital cameras have been around for years, yet digital photography is still in its infancy. Despite recent advances, most professional photographers prefer to stick with their analog SLR cameras.

The biggest problem with digital photography is the simple matter of quality. The image quality of a digital camera is primarily determined by its resolution. The higher the resolution, the more detail the camera can capture, resulting in a higher-quality photograph. However, it's only recently that the resolution of digital cameras has begun to match the quality associated with conventional cameras.

A couple of years ago you could expect to pay more than £1,000 for a camera with a one million pixel (megapixel) resolution. But the cameras in this Test Drive provide resolutions of up to 4.3 megapixels at prices between £500 and £800. That's remarkable progress in such a short space of time and digital cameras are now more than adequate for most hobbyists and amateur photographers. Professional

photographers still tend to be sniffy about digital kit, but the quality of the latest generation of digital cameras is making some genuine converts.

There's more to a digital camera, however, than its resolution. Features such as zoom lens, focus, shutter and flash controls are all important requirements even for an amateur photographer. But while these features are now quite common, even in very low-cost digital cameras, they're often extremely difficult to use.

Like many computer peripherals, digital cameras often seem to be designed by engineers who are out of touch with the real world and who give little thought to the needs of ordinary users. Clumsy ergonomic design, complex menu systems and manuals that seem to be written in double Dutch are all common flaws in the digital cameras that we review month after month.

So for this Test Drive we found two photographers with different levels of experience and let them loose with some of the latest digital cameras. Hugh Threlfall is a professional

photographer whose work regularly graces the pages of *PCW*. Like many pros, he still prefers conventional cameras, but he's familiar with digital technology and has used a number of digital cameras in the past. This means he's in a good position to compare digital and non-digital cameras. Niamh Neville, in contrast, is a complete newcomer to digital cameras. However, she's an experienced photographer and knows what to look for in a good camera.

We set our guinea pigs four tasks designed to test the main features of each camera. These included taking an outdoor shot using manual focus control, and then an indoor shot that let the camera's autofocus and built-in flash do all the work. We also asked them to take some sort of high-speed action shot to test the shutter controls for each camera. However, fancy features are no good if you can't figure out how to get your pictures onto your PC, so a simple download from camera to PC was our final test. And, as you'll see, some of these expensive cameras couldn't even get that right.

DIGITAL CAMERAS **TEST DRIVE**



TEST DRIVE DIGITAL CAMERAS

DETAILS

CANON POWERSHOT G1

PRICE £800 inc VAT

CONTACT Canon UK

0800 616 417

www.powershot.com

PROS 3.34megapixel resolution, good build quality and bundled software

CONS Heavy and uncomfortable to hold. The cramped control layout proved particularly irritating

OVERALL The PowerShot G1 is technically impressive, but Canon could do much to improve its ease of use

The built-in microphone can be used when recording moving images

The cramped controls proved awkward to use



The rotating LCD allows you to take pictures from almost any angle



Testing...testing

Canon PowerShot G1

Canon's PowerShot G1 proved to be something of a mixed bag. It has a good technical specification, but this is marred by the camera's clumsy design.

With its 3.34megapixel CCD sensor, the PowerShot's image quality impressed both testers. The camera has both a built-in flash and a hotshoe for adding an external flash. The optical viewfinder is complemented by a small LCD screen that can be rotated, allowing you to take pictures from a variety of different angles. It's primarily a stills camera, but it does provide a 'movie' mode that allows you to capture up to 30 seconds of video and, thanks to the built-in microphone, your movies will also have sound.

But while the camera's features and image quality were quite impressive, both our testers found the PowerShot difficult to use. 'It's uncomfortable to hold,' Hugh said. 'And it's the heaviest of the four cameras. I think that's an important consideration in a compact camera.' Niamh agreed that the

camera was overly heavy, and added that she found its boxy design 'uncomfortable to hold for long periods of time'.

Both our testers also found the camera's controls rather fiddly to use, mainly because many of the dials and buttons are placed so close together. Hugh was frustrated by the layout of the buttons. 'I particularly disliked the fact that the On button is right next to the Settings dial – it's easy to jog the dial and accidentally alter the settings,' he said. 'It's rather irritating.'

However, the PowerShot G1 does have its strong points. Hugh acknowledged that the weight of the camera reflected its 'solid build quality', while Niamh liked the rotating LCD and its easy-to-use on-screen menu system. The close-up macro function worked well, although it was felt that the 3x optical zoom was rather limited. The comparably priced Fujifilm FinePix 4900 provides a 6x optical zoom.

Both testers were also able to complete the tasks we set them without too much difficulty. Niamh



DIGITAL CAMERAS TEST DRIVE

It may look odd, but the FinePix is light and comfortable to use

Flash unit: the pop-up flash works well and reduces red eye

DETAILS

FUJIFILM FINEPIX

4900 ZOOM

PRICE £799.99 inc VAT

CONTACT Fujifilm

020 7586 1477

www.fujifilm.co.uk

PROS Good lens; well designed and easy to use

CONS Delay between pressing shutter button and taking picture

OVERALL It's not perfect, but its lens quality, comfortable design and ease of use make this clearly the best of the bunch

The powerful lens provides 6x optical zoom



liked the ZoomBrowser software supplied with the camera. She felt that its interface – which looks like an actual roll of film – was 'cute', but also made it very easy to download pictures onto her PC.

The various shutter and focus controls also worked quite well, and didn't cause any problems with the indoor and outdoor shots we asked the testers to take. However, the experienced eye of Hugh, the professional photographer, did notice that the PowerShot's built-in flash tended to focus more strongly on the background area of an image, rather than its foreground. Even so, he felt that the PowerShot was one of the better cameras in this group: 'It's quite complex to use, but still a good-quality camera,' he commented.

FujiFilm FinePix 4900 Zoom

The FinePix 4900's bulging grip and big fat lens may not look particularly elegant, but the design of the camera drew praise from both users.

'It's really easy to hold and very well designed ergonomically,' Niamh enthused. 'There's a proper focus ring on the lens and a dial for shutter

control. Combined with the well-designed menus this is the easiest to use of all the cameras.' She really liked the 'focus-check' that allows you to zoom in on the centre of the frame in order to check that you're accurately focused. There's also a 'grid' option in the viewfinder that helps less-experienced users to frame shots properly so that they don't chop the heads off people in their pictures.

A camera that appeals to a hobbyist doesn't always appeal to a professional user, but the FinePix's specification drew praise from Hugh: 'It had an impressive 6x optical zoom. The macro feature also worked well and was able to focus very close up.'

The FinePix outputs a higher-resolution image than any of the other cameras tested and has a quoted image size of 4.3megapixels. However, the FinePix only uses a 2.4megapixel CCD so the image is actually being scaled up to 4.3megapixel levels. This means it really only matches the 3.3megapixel CCDs of the other cameras on test here. However, the FinePix does have an impressive 6x optical zoom.

The camera's versatile controls and ease of use meant that our



SENSOR RESOLUTION

A digital camera is a bit like a scanner. Both devices have an electronic sensor called a CCD (charged coupled device). This sensor converts light from an image into a series of electronic pulses that can then be stored as data on the camera's internal storage device.

The resolution of this sensor determines the number of pixels in the resulting photograph. The higher the resolution of the CCD, the more detail the camera can capture. You can buy cheap digital cameras for around £100, but these generally have a resolution of just 640 x 480 pixels, which amounts to a total of about 300,000 pixels for the entire image. That's nowhere near the quality you'd get even from a cheap conventional camera, but the more expensive cameras in this test all provide many times that resolution.

While the FinePix 4900 Zoom would seem to have the best resolution of any of the cameras on test here, it actually only uses a 2.4megapixel CCD and then scales the image up to 4.3megapixel size. So the FujiPix only really matches the 3.3megapixel CCDs used on the other cameras.

TEST DRIVE DIGITAL CAMERAS

DETAILS

KODAK DC4800

PRICE £499.99 inc VAT

CONTACT Kodak

0870 243 0270

www.kodak.co.uk

PROS One of the more affordable cameras, with a comfortable ergonomic design and uncluttered control panel

CONS Lacks manual focus, and the bundled software was difficult to use

OVERALL The DC4800 has potential, but is marred by its poor software and the confusing layout of the controls, which frustrated both users

Curved edge is comfortable to hold

The position of the On/Off button confused our testers



The flash unit folds away when not in use



testers had no problems completing the tasks. 'It's easy to switch between manual and autofocus,' Hugh said. 'And the flip-up flash is a long way from the lens, which helps reduce red eye.'

Hugh did have one serious criticism. The delay between pressing the shutter button and taking a picture was a real problem. 'I tried to take a picture of a child jumping out of a tree, but I completely missed it. The child was out of the frame before the camera took the picture.' This will obviously be a serious problem for anyone who wants to take action shots, such as sport events or even a skiing holiday. Even so, the FinePix's high-quality lens, ease of use and comfortable design clearly appealed to professional and amateur alike.

Kodak DC4800

Opinions were divided over the DC4800. Hugh felt it was 'a nice, simple camera', but Niamh struggled with several of the camera's controls.

Initial impressions were quite favourable. The camera's shape is a little odd, bulging outwards on the right-hand side, but Niamh quite liked its feel. 'It's lovely to hold. The curved edge fits nicely in my hand,' she said.

Hugh was also keen on the camera's layout. 'I liked the simple, uncluttered design. There aren't too many buttons,' he said. But there were problems when it came to taking pictures. Both testers pointed out that the On/Off button is where you'd expect the Shutter button to be. As a result, both reported that they had accidentally turned the camera off several times by pressing the On/Off button instead of the Shutter button.

The first task we set was simply to download some pictures onto a PC, but both Niamh and Hugh hit problems straight away. 'I couldn't transfer pictures at all,' said Hugh. 'I installed the software with no problem, but I couldn't get the software to recognise the camera.' Niamh had similar problems downloading pictures, as the software on her PC failed to display the pictures stored on the camera.

Our second test also fell by the wayside as the camera lacked the



LCD VIEWFINDERS

All the cameras here have a small built-in LCD display, whose basic function is to act as an alternative to the standard optical viewfinder. It's handy if you wear glasses that might bump up against the optical viewfinder, and it allows you to take pictures while holding the camera at arm's length as you can see the screen from a distance.

Some cameras have a screen that can fold out from the body of the camera and be rotated.

The LCD also displays the menu system that allows you to adjust settings such as image resolution and flash controls. Ease of use is important, as a poor menu system can make the camera hard to use.



The LCD control panel

DETAILS

NIKON COOLPIX 880

PRICE £649.99 inc VAT

CONTACT Nikon UK

0800 230 220

www.nikon.co.uk

PROS Very good image quality and fast response times

CONS Clumsily positioned lens; poor documentation and software support

OVERALL A schizophrenic camera – it provides good-quality images but has design flaws that make it a touch annoying to use

Four-way rocker switch for menu navigation



Advanced colour TFT screen

manual focus control required to complete the test. The remaining tests were more successful, though, and Hugh was complimentary about the fold-away flash unit. 'I like having that control. There are lots of shutter and aperture settings available too.'

However, Niamh found it difficult to locate some of these settings. 'The menu is difficult to navigate and a lot of controls are buried in there. It's a bit of an effort to change the shutter speed.'

The camera's 3.3megapixel resolution produced some good pictures, but the overall feeling from both our testers was that the DC4800 was under-specified compared to its rivals, and that the poor software support was very frustrating.

Nikon CoolPix 880

For the most part, our test-drivers liked the Nikon CoolPix 880. Its 3.34megapixel resolution and built-in flash produced some very good pictures, however, both our testers came across one or two specific features of the camera that they disliked quite strongly.

The camera's compact design and light weight met with general approval.

Hugh praised it as 'very light and easy to use', while Niamh also liked its 'nice compact size'. Both users were also impressed by the rapid response when taking pictures. Many digital cameras suffer from a slight delay between pressing the shutter button and actually taking a picture, but as Hugh pointed out, 'it's got a fast response. There's no delay between pressing the button and taking the picture'.

However, they both struggled with the NikonView software used to download pictures from the camera onto a PC, and Niamh was particularly scathing about this aspect of the package. 'When I tried to download images onto the computer I couldn't find the instructions in the manual.' There are some Help files on another CD, but Niamh couldn't understand how Nikon could hide away important information relating to the camera's USB drivers in a ReadMe file on one of the CDs.

Hugh was irritated by another basic fault. 'The lens is situated right on the left-hand edge of the camera, so every time you pick it up you put your finger on the lens,' he said. As a

professional photographer he found this a particularly clumsy design flaw. The LCD screen is also right on the edge of the camera, which means that it quickly gets smudged by thumbprints. The mere 2.5x optical zoom is also something of a disappointment.

However, the CoolPix 880 performed better on our other tests. 'The pictures all came out particularly well using the flash and autofocus,' Hugh said, while Niamh liked the fact that the LCD screen allows you to quickly compare several pictures at a time.

The CoolPix 880 is therefore appealing and maddening in equal measure. Its image quality and controls earned genuine praise. However, the poor documentation irritated our novice user, while the clumsy positioning of the lens earned scorn from the professional.



Conclusion

Now they've captured the sights, what do Niamh and Hugh think about the cameras they tested?

After testing all four cameras, our two photographers came to pretty much the same conclusions. The two issues they were most concerned with were features and ease of use, and they were in clear agreement about which cameras fared best in each area.

The Kodak DC4800 was clearly not as fully featured as the other digital cameras we looked at here. Its lack of manual focus meant that it was unable to complete at least one of our assigned tasks, and both photographers had trouble with the simple job of downloading pictures from the camera to their PCs. To be fair, the DC4800 is by far the cheapest camera in the group, and does well to provide its 3.4megapixel resolution so inexpensively. However, it was felt by both our testers that the Kodak had sacrificed some important features in order to keep the price down, and Niamh in particular felt that this was an unwise compromise.

When it came to the Nikon CoolPix 880, both testers struggled to download pictures from the camera onto their PCs and the manual wasn't much help in this area. Both the Nikon and Kodak cameras also highlighted the issue of ergonomic design. The fact that two experienced photographers kept turning the Kodak camera off by accident, because the Off button is where they expected to find the Shutter button, leads you to wonder what Kodak's engineers were thinking.

Nikon's engineers also seem a bit unclear about basic human physiology. Their decision to place the lens of the CoolPix camera right where you want to rest your fingers is quite inexplicable.

Ease of use also proved to be the weak point of Canon's PowerShot G1. This camera had all the features required to complete our various tests and Hugh, the professional photographer, appreciated its many control settings. However, even Hugh had to admit that the camera was quite complicated to use, while Niamh found it uncomfortable to hold and fumbled over the layout of the various buttons.

In contrast, the Fujifilm FinePix 4900 Zoom scored well both on features and ease of use. Niamh got right to the point when she said that this digital camera came the closest to working just like the ordinary SLR camera that she is used to. As a result, she felt more at home with this camera than with any of the others. The FinePix also impressed both of our testers with its range of features and the high-quality lens. Its 6x optical zoom and close-up macro mode drew praise even from the demanding professional, Hugh.

It wasn't surprising, then, that both of our Test Drive photographers chose the Fujifilm FinePix as their favourite camera. So the lesson is clear: don't skimp on features just to save money. But when manufacturers are building features into a digital camera it's also vital that those features are presented in a way that makes the camera easy to use.

PCW

REVIEWERS' VERDICTS



NIAMH'S VERDICT

She may be new to digital photography, but Niamh had no doubts about her verdict. 'There's no way I'd pay £500 for the Kodak – or for the Nikon. They just don't have enough features. The Canon has more features, but it's complicated – it takes a lot to get your head around it.'

That leaves the Fujifilm FinePix 4900 Zoom as her clear first choice. It's not perfect: 'the screen isn't that good', but Niamh liked its design and its ease of use. 'The curved grip fits nicely into your hand, and you can move between the screen and the viewfinder at the flick of the switch.' Ultimately it was the combination of features and ease of use that appealed to Niamh.



HUGH'S VERDICT

Hugh wasn't quite as dismissive of the Kodak and Nikon cameras as Niamh. 'They're all good cameras and they all have advantages,' he said. The lens quality and versatile settings of the Canon PowerShot G1 drew particular praise. But, like Niamh, he had little hesitation in choosing the Fujifilm FinePix 4900 Zoom as the best in the group. 'This was my favourite. It had the best lens, with a 6x optical zoom. It was very light and comfortable to use.'

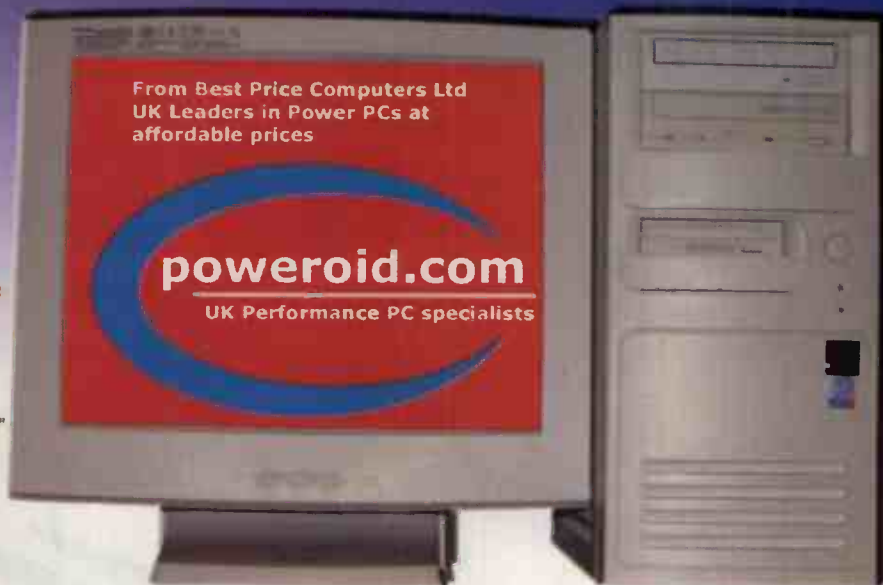
Hugh was critical of the camera's shutter delay, but still felt that the camera's lens quality and ease of use were superior to those of its rivals.

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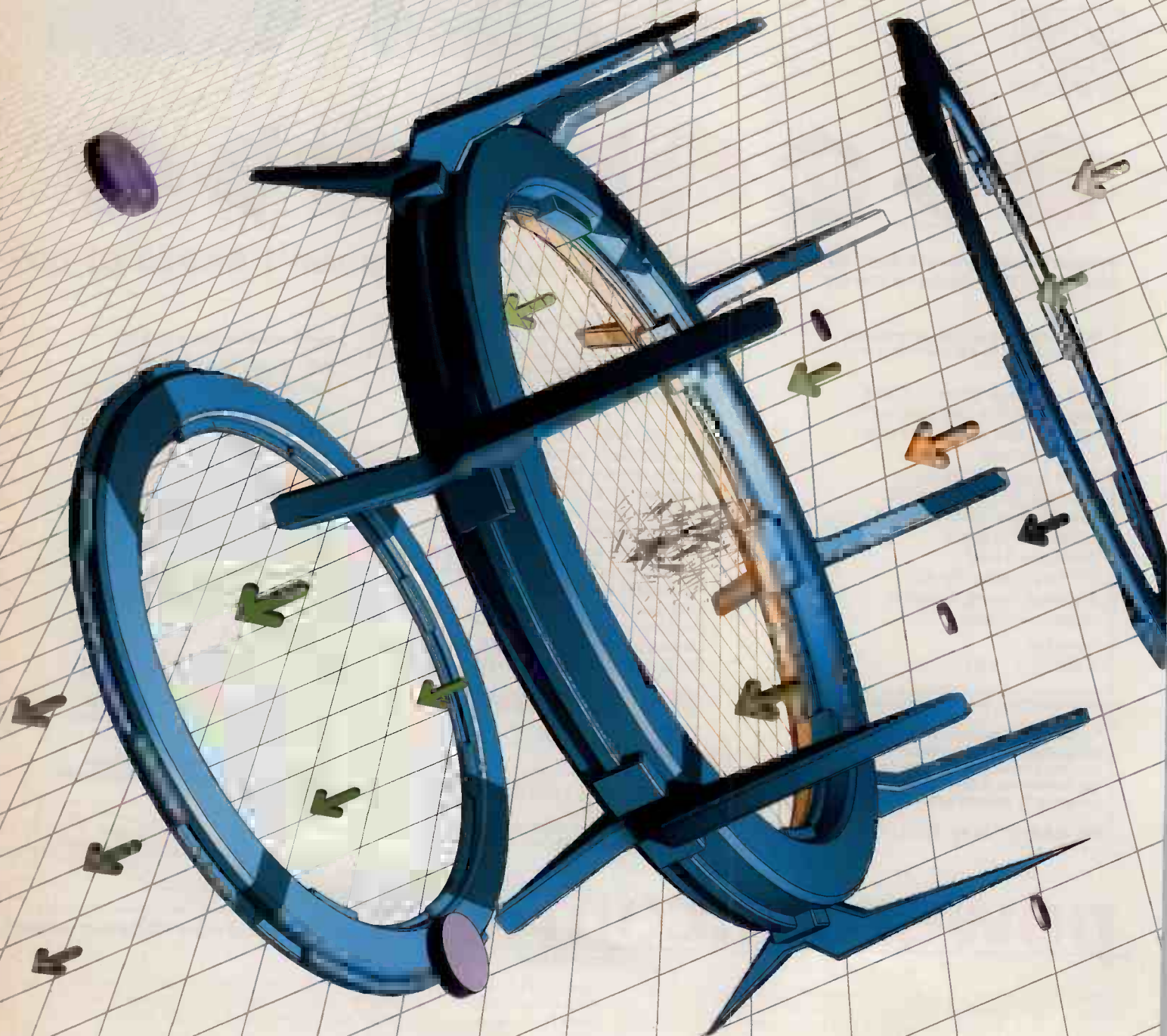
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WORDS: TERENCE GREEN ILLUSTRATIONS: MAGICTORCH

Better safe than sorry

As soon as you link your computer to the Internet you are risking attack from various sources, so security should be the byword of every surfer. Our three workshops will put you on the road to a safer, more secure online experience

Hopefully, the importance of stringent security has been hammered home to users of 'always-on' ADSL and cable modem Internet connections, but the online risks for unmetered modem users are equally as threatening yet go almost unnoticed.

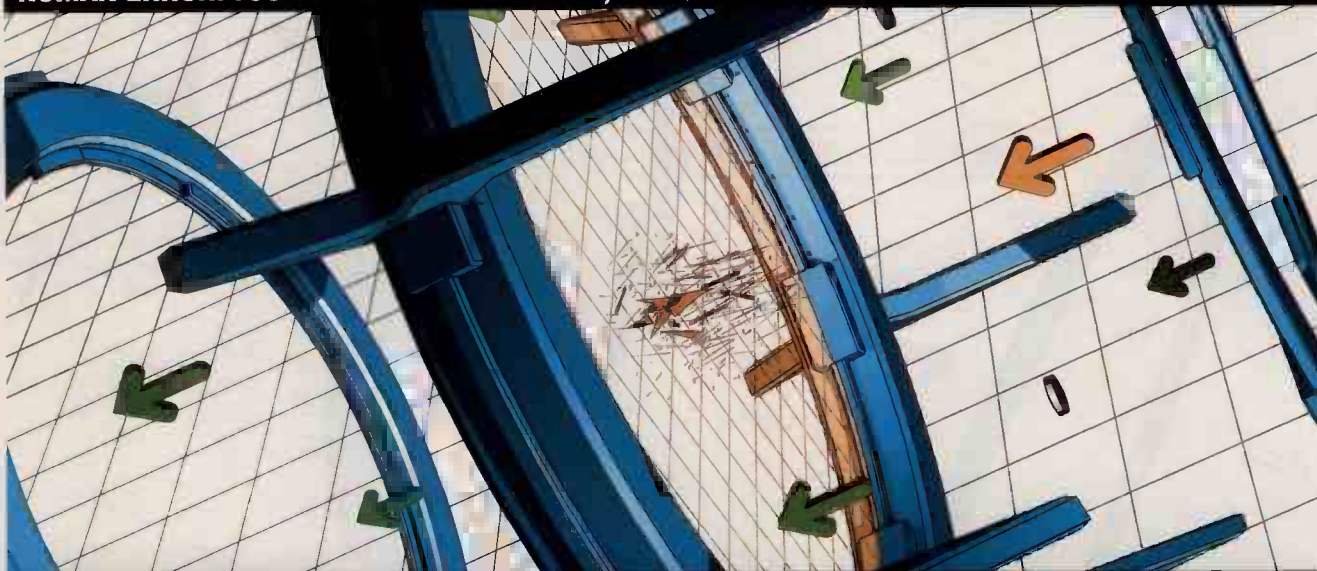
Previously restricted to big businesses with big pockets, broadband technology is now within reach of many homes and small offices. Security companies have been quick to promote downsized versions of their security products that can simply be interposed between a home computer or network and an incoming ADSL port or cable modem. That's fine up to a point

but it doesn't address the needs of modem users and creates an impression that security is a device or piece of software when, in fact, it's a process of continuous evaluation and balanced risk against reward.

Broadband users face greater risk, not because they have faster connections or different technology but because a computer that is continuously connected to the Internet is far easier to breach than one connected for short periods. Last year, when ISPs began offering flat-rate dial-up access packages, modem users began spending hours online and their risk grew too. Far more people go online using a modem than broadband and it's likely to stay that way for some time, given the chaos in ADSL and cable modem provision.

Broadband users face greater risk, as a computer that is continuously connected to the Internet is far easier to breach

HUMAN ERROR: YOU ARE THE WEAKEST LINK, GOODBYE!



As far as security is concerned, humans are the weakest link. In terms of risk, human error is often perceived to involve action – opening attachments, downloading from dodgy websites – by the user, but that's not always so. In the March issue, we carried a workshop on making Outlook Express less of a security loophole. Shortly afterwards a reader contacted us to say that, despite having followed our instructions to the letter, Outlook Express was still initiating an automatic dial-up networking (DUN) connection on receipt of a particular email.

This is the result of a 'good idea' designed to liven up email that has the unexpected side effect of creating a security risk. Email clients such as Outlook, Outlook Express and Netscape Messenger use the Internet Explorer HTML viewer embedded in Windows to display font and image effects when HTML codes are embedded in the incoming email

message. At present, this action cannot be disabled in Outlook or Outlook Express, even if all scripting is disabled, and it can be exploited by malicious code in HTML mail. Fortunately, our reader's problem involved references to benign images stored on a website. The DUN connection was triggered when Outlook Express attempted to retrieve them. Microsoft's desire to enhance the email experience removes the responsibility for human error from the only person in a position to make a judgement call at the point of impact.

Human error should never be discounted, but that happens often. Microsoft's security framework is predicated on digitally signed code. A digital certificate such as the one you see when using Windows Update certifies that the code you downloaded originated from Microsoft. Accept it and the code runs completely unrestricted on your system.

Recently, Verisign, the leading issuer of security certificates, sold some digital certificates to someone posing as Microsoft. Whoever obtained these certificates under false pretences could disseminate software certified as coming from Microsoft that trashed your hard disk or worse. Once Microsoft realised how serious this act was it posted a Critical Update. If you install it you shouldn't have to worry about the two spurious certificates any more, but Verisign's error is a salutary lesson on how the responsibility for trust can be blurred.

The security warning displayed when Explorer encounters a digital certificate doesn't verify the code, it verifies the publisher that asserts its code is safe. That assertion is as trustworthy as the publisher. Someone posing as Microsoft has done us all a favour by demonstrating that, in reality, it is our responsibility to trust all incoming code.

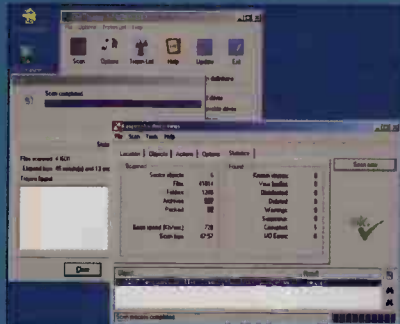
According to research published in February by Oftel, the UK Government regulator for telecommunications, 2.3 million UK homes had some form of unmetered access by the end of 2000. At that time the total number of unmetered broadband services (ADSL and cable modems) was under 50,000; since Home Highway (ISDN) is a minority sport, it's safe to say that over two million homes in the UK have unmetered modem connections to the Internet.

Two million homes connected to the Internet for hours at a time is a big target for anyone with mischief in mind. If our mischievous friends also have unmetered access they have all the time they need to test our defences. This, of course, assumes a risk in the first place. It's not uncommon to believe that talk of security problems, such as anti-virus scares, is no more than a sales pitch designed to encumber the unwary with costly or unnecessary security devices. Would that it were so! The fact is, when you connect your computer to the Internet you're also, naturally, connecting the Internet to your computer. You can discount this as a risk only

if you believe there are no bad guys out there. Many of the bad guys are just amateurs playing with tools they barely understand, but they can still cause problems, as demonstrated recently by the Kournikova virus. Clearly, when we use the Internet, we have to accept that there are risks. We can ignore them and surf regardless, we can avoid all risk by not connecting to the Internet at all, or we can compromise and minimise risk without restricting our use and enjoyment of the Internet.

Security is the process of arriving at that compromise and it should be a continuing process since risk changes, often as a result of our own behaviour. An email attachment is a risk; opening it magnifies the risk. We can also influence the nature of the risk. Many unsolicited emails (spam) include an 'unsubscribe' option. By itself, the spam may present a slight risk but responding with a request for your name to be removed from the list will validate your email address for the spammer and open you up to a new set of risks.

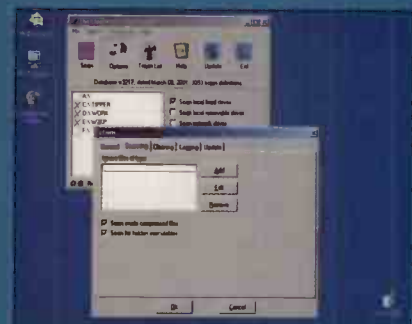
Realising that we are part of the problem is essential to

HOW TO CHECK FOR VIRUSES AND MALICIOUS CODE

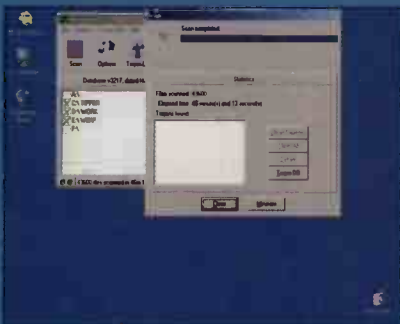
1 Before securing your system, ensure it isn't already harbouring any nastiness like trojans and backdoors. You have several options; The Cleaner (www.moosoft.com) is a trojan-specific scanner and cleaner available on a 30-day trial. Since you should also scan for viruses, which The Cleaner doesn't do, you may prefer to use a quality anti-virus scanner, such as KAV from www.kaspersky.com, which has a good reputation for detecting trojans and viruses. Or use both to be double certain.



2 Download and install The Cleaner from www.moosoft.com. Start it and click on the Evaluate button. This is a fully functional version. The database loads and the scanner window is displayed, but to get the best results, connect to the Internet and update the database so that you are using the latest trojan definitions when you scan your drives. Click on the Update button and follow the prompts to download and install the most recent database.



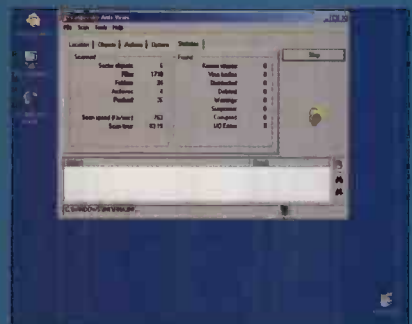
3 In The Cleaner window next to the list of drives, click on 'Scan Local Fixed Drives' to select them. Since we want to perform a comprehensive scan, click on the Options button and on the Scanning tab and select both Scan inside compressed files and Scan for hidden executables. The scan will take longer but will now detect trojans that use stealth techniques to hide themselves, as well as any that may be hiding inside file archives.



4 Close the Options windows and click on the Scan button to initiate the scan. Depending on the speed of your processor and the amount of data storage you have, this could take quite a long time because of the depth of the scan. If any trojans are discovered, click on the Clean All button to remove them. Use the Details button for more information or the TrojanDB for some interesting descriptions.



5 Go to www.kaspersky.co.uk to download a copy of Kaspersky Anti-Virus (AVP) Gold. Request a 30-day trial when offered as this enables full function which you need in order to download the latest anti-virus signatures. Install KAV using the Custom option to deselect AVP Control Centre as this is only required for centralised administration on networks. Reboot as requested once installation has completed and select OK to download updates from the Internet when prompted.



6 Start the Kaspersky AVP Scanner from the Programs menu. Select Local hard disks from the Location menu, from the Objects menu select all the objects and set file type to All, leave the remaining options unchanged, and click on Scan. Since every file as well as compressed files and mail databases will be checked, this will also take some considerable time. If any viruses are found, read the Help file and then disinfect them.

defeating the biggest security flaw of all – the belief that security is something we can interpose between us and the bad guys. In reality, security is what we trust and, as the *Human error* box (left) shows, all we can really trust is what we can touch, and even that's suspect. This isn't a counsel of despair, only a reminder that installing a piece of software or hardware is only part of the security process.

To create effective security we need an awareness of the type of risks we face. When we first consider risk it's natural to assume that threats arrive from outside and are aimed at us, but it works both ways. We need to protect our data against external threats but, increasingly, our data is an unfortunate bystander as high-profile attacks have

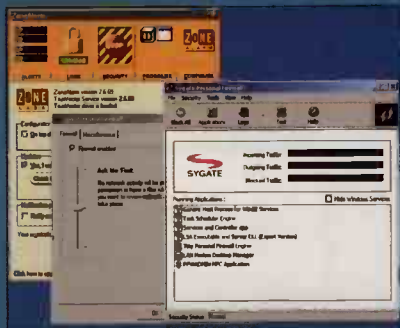
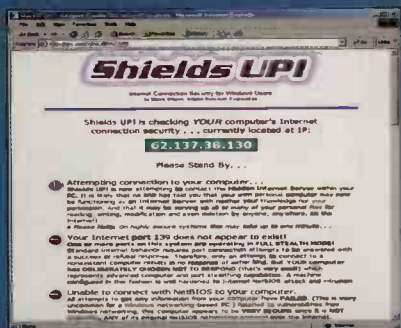
demonstrated. Classic examples such as the I Love You and Melissa viruses take swipes at our data, but are far more effective at propagating themselves via the Windows address book to all our contacts.

As many can attest, by far the biggest threat to our data is an operating system or software/hardware glitch, or simple human error. We install a new peripheral, something goes wrong, and suddenly we're reinstalling the operating system. The only way to recreate our data is by restoring from a recent backup; this also happens to be an essential security tool should some incoming threat wreak havoc on your data. To cover for the situation where you don't spot a problem immediately, use a grandfather-father-son backup strategy

QUICK TIP

Never ever 'fit-and-forget' anti-virus software or personal firewalls. Update anti-virus signatures at least once a week – more frequently if you're using an unmetered connection – and check for program updates regularly.

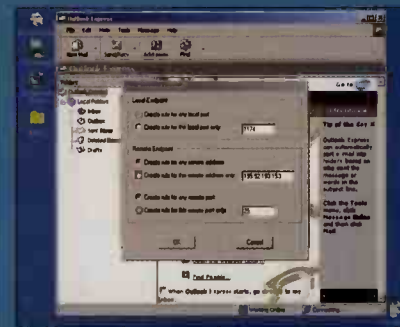
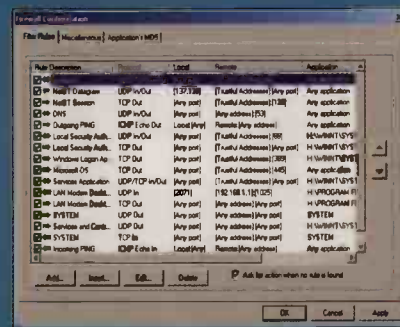
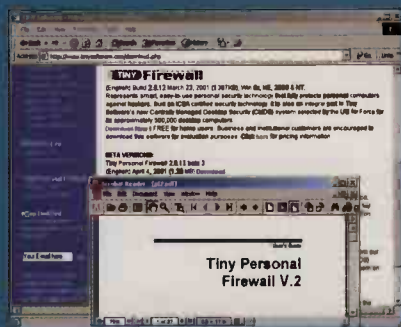
HOW TO INSTALL A PERSONAL FIREWALL



1 Several personal firewalls are free for home use, including Sygate Personal from www.sygate.com, Tiny Personal Firewall from www.tinysoftware.com and Zone Alarm from www.zonelabs.com. Try them all to see which fits your needs. After installing your firewall, visit <http://grc.com> and use ShieldsUp and LeakTest to see how well it performs. As a Windows user you want to be sure that NetBIOS isn't being exposed through your Internet connection.

2 Personal firewalls aren't toys; they do a good job of closing obvious holes in Windows and can prevent trojans that have managed to install themselves on your system from making outbound connections, but you shouldn't depend on a free software firewall if you have truly sensitive data to protect. Zone Alarm is the easiest to use because it is highly automated, but Tiny and Sygate are more flexible if you want to learn more about how personal firewalls work.

3 Tiny Personal Firewall most resembles a traditional firewall. Installation takes minutes, then you must reboot so Tiny can load itself before any other application that might access the Internet. If you have a network card installed, Tiny will detect it and let you choose whether you allow other computers on the same local network to access Windows resources on your computer. Tiny will create a rule based on your reply.



7 As Tiny Personal Firewall does not include any Help, you may wish to download the User's Guide from the Tiny Software website. It is a little out of date but offers some help on the custom settings. Normally, the default settings are satisfactory, but as you learn more about firewalls and how your applications interact with them you may want to limit some outgoing actions to specific remote ports in order to tighten up security.

8 Rules can be edited or deleted at any time. You should delete rules for apps you no longer use. Open the Personal Firewall Administration window on the Firewall tab and click on the Advanced button to display the rules. The first rule, the Loopback, is mandatory. If you remove it the firewall won't be able to communicate with the operating system and you will need to reinstall the firewall to re-establish the Loopback rule.

9 As you become familiar with the firewall you can begin to refine the rules. If you use Outlook Express, use Administration to delete its rule. Run Outlook Express send/receive and opt to customise the rule. Restrict the remote address and port the specific numbers listed. When you next try to send and receive Outlook Express will only be able to send mail because the rule does not include port 110, the port for receiving mail. The rule is too restrictive.

QUICK TIP

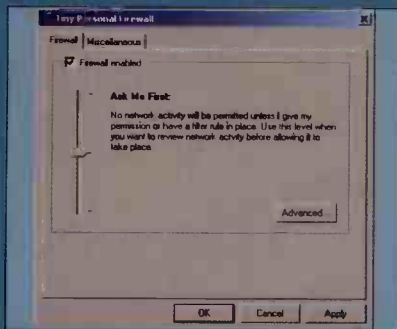
Use Windows Update to install critical updates on a regular basis, and don't be deterred by large time-consuming downloads. Be especially vigilant if Internet Explorer is installed and you use Outlook or Outlook Express.

to keep at least three weekly generations of full backups. Periodically, take a full backup out of the cycle and store (archive) it off-site as a precaution against flood, fire or meteors taking out your entire home.

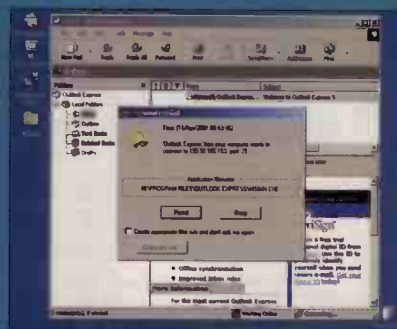
The risk of inconveniencing friends and alienating business contacts by spreading a virus such as I Love You to them through the Windows address book is one we can all understand, but most incoming attacks these days carry multiple warheads. I Love You is classified as a worm because it propagates itself via email over a network. This has the side effect of overloading some mail servers and causing them to shut down. I Love You also contains a

component (a trojan) that surreptitiously attempts to connect to a website to download a program that steals passwords.

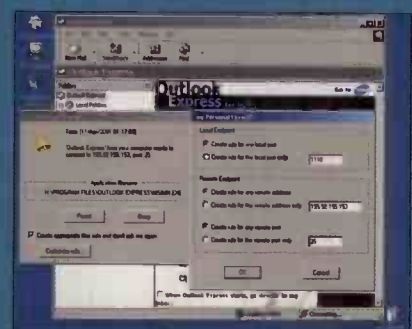
Other recent attacks such as Kournikova have also attempted to connect to websites for various reasons. If many connection attempts all happen in a short space of time, as would happen when a virus spreads rapidly, they can overload web servers or the routers that control Internet traffic. Some attacks, called Denial of Service (DoS) attacks, are specifically designed to do just this, preventing Internet sites from providing service. Under certain circumstances an attacker could co-ordinate multiple computers to mount a Distributed Denial of Service (DDoS) attack. A year ago, many



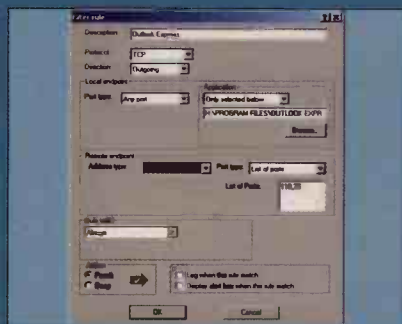
4 Tiny (and ZoneAlarm and Sygate) are intrusive at first because they default to blocking all communication between your computer and the Internet. Open Tiny's Personal Firewall Administration window from the System Tray icon or the Start menu. The default option 'Ask Me First' ensures that no network/Internet traffic will be passed without your say-so. A dialog box will pop up the first time an app attempts to transmit to or is contacted from the Internet.



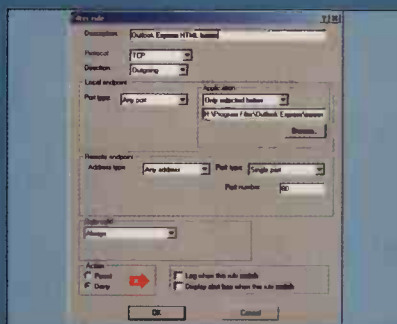
5 To be notified every time there is communication between an app and the Internet, click on 'Permit' or 'Deny' to allow the current action. Manual Permit/Deny options are normally only used when you are familiar with an app but don't know why it needs to communicate with the Internet. If you Deny access and the app doesn't malfunction you can set a Deny rule next time; if it does malfunction with Deny you have to consider setting a 'Permit' rule.



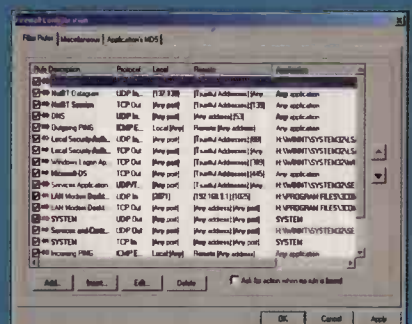
6 Initially, rules are created in order to automate those processes you decide to allow. They can be refined later. Place a tick in the box next to 'Create a filter rule...' and click on Permit or Deny to create a rule for outgoing and/or incoming communication whenever this particular set of circumstances occurs in future. To place further restrictions on the rule click on the 'Customise rule' button before confirming the rule with the 'Permit' or 'Deny' buttons.



10 To create a specific Outlook Express rule go to Filter Rules and Edit its rule. Change port to 'List' and add 25 (SMTP send) and 110 (POP3 receive). Leave the remote endpoint address at 'Any Address' if you collect mail from multiple mail servers. With this rule in place Outlook Express can send and receive mail but won't be able to access newsgroups. Our rule is becoming very complicated, and we're not making Outlook Express any safer.



11 To make Outlook Express less of a risk we must stop it opening web URLs in response to emails containing potentially risky HTML code. One way of doing this would be to return to the original general rule for Outlook Express and to insert a new rule above it that denies it access to port 80, the port used by web servers. If the web filter rule came after a general rule allowing all access it would have no effect.



12 Constructing rules is a tricky business but you can find plenty of help on the web and in newsgroups for whichever personal firewall you settle on. At any time you can return to the starting point by deleting the rules you have created. Once you have finalised your ruleset you can disable 'Ask for action when no rule is found' and any action you haven't explicitly permitted will be denied. For a correctly configured firewall this is the safest option.

major websites, including Yahoo, MSN and Amazon, were overwhelmed by a flood of incoming traffic that cut them off from the web. Dozens of Internet servers became the unwitting accomplices of the perpetrators.

Although there is no evidence yet of a co-ordinated DDoS attack using home computers, there are many different ways in which a DDoS attack could be mounted, several known DoS programs, and plenty of ways in which they can be distributed to large numbers of computers.

On top of this, a whole class of programs called 'backdoors', the best known of which are BackOrifice and Subseven, can use file attachments or web downloads to

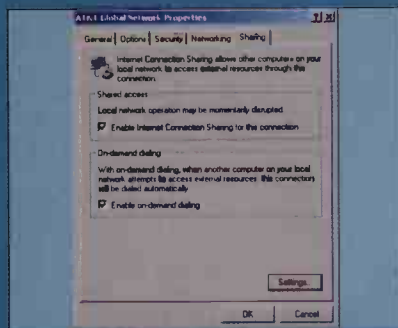
secretly install a remote access client on your computer. The client will broadcast its presence whenever you are online and allow anyone who picks up the call to control your computer remotely. Depending on the capabilities of the remote client your computer could be used to mount an attack on another computer, or something equally as sinister, while you're innocently browsing the web.

With many more people spending ever longer online thanks to unmetered access and almost exclusively using Windows, an operating system with numerous security loopholes that most users aren't aware of and therefore don't fix, the risk of mischief is high. Enlightened self-interest says

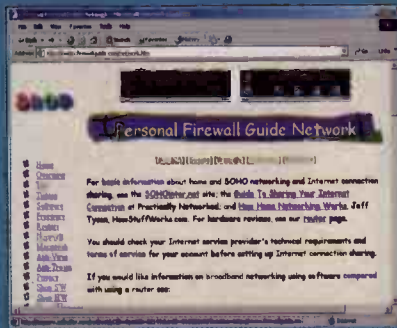
QUICK TIP

Raise your awareness of security issues and receive rapid notification of new threats by signing up to receive regular newsletters on the latest security issues from a security advisory site such as www.securityportal.com.

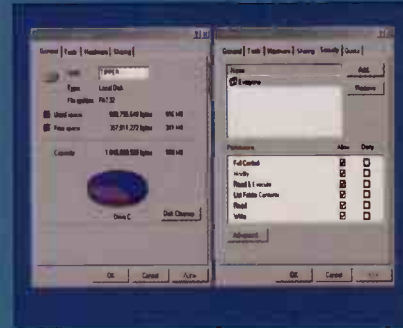
HOW TO TIGHTEN UP LOCAL SECURITY FOR A HOME NETWORK



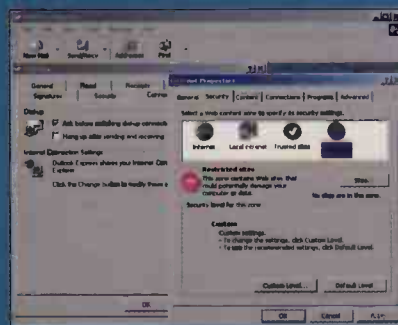
1 Many homes run two or more computers connected to the Internet through a dial-up connection by means of a proxy such as Windows Internet Connection Sharing (ICS). Proxies are similar to firewalls in that they inspect data transmissions and decide how they are treated, but a proxy doesn't necessarily replace a firewall. For a free firewall/proxy combo, use ICS and install the Sygate or Tiny personal firewall on all computers that connect to the Internet.



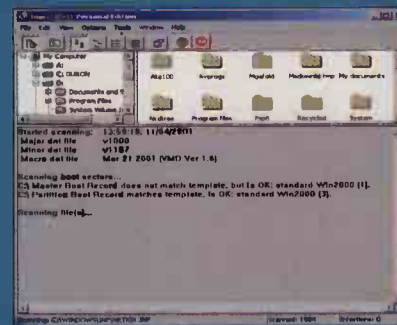
2 A personal firewall only protects the computer on which it is installed and the firewall installed on the computer that shares its Internet connection (the gateway) must be capable of working with the proxy. Tiny also sells firewall/proxy packages. You can find more information about connection options for home networks at www.firewallguide.com.



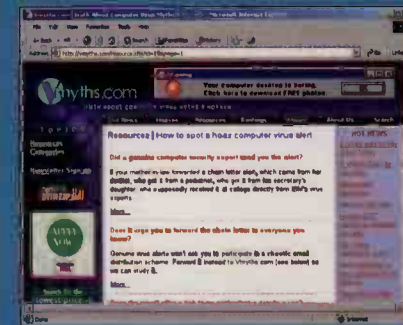
3 If you're planning to share a modem connection to give a home network access to the Internet, consider upgrading the gateway computer to Windows 2000 Professional to provide an additional layer of security that Windows 98 and Me cannot. Security permissions that prevent outsiders from accessing sensitive data can be applied to hard disks formatted with Windows 2000's NTFS file system, which also allows files to be encrypted.



7 If you must use Outlook Express, use Tools/Options/Security to move it into the Restricted Zone; then click on the Connections tab and use the Change button to open Internet Properties. Click on Security, click on Restricted Sites, click on Custom level, and make sure all settings are at 'Disable', 'Prompt' or 'High Safety'. Scripting should be disabled. Consider using less insecure email and news clients such as Forte Agent (www.forteinc.com), Pegasus, Eudora and PocoMail.



8 Use a top-quality anti-virus (AV) program with its on-access monitor enabled on your gateway computer to ensure that all incoming data is scanned. Update signatures regularly. Install AV software on each networked computer. A free scanner such as Inoculate (<http://antivirus.cai.com>) saves splashing out on network licence fees. Set email clients to save attachments to a single folder and scan daily. You can't do this with Outlook Express as it saves mail and attachments in a single database.



9 Never open file attachments unless you are absolutely certain of their provenance. Try to avoid sending attachments unless absolutely necessary. Your friends may think you dull if you resist the impulse to send them the latest dancing bottles or cartoon sex, but imagine what they'll think if it happens to contain the latest example of a new virus that trashes their data. Also, resist the impulse to send the latest hoax virus to everyone you know. It's not news!

QUICK TIP

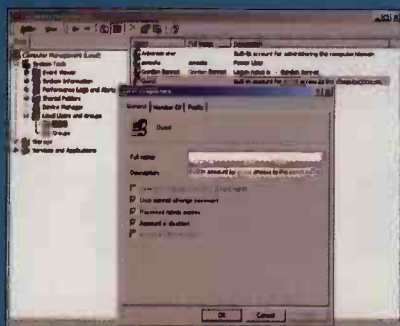
Move data files away from their default locations. This makes it harder for anyone who does manage to gain access to your system to discover them, and it will make data-only backups easier.

we all need to take precautions against such attacks, even if they don't explicitly target us or sites important to us, because the Internet reroutes around blockages and the impact of disruption anywhere ripples out across the network. When a JCB cuts through an Internet trunk route in Idaho, it's not unknown for the impact to be felt in the UK. There are many tools, both hardware and software, with which we can defend ourselves from these risks.

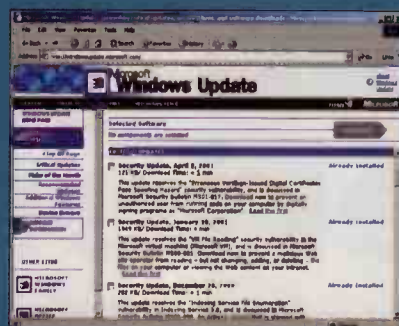
The most effective starting point for the home user is a combination of anti-virus protection (see June's anti-virus group test) and a personal firewall, but this should be accompanied by some self-education and an all-round

update of Windows and Internet applications. A good anti-virus scanner will catch known exploits and if the scanner also detects suspicious behaviour (heuristic detection) it may catch some (but probably not all) new exploits. This is where a good personal firewall, designed to detect and block all outgoing transmissions except those that you have explicitly allowed, becomes your second line of defence. Unfortunately, most personal firewalls do not yet permit the fine-grained control you need to stop all potentially risky outgoing transmissions, and this is where you come in.

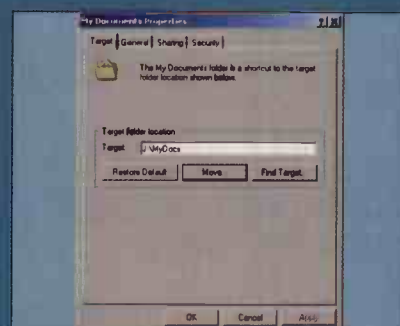
As the only person you can trust to make decisions about



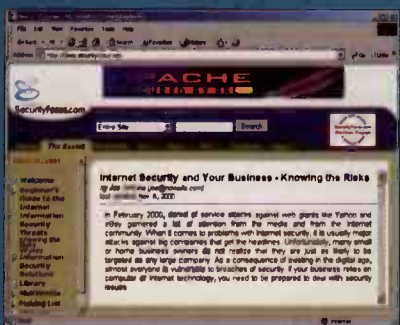
4 In order to use Windows 2000 security permissions effectively, do not enable the Guest account as this will allow anyone inside or outside the network to gain anonymous access to Windows 2000. Each person who will use the shared Internet connection should be given a User account on the Windows 2000 system. They will only be given access to Windows 2000 if they log on to their computer with their Windows 2000 username and password.



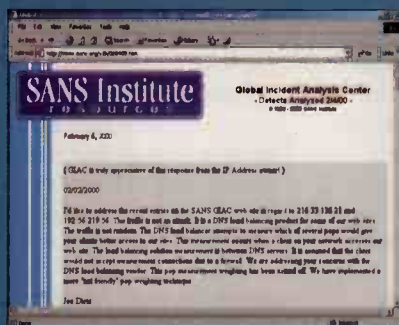
5 Whichever version of Windows you use, and whether on standalone or networked computers, upgrade Internet Explorer to version 5.01 Service Pack 2 or later as earlier versions had security weaknesses that affect Outlook Express and other apps that use the Internet Explorer services embedded in Windows. Install ALL critical security updates. Use Microsoft Downloads rather than Windows Update if you wish to download updates once for several computers.



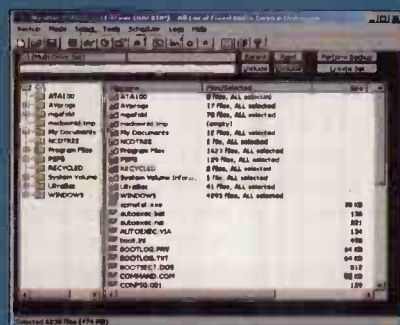
6 When installing applications or using Windows locations such as 'My Documents', specify a custom location rather than the default for storing data files. This will make it harder for someone who gains access to your computer to locate your data and it will be easier to set up data backups. If you create your own recovery CDs, hard disks divided into C: drives for systems and apps and D: drives for data will speed up recovery after a system crash.



10 Read about it! There are literally dozens of security sites loaded with information on security threats, the latest virus alerts, and the security holes discovered in popular operating systems and applications. This information is available to all; you can bet someone out there is trying to put it into practice. For the best available real-world overview of security get hold of the book *Secrets and Lies* by Bruce Schneier or subscribe to his newsletter at www.counterpane.com.



11 Don't overdose on risk and assume that every unknown incoming transmission trapped by your firewall represents a threat. Lots and lots of 'threats' have mundane technical explanations. For example, many ISPs use special techniques to spread the load over several servers and this 'load balancing' technology can sometimes be mistaken for a real attack. The important point is that whether it's an attack or not, the firewall blocked it. That's why it's there – to stop you worrying.



12 Finally, backup, backup, backup! When things go bad it's the only way to recover quickly with a minimum of effort. The Backup program included in Windows is extremely basic. To make backup easy and automatic so that you don't forget to do it, invest in a fully featured backup utility, for example, the grown-up version of Windows backup from Veritas (www.veritas.com) or UltraBac from www.ultrabac.com. Always remember to do test restores. Nothing hurts like a backup that won't restore.

the level of security on your system, you can educate yourself by visiting security-oriented sites to learn about the vulnerabilities of your chosen software and the actions you can take to reduce your exposure. The page on Information Security Threats in the section titled 'The Basics' at www.securityfocus.com is a good place to start, and www.safer-hex.com has a good selection of news on various threats, plus news of risks and updates in operating systems and software.

We haven't said much about the ability of personal firewalls to block incoming threats because the principal benefit to most home users is the blocking of some of the

more egregious security holes in Windows through which personal data or attacks on other computers may exit the system. Personal firewalls provide some benefit by discarding unsolicited incoming transmissions, but these do not always represent attacks on the system. In many cases they are benign, but personal firewalls don't usually provide enough information for the home user to evaluate the risk. A personal firewall is best treated as a quick fix and a primer on security issues. View incoming alerts as a prompt to research the cause rather than a significant risk and in most cases you will be right, provided you have taken reasonable steps to secure your system.

QUICK TIP

If you use the Eudora email client, update to the latest version, then go to Tools/Options/Viewing Mail and make sure that 'Allow Executables in HTML Content' and 'Use Microsoft Viewer' are disabled.

Building on eXPerience

Kiss goodbye to the Blue Screen of Death as Microsoft prepares to ditch the volatile code of DOS and Windows 95, to deliver a stable, 32bit OS to long-suffering consumers

In case you haven't realised, Microsoft is preparing to release a new OS that will finally bring together all the different versions of Windows into a single code base. The final product will be called Windows XP, but at present it is codenamed Whistler. This code sets the scene for the consumer operating system that will supersede Windows Millennium Edition (Me) this autumn. We've taken a look at the latest second beta of Whistler released at the end of March.

Whistler merges the consumer appeal of Windows Millennium with the reliability of Windows 2000, and delivers all the bells and whistles of Millennium without its fragility, thanks to the fact that Whistler is built on crash-resistant NT technology rather than DOS. Although descended from Windows 2000, Microsoft's business operating system, Whistler has full support for games and multimedia hardware and software: digital cameras, video cameras, web cams, games controllers, DVDs are all supported. Windows Media Player 8 plays a wide range of audio and video media and Movie Maker provides basic audio/video recording and editing features. You can already find most of these features in Millennium, but what you don't get from this is the stability and reliability that comes from the 2000 code base on which Whistler rests.

At first sight, Whistler bears no resemblance to a boring old business OS because most of the visibly grey areas familiar to Windows users have been given a colour makeover. Dollops of primary colour have been liberally applied and the new 'Luna' interface, named after one of the latest wallpaper backgrounds, replaces edgy rectangles with softer, rounder, windows.

Whistler's appearance shouldn't come as a huge surprise if

you've viewed any of the multitude of websites through which Whistler's progress from beta 1 to beta 2 has been leaked. The official beta release confirms, more or less, the final feature set and shows off the new user interface that's grown out of the mock-up that graced beta 1. The interface brings colour to Windows, but the Whistler feature set is the real star of the show and in this first release it's very much aimed at home users rather than corporate wallahs.

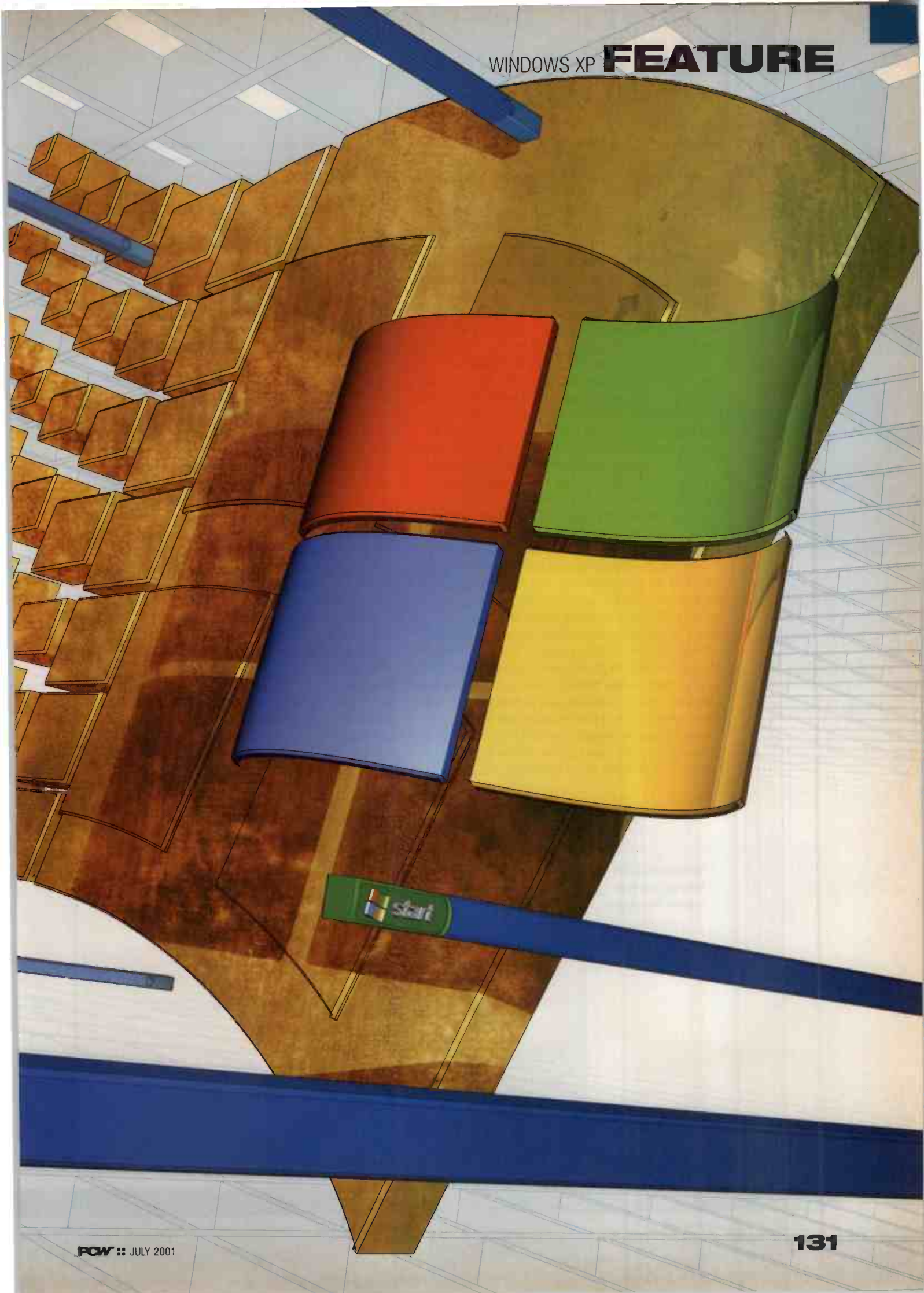
While Whistler beta 2 was brewing, Microsoft revealed that the finished product would be called Windows XP and would ship in two editions, Home and Professional, broadly aimed at Windows 98/Millennium and 2000 users respectively. The positioning is not precise; Windows XP Professional Edition will appeal to home users who like to play with new hardware, while Windows XP Home Edition will be more than adequate for small businesses that use standard hardware and don't have time to become hardware gurus.

A single, unified desktop

Initially the soft edges, primary colours and plethora of wizards don't appear to promise much in the way of speed or stability, but under the surface there are significant enhancements to the reliability of the whole OS. Such attributes don't necessarily show through in a beta test version, but the glossy finish and a long list of new features can't disguise the fact that Windows XP is a polished Windows 2000 rather than a radical revision. What we're looking at is an operating system whose primary task is to wean consumers away from Windows Millennium and 98 towards a single, unified Windows OS for both consumer ➤

WORDS: TERENCE GREEN **ILLUSTRATION:** MAGICTORCH





and business desktops. This is more than a cash-gathering upgrade, it's a consolidation that should benefit everyone. Currently, Microsoft supports multiple varieties of Windows – 98, 98 SE, Me, NT, and 2000 – each with multiple configurations depending on the set of upgrades and updates installed. A single Windows desktop OS will make life easier, not just for Microsoft but also for users.

Microsoft has other motives for unifying Windows, not least its aim to sell software as a service, for which a single OS over which it has complete control is necessary. Windows Product Activation (WPA), a new feature in Windows XP that attempts to prevent a single copy of the OS being installed on multiple PCs, is a harbinger of future subscription services (see box on WPA).

Other changes in Windows XP are also designed to pave the way for Microsoft's .Net service on which subscription services will be hosted. With such changes in mind, some view Windows XP as a signal to investigate alternatives. Maybe, but competitors such as Linux and BeOS aren't yet in a position to compete as mass market desktop operating systems and Microsoft's control of the desktop doesn't automatically imply control of anything else – Windows CE, WebTV, and the Sega Dreamcast haven't exactly set the world alight. As yet nobody can say with any certainty where the web is going next, but wherever it does go Windows will try to follow and the benefits of a single Windows desktop OS today outweigh any hypothetical lock-ins tomorrow.

There's no doubting that Windows 2000 has proved to be a more stable OS. Initial sales weren't exactly stellar as businesses took time to appraise the new OS, but firms are now starting to bite as the OS has proven reliable and has fixed the lack of support for modern hardware in NT. Windows XP is merely the transition of Windows 2000 as a business OS into Windows 2000 the consumer OS. In the process, some deficiencies identified by business users have also been addressed, but it's very clear from a consumer viewpoint that Windows XP is the next version of Me, while in business terms it's only Windows 2000 version 1.1.

Large organisations are only now starting to roll out Windows 2000 in quantity. Having spent the past year developing their Windows 2000 strategies they're not going to jump into Windows

XP right away, and whichever way you look at the Windows XP feature list, the balance is heavily weighted towards the home user and small business. New features like the consumer-friendly interface, loads of new multimedia support, integrated CD burning capability, new personal firewall, automatic updates, the adaptive user environment, and home networking wizards, don't set corporate hearts ablaze. Some new features, such as the remote desktop that enables users to connect to and control another Windows XP system from any computer, anywhere, are even likely to cause corporate hearts to stop dead until they've discovered how to make it absolutely secure against misuse. For consumers, however, the flashy interface, multimedia features, shared use, and easier install, maintenance and updating are dead on target.

Sharing and caring

The new features in Windows XP that allow multiple users to share a computer are particularly interesting and move forward from the sharing features in Windows 2000. Let's first look at what Windows 2000 offers. Unlike Windows Me and 98, Windows 2000 allows several people to share applications while keeping their personal data files confidential. Each individual who logs on using Windows 2000 security can use the general services and applications. They can also customise their system as though it was theirs alone without affecting other users' preferences or exposing their private files to other users. Only one person can log on at a time and they have to close their applications when they log off so someone else can use the computer.

Windows XP goes a whole lot further when it comes to sharing. It uses a method that Microsoft calls Fast Switching. This allows several people to share a computer without each one having to close their applications and log off. Let's suppose another family member wants to check their email, instead of logging off you simply select the 'switch user' option. When they're finished, you switch back to exactly where you left off. Fast Switching is based on Windows Terminal Services technology, which also provides the Remote Desktop that allows you to control a remote Windows XP computer over a network or the Internet.

Tasks listed in the Web bar and files ordered by category





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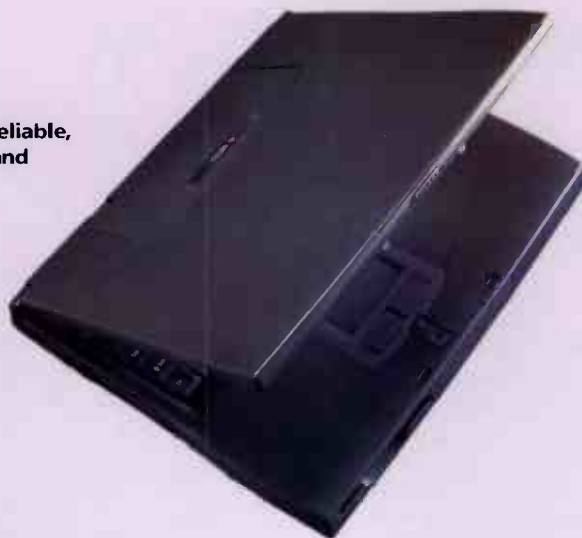
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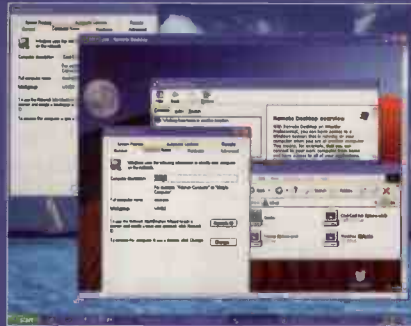
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WHISTLE WHILE YOU WORK... OR PLAY

Windows XP's Home and Professional editions will be the first members of the Whistler family to ship. Next year, the Server, Advanced Server, and Datacenter Server versions of Whistler will appear, but Microsoft has not yet announced whether they'll take the XP name. Pricing hasn't been set, but Windows XP Home and Professional are likely to reflect the current pricing for Windows Millennium and Windows 2000 Professional respectively.

Although the Home Edition does what it says on the box, its subset of Professional's features may not be the best choice for all home users. Most home users won't miss all the management, networking, security,

and storage features that are designed for server-based Active Directory domains but, with the prevalence of cheap processors, they may miss the absence of support for



multiprocessor systems (Professional supports up to two processors). Home users also miss out on DualView support, an extension to multi-monitor support that enables dual-monitor support for most laptop video chips and for single-board dual-output cards such as the Matrox DualHead. The Remote Desktop (pictured here) is also omitted from Home Edition (see main text), as is Internet Information Server 5.

Windows XP Home Edition will upgrade Windows 98, 98 Second Edition, and Millennium. Windows XP Professional Edition can also upgrade Windows NT4 Workstation, Windows 2000 Professional, and Windows XP Home Edition.

In order to use Remote Desktop you need to set up a user account and enable the service. The computer also needs to be accessible on a network or the Internet. Once you've set all this up you can connect to your computer from anywhere and use it as if you were at its keyboard. If someone else is using the computer when you try to connect, a pop-up window will appear that asks them whether or not they want to allow you to take control of the system. If you do get control, they won't be able to see what you're doing or use the system until you've finished.

Despite the addition of features such as these, the first noticeable difference when you start up Windows XP is the new interface. It is certainly more colourful and rounded than anything we have seen before from Microsoft, but all those extras take up a lot of space. Windows XP uses new adaptive techniques to minimise desktop and task bar clutter. It also tries to intelligently hide irrelevant options in menus. Sometimes you want this, sometimes you don't, so it's a good move on Microsoft's part to have made the interface thematic.

You can stay with the default XP theme, choose a different one, or flip back to the more spartan 'classic' 2000 look. If you stick to the new theme you'll find that many apps pick up most new features automatically, but grey rectangles will still pop up at times.

The themes are configurable so you can adapt one to your needs by only selecting those features you like. However, it takes a little work to find all the options because Microsoft, as usual, has moved all the furniture around to refine its 'task-based' user interface. This is just a fancy name for something very simple. Microsoft has gathered related tasks under a single heading instead of making people hunt around to find all the different locations in which, say, a dial-up time-out can be altered. If you're new to Windows this is a good thing. If not, you have to figure out why the 'My Network Places' folder has disappeared along with Settings/Network Connections and then you have the choice of putting it back the way it was or coming to terms with the changes. Until the next upgrade, that is.



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For newcomers, the task-based interface provides a useful list of related tasks in the left-hand pane. The Network Places folder lists 'view network connections', 'create a network connection', 'set up a home network', and 'search for computers'. It also has lists of other 'places' such as My Computer and My Documents and when you arrive there they each have their lists of tasks. If nothing else, the new interface provides a powerful motivation for figuring out the quick routes to where you want to go so you can switch off the space- and time-consuming idiot bars as soon as possible!

Staying alive

Windows XP's hand-holding can be irritating, but it does pay off in the areas of installation, upgrade and maintenance. Very few people actually go out and buy a shrink-wrapped copy of Windows. Most of us choose a version of Windows when we order a PC and our choice arrives pre-installed, which means that we don't have to worry about hardware until we need to install some new device. Installing drivers for new devices is the single biggest cause of Windows problems.

Device driver management in Windows 2000 is miles ahead of Windows 98/Me because it is much more circumspect about drivers. Hardware vendors submit drivers for testing and if they pass they're digitally signed. When a new driver is introduced, Windows 2000 checks for a signature and gives a warning whenever an unsigned driver is being installed. You can still choose to install the unsigned driver, so the warning effectively only serves as a reminder of where to start looking if problems appear after a driver update. Few drivers had been certified when Windows 2000 first shipped. Since then, many more have been tested and certified so XP can safely claim to support most of the hardware that has appeared over the past three years.

Windows XP also automates the process of locating new drivers. With Windows 2000 you have to manually trawl through Microsoft's Hardware Compatibility lists, the hardware manufacturer's website, and Windows update to locate new and updated drivers. Windows XP builds this whole process into the Help and Support system. When you install a new device, Windows XP prompts you to search online for a driver if it can't

find one locally. If it still can't find one online, it will direct you to the manufacturer's website.

The driver search feature is also built into the Windows XP installation process. Drivers for most devices are included on the Windows XP CD, but with the passage of time these drivers will become dated. If installation is attempted some months after the CD's production date, Windows XP will offer to search online for newer drivers. Windows XP also goes beyond Windows 2000 in driver support by incorporating a new Driver Rollback mode that may be able to recover a previous working driver if a driver update fails.

It doesn't promise to work in every case, but driver rollback stores a copy of the old driver when a new driver is installed and notes the system changes, so that in the event of a problem there's a possibility of reverting to the previous working configuration. In addition to Driver Rollback, Windows XP has an enhanced version of the Windows Millennium System Restore feature that enables you to roll the whole operating system state back a step in the event of a misconfiguration by yourself or some software installation.

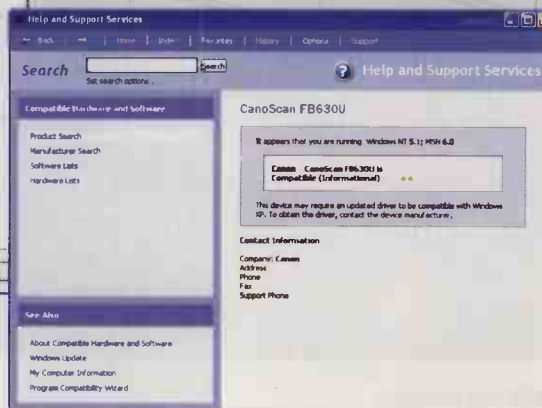
Rolling back

The System Restore automatically creates restore points for a range of operating system files and settings. It also creates restore points for some application files on a daily basis – you can also create your own restore points – and kicks into gear whenever an unsigned driver is installed. System Restore needs a minimum of 200MB of disk space, but you can limit the maximum. When it hits the maximum, the oldest restore points are dropped to make room for new ones.

The whole system complements and works with features such as Windows File Protection to enable Windows XP to roll back or recover from failed driver, application, or utility installs in a way that is impossible for Windows Millennium's System Restore. Because Driver Rollback and System Restore are separate but similar features with some interaction between the two, you'll have to be careful about how you use them. However, Windows XP's driver and system protection does



Windows Update can now update your system automatically in the background



Help and Support really helps when you need new drivers

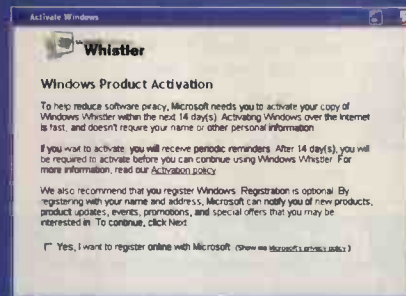
WINDOWS PRODUCT ACTIVATION IS WATCHING YOU

Windows Product Activation (WPA), a new feature in Windows XP, is described by Microsoft as 'necessary to verify that your installation is performed with a genuine Microsoft product'. In reality Product Activation, first seen in Office XP, is designed to prevent a copy of Windows XP being installed on more than one PC at a time. WPA may prevent casual copying but has proved an irresistible challenge to inventive minds and news of hacks spreads quickly on the net.

WPA applies to retail copies of Windows XP and not to copies purchased under volume licence agreements. New PCs with Windows XP pre-installed may or may not be pre-activated by the supplier. PCs that have been

pre-activated won't present the user with the initial activation scenario, but WPA will still be lying in wait, monitoring your hardware.

WPA will bite people who make 'significant hardware changes' to their Windows XP



system. Microsoft won't reveal the exact details but 'significant' is cumulative so the requirement to reactivate Windows XP could strike the happy upgrader at any time. Activation and reactivation can be performed over the Internet, in which case it takes seconds, but if the request is denied you'll have to phone and explain yourself.

The issue with WPA is not whether honest customers with legitimately purchased copies will have to explain their actions to a phone droid (although that's reason enough to drop WPA as a bad idea), but whether an OS can be described as reliable if it can deactivate itself arbitrarily based on hardware changes Microsoft won't detail.

make Windows XP a far better choice than Windows Millennium for your new computer.

Application compatibility, in particular games support, was one of the bugbears with NT that 2000 never quite succeeded in fixing, and it undoubtedly deterred people who wanted the reliability of 2000 but needed to run older applications or games. Although the addition of full DirectX support was a huge improvement, some games and applications remained happier with DOS or Windows 95. With the benefit of a further year's development, Windows XP puts to bed most of these issues and where it doesn't, the Compatibility Mode allows you to start an

application as if it was running in an earlier version of Windows. It's a kludge but if it works, who's complaining?

If you visit the Windows XP page on Microsoft's website you'll find reams of information on other features we haven't the space to discuss here. Some, such as Windows Media Player 8, attempt to do everything except clean the kitchen sink. Others, such as Internet Explorer 6, seem to offer very little in return for the jump from version 5.5 to 6. However, all of them add up to an operating system that has the potential to kill off the flaky DOS-based Windows Millennium line once and for all.

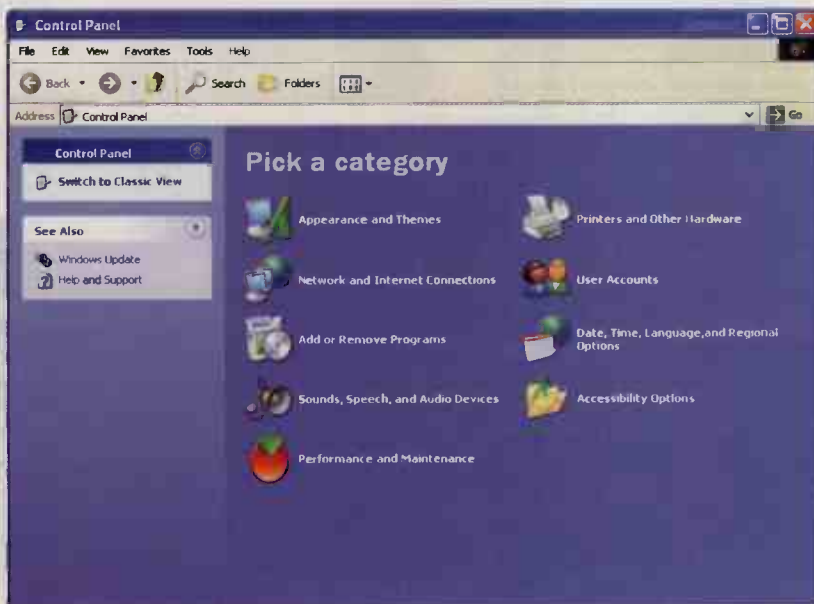
MINIMUM SYSTEM REQUIREMENTS

233MHz Pentium processor (or equivalent, eg AMD)

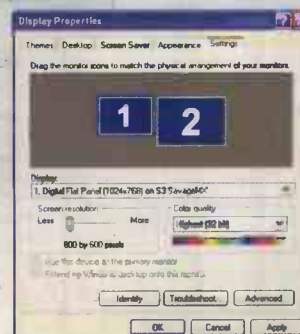
64MB of RAM (128MB recommended)

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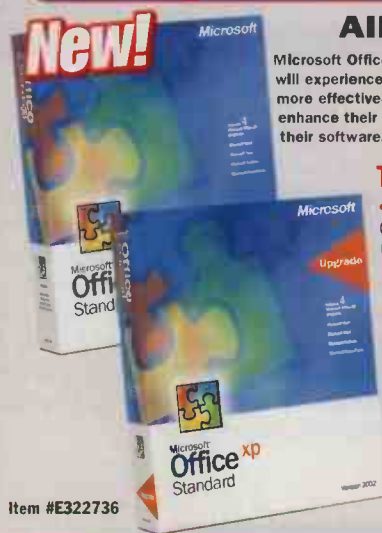
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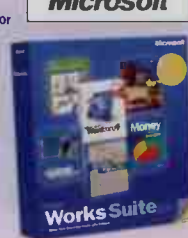
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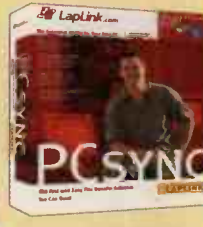
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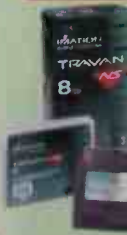


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Delving into your BIOS

Thank goodness for graphical operating systems like Windows – after all, you can just point and click at what you want and the PC takes care of the rest. There's no longer any need to tap away into a text-based interface such as DOS, unless, of course, you really want to. Yes, two decades after the birth of the IBM PC, the user experience is in pretty good shape. Or is it?

Most PC users are aware of something called the BIOS which rears its head as they power up their systems. Many may have pressed the Delete key (as instructed during their system start-up) and actually entered their BIOS, to be confronted by a bewildering array of highly technical, text-based options. Some may have successfully made the changes they needed to, and got out before any real damage was done. A handful of technical enthusiasts might even make regular visits into the depths of their PC's BIOS, and deliberately tweak in an effort to enhance performance.

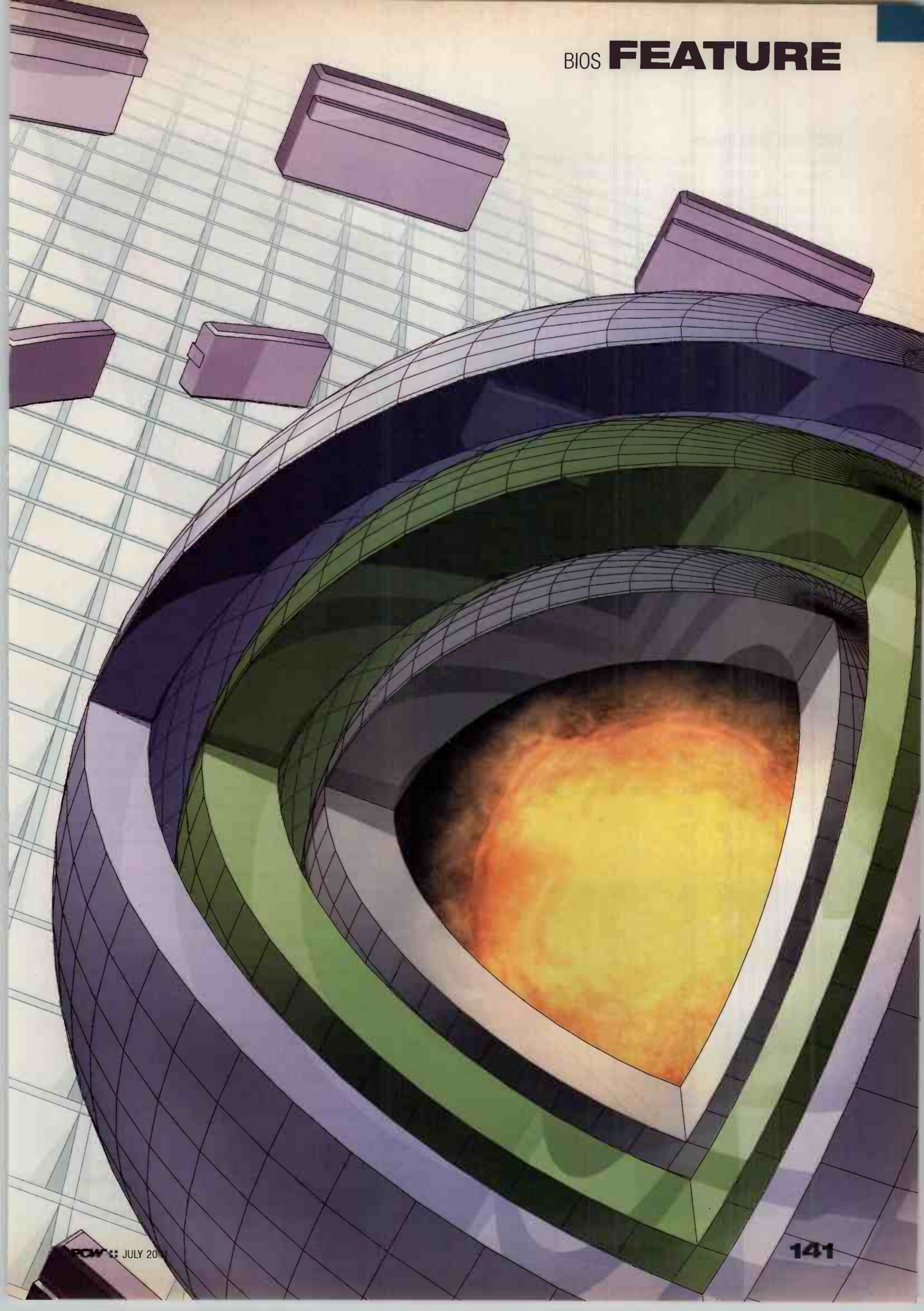
Even if you are a PC technology-phile, the chances are that there are several options in the BIOS that remain a mystery to this day. Then there's the vast majority of users who find that they have to enter the BIOS from time to time and are, quite frankly, a bit lost. There's always the motherboard manual, but it's written by engineers for engineers, and often suffers from a less than authentic translation from its native Taiwanese.

This is where we come in. Over the following seven pages, we'll look deep into your BIOS to explain the most important and common settings, along with listing the finer details for those who fancy a bit of tweaking. Speaking of which, there's also a box of BIOS tips for the overclockers out there, not to mention advice on updating your BIOS and getting the worthy, but often pesky power management options under control.

Warning!

Before going any further, be aware that changing a setting in your BIOS could make your PC unstable, or even prevent it from working properly, so always proceed with caution. Keep this feature and your motherboard manual at your side at all times and only ever change a setting if your PC isn't operating as it should!

Although some may be aware of its presence, for many users the BIOS is uncharted territory. We take you into the depths of your PC and explain the importance of the mysterious BIOS



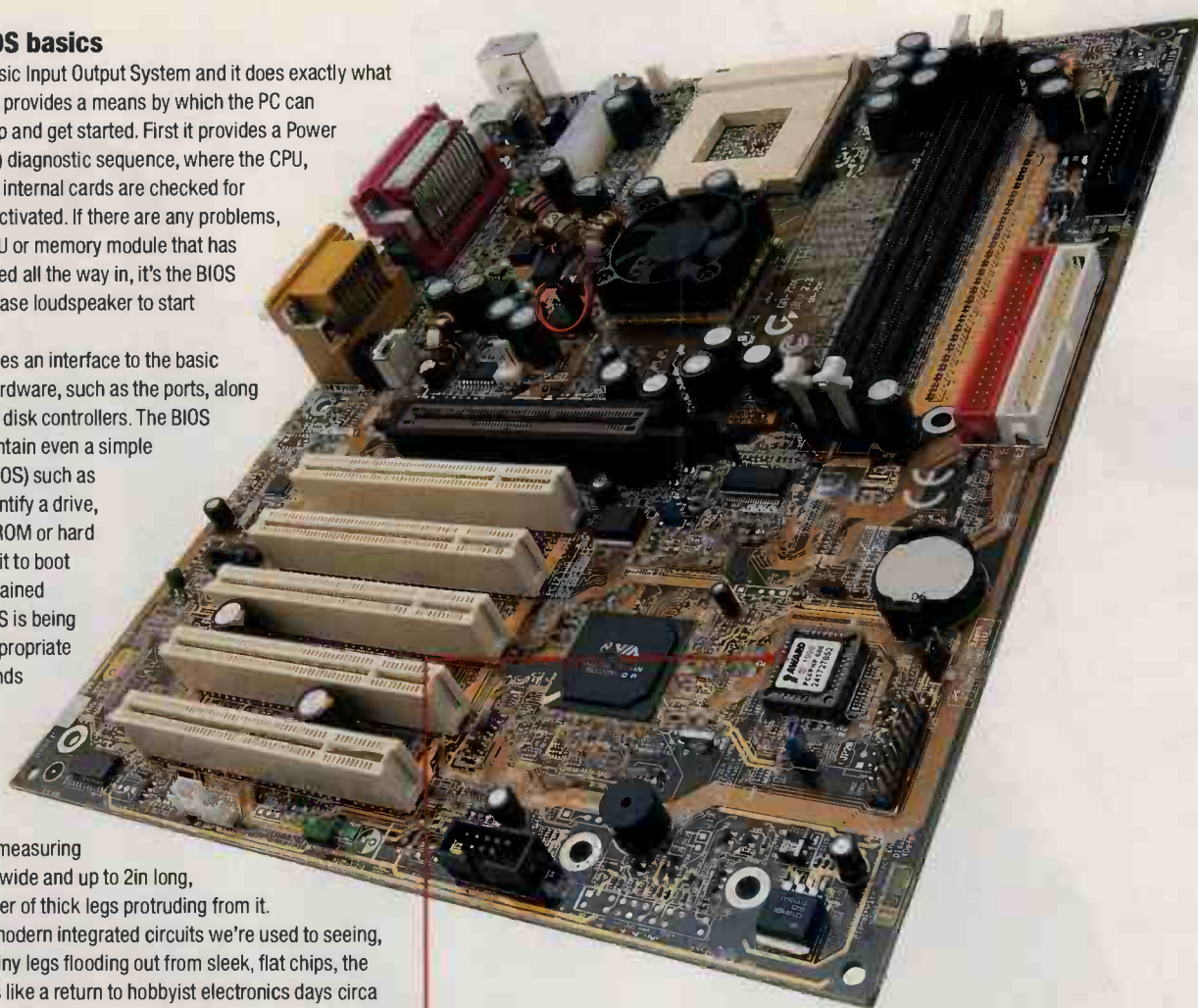
FEATURE BIOS

POST and BIOS basics

BIOS stands for Basic Input Output System and it does exactly what it says on the tin: it provides a means by which the PC can essentially wake up and get started. First it provides a Power On Self Test (POST) diagnostic sequence, where the CPU, memory and basic internal cards are checked for attendance, then activated. If there are any problems, such as a card, CPU or memory module that has failed or isn't pushed all the way in, it's the BIOS that instructs the case loudspeaker to start beeping furiously.

The BIOS provides an interface to the basic PC input/output hardware, such as the ports, along with keyboard and disk controllers. The BIOS can't, however, contain even a simple operating system (OS) such as DOS, but it can identify a drive, be it a floppy, CD-ROM or hard disk, then instruct it to boot or start an OS contained within. Once the OS is being booted from an appropriate drive, the BIOS hands over control.

The BIOS itself is, in fact, a very old-fashioned looking chip on the motherboard, measuring about half an inch wide and up to 2in long, with a small number of thick legs protruding from it. Compared to the modern integrated circuits we're used to seeing, with hundreds of tiny legs flooding out from sleek, flat chips, the chunky BIOS looks like a return to hobbyist electronics days circa 1980. The most common BIOSs are made by Award or AMI (American Megatrends Inc), and are modified by the motherboard manufacturer to reflect the design and components used in their products. Consequently, when you're looking for a BIOS update, you should head straight for the support section of the motherboard manufacturer's website.



Above: The BIOS looks like an old-fashioned chip on the motherboard

The BIOS chip itself is simply a piece of memory, into which the BIOS program and default configuration settings are stored. The BIOS does, however, need to know about your specific PC configuration, such as which drives are present, which ones it should attempt to boot from and in which order, not to mention the real essentials, such as the time and date. This unique configuration information is stored in a reprogrammable section called the CMOS (Complementary Metal Oxide Semiconductor).

Left: The POST sequence appears each time you start up your PC

When you modify a BIOS, say, to define your drives or change the clock, these new settings are stored in the CMOS. The CMOS itself uses a battery to remember your settings after you power down the PC. A few years ago, this battery was often soldered to the surface of the motherboard, but these days, it's more likely to be a flat, removable, calculator-style battery, around the size of a 10pence coin. This battery, which normally uses lithium technology, should long outlast the effective lifespan of the motherboard, although it's easily replaced should anything go wrong.

In the event that battery power is lost to the CMOS, it will return to its default settings, usually with basic drives selected and an old date and time. Note that the realtime clock in most PCs loses a few seconds per month, so may need occasional correcting. Fortunately, there's no need to go into the CMOS to do this, as modern operating systems can set it directly from their date and time control panels.

POST sequence

Before delving into changing CMOS settings, it's worth going over the actual POST sequence, which takes place every time you power up your PC (see picture of start-up screen, left). The first thing that happens is that some basic information is briefly displayed on-screen



HOW TO UPDATE YOUR BIOS

PC users have become used to downloading small patches and updates, in order to make their applications and operating systems work properly – it's a fact of life. Many users may, however, be unaware that the software for their BIOS is also updated on a fairly regular basis, and the latest version might just be what you need to fix some strange incompatibility or system instability issue.

To check for an update, note the BIOS version you're running the next time you restart your PC – it'll be displayed at the top of the screen during the POST sequence. Head to your motherboard manufacturer's website and check its support section to see if there is a newer BIOS version for your motherboard, then download as necessary.

Updating your BIOS cannot, however, be done from Windows, or indeed your hard disk. You'll need to make a bootable floppy disk, by formatting it and ticking the Copy System Files or Make System Disk box. Next, unzip and copy the BIOS update software onto the floppy – there should be a piece of code and a Flash executable utility to install it, which you may have to download separately.

Then, insert the floppy and reboot your PC, ensuring your BIOS boot sequence will check drive A before drive C. Your PC will then boot from the floppy and present you with the DOS command prompt. Run the Flash executable and follow the instructions. It's crucial that you choose to back up your existing BIOS first (in case anything goes wrong) and

ensure you don't switch off your PC during the process – it should take a couple of minutes before reporting back that everything's fine.

Next time you restart your PC, you should see the BIOS has a new version number, and may indeed feature some new options or menus within. Remember that any additional drive controllers you have will also feature a BIOS or Firmware that may need updating from time to time, so it's always a good idea to keep your eye on the manufacturer's website to check for newer versions.

Finally, always bear in mind the golden rule: if your system is working fine, then don't update the BIOS. Simply sit back and enjoy your PC working properly!



about your graphics chip/card, such as the brand, model, amount of memory, and maybe its own BIOS revision – as even graphics cards have a BIOS too.

A second or so later, the monitor will momentarily go blank, then the PC will display its main BIOS information on-screen. Normally, the BIOS maker and the all-important version number will be listed at the top of the screen, while a string of characters at the bottom can be used to identify the chipset and motherboard manufacturer.

In a matter of a few seconds, the CPU is identified, followed by the amount of installed memory in kilobytes, which may slowly count upwards if the CMOS has instructed it to check for errors – this may make a clicking sound. Note that the memory stated may be slightly smaller or larger than you thought you had fitted. This is due to the conversion from megabytes into kilobytes and often the fact that the BIOS has already taken off the base 640KB originally employed by DOS, and any additional memory used for shadowing.

Next, the drives connected to the onboard EIDE controllers are identified, then, depending on your configuration, any SCSI or other drive controllers will begin their own checks. Once this is completed, the BIOS will instruct the PC to boot an OS from a drive specified in the CMOS and, if you've installed Windows, this is when it will start loading.

The important part for this feature, however, is that during the POST sequence, a message is displayed on-screen, giving the option to enter the BIOS, or as it's more commonly referred to, the Setup. This is normally done by pressing the Del key, or some combination of Esc, Ctrl and Alt. The exact key or keys to press will be stated on-screen during the POST sequence, or explained in the motherboard manual.

Above: Your setup options are displayed in the CMOS Setup screen

Below: Check out your EIDE drives in the CMOS Features screen

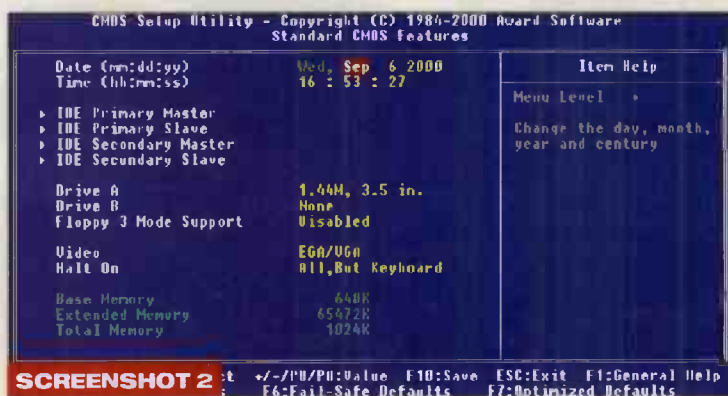
Entering the Setup shows you all the BIOS and CMOS options, usually presented as a list of about six main subject headings on-screen (see screenshot 1). Normally the mouse will not work here, so you'll need to navigate and activate options by using the arrow or page up and page down keys in conjunction with the Enter button; to go back a step, press Esc. Once you've completed your changes, you should go to the option to Save and Exit BIOS, or if you've made a few mistakes, it might be better to Exit without saving. Once exited, the PC will automatically reboot itself.

As explained in the introduction to this feature, what follows is not an exhaustive guide to all the options presented in typical BIOSs, but is a guide to the most important settings used to set up a PC and tweak it for the best performance. Note that BIOSs in different PCs may vary slightly in their descriptions of options, but we'll list the main ones for the most common models. Our screenshots are from the Abit VP6.

Standard CMOS Features

At the very top of the Standard CMOS Settings menu are the date and time (see screenshot 2). Simply use the arrow and page up/page down keys to navigate to the desired portion and adjust as required – remember, you can always do this directly from Windows using the Date and Time control panel.

Below the date and time are the details of your various internal EIDE drives, as supported by the controller in your chipset. If you have an additional drive controller, be it SCSI or EIDE on, say, a separate HighPoint or Promise chip, then this will have its own BIOS to set up independent of the PC's BIOS. The section of the Standard CMOS



POWER MANAGEMENT SETUP

Power management is one of the best and worst things to happen to modern PCs. The good news is that by automatically powering down various devices, it can extend the life of your PC, while saving you money and the environment at the same time. The bad news is that power management is almost single-handedly responsible for some of the greatest PC headaches in recent years, causing some systems not to shut down or wake up properly, or even become unstable.

Advanced Power Management (APM) was introduced and supported by Windows 95. Essentially, it shut down any portions of the system that weren't being used and woke them up again as and when required. Unfortunately, once APM was activated, the system became oblivious to wake-up calls from networks or incoming phone calls.

The solution was the more sophisticated

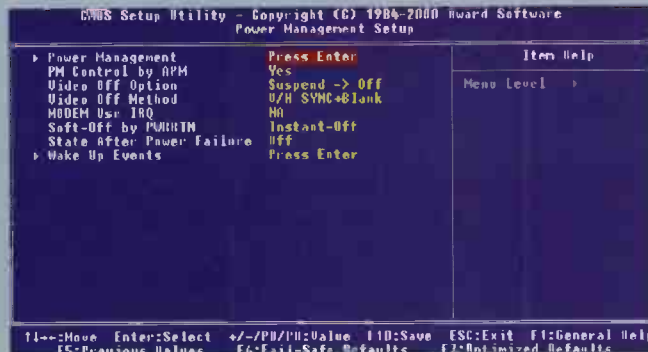
ACPI (Advanced Configuration and Power Interface) developed by Intel, Microsoft and Toshiba. The ACPI interface gives the OS direct control over the power management and plug-and-play functions of a PC – it's supported by Windows 98, Me and 2000.

So far so good, but how do you set it up? Before doing anything else, you must go to the Power Management Setup menu in the BIOS and enable ACPI if it's present – in some BIOSs it's activated as standard. You may find that a Windows 98/Me/2000 system performs

more reliably if the older APM is disabled. The really important thing, though, is that ACPI can't reliably be enabled after Windows has already been installed. For the ultimate reliability, we're afraid you'll have to enable ACPI in the BIOS, then reinstall Windows. Fortunately, most ACPI-capable systems will have had it enabled before installing the OS.

If you're still experiencing ACPI problems, such as the PC refusing to automatically switch itself off through software, then you should look for a BIOS update – see the box on page 143. Note that after updating the BIOS for ACPI support, you may be facing a reinstallation of Windows for it to work properly.

Finally, you may find that some of your older internal devices are not fully ACPI-compliant, so if problems persist, consider deactivating a few options in the Power Setup Windows control panel.



Settings we're talking about in this feature refers specifically to the standard Primary and Secondary EIDE controllers built into virtually every PC chipset. If your various hard disks, CD/DVD-ROM drives etc, are connected to these two standard controllers, this is where you should set them up.

You'll see a list of four EIDE devices, labelled as Primary Master, Primary Slave, Secondary Master and Secondary Slave, and each of these refers to the actual drives you have physically connected to the standard EIDE controller on the motherboard. Since it's best to keep fast drives on their own EIDE channel, you'll normally have your main hard disk as the Primary Master and the CD-ROM drive as your Secondary Master.

In the old days you'd have to know the number of heads, cylinders and sectors of your specific hard drive, but today they feature enough built-in intelligence to make your job immeasurably easier. Simply highlight each EIDE device, and set it to AUTO, and your BIOS will do the rest. If you don't know which ones are being used, set all four to AUTO, as the BIOS will ignore it if nothing is connected.

Below the EIDE drive settings are options for your floppy drives. Most PCs have a single 3.5in 1.44MB floppy drive, labelled as drive A, but it's possible to install a second drive here and/or support for a higher- or lower-density floppy. Below this is a video option, which should be left at EGA/VGA to support all but the most ancient graphics cards (and we're talking about monochrome ones here). Finally, you can set the BIOS POST sequence to Halt at specific errors, or ignore them, if you consider them to be irrelevant.

Advanced BIOS Features

The Advanced BIOS Features or BIOS Features come immediately after the Standard CMOS Setup, and feature an interesting array of important options. First is usually one referring to a Virus Warning or Detection (see screenshot 3). If this is enabled, it will flash up a warning if there's an attempt to access your disk's boot sector or



SCREENSHOT 3 ct +/-/PU/PD:Value F10:Save ESC:Exit F1:General Help

Top of the list of Advanced Features is a virus warning

partition table. In theory this sounds good, but when enabled, it can cause problems during the installation and running of Windows. Consequently, we recommend you stick with the default option, which is to leave it disabled.

Next up come a series of options to de-activate your CPU's caches. These are only there for advanced diagnostics and should, of course, be left enabled for the best performance, as should ECC checking for further stability.

After this in modern BIOSs is Intel's infamous Processor Number feature, which allows Windows software to access a Pentium III serial number – for privacy, leave this disabled. Finally, if you're getting fed up watching the memory counter tick away every time you restart your PC, then enable the Quick Power On Self Test option.

OVERCLOCKING TIPS AND WARNINGS

Overclocking is the process of pushing a component beyond its rated specification, to gain extra performance – it's most commonly done with CPUs where, for example, a 600MHz chip is forced to run at 800MHz.

Chip manufacturers highly discourage this, as they claim that it can seriously damage a CPU, or significantly reduce its lifespan. Even if the chip does seem to work at higher clock speeds, it may result in an unstable system that keeps crashing.

PC enthusiasts still enjoy the thrill of overclocking, however, and this is reflected in the many additional options presented in a modern BIOS.

Above is a screenshot from the SoftMenu provided on the BIOS of most Abit motherboards – similar facilities are offered on many other BIOSs, usually under the title of Frequency and Voltage control.



Proceed at your own risk – we can't take any responsibility for any damage!

At the top of Abit's SoftMenu you can choose one of a standard list of CPU speeds, or more excitingly, go for a user-define. Since Intel and AMD lock the multiplier factor on their CPUs, this figure must be left at the correct amount – for a Pentium III 600E, this would be six-speed. To overclock a chip, your only choice is to choose a higher external clock or front-side bus (FSB) speed. The PIII 600E is designed for a 100MHz FSB (hence the six-speed multiplier), but increasing

this FSB to 133MHz would thereby attempt to drive the chip at six-speed 133 or 800MHz.

Most CPUs won't reliably overclock unless you feed them a slightly higher core voltage, but take it easy. Add no more than 0.1v, and remember to upgrade your heatsinks and fans to dissipate the additional heat generated. Remember to ensure your memory can handle being driven at a higher clock

speed, as most are locked into the speed of the FSB. See *PCW's Hands On Hardware* each month for more overclocking tips.

Finally, you should check the PC health sections of the BIOS to monitor the temperature of your CPU – an adequately cooled one should be running under 40 degrees Celsius. If yours is running above 60 degrees, then you should get a more efficient heatsink and ensure you're using a thin scraping of thermal transfer compound paste in between. Check suppliers such as www.overclockers.co.uk for accessories.

The next portion refers to the actual boot sequence, or in other words, which drive should be checked for an OS first. Older BIOSs may only offer a limited range of options, such as A, C (floppy disk then first hard disk) or vice versa. Modern BIOSs can be instructed to boot from a huge range of drives in almost any order, from multiple hard disks to CD-ROMs, LS-120s, ZIPs and external disk controllers. If you are installing a new OS then booting from CD-ROMs can greatly speed up the installation process, and should be chosen if your OS CD supports it. In normal circumstances this should be set to boot from your main bootable hard drive. The external controller option should be selected if your boot disk is connected to an independent drive controller, such as SCSI, or a faster or additional EIDE controller.

Below this are a series of keyboard options, allowing you to set the Typematic delay (pause before a held key repeats itself) and whether the Numeric Lock is activated by default. There may be a clock option, too, for greater compatibility with older keyboards. You can also set the conditions for any BIOS passwords that have been set up from the main BIOS screen. If you set the Security Option to Setup, then the password is only required to enter and modify the BIOS. If it's set to System, then you'll need the password to start the PC itself – obviously set these options with care!

Users with more than 64MB of RAM may be confused by the line reading 'OS Select for DRAM > 64MB'. This is there because OS/2 handles memory above 64MB differently to other operating systems. If you're using OS/2, choose the 'OS/2 option', otherwise, go for 'Non OS/2'.

Finally, you'll get a taste of the first slightly intimidating settings, with an array of Shadowing options, but there's no need to worry. Shadowing is simply the process of copying, say, a slow Video BIOS into main system RAM for better performance.



While this should remain enabled, the series of specific address shadows that follow are best left disabled, unless you've got an old interface card that uses such memory blocks. The golden rule here, though, is only change a shadow setting if you're experiencing system instabilities – if it ain't broke, don't fix it!

Advanced Chipset Features

The Advanced Chipset Features screen (see screenshot 4) is where things really begin to get interesting, especially for the tweekers among us. Forget boring old front-side bus (FSB) hardware settings, as this is the portion of the BIOS where you can really affect memory performance and, like comedy, it's all in the timing.

Take latency, for example, which defines the time delay between SDRAM receiving data and actually reading it. The lower the latency, the faster the memory will perform, but yours might not be able to keep up with the pace. For a desirable Cycle length or CAS Latency of 2, you'll need SDRAM which is actually rated as CAS2 or CL2. Bear in mind that the PC100 or PC133 label is irrelevant here, as both types of memory are available with latencies of either CAS2 or CAS3.

Sadly, we haven't found a utility that can check to see what type of memory you have, so you'll have to open the case to look for a sticker on the memory module saying either CAS2 or CAS3, or if that fails actually trying it in the BIOS and watching out for unreliability. (For more on CSA2 see this month's *Hands On Hardware* column.)

RTFM: Keep your manual beside you at all times when you're changing your settings

FEATURE BIOS

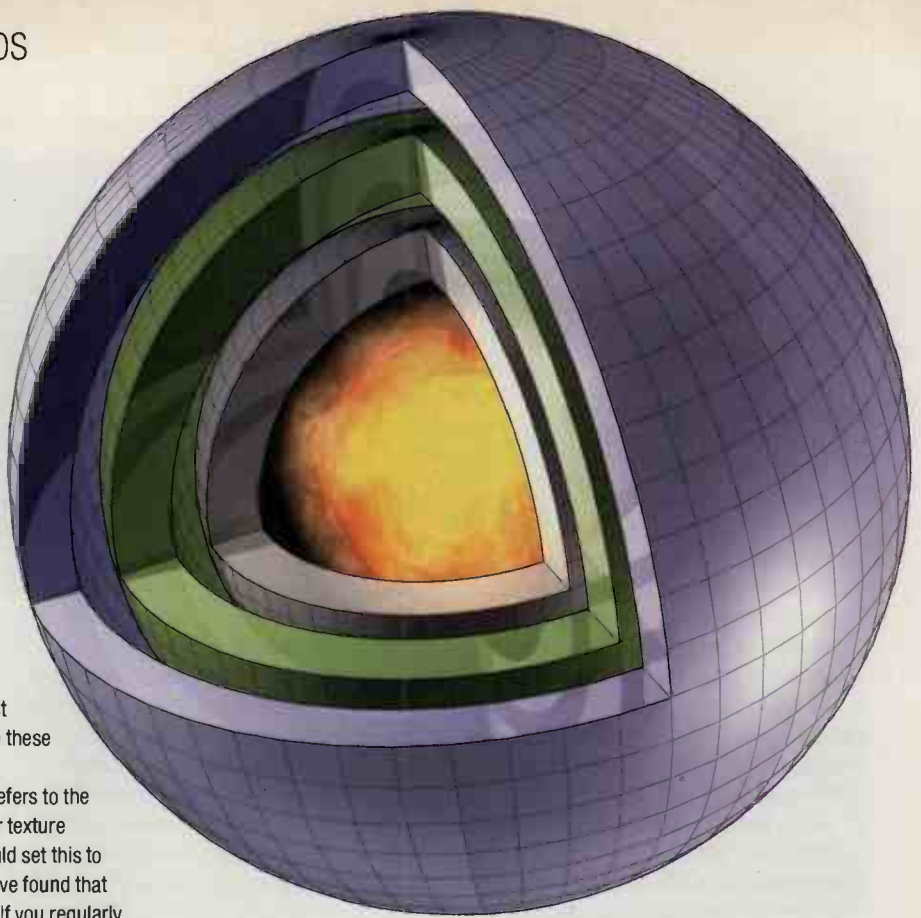
If your system uses the slightly cheaper memory, rated as CAS3 or CL3, then you'll need to leave your BIOS Latency or Cycle length settings at 3. You can always try your luck setting it at 2, but if your memory is not quick enough, then your system will become very unstable, and you'll need to go into the BIOS and change it back to 3.

If you do have memory that can be driven at a latency of 2, then you might want to try speeding up your timings too, from the bog-standard 8/10ns settings to a Fast (6/8ns) or Turbo (5/6ns) option – again, it's a matter of experimenting, and being prepared for regular crashing if your memory isn't quick enough. Finally, if you've bought the more expensive ECC type of memory, you should set any Data Integrity options to ECC in order to make use of its error checking capabilities.

Next up are a handful of extra video options, the first offering to cache the video BIOS and video RAM. Since these are already going sufficiently fast on modern graphics systems, leave both disabled. The AGP Aperture Size refers to the maximum amount of system RAM that can be used for texture storage. While many enthusiasts believe that you should set this to double the amount of video memory on your card, we've found that the default setting of 64MB is fine for most situations. If you regularly run Quake benchmarks at high resolutions and colour depths on 64MB cards, however, you may want to try an AGP Aperture of 128MB and re-test to see if there's any benefit. Finally, any option to enable an AGP two-speed or four-speed mode should only be used with a graphics card that supports it.

Integrated Peripherals

Unsurprisingly, the Integrated Peripherals section of the BIOS setup refers to the various ports and controllers that came built in to your motherboard as standard (see screenshot 5 below). These could be



Screenshot 4:
Advanced
Features – for
the tweekers

Screenshot 5:
Integrated
Peripherals
screen

part of the standard chipset, or supported by additional third-party components, such as a separate EIDE controller. Either way, this is the page where you activate or deactivate them.

First up are the settings for the Primary and Secondary EIDE controllers that come as standard with virtually every chipset. If you're using them, they should obviously both be enabled. Next up are the actual data transfer modes for the Master and Slave portions of each EIDE channel. Normally, there are separate options so that you can manually set the exact PIO or UltraDMA transfer modes for each one, but unless you're experiencing problems with your drives in Windows, then it's best to leave all of these at AUTO.

Users with two graphics cards should pay heed to the line that reads Init Display First. This can be set to AGP or PCI, and selects the card with which the PC's boot information is displayed when first starting. If you've only got one card, ignore this option.

Next are a series of port enablers, which simply activate or configure your various ports one at a time. Here you can switch on or off your serial, USB and parallel ports, along with enabling the floppy drive controller, or any external third-party drive controllers, such as an additional EIDE chipset. It goes without saying that most users will leave all of these enabled, although those wanting to free up system resources and interrupts may wish to selectively disable a few unused ports.

It is worth looking a little closer, though. This is the section where you can set the mode of your parallel port from Normal to EPP, ECP or ECP/EPP. Normally, parallel port printers and scanners like the port to be set at ECP, while some parallel port drives (like ZIPs) may prefer EPP mode. You'll need to check your device instructions, but this is the portion of the BIOS you should subsequently modify for them to work as intended.

Finally, fans of infra-red may also spot an option to set one of their serial port UARTs to infra-red mode. If this is activated, you can connect a third-party infra-red module to a suitable 5pin jumper on your motherboard and enjoy infra-red connectivity with PDAs, notebooks and mobile phones, albeit only at a maximum of 115Kbits/sec.



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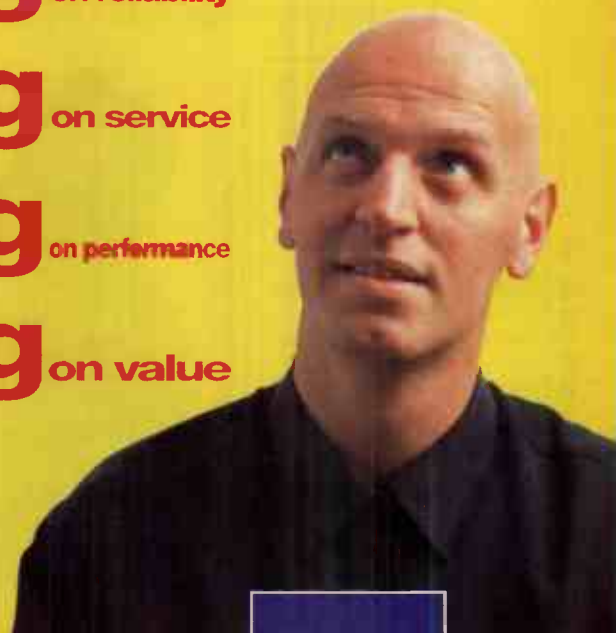
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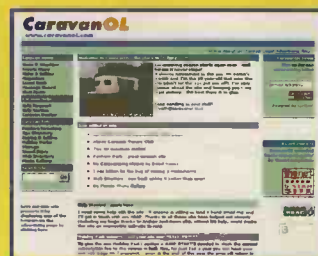
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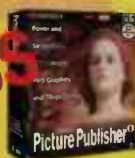
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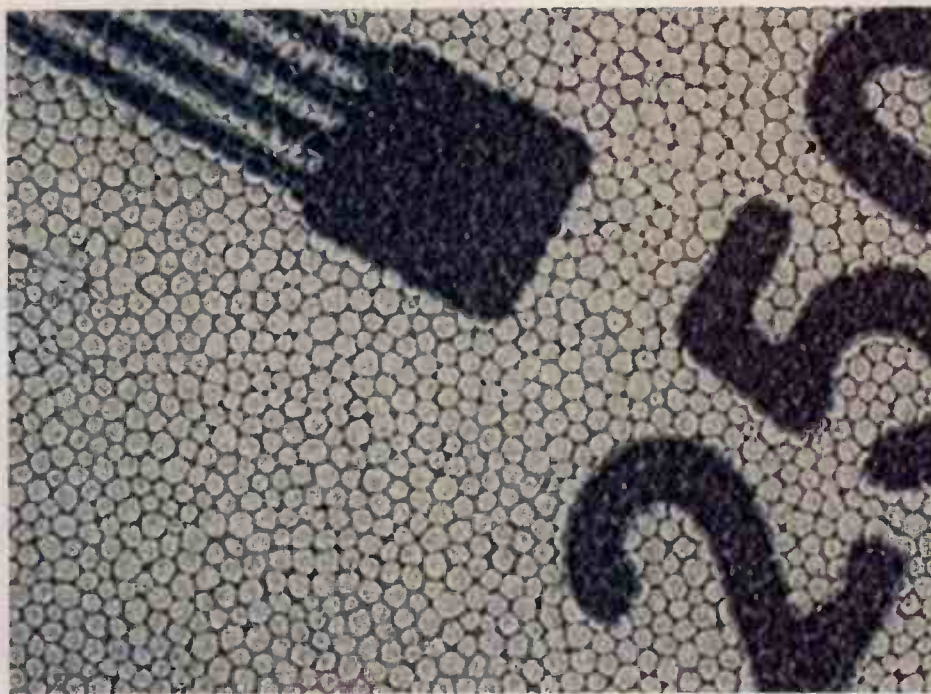
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Microelectronic devices produced from nanoparticle-based ink could be used to create PDA displays



Print a chip

Creating plastic semiconductor chips is now possible, and it can be done using a standard inkjet printer

This might sound a bit mad, but imagine if you could print out your own computer. With new developments in fabricating semiconductor chips from plastic instead of silicon, it might just happen.

The conventional manufacturing process for silicon-based chips is expensive, slow and error-prone. A typical chip production plant costs upwards of \$2b, and it takes two weeks of full-time manufacturing to make a single chip of Pentium-scale complexity. It's like that because each 12in silicon wafer, which can hold a few hundred identical chips, must be processed again and again by different machines, as the complex patterns are etched into the silicon. But now a completely different manufacturing technique is emerging, which promises to revolutionise the industry. Researchers are printing chips onto flexible plastic sheets, and they're doing it on the desktop.

Joseph Jacobson, director of the Printed PC Lab at MIT, is working on printing transistors using an 'ink' comprising nanometre-scale semiconducting particles (www.media.mit.edu/nanomedia/projects.html). Amazingly, this is achieved using a conventional inkjet printer. Another approach

they're taking is to create a rubber stamp that holds a circuit layout in relief. The stamp is 'inked' with the semiconducting particles, and the circuit is stamped onto a plastic substrate.

In the UK, a new company called Plastic Logic has patented a method for depositing plastic onto a polymer substrate, using an Inkjet-based printing system (www.plasticlogic.com). It uses organic polymers that, if deposited suitably on the substrate, behave as thin-film transistors. The company is specifically working to print the arrays of switching transistors needed by flat-panel liquid crystal displays, which currently use conventional silicon technology.

Many industry watchers are cautious about some of the dramatic claims made by the chip printers. While unarguably cheaper and more efficient to produce, the transistors on plastic chips currently work far slower than those made from silicon, and their packing densities are several hundred times less. But there are many applications, such as smart cards and intelligent food labelling, which don't need the massive processing power of conventional chips. And it's in examples of embedded computing like these that plastic chips are likely to proliferate.

Combinations of printed circuits and conventional chips are already appearing. New

Jersey toy designer Randi Altschul is about to start test-marketing the world's first disposable mobile phone (www.dtcproducts.com/home.html). According to her patent, the keys and circuit interconnections of the phone are printed onto a substrate, which also hosts a conventional phone microprocessor. The substrate is then folded over on itself, to make a multi-layered sandwich about half a centimetre thick. This is covered with a plastic wallet which forms the phone's body. A hands-free mic and earpiece plug in. Altschul's initial model will only be able to make outgoing calls, and she predicts that it will sell for \$10 (£6.25) from a vending machine. You'll get an hour's talk time, and if you don't want to top it up from your service provider, you just throw the phone away. Altschul says her company has more ambitious plans, including disposable handheld games, and even laptops.

The idea of having a machine on your desktop that can print chips opens up some amazing possibilities. You could download a new CPU design from the web, print the chip out onto a bit of blank plastic substrate, and install it straight into your PC. First we had open-source software, now it's open-source hardware. What will they think of next?

Toby Howard

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WORDS: RIYAD EMERAN, JALAL WERFALLI PICTURES: MAX BAKER

High & mighty

When you're spending £1,500 on a new PC you'd expect to get a top-of-the-range processor, meaty hard drive, an impressive sound system and a whole lot more. We challenged 13 manufacturers to see which could produce the best high-end PC

There is an air of change in the performance PC arena, which is heavily centred on that vital system component – memory. Prices have always ebbed and flowed in unison with the economic climate, but as you will see in this group test, Double Data Rate (DDR) SDRAM memory is rapidly becoming the norm in high-end systems. Having said that, PC133-rated memory can still hold its own performance-wise, but appears to be heading for the back seat as more and more DDR motherboards flood the market. Almost all the DDR motherboards in this test are designed with AMD's Athlon processor in mind, but look out for the Pentium 4 platforms with DDR support, expected to launch in the first quarter of 2002.

The overall theme to the group test was kept wide open, with a generous pluggy bank of £1,500 excluding VAT but including delivery and any credit card surcharge. While we were looking for high-end machines that offered feature-rich specifications you would be proud to show off to your friends, we also wanted to see an element of future-proofing and a three-year parts and labour warranty.

As ever, we set a minimum specification that included a meaty processor clocked at 1GHz or above, backed by a full 256MB of RAM. We wanted to see at least a 32MB graphics card, a 19in monitor and a decent sound card with speakers, giving you an excellent visual and audio experience.

As well as the basic components you'd expect in most of today's PCs, such as CD or DVD drives and a means to connect to the Internet, our specified criteria requested some form of backup device, a 20GB hard drive or bigger and an office suite, all installed with Microsoft's Windows Me at the helm.

Read on to see how the manufacturers interpreted these requirements, producing some interesting configurations.

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GROUP TEST £1,500 PCS

Atlas Meridian A1300 PWL

PRICE £1,761.33 (£1,499 ex VAT) **CONTACT** Atlas 020 8532 6515

PROS Fast graphics; monitor; TV-tuner; large hard drive **CONS** Less room for upgrades

OVERALL More memory would be better. Pipped by those offering FireWire and RAID

FEATURES ■■■■■ **PERFORMANCE** ■■■■■

VALUE FOR MONEY ■■■■■ **OVERALL** ■■■■■

Kicking off this group test with what seems to be a bit of a trend, Atlas' system sports a 1.33GHz AMD Athlon, backed up by PC2100 memory. There's 128MB of DDR SDRAM on a single module, leaving one DIMM slot free on the Asus A7M266 motherboard. However, we've been assured that this will be doubled by the time you read this. Having said that, the Meridian's performance is still very impressive, indicating that Atlas has spent some time configuring the system for maximum speed.

Sticking with performance, the 64MB nVidia GeForce3 based graphics card is no slouch and helps lift the Meridian to fourth spot in all the 3D charts. The graphics card is connected to a 19in CTX PR960F monitor that houses a trusty Sony FD Trinitron aperture-grille tube, which provides excellent contrast, little reflection and vivid colour representation.

Instead of a RAID system, there's a spacious 60GB Quantum hard

drive that meets the UltraDMA100 standard of the board's VIA 686B southbridge chip. This should provide enough storage for some time to come, but if you need to back up your data the LG CD-RW will come in handy. For DVD movie fans, there's a 16-speed DVD-ROM drive also from LG. This leaves one 5.25in, and two 3.5in bays free.

There are only two vacant PCI slots as the ProLink TV-tuner and the Creative SoundBlaster Live! 5.1 sound card take up the other two dedicated PCI slots. The latter is put to good use when connected to the set of Cambridge Soundworks' Desktop Theatre 5.1 speakers. For Internet connection, an Allied Data V.90 modem sits in the shared PCI/AMR slot.

Finally, a Logitech webcam is bundled together with Microsoft Works Suite 2001. All in all the Meridian is a good system, but just misses out because it lacks those extra features seen elsewhere.



Compute IT Infinity Pro R-G

PRICE £1,761.33 (£1,499 ex VAT) **CONTACT** Compute IT 08707 487487

PROS Great specs for the money; future-proof and quick too **CONS** No DDR memory

OVERALL A winning system that will last for some time to come

FEATURES ■■■■■ **PERFORMANCE** ■■■■■

VALUE FOR MONEY ■■■■■ **OVERALL** ■■■■■

Over the past couple of months, we've seen some good machines from Compute IT and this is no exception. Inside the full-tower ATX case from AOpen is an EpoX EP-8KTA3+ motherboard that makes use of VIA's Apollo KT133A chipset. This supports a new 266MHz bus speed Athlon beating at 1.33GHz.

Compute IT has opted for two 128MB sticks of PC133 SDRAM in preference to PC2100 memory. The performance difference is not huge, but if you wish to add more memory there are another two DIMM slots free.

For storage there are two 30.7GB IBM hard drives coupled to the board's HighPoint RAID controller and set up in a RAID 0 configuration for high I/O rates. If that's not enough you have another two EIDE channels to connect up to four more drives. A Plextor BurnProof CD-RW writes at 16-speed and rewrites at 10-speed. There's also a 16-speed Pioneer DVD-ROM with a slot opening.

With five 3.5in and two 5.25in bays left, there's room to expand. But this may be limited by just two spare power cables and one dedicated PCI slot free. A USB plate with two extra ports also blocks the shared ISA/PCI slot, but this can be removed.

A 64MB nVidia GeForce3-based card from Leadtek provides great 3D performance and also comes with S-Video and DVI sockets. The NEC 19in monitor is good too, providing a stable and sharp picture.

A FireWire card is included with three external ports and one internal, which is ideal for DV editing. Audio comes from a Creative Live! Platinum 5.1 card, and is controlled by an infra-red-enabled Live! Drive IR panel. A set of Cambridge Soundworks DTT2200 speakers completes a great audio setup.

Lotus SmartSuite Millennium, a cordless Logitech keyboard and wheel mouse finish off the Infinity Pro-R, the ultimate future-proof power machine.

Dell Dimension 8100

PRICE £1,585.07 (£1,349 ex VAT) **CONTACT** Dell 0870 907 5664

PROS P4 if you want **CONS** Slow; combo drive; no surround sound; average monitor

OVERALL Unfortunately, sticking with an Intel chip made it near impossible to compete

FEATURES ■■■■ **PERFORMANCE** ■■■■

VALUE FOR MONEY ■■■■ **OVERALL** ■■■■

Dell only supplies systems based on Intel processors and, as a result, the performance of the Dimension 8100 can't compare with the DDR AMD Athlon machines. That said, it's testament that a higher number doesn't necessarily mean higher performance. The 1.5GHz Pentium 4 CPU in this Dell is the fastest clocked chip on test, but it's no match for a 1.33GHz DDR Athlon.

Backing up the Pentium 4 is 256MB of RDRAM which fills two of the four RIMM sockets on the Dell-designed motherboard based on the Intel 850 chipset.

The black and silver-coloured 8100 stands out from the crowd, but the untidy mass of ribbon and power cables inside is less appealing. There are three 5.25in bays, one of which is filled with a Samsung DVD/CD-RW combo drive. Although this covers both bases and saves space, we would have expected two separate drives at this price. One of the three

internal 3.5in bays is filled with a 40GB Maxtor hard disk.

An nVidia GeForce2 Ultra card sits in the AGP slot, providing a decent graphics solution. Displaying the signal is a 19in Dell monitor. Although this isn't a bad unit, it uses a shadow-mask tube that looks very curved compared to the flat aperture-grille models supplied with other systems.

A Turtle Beach Santa Cruz sound card fills one of the five PCI slots, and pumps its signal out to a set of rather impressive-looking Harmon Kardon speakers. Unfortunately, the speaker set is only made up of two satellites and a sub-woofer, so there's no chance of surround sound for DVD watching or game playing.

The second and final PCI card is a 56K modem. Bundled with the system is a copy of MS Works Suite 2000.

If you're desperate for a Pentium 4 machine the 8100 might be worth a look, but there are faster and better-specified machines on test.



Elonex Webrider Pro

PRICE £1,761.33 (£1,499 ex VAT) **CONTACT** Elonex 020 8452 4444

PROS Reasonable 2D performance; tidy build **CONS** Speakers; graphics card driver

OVERALL A reasonable attempt from Elonex, but not as complete as its opponents

FEATURES ■■■■ **PERFORMANCE** ■■■■

VALUE FOR MONEY ■■■■ **OVERALL** ■■■■

Breaking the 1.33GHz Athlon trend is Elonex's entrant. This features the 1.3GHz Athlon processor that uses a 200MHz front-side bus (FSB). Designed to complement 200MHz PC1600 DDR SDRAM, Elonex has, instead, plugged this Athlon into an MSI K7T Pro2 motherboard that only supports PC133 SDRAM modules. Although it has 256MB of lower clocked memory, the Webrider turned out to be a reasonable performer – with an overall SYSmark score of 212.

Inside, the cables and wires were tied back and out of the way. A roomy 40GB Fujitsu hard drive takes care of the main storage, alongside an Acer CD-RW drive that writes at 12-speed and rewrite at eight. A 16-speed Panasonic DVD-ROM completes the Webrider's optical storage solution.

A SoundBlaster Live! 5.1 sound card is connected to a set of PCWorks speakers from Cambridge Soundworks. These aren't up to the standard of other sound systems, offering

just four-point surround sound, but at least you have a Dolby Digital 5.1 capable sound card in place if you ever decide to upgrade the speakers.

Sitting in the shared PCI/CNR slot is a CNR V.90 modem, leaving four dedicated PCI slots free.

In terms of 3D performance, the Webrider languishes at the bottom of the charts, even though the card is based on nVidia's Geforce2 Ultra chipset, together with 64MB of video memory. This can only be a driver issue, as you would expect similar 3D scores to the Dell or Mesh systems that feature cards with the same chipset. Hooked up to the D-SUB port on the graphics card is an Iiyama Vision Master 452 monitor, which offers a visually flat screen, good contrast and a stable image.

A copy of MS Office 2000 Premium is included as part of the package. Overall, the Elonex Webrider is a reasonable machine that is let down in a couple of key areas.



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- Smart Li-Ion Battery **
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evesham.com Axis Ultimate

PRICE £1,761.33 (£1,499 ex VAT) **CONTACT** evesham.com 08707 287 070

PROS CPU; graphics; front-mounted USB ports **CONS** Limited memory expansion

OVERALL Well-rounded, but motherboard and office suite are not as impressive as others

FEATURES ■■■■■ **PERFORMANCE** ■■■■■

VALUE FOR MONEY ■■■■■ **OVERALL** ■■■■■

AMD's flagship 1.33GHz Athlon processor provides the power inside evesham.com's offering this month. Based on an Asus A7M266 motherboard, the system is fitted with a healthy 256MB of PC2100 memory, leaving one free DIMM slot for additional memory modules.

Future expansion is catered for by two USB ports mounted on the front of the case. These provide easy access for plugging in peripherals. A SoundBlaster Live! 5.1 sound card and Diamond 56i Pro modem occupy two PCI slots, leaving two additional slots free.

An UltraDMA100 40GB Maxtor hard disk, and a Teac CD-RW that writes and rewrites at 12- and 10-speed respectively cover storage in the Axis Ultimate. A 16-speed Pioneer DVD-ROM drive completes the drive array. Also bundled is a set of Cambridge Soundworks DTT2200 Dolby Digital speakers that offer an ideal home cinema setup.

As one might expect with a system sporting a top-notch processor, evesham.com has opted for nVidia's GeForce3 chipset as the graphics solution, complete with 64MB of DDR SDRAM. This has helped the Axis Ultimate reach the number three spot in both our 3DMark and Quake III tests.

With such an impressive 3D performance, evesham.com has thankfully provided a decent Mitsubishi Diamond Plus 92 monitor that uses a Diamondtron Natural Flat aperture-grille tube. The picture is vibrant and sharp even at the maximum resolution of 1,600 x 1,200 at 75Hz. The nVidia graphics board also carries an S-Video port for gaming on your TV.

evesham.com has bundled a copy of Lotus SmartSuite Millennium with the Axis, but we would have preferred a copy of MS Works Suite 2000 given the generous price limit.

Overall, evesham.com has put together a well-rounded system that is just outshone by the winners.



Intellect Pro 1000Plus

PRICE £1,761.33 (£1,499 ex VAT) **CONTACT** Intellect 0161 429 9911

PROS Office SBE; warranty **CONS** Slow CPU and graphics card; poor performance

OVERALL A PIII machine that is outclassed and outperformed by the Athlon competition

FEATURES ■■■■■ **PERFORMANCE** ■■■■■

VALUE FOR MONEY ■■■■■ **OVERALL** ■■■■■



Intellect has taken the Dell route and opted for an Intel processor rather than an AMD solution. Unlike Dell, though, Intellect has gone for a Pentium III instead of a Pentium 4. Unfortunately, the fastest Pentium III CPU only runs at 1GHz, so it's a fair bit slower than the 1.33GHz Athlons in other machines.

Backing up the 1GHz Pentium III is 256MB of PC2100 DDR SDRAM in a single DIMM, leaving three slots free for future upgrades. We haven't seen too many DDR Pentium III systems, but the ones we've come across have shown little performance improvement over standard PC133 systems.

It's a shame that Intellect has gone for a GeForce2 MX-based graphics card, albeit a 64MB version, as there's just no comparison between an MX card and the GeForce3 cards. The other half of the display set is more impressive, though. The NEC Multi-Sync FE950+ monitor is a joy to behold and has a detailed OSD to con-

trol it, and the 19in Diamondtron NF tube produces a sharp, vibrant image.

There's only one other expansion card in the Intellect – a 56K modem that fills one of the five PCI slots. There's no sound card because the motherboard has onboard sound, which is a little disappointing, and there's no surround sound on offer from the set of Cambridge Soundworks SW310 speakers.

One of the two internal 3.5in bays is filled with a 30GB IBM Deskstar hard disk, while single external 3.5in and 5.25in bays are also free. The top two 5.25in bays are filled with a Panasonic 16-speed DVD-ROM drive and a Mirai CD-RW.

Rounding off the package is a copy of Microsoft Office 2000 SBE, which is probably the best component in the bundle, a Microsoft Internet keyboard and Intellieye mouse. However, even the three-year on-site warranty isn't enough to recommend the Intellect in light of the superior competition.

Mesh Matrix Pro 1300DDR

PRICE £1,761.33 (£1,499 ex VAT) **CONTACT** Mesh 020 8208 4706

PROS Well built; reasonably fast **CONS** No GeForce3; poor USB port placement

OVERALL Another fine system from Mesh, but this time the competition was too strong

FEATURES ■■■■ **PERFORMANCE** ■■■■
VALUE FOR MONEY ■■■■ **OVERALL** ■■■■

Mesh is no stranger to the winner's podium here at *PCW*, so we expect good things from the company. This time, it has tried to produce the ultimate machine for many uses.

The Matrix Pro 1300DDR is built inside the impressive Mesh mid-tower case that needs no tools to access the internals and has all the major components laid out in a sensible, unhindered manner.

At the heart of the system is a 1.33GHz AMD Athlon processor backed up by 256MB of PC2100 DDR SDRAM. Both the DDR DIMM sockets in the Asus motherboard are full, which is a shame, but 256MB should be fine for most users.

Mesh has included two extra USB ports but has chosen to mount the backing plate so it blocks a PCI slot, even though there is a spare backing plate above the AGP slot.

Filling the single AGP slot is a Gainward GeForce2 Ultra graphics card, which used to be the pinnacle of

graphics technology. However, the GeForce3 chipset was released recently and many competing systems in this group test sport cards based on this newer technology.

There's an impressive Mitsubishi Diamond Pro 920 19in monitor. Based on the Natural Flat Diamond-tron tube this is a great display that produces a superb image at a resolution of 1,280 x 1,024.

Storage is taken care of amply by a 40GB Western Digital hard disk, while two of the three 5.25in bays are filled with a 16-speed Pioneer DVD-ROM drive and a Teac CD-RW drive.

A SoundBlaster Live! 5.1 fills one of five PCI slots and pumps its signal to a set of Desktop Theatre 2200 speakers. The Dolby Digital processing on the card makes this great for DVD watching. There is also a 56K modem and a copy of MS Works Suite 2000.

Although performance is good, the old graphics card lets the Mesh down.



IS INTEL'S PENTIUM 4 TRUE TO THE CORE?

If you are a regular reader of *PCW*, you will probably have noticed that there is a performance difference between systems powered by the latest AMD and Intel processors. While we believe our tests to be a fair indication of a system's overall number-crunching ability in real-world computing, Intel's new Pentium 4 NetBurst micro-architecture is, in its own words, geared toward the 'visual Internet'. This encompasses audio and video encoding, as well as imaging programs, speech recognition and gaming.

NetBurst allows the Pentium 4 core to beat away at higher clock speeds, while its greater pipeline depth (double that of the Pentium III and Pentium Pro P6 core), known as hyper-pipelined technology, boosts the processor's frequency and scalability.

More significant is the CPU's support for SSE2 (Streaming SIMD Extensions 2), which enhances the SIMD (Single Instruction Multiple Data) capabilities that MMX and SSE technology delivered in the older Pentiums. What this means in layman's terms is a reduction in the number of instructions required to execute a particular program, which in turn

increases overall performance. However, since a number of today's applications, our tests included, have not been coded to take advantage of SSE2, we have seen little evidence to substantiate these multimedia performance boosts.

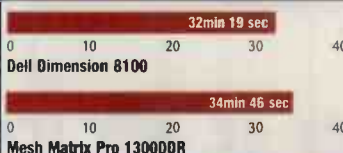
Putting this technology to the test we decided to run a mini benchmark to assess the efficiency of the Pentium 4's new instruction set, in comparison to an AMD Athlon. We selected two similarly specced machines from this month's group test: the Mesh Matrix Pro 1300DDR, sporting a 1.33GHz Athlon with 256MB of PC2100 memory, and the Dell Dimension 8100, with its 1.5GHz Pentium 4 and 256MB of RDRAM. We then ripped a DVD movie to the hard disk on each system, and installed the FlaskMPEG (<http://go.to/flaskmpeg>) video conversion utility that has been encoded with MMX, 3Dnow and, significantly, SSE2 optimisations. Using this we converted the DVD files into DivX format, which translates the movie files from MPEG-2 into MPEG-4, and the audio track from AC3 to MP3. The time it took to complete this on each machine was recorded.

The verdict

Looking at the results, there is indeed a time difference of approximately two minutes 30 seconds in favour of the Pentium 4 system. However, it should be noted that the Mesh system actually achieved a much higher overall SYSmark 2000 score. Whether this is significant for the end user really depends on how they use their PC, as well as the availability of appropriately coded software.

Nevertheless, this simple test could indicate that Intel has got something to work with, especially in an age where convergence technologies are being driven forward. What remains now is to see how an equally clocked Athlon processor measures up.

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Quote Ref 77870

Fusion Ultra 1GHz

Intel® Pentium® III Processor 1GHz
128Mb PC133 SDRAM
40Gb Ultra-DMA 7,200 RPM HDD
AGP 32MB nVIDIA TNT2 graphics
1.44Mb 3.5" Floppy
16 x DVD ROM (x40 CD)
17" ViewSonic E70 .27 Monitor
Panrix Mini Tower Chassis/Desktop
Integrated AC'97 audio 200w Speakers
56.6 V.90 PCI Internal Voice/Fax/Modem
Win '98 Keyboard/MS Wheel mouse
MS Windows® ME CD
MS Works 2000 CD

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3 Years Warranty (1st year on-site)

£1,173.83 inc. VAT

£38.32 monthly x 36 payments APR19.8%

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128Mb Rambus Module
20GB Ultra-DMA Hard Drive
AGP 32MB nVIDIA TNT2 graphics
1.44Mb 3.5" Floppy
16 x DVD ROM (x40 CD)
17" ViewSonic E70 .27 Monitor
Panrix 600 Mini Tower Chassis/Desktop
PCI Creative SB128 & 200w PMPO Speakers
56.6 V.90 PCI Internal Voice/Fax/Modem
Win '98 Keyboard/MS V2 Intellimouse
MS Windows® ME CD
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Intel® Pentium® III Processor
Featuring Speedstep™ Technology
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Thin (1.6") and Lightweight (6.8lb)
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ATI 3D Mobility Graphics Accelerator
1.44Mb 3.5" Floppy Built In
8 x DVD ROM Built In
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Quote Ref 77955

SERVERS



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15Gb Ultra-DMA Hard Drives
AGP 8Mb Graphics
1.44Mb 3.5" Floppy
52x EIDE CD-ROM
Panrix Max Midi Chassis
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Intel® Pentium® III Processor 866MHz
Intel BX PCI Chipset, Dual CPU Option
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9.1Gb Ultra SCSI-2 LVD 7,200 rpm HDD
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1.44Mb 3.5" Floppy
52 x EIDE CD ROM
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GROUP TEST £1,500 PCS

Multivision Vision RAID 4500

PRICE £1,761.33 (£1,499 ex VAT) **CONTACT** Multivision 0870 066 0885

PROS Audio; RAID; FireWire; USB ports **CONS** No room for expansion; not the fastest

OVERALL Full of features that should stand the test of time and keep enthusiasts happy

FEATURES ■■■■■ **PERFORMANCE** ■■■■■

VALUE FOR MONEY ■■■■■ **OVERALL** ■■■■■

This Multivision offering includes a RAID controller card connected to two 30GB Western Digital hard drives in a RAID Level 0 configuration. This means that data is split across the drives and read and written to both simultaneously, resulting in a higher data throughput. However, if one disk were to fail, all data would be lost.

If this plays on your mind, you could make backups with the Mirai CD-RW. This can write at 16-speed and rewrite at 10-speed. It also features BurnProof technology that prevents buffer underrun, so you can work as you burn. A slotted 16-speed DVD-drive is also included, leaving two 5.25in bays available.

As for the nerve centre, an AMD Athlon, clocked at 1.33GHz and backed up by 256MB of PC2100 SDRAM, provides the system with the processing power to mix it with the rest. In addition, the memory comes on one stick, leaving two DIMM slots free on the Gigabyte GA-7VTX.

This motherboard employs VIA's Apollo KT266 chipset that supports UltraDMA100 drives and offers an extra four USB ports via two internal cables. Residing in the AGP Pro slot is a 64MB Hercules 3D Prophet 4500. This is based on ST Microelectronics' Kryo II chipset and offers a powerful alternative to an nVidia-dominated arena. There's a 19in Hitachi monitor with a flat-faced shadow-mask tube that displays a decent picture.

Two other products from Hercules are included: a DV Action FireWire board with three external and one internal IEEE1394 ports, and a Game Theatre XP sound card that links up with a rack offering Dolby Digital decoding, perfect for the VideoLogic DigiTheatre LC speaker set. Furthermore, four USB ports, optical and coaxial digital ports, a mic jack and MIDI-In/Out DIN connectors are present.

Finally, a copy of Lotus SmartSuite Millennium completes a package that takes a Highly Commended award.



NEC Direct Powermate Select XL3

PRICE £1,761.33 (£1,499 ex VAT) **CONTACT** NEC Direct 0870 010 6328

PROS DVD-R/CD-RW combo; Office SBE; warranty **CONS** Not the fastest; display set

OVERALL A slightly unbalanced system, but one with some great, original features

FEATURES ■■■■■ **PERFORMANCE** ■■■■■

VALUE FOR MONEY ■■■■■ **OVERALL** ■■■■■



NEC walked away with a Highly Commended award in last month's group test, and this time it has submitted yet another impressive machine.

Like many other systems on test, the NEC is based on a 1.33GHz AMD Athlon processor, along with 256MB of PC2100 DDR SDRAM. Unlike some machines, the NEC has its 256MB of RAM on a single DIMM, leaving another slot free for future upgrades.

Even the most space-hungry user will be happy with the hard drive that NEC has supplied. The Quantum Fireball drive sports a massive 60GB of storage, but the hard drive isn't the most impressive storage device in this system. Sitting in one of the 5.25in bays is a Pioneer DVD-R/CD-RW combo drive that will read DVDs and CDs, and write CD-R, CD-RW and DVD-R discs. The beauty of DVD-R is that it can be read on any DVD device, even DVD-Video players.

What's most impressive is that the last time we looked at a DVD-R drive


it cost over £3,000, so this is a great addition to any PC. NEC has even included a 16-speed Pioneer DVD-ROM drive for disc-to-disc copying.

Letting the specification down slightly is a 32MB GeForce2 GTS graphics card, which has been superseded by the GeForce2 Ultra and the GeForce3 chipsets.

Unfortunately, the 19in NEC VR19 monitor is not the best we've seen. It's especially disappointing when you consider that the Intellect shipped with a far superior monitor from NEC. The VR19 is a shadow-mask unit with a noticeably curved screen, although the image is sharp.

Also included is a SoundBlaster Live! Value sound card and a set of Labtec LCS-2514 speakers. This is fine for surround sound on games, but not for Dolby Digital playback on DVD movies.

Rounding things off is a 56K modem, a copy of MS Office SBE and a three-year, on-site warranty.



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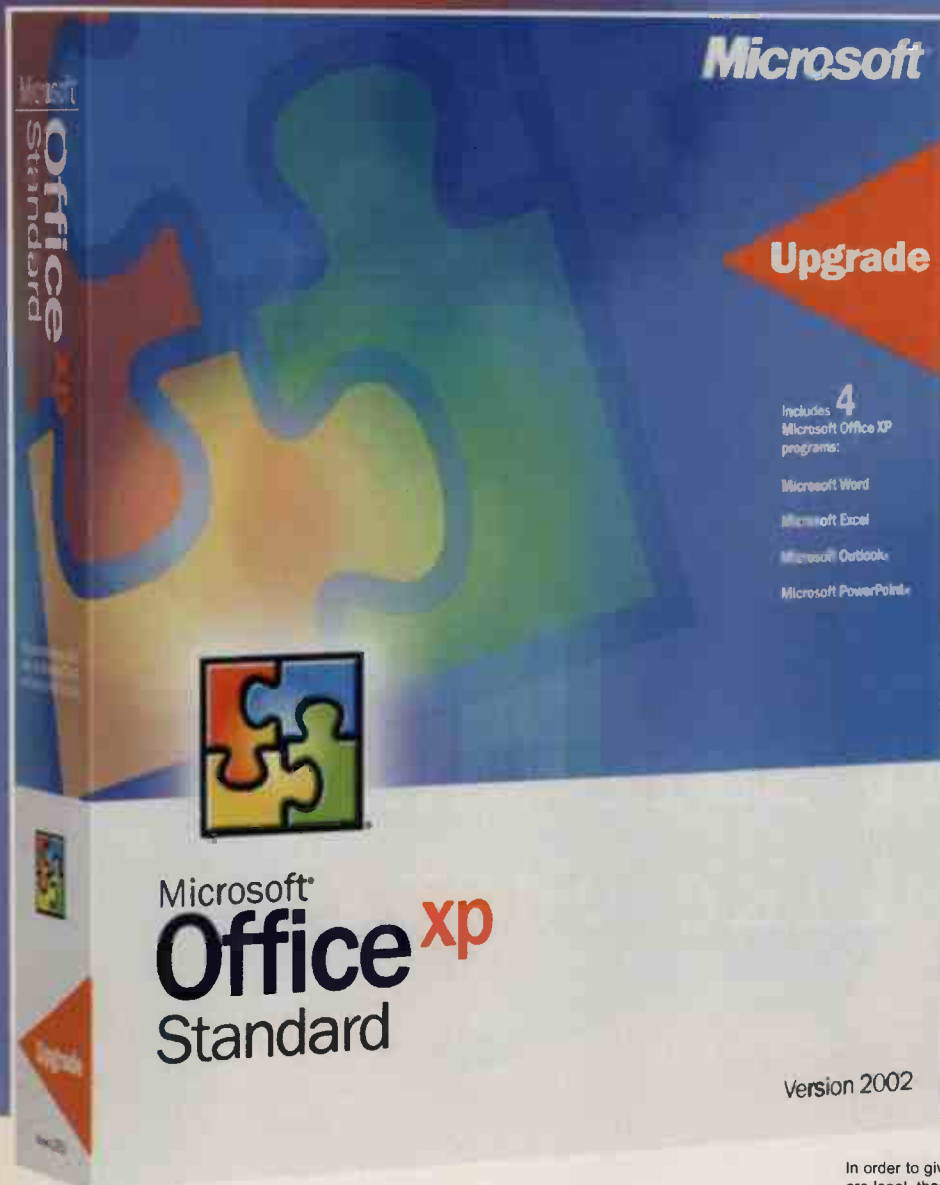
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Office XP
Top 3 Reasons to
Upgrade



Upgrade

Personal Experience

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Context-sensitive smart tags provide users with relevant options for quick, easy access to information by alerting users to important actions such as formatting options for pasted information, formula error correction, auto correct options for bulleted lists, capitalization, fractions and more.

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E322738	Office XP Win32 English Intl CD	£349.99 (£411.24)
E322736	Office XP Win32 English Intl VUP CD	£159.99 (£187.99)
E322795	Office XP Pro Special Ed Win32 English Intl VUP CD	£269.00 (£316.08)
E322740	Office XP Pro Win32 English Intl CD	£445.00 (£522.88)
E322763	Office XP Dev Win32 English Intl CD	£595.00 (£699.13)
E322764	Office XP Dev Win32 English Intl VUP CD	£392.99 (£461.76)
E322742	Office XP Pro Win32 English Intl VUP CD	£226.00 (£265.55)

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VAT inclusive pricing is shown in brackets @ 17.5%

Panrix Magnum 1333 Turbo

PRICE £1,761.33 (£1,499 ex VAT) **CONTACT** Panrix 0113 244 4958

PROS Powerful PC; graphics and sound; USB networking **CONS** Monitor; slower CD-RW

OVERALL Respectable, quick, with interesting features; let down by uninspiring monitor

FEATURES ■■■■ **PERFORMANCE** ■■■■

VALUE FOR MONEY ■■■■ **OVERALL** ■■■■

The Panrix Magnum 1333 Turbo is another machine to feature AMD's 1.33GHz Athlon processor. The CPU resides in an MSI K7T266 Pro motherboard and is backed up with 256MB of PC2100 memory.

The Magnum 1333 Turbo managed to power its way to third place in our SYSmark tests. With two DIMM slots free, it has room for additional memory. A modest 30GB Ultra-DMA100 Maxtor hard disk provides the primary means of storage, alongside a CD-RW from Samsung that can write and rewrite at eight-speed. A 16-speed Pioneer DVD-ROM drive is also included, leaving one vacant 5.25in bay.

Internet connection is catered for by a Diamond SupraExpress 56i Pro PCI modem. Occupying another PCI slot is Creative's SoundBlaster Live! 5.1 audio card that, when married to the set of DTT2200 loudspeakers from Cambridge Soundworks, offers full Dolby Digital surround sound.

Inside the screwless case are two dedicated PCI slots left free for other devices, while another is shared with the CNR slot. A backing plate with two additional USB slots is also provided. A USB PC-to-PC onboard network controller also allows you to network two PCs over the supplied USB cable.

Panrix has squeezed in a graphics card based on nVidia's GeForce3 chipset. Like most other cards, the Leadtek design sports 64MB of DDR SDRAM, but also comes with DVI and S-Video connectors.

The Panrix system scores well in our 3D tests. Plugged into the D-SUB output of the Leadtek card is a Hansol 910A monitor. This 19in model produces a reasonably focused picture at resolutions of up to 1,600 x 1,200 at 85Hz. However, the screen is a bit reflective and the rotary dial control is awkward to use.

A copy of MS Works Suite 2000 completes this well-rounded system, and helps it win an award.



Polar Panache 1200

PRICE £1,762.50 (£1,500 ex VAT) **CONTACT** Polar 0800 138 1238

PROS EIDE RAID configuration; heatsink **CONS** Graphics card; no sound card

OVERALL A disappointing system. There are much better packages on offer

FEATURES ■■■■ **PERFORMANCE** ■■■■

VALUE FOR MONEY ■■■■ **OVERALL** ■■■■

Polar has gone for an AMD solution, but instead of a 1.33GHz Athlon, the Panache sports a 1.2GHz chip. Unfortunately, the slower chip has affected the Polar's performance.

Supporting the CPU is 256MB of PC2100 DDR SDRAM, but Polar has supplied two 128MB DIMMs, so there's no way of upgrading without discarding what you already have.

The most impressive part of this system is the huge circular heatsink covering the CPU. It doesn't do anything special, but it looks great.

The Asus A7M266 motherboard supports two extra USB ports, which Polar has thoughtfully located in an unused backing plate.

A slightly aging nVidia GeForce2 GTS graphics card fills the AGP slot. Although this card can deal with any 3D game you throw at it, it doesn't have the future-proofing of the GeForce3 cards supplied elsewhere.

An Iiyama S900MT 19in monitor displays the image and does a fairly

good job, considering this is one of Iiyama's budget models. The tube is a shadow-mask unit and the screen is curved, but the image is sharp across the whole surface.

Only two of the five PCI slots are filled, one with a 56K modem and the other with a Promise FastTrack EIDE RAID controller. The latter controls the two 20GB IBM Deskstar hard disks configured in RAID 0 for optimum performance. This means the system sees both drives as one; it reads from and writes to them simultaneously.

The top two 5.25in bays are occupied by a 12-speed DVD-ROM drive and a CD-RW drive, both from Samsung. There's no sound card, which is disappointing considering the price. Also disappointing are the Labtec LCW-1070 speakers that consist of just two satellites with no sub-woofer.

Ultimately, Polar has produced a machine with some decent features, but as a whole it's eclipsed by the far stronger competition.



GROUP TEST £1,500 PCS

Poweroid.com 3010

PRICE £1,709.63 (£1,455 ex VAT) **CONTACT** Poweroid 0870 220 0444

PROS Quality monitor; RAID 0 array; sound system **CONS** Slower 3D; older graphics card

OVERALL An admirable showing from Poweroid, but not as feature-rich as others

FEATURES ■■■■ **PERFORMANCE** ■■■■

VALUE FOR MONEY ■■■■ **OVERALL** ■■■■

Poweroid.com has powered its system with a 1.33GHz Athlon. However, the Asus A7V133 motherboard does not support DDR memory, and mounted in one of three DIMM slots is 256MB of PC133 memory.

Performance is improved thanks to the PCI RAID controller card hooked up to two IBM 40.1GB hard drives, providing enough storage to see you through the next few years.

For making removable backups, Poweroid.com supplies a BurnProof Plextor CD-RW capable of writing at 12-speed and rewriting at 10-speed. The 16-speed DVD-ROM drive makes watching DVDs a possibility, but CD-to-CD copying would benefit if the two optical drives were each connected separately to one of A7V133's four EIDE connectors.

Sitting in the AGP slot is a 32MB 3D Blaster GeForce2 GTS card that, as the name suggests, utilises nVidia's GeForce2 GTS chipset. Disappointingly, this card is outclassed by those

with 64MB of video memory, faster GPU cores and more connectors, as this only comes with a D-SUB port.

Hooked up to the graphics card is an Iiyama Vision Master Pro 451 monitor that uses a 19in Diamondtron NF tube to great effect. The image is bright and well focused, making it a pleasure to use at the typical resolution of 1,280 x 1,024. There are two D-SUB connectors and a USB hub, with one upstream and four downstream ports.

A SoundBlaster Live! 5.1 audio card and a set of DTT2200 speakers ensure Dolby Digital surround sound, while another two USB ports can be found on a backing plate. For upgrading, you are left with two dedicated PCI slots free and one of each bay size for other drives.

Lotus SmartSuite Millennium is the office suite of choice, which means you can start working straight away. Overall, a capable system but behind the front runners in terms of features.



Systemax A1300RV Lifestyle

PRICE £1,761.33 (£1,499 ex VAT) **CONTACT** Systemax 08707 297 366

PROS Monitor; large hard disk; 256MB DIMM **CONS** Graphics card; warranty

OVERALL A solid package, but Compute IT and Multivision offer more for the money

FEATURES ■■■■ **PERFORMANCE** ■■■■

VALUE FOR MONEY ■■■■ **OVERALL** ■■■■

Systemax has always managed to produce first-rate systems while keeping costs down. Unfortunately, the A1300RV Lifestyle 0780 only comes with a one-year, on-site warranty. That aside, Systemax has put together another solid machine.

Unsurprisingly, at the heart of the machine is a 1.33GHz AMD Athlon supported by 256MB of PC2100 DDR SDRAM. The memory comes on a single DIMM, so you've still got one spare for future upgrades. The inside of the case is fairly tidy and there are single 5.25in and 3.5in bays free.

Filling the top two 5.25in bays are a 52-speed CD-ROM drive and a Ricoh DVD/CD-RW combo drive. Although you can still perform disc-to-disc copies, we'd have preferred a DVD-ROM and a CD-RW. That said, the Ricoh combo unit is a good one.

The display set is a mixed bag. The 19in CTX monitor is a fine example, sporting a Sony FD Trinitron tube. The picture is bright and well focused,

and the OSD is fairly intuitive. Feeding the monitor is an nVidia GeForce2 Pro graphics card that can't really compete with the GeForce3 cards when it comes to 3D. However, the Systemax did manage to top the chart in the 2D SYSmark test.

Sound is well taken care of with a Creative SoundBlaster Surround 5.1 retail bundle. This consists of a SoundBlaster Live! 5.1 and a set of Desktop Theatre 2200 speakers, providing excellent effects for both games and DVD movies. The only other expansion card is a 56K modem, leaving three PCI slots free.

Systemax has supplied a 60GB Maxtor hard disk, which should please even the most space-hungry user. There's a Microsoft IntelliEye mouse and Internet keyboard, as well as an MS Sidewinder gamepad and Lotus SmartSuite Millennium.

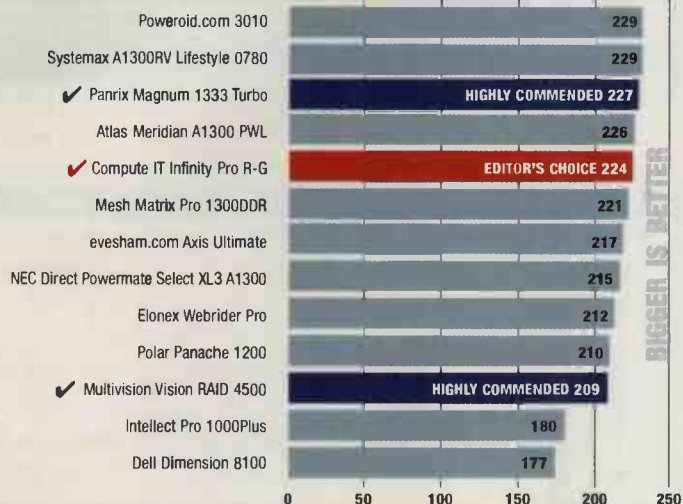
The Systemax is a good machine, but it's not good enough to grab an award this month.



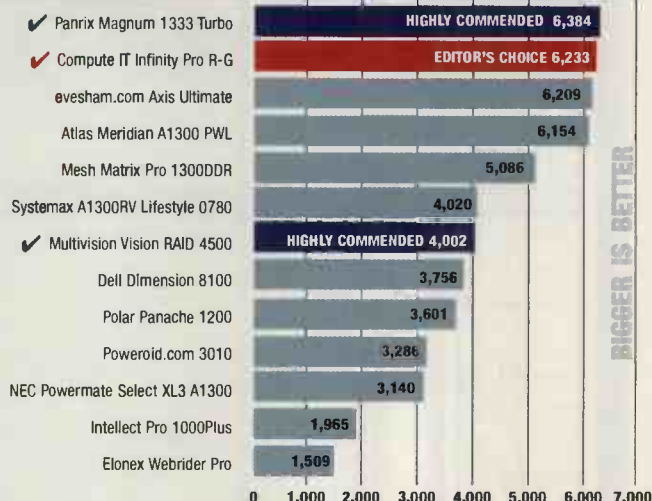
LAB RESULTS



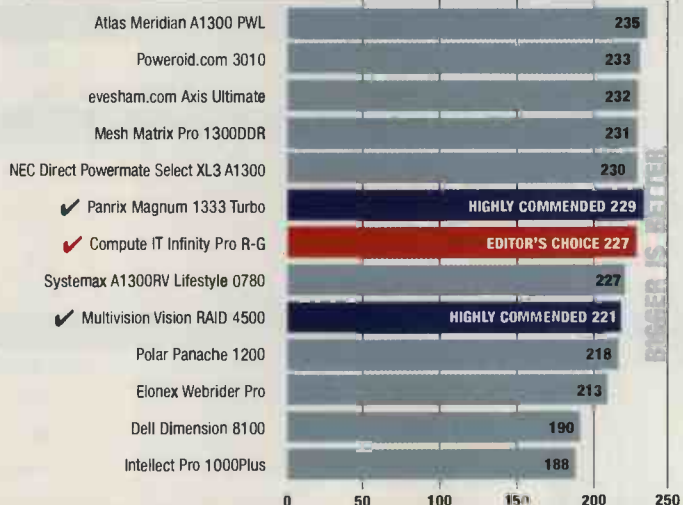
SYSmark 2000 overall



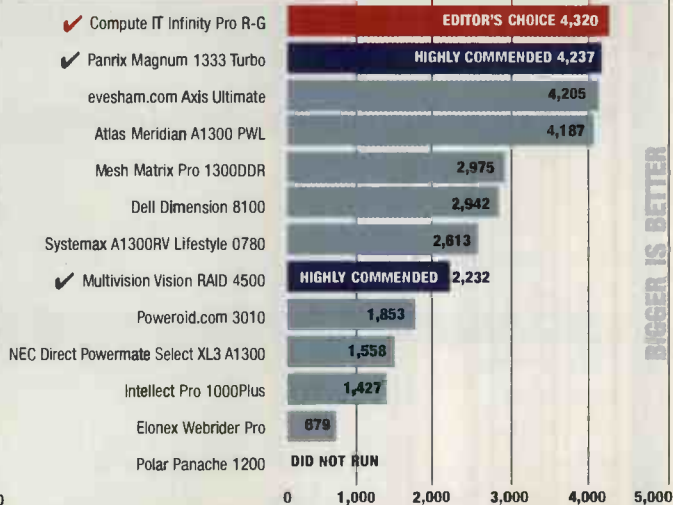
3DMark 2000 (1,280 x 1,024 at 32bit)



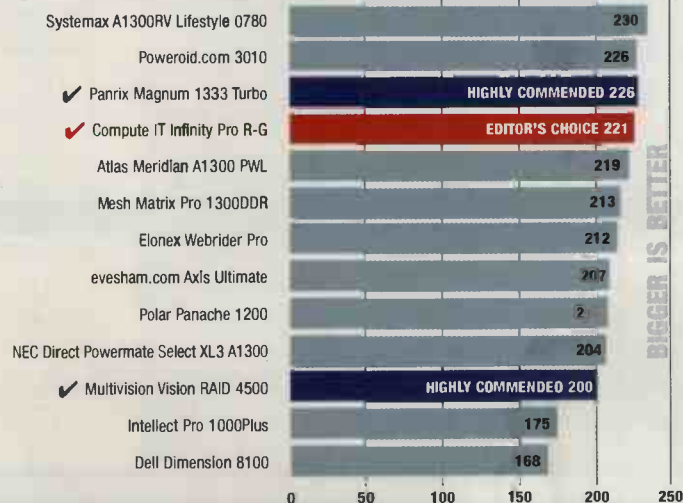
SYSmark 2000 Internet content creation



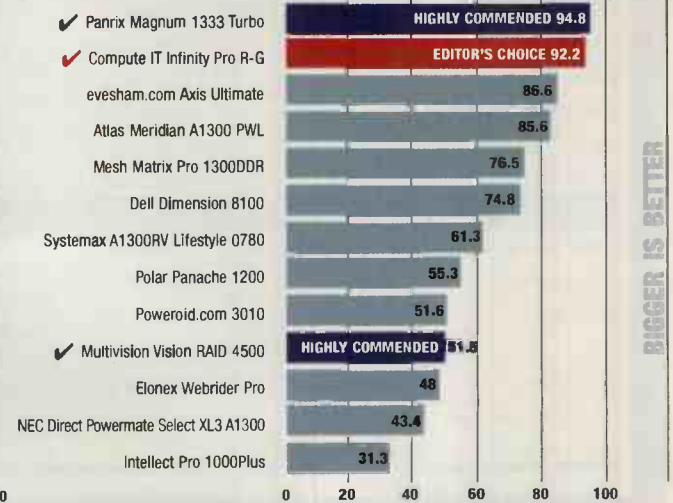
3DMark 2001 (1,280 x 1,024 at 32bit)



SYSmark 2000 office productivity



Quake III (fps) (1,280 x 1,024 at 32bit)



Please see page 62 for an explanation of how we tested the PCs

TABLE OF FEATURES



MANUFACTURER	ATLAS	COMPUTE IT	DELL	ELONEX	EVESHAM.COM	INTELLECT COMPUTERS
MODEL NAME	MERIDIAN A1300 PWL	INFINITY PRO R-G	DIMENSION 8100	WEBRIDER PRO	AXIS ULTIMATE	PRO 1000PLUS
Price inc VAT (ex VAT)	£1,761.33 (£1,499)	£1,761.33 (£1,499)	£1,585.07 (£1,349)	£1,761.33 (£1,499)	£1,761.33 (£1,499)	£1,761.33 (£1,499)
Telephone	020 8532 6515	08707 487 487	0870 907 5664	020 8452 4444	08707 287 070	0161 429 9911
URL	www.atlasplc.com	www.it-pc.co.uk	www.dell.co.uk	www.elonex.co.uk	www.evesham.com	www.intellect.uk.com
HARDWARE SPECS						
Processor	AMD Athlon 1.33GHz	AMD Athlon 1.33GHz	Intel Pentium 4 1.5GHz	AMD Athlon 1.3GHz	AMD Athlon 1.33GHz	Intel Pentium III 1GHz
RAM/type	128MB/PC2100	256MB/PC133	256MB/RDRAM	256MB/PC133	256MB/PC2100	256MB/PC2100
Occupied/spare RAM slots	1/1	2/2	2/4	1/2	1/1	1/3
Max memory in this configuration	640MB	1.28GB	1GB	1.28GB	768MB	1.8GB
Max mem supported by m'board	2GB	1.5GB	1GB	1.5GB	2GB	4GB
Hard disk (manufacturer/model)	Quantum Fireball Plus AS	IBM Deskstar DTLA-307030	Maxtor 5T040H4	Fujitsu MPG3409AH	Maxtor 5T040H4	IBM Deskstar DTLA-307030
HD size/interface	60GB/EIDE	2 x 30.7GB/EIDE (RAID 0 ctrl)	40GB/EIDE	40GB/EIDE	40GB/EIDE	30.7GB/EIDE
Storage drive	LG CED 8120-BB	Plextor PX-W1610A	Samsung SM-308B	Acer 1280A CD-RW	Teac CD-W512E	Mirai CRD-BP1400P
manufacturer/model	(12x 8x 32x)	BurnProof (16x 10x 40x)	(8x 4x 32x DVD 8x)	(12x 8x 32x)	(12x 10x 32x)	(BurnProof) (16x 10x 40x)
Size of storage drive/interface	650MB/EIDE	650MB/EIDE	650MB/EIDE	650MB/EIDE	650MB/EIDE	650MB/EIDE
MOTHERBOARD COMPONENTS						
Motherboard manufacturer	Asus	EPoX	Dell Custom	MSI	Asus	Gigabyte
Model/chipset	A7M266/AMD-761/VIA 686B	EP-8KTA3+/VIA KT133A	Dell/Intel 850	K7T Pro2/VIA KT133A	A7M266/AMD-761 & VIA 686B	GA-6RX/VIA Pro266
EXPANSION AND I/O						
No of 3.5/5.25in bays	3/4	8/5	3/3	4/3	3/3	4/3
No of free 3.5/5.25in bays	2/1	5/2	1/2	2/1	1/1	2/1
No of PCI/ISA/shared/AMR slots	4/0/1/0	5/0/1/0	5/0/0/0	5/0/1/0	4/0/1/0	5/0/0/1
Free PCI/ISA/shared/AMR slots	2/0/0/0	1/0/1/0	3/0/0/0	4/0/0/0	2/0/1/0	4/0/0/1
No of USB/serial/parallel/PS/2	4/2/1/2	4/2/1/2	4/1/1/2	2/2/1/2	4/2/1/2	2/2/1/2
MULTIMEDIA						
DVD manufacturer/model	LG/DRD8160-BB	Pioneer/DVD-105s	Samsung/SM-308B (as above)	Panasonic/SR-8586	Pioneer/DVD-116	Panasonic/SR-8586B
DVD speed/interface	16x/EIDE	16x/EIDE	8x/EIDE	16x/EIDE	16x/EIDE	16x/EIDE
Sound card manufacturer	Creative	Creative	Turtle Beach	Creative	Creative	Creative
Sound card model	SoundBlaster Live! 5.1	SoundBlaster Live! Platinum 5.1	Santa Cruz	SoundBlaster Live! 5.1	SoundBlaster Live! 5.1	CT5880 (onboard)
Speakers (manufacturer/model)	Cambridge Soundworks Desktop Theatre 5.1 DTT2200	Cambridge Soundworks Desktop Theatre 5.1 DTT2200	Harmon Kardon 695	Cambridge Soundworks PCWorks FourPointSurround	Cambridge Soundworks Desktop Theatre 5.1 DTT2200	Cambridge Soundworks SW310
Graphics card manufacturer/model	nVidia GeForce3	Leadtek WinFast GeForce3	nVidia GeForce2 Ultra	nVidia GeForce2 Ultra	nVidia GeForce3	Hercules 3D Prophet II MX
Chipset	nVidia GeForce3	nVidia GeForce3	nVidia GeForce2 Ultra	nVidia GeForce2 Ultra	nVidia GeForce3	nVidia GeForce2 MX
Memory and type	64MB DDR SDRAM	64MB DDR SDRAM	64MB DDR SDRAM	64MB DDR SDRAM	64MB DDR SDRAM	64MB SDRAM
Graphics card interface	AGP	AGP	AGP	AGP	AGP	AGP
Monitor manufacturer/model	CTX PR960F	NEC MultiSync 95F	Dell M991	Iiyama Vision Master 452	Mitsubishi Diamond Plus 92	NEC MultiSync FE950+
Monitor size/max viewable diag	19in/18in	19in/18in	19in/18in	19in/18in	19in/18in	19in/18in
Max resolution at VESA refresh	1,600 x 1,200 at 75Hz	1,600 x 1,200 at 75Hz	1,600 x 1,200 at 75Hz	1,600 x 1,200 at 75Hz	1,600 x 1,200 at 75Hz	1,600 x 1,200 at 75Hz
OTHER INFORMATION						
Modem manufacturer and model (standard, interface)	Allied Data Internal (V.90, PCI)	Conexant HCF Speakerphone, (V.90, PCI)	Lucent Win Modem (V.90, PCI)	CNR modem (V.90, PCI)	Diamond SupraSST 56i Pro DF (V.90, PCI)	Zoom Model 3025 (V.92, PCI)
Misc hardware	ProLink TV-tuner, Logitech QuickCam Express	FireWire card (3 external & 1 internal ports)	N/A	N/A	N/A	N/A
Bundled software	Microsoft Works Suite 2001	Lotus SmartSuite Millennium	Microsoft Works Suite 2003	Microsoft Office 2000 Premium	Lotus SmartSuite Millennium	Microsoft Office 2000 SBE
Warranty (RTB = return to base, C&R = collect and return)	1yr on-site, 2yrs RTB	3yrs RTB	1yr on-site, 2yrs C&R	3yrs on-site	2yrs on-site, 1yr RTB	3yrs on-site

£1,500 PCS GROUP TEST



MESH	MULTIVISION	NEC DIRECT	PANRIX	POLAR	POWEROID.COM	SYSTEMAX
MATRIX PRO	VISION RAID	POWERMATE	MAGNUM 1333	PANACHE 1200	3010	A1300RV
1300DDR	4500	SELECT XL3 A1300	TURBO			LIFESTYLE 0780
£1,761.33 (£1,499)	£1,761.33 (£1,499)	£1,761.33 (£1,499)	£1,761.33 (£1,499)	£1,762.50 (£1,500)	£1,709.63 (£1,455)	£1,761.33 (£1,499)
020 8208 4706	0870 066 0885	0870 010 6328	0113 244 4958	0800 138 1238	0870 220 0444	08707 297 366
www.meshcomputers.com	www.multivision.co.uk	www.nec-online.co.uk	www.panrix.com	www.polartechnology.com	www.poweroid.com	www.systemaxpc.co.uk
AMD Athlon 1.33GHz	AMD Athlon 1.33GHz	AMD Athlon 1.33GHz	AMD Athlon 1.33GHz	AMD Athlon 1.2GHz	AMD Athlon 1.33GHz	AMD Athlon 1.33GHz
256MB/PC2100	256MB/PC2100	256MB/PC2100	256MB/PC2100	256MB/PC2100	256MB/PC133	256MB/PC2100
2/0 (DDR DIMM slots), 0/3 (SDR DIMM slots)	1/2	1/1	1/2	2/0	1/2	1/1
256MB	1.28GB	768MB	768MB	256MB	1.28GB	768MB
2GB DDR or 3GB SDR	3GB	2GB	3GB	2GB	1.5GB	2GB
Western Digital WD400BB	Western Digital WD300BB	Quantum Fireball Plus AS	Maxtor 5T030H3	IBM Deskstar DTLA-305020	IBM Deskstar 40.1GB	Maxtor 5T060H6
40GB/EIDE	2 x 30GB/EIDE (RAID 0 ctrl card)	60GB/EIDE	30GB/EIDE	2 x 20.5GB/EIDE (RAID 0 ctrl)	2 x 40.1GB/EIDE (RAID 0 ctrl)	60GB/EIDE
Teac CD-W512E	Mirai CRD-BP1400P	Pioneer DVR-103	Samsung SW-408B	Samsung SW-208B	Plextor PX-W1210A	Ricoh MP9120 DVD/CDRW
(12x 10x 32x)	(BurnProof) (16x 10x 40x)	(8x 4x 2x DVD-R)	(8x 4x 32x)	(8x 4x 32x)	BurnProof (12x 10x 32x)	(12x 10x 32x DVD 8x)
650MB/EIDE	650MB/EIDE	650MB (4.7GB for DVD)/EIDE	650MB/EIDE	650MB/EIDE	650MB/EIDE	650MB/EIDE
Asus	Gigabyte	Gigabyte	MSI	Asus	Asus	Gigabyte
A7A266/ALIMaGK 1	GA7VTX/MA KT266	GA-7DX/AMD-761/MA 686B	K7T266 Pro(MSI-6380)/MA KT266	A7M266/AMD-761 & VIA 686B	A7V133/MA KT133A	GA-7DX/AMD-761 & VIA 686B
3/3	4/4	5/2	4/3	5/2	4/3	3/3
1/1	1/2	3/0	2/1	2/0	1/1	1/1
4/0/1/0	5/0/0/1	5/0/0/1	4/0/1/0	4/0/1/0	4/0/1/0	5/0/0/1
1/0/1/0	1/0/0/1	3/0/0/1	2/0/1/0	3/0/0/0	2/0/0/0	3/0/0/1
4/2/1/2	6/2/1/2	3/2/1/2	4/2/1/2	4/2/1/2	4/2/1/2	2/2/1/2
Pioneer/DVD-115	Pioneer/DVD-105s	Pioneer/DVD-105	Pioneer/DVD-105s	Samsung/SD-612F	Pioneer/DVD-116	AOpen CD-952E/AKH, 52x CD-ROM
16x/EIDE	16x/EIDE	16x/EIDE	16x/EIDE	12x/EIDE	16x/EIDE	8x/EIDE (Ricoh)
Creative	Hercules	Creative	Creative	C-Media	Creative	Creative
SoundBlaster Live! 5.1	Game Theatre XP	SoundBlaster Live! Value	SoundBlaster Live! 5.1	CMI-8738	Creative SoundBlaster Live! 5.1	Creative SoundBlaster Live! 5.1
Cambridge Soundworks Desktop Theatre 5.1 DTT2200	VideoLogic DigiTheatre LC	Labtec LCS-2514	Cambridge Soundworks Desktop Theatre 5.1 DTT2200	Labtec LCW-1070	Cambridge Soundworks Desktop Theatre 5.1 DTT2200	Creative Desktop Theatre 5.1 DTT2200 (retail)
Gainward GeForce2 Ultra	Hercules 3D Prophet 4500	Leadtek WinFast GeForce2 GTS	Leadtek WinFast GeForce3	Asus AGP-V7700 Pure	Creative 3D Blaster GeForce2 GTS	nVidia GeForce2 Pro
nVidia GeForce2 Ultra	Kyro II	nVidia GeForce2 GTS	nVidia GeForce3	nVidia GeForce2 GTS	nVidia GeForce2 GTS	nVidia GeForce2 Pro
64MB DDR SDRAM	64MB DDR SDRAM	32MB DDR SGRAM	64MB DDR SDRAM	64MB DDR SGRAM	32MB DDR SGRAM	64MB DDR SDRAM
AGP	AGP	AGP	AGP	AGP	AGP	AGP
Mitsubishi Diamond Pro 920	Hitachi CM771	NEC VR19	Hansol 910A	Iiyama S900MT	Iiyama Vision Master Pro 451	CTX PR960F
19in/18in	19in/18in	19in/18in	19in/18in	19in/18in	19in/18in	19in/18in
1,600 x 1,200 at 85Hz	1,600 x 1,200 at 75Hz	1,600 x 1,200 at 85Hz	1,600 x 1,200 at 85Hz	1,600 x 1,200 at 85Hz	1,600 x 1,200 at 75Hz	1,600 x 1,200 at 85Hz
Etec 56K Voice Modem (V.90, PCI)	Intel HaM Dat Fax Voice (V.90, PCI)	Conexant SoftK56 Data Fax (V.90, PCI)	Diamond SupraExpress 56i Pro VCC (V.90, PCI)	Diamond SupraSST 56i Pro DF (V.90, PCI)	Haicom Internal modem (V.90, PCI)	Conexant HCF (V.90, PCI)
N/A	Hercules DV Action FireWire card, 3ware RAID card	N/A	N/A	Promise FastTrak100 UltraDMA100 controller (RAID 0)	Promise FastTrak100 UltraDMA100 controller (RAID 0)	Microsoft SideWinder Game Pad Pro
Microsoft Works Suite 2000	Lotus SmartSuite Millennium	Microsoft Office 2000 SBE	Microsoft Works Suite 2000	Lotus SmartSuite Millennium	Lotus SmartSuite Millennium	SmartSuite Millennium & games
1yr on-site, 2yrs RTB	3yrs C&R	3yrs on-site	1yr on-site, 2yrs RTB	1yr on-site, 2yrs RTB	1yr C&R, 2yrs RTB	1yr on-site

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PCW November 1999



ARMARI R8-CM733
PCW January 2000



ARMARI R8-2000
PCPRO February 2000

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PCW April 2000

ARMARI S8-DV500
PC PLUS Autumn 2000

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ATD Geforce3
Ultimate Entertainment System



R850 DV500plus
Pentium® 4 Real-time DV Editing Workstation



R9
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AMD K7 Athlon 266MHz Bus Processor
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256MB 133/266MHz DDR SDRAM (PC2100)
Elsa Gladiac 920 nVidia Geforce3 (NV20) 64MB DDR AGP 4x
IBM Deskstar 60GXP 40GB 7200rpm UDMA100 Hard Drive
Ricoh CDRW-DVD 12x10x32x8 IDE Kit with DVD Player Software
Supra Express 56i Pro PCI Modem, 1.44MB Floppy
Sound Blaster LIVE! Player 5.1 Sound card
CSW Desktop Theatre 2200 Speakers
Armari S2 250W ATX Midi Tower Enclosure
Mitsubishi 19" Diamond Pro 920 Natural Flat Monitor
Microsoft Internet Keyboard Pro & Logitech Gaming Mouse
Microsoft Windows ME inc. system recovery CD

AMD K7 Athlon Processor 1.0GHz DDR £1559 (1831.83)
AMD K7 Athlon Processor 1.2GHz DDR £1579 (1855.33)
AMD K7 Athlon Processor 1.3GHz DDR £1599 (1878.83)

Intel® Pentium® 4 Processor with 400MHz Front Side Bus
Intel® D850GB Pentium® 4 850 Chipset ATX Motherboard
256MB 400/800MHz DDR RAMBUS (2x 128MB Modules)
Asus V7100 Geforce2 MX 32MB Twin Monitor AGP Accelerator
Pinnacle DV500plus Real-time DV editing card with Premiere 6.0
Twin IBM 60GXP Drives - 40GB System & 60GB Video Disk
Plextor PX-W1610TA 16x10x40 IDE CDRW, 1.44MB Floppy
Pioneer DVD-106S 16x DVD-ROM 40x CD-ROM, PowerDVD v3.0
Sound Blaster LIVE! Player 5.1 Sound card & CSW Digital Speakers
Supra Express 56i Pro PCI Modem
Armari S3 Aluminium 250W Lightweight Workstation Enclosure
Mitsubishi 19" Diamond Pro 920 Natural Flat Monitor
Logitech Internet Keyboard & Logitech Pilot Wheel Mouse
Microsoft Windows ME inc. system recovery CD

Intel® Pentium® 4 Processor 1.4GHz £2449 (2877.58)
Intel® Pentium® 4 Processor 1.5GHz £2499 (2936.33)
Intel® Pentium® 4 Processor 1.7GHz £2549 (2995.08)

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New! Supramicro 370DDI Dual CPU ATX Motherboard
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Elsa Gladiac 511 Geforce2 MX400 64MB DDR AGP 4x Accelerator
IBM Deskstar 60GXP 40GB 7200rpm UDMA100 Hard Drive
Ricoh CDRW-DVD 12x10x32x8 IDE Kit with DVD Player Software
Intel Pro/100 S PCI card with Wake-on LAN
Sound Blaster LIVE! 1024 PCI Sound card, 1.44MB Floppy
CSW Soundworks SW310 3 Piece Speakers
Armari S2 300W ATX Midi Tower Enclosure
Mitsubishi 19" Diamond Pro 920 Natural Flat Monitor
Logitech Internet Keyboard & Logitech Pilot Wheel Mouse
Microsoft Windows 2000 Professional inc. system recovery CD

Dual Intel® Pentium® III Processors 866/133MHz £1799 (2113.83)
Dual Intel® Pentium® III Processors 933/133MHz £1819 (2137.33)
Dual Intel® Pentium® III Processors 1000/133MHz £1879 (2207.83)

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Editor's Choice

Armed with a generous budget of £1,500 excluding VAT, this month's contenders had ample room to show what they could really do. The turnout was very impressive with most machines sporting top-of-the-range processors, graphics cards, 19in monitors, CD-RWs and sound systems that have the potential to reproduce cinema-like surround sound. Several of the machines even come with hard drives connected to RAID controllers for improved performance, while the appearance of a DVD-R drive marks the mainstream introduction of this new recording format. Sadly, the variety of components in many of the systems is not reflected in the choice of processor.

In a field dominated by AMD and its latest Athlon incarnation, Intel is only represented by two of its chips: a 1GHz Pentium III and a Pentium 4 clocked at 1.5GHz. However, processor speed is not the only issue to consider when it comes to choosing the winners. We wanted to see powerful graphics cards and a great balance of durable components, too. An office suite was also a prerequisite.

With all these factors in mind, several offerings nearly made the top slot. NEC Direct came close by bundling a Pioneer DVD-R drive and Microsoft Office 2000 Small Business Edition. This does not come cheap, so opting for the older 32MB GeForce2 graphics card, cheaper Creative sound card and Labtec speakers, along with a standard 19in monitor, made the savings.

The winners

The first to the podium to accept the **Editor's Choice** award is the **Compute IT Infinity Pro R-G**. Compute IT machines have been getting better and better over the past few months and this one hit the right combination. You get a full-sized tower case that houses a plethora of bits and bobs, as well as room for any future additions. A nifty 1.33GHz Athlon, along with 256MB of PC133 memory, provides the necessary power to make everyday applications run efficiently, while two 30.7GB IBM hard drives linked to the EPoX EP-8KTA3+'s onboard RAID controller offer high performance and enough storage for the most space-hungry users. A BurnProof Plextor CD-RW is one of the best

in the group test and ensures that you can work while writing.

If you're into gaming, watching DVD movies or just want to have the best PC on the block, then you won't be disappointed with the fully featured 64MB nVidia GeForce3. The 16-speed DVD-ROM drive, SoundBlaster Live! Platinum 5.1 sound card and DTT2200 speakers also offer rich audio and a home cinema setup. Just sit back and control those sound levels from the comfort of your armchair with the infra-red remote that comes with the Creative Live! Drive IR panel. A FireWire card is also included with three external ports and one internal, ideal for DV editing on the decent 19in NEC monitor. With a copy of Lotus SmartSuite Millennium, a cordless Logitech keyboard and wheel mouse, this is a very versatile PC.

Following closely behind is **Multivision's Vision RAID 4500** which gets a **Highly Commended** award. It's a RAID machine, too, with two 30GB hard drives. It has the same processor as the Compute IT machine, but this time is backed up by PC2100 memory and plugged into a Gigabyte motherboard offering no fewer than six USB ports. There's a BurnProof CD-RW and a FireWire card with the same number of ports. The 64MB Kryo-II-based graphics board, coupled with the solid 19in Hitachi monitor, makes for a competent graphics solution and a refreshing change to the typical nVidia card/-Mitsubishi CRT solution. A superb audio setup in the shape of Hercules' excellent Game Theatre XP and VideoLogic's DigiTheatre LC speakers ensures that your eardrums will be impressively resonated. Another all-round PC that will keep you happy.

Choosing the winner of the second **Highly Commended** gong was a difficult decision, but we went for the **Panrix Magnum 1333 Turbo** on the basis that it's a super-quick machine in both 2D and 3D applications, thanks to the nVidia GeForce3-based graphics board, 1.33GHz AMD Athlon and 256MB of PC2100 memory. Audio is looked after well by Creative's SoundBlaster Live! 5.1 sound card and the set of DTT2200 loudspeakers from Cambridge Soundworks. We also liked the screwless case, and the way you can network two PCs using the motherboard's onboard USB network controller.



Compute IT Infinity Pro R-G



Multivision Vision RAID 4500



Panrix Magnum 1333 Turbo



The Infinity Pro R-G offers rich audio and a home cinema setup



What PC?
Dec 2000

**EDITOR'S
CHOICE**

PC Live!
Dec 2000



PC Home
Dec 2000



PC Plus
Jan 2001



Computer Buyer
Jan 2001



Personal Computer World
Jan 2001



What PC?
Jan 2001



What PC?
Feb 2001



Personal Computer World
Feb 2001



Computer Shopper
Feb 2001



PC Advisor
Feb 2001

Time Flex Series

Flex 4



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- Intel® Pentium®4 platform with RAMBUS PC800 RDRAM
- 3 year warranty and 24 hour on-line support over the Internet
- nVidia GeForce 2 MX GPU system & Creative Labs sound
- Tailor-made with a wide range of options
- supanet unlimited, unmetered Internet access option available

	Flex 4 1.4	Flex 4 1.5	Flex 4 1.7
Processor	Intel® Pentium®4 1.4GHz	Intel® Pentium®4 1.5GHz	Intel® Pentium®4 1.7GHz
Motherboard	Intel® P4 ATX	Intel® P4 ATX	Intel® P4 ATX
Memory	128MB RDRAM - PC800	128MB RDRAM - PC800	256MB RDRAM - PC800
Hard Disk	40GB UDMA 100 with 2MB buffer	40GB UDMA 100 with 2MB buffer	40GB UDMA 100 with 2MB buffer
Graphics System	32MB nVIDIA GeForce 2 MX 200	64MB nVIDIA GeForce 2 MX 400 TV-out	64MB nVIDIA GeForce 2 MX 400 TV-out
Monitor	17" 0.28dp 70 KHz	17" 0.28dp 70 KHz	19" 0.26dp 96 KHz
Multimedia	16x DVD-ROM drive	16x DVD-ROM drive	16x DVD-ROM drive
Modem	56k v90	56k v90	56k v90
Removable Storage	Optional	CD-Rw CD-copier (8x4x32)	CD-Rw CD-copier (8x4x32)
Sound System	3D Wavetable Sound	3D Wavetable Sound	SoundBlaster 1024 Live
Speakers	Subwoofer + 2 satellites	Subwoofer + 2 satellites	Creative Labs 4 point surround
Common features	2 USB ports, 1.44MB floppy drive, ATX tower case, Microsoft Intellipoint mouse, Cyberlink DVD playback CD creation & copy software (CD-Rw systems), Windows ME, supanet Internet access		
Support Pack	3 years Total Warranty Package, 24 hour-online support Advanced system recovery disk, hotline technical support		
Price Ex VAT	£999	£1179	£1469
Price Inc VAT	£1173.83	£1385.33	£1726.08
Popular Upgrades	• RAMBUS memory to 512MB • Processors to 1.7GHz • Graphics cards • Monitors • TFT screens • Storage • Software • Others - see page 4 for all price upgrades and pay the difference		



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Power Flex

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- Tailor-made with a wide range of options

	Power Flex 1300	Power Flex 1333	Power Flex 1400
Processor	AMD Athlon 1300MHz 200MHz bus	AMD Athlon 1333MHz 266MHz bus	AMD Athlon 1400MHz 266MHz bus
Motherboard	MSI 6330 V3 ATX	MSI 6330 V3 ATX	MSI 6330 V3 ATX
Memory	128MB SDRAM	256MB SDRAM (PC133)	512MB SDRAM (PC133)
Hard Disk	40GB UDMA 100 with 2MB buffer	40GB UDMA 100 with 2MB buffer	80GB (twin 40GB) UDMA 100 with 2MB buffer
Graphics System	32MB nVIDIA GeForce 2 MX 200	32MB nVIDIA GeForce 2 MX 200	NEW 64MB DDR nVIDIA GeForce 2 Pro TV-out
Monitor	17" 0.28dp 70 KHz	17" 0.28dp 70 KHz	19" 0.26dp 96 KHz
Multimedia	16x DVD-ROM drive	16x DVD-ROM drive	16x DVD-ROM drive
Modem	56k v90	56k v90	56k v90
Removable Storage	Optional	CD-Rw CD-copier (8x4x32)	CD-Rw CD-copier (8x4x32)
Sound System	3D Wavetable Sound	3D Wavetable Sound	SoundBlaster 1024 Live
Speakers	Subwoofer + 2 satellites	Subwoofer + 2 satellites	Creative Labs 4 point surround
Common features	4 USB ports, 1.44MB floppy drive, ATX tower case, Microsoft Intellipoint mouse, Cyberlink DVD playback CD creation & copy software (CD-Rw systems), Windows ME, supanet Internet access		
Support Pack	3 years Total Warranty Package, 24 hour-online support Advanced system recovery disk, hotline technical support		
Price Ex VAT	£949	£1099	£1349
Price Inc VAT	£1115.08	£1291.33	£1505.08
Popular Upgrades	• SDRAM memory to 512MB • Processors to 1333MHz • Graphics cards • Monitors • TFT screens • Storage • Software • Others - see page 4 for all price upgrades and pay the difference		



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PC Answers
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Professional Systems



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- Flatron/Flatscreen technology monitors with other options
- 64MB nVidia GeForce 2 GPU system including new GeForce 3 & Creative Labs sound
- Tailor-made with a wide range of options and includes 3 year warranty

	Power Flex DDR 1333	Power Flex DDR 1333s	Power Flex DDR 1400
Processor	AMD Athlon 1333MHz 266 bus	AMD Athlon 1333MHz 266 bus	AMD Athlon 1400MHz 266 bus
Motherboard	Gigabyte DDR ATX	Gigabyte DDR ATX	Gigabyte DDR ATX
Memory	128MB DDR - PC2100	256MB DDR - PC2100	256MB DDR - PC2100
Hard Disk	40GB UDMA 100 with 2MB buffer	40GB UDMA 100 with 2MB buffer	80GB (twin 40GB) UDMA 100 with 2MB buffer
Graphics System	64MB nVIDIA GeForce 2 MX 400 TV-out	NEW 64MB DDR nVIDIA GeForce 2 Pro TV-out	NEW 64MB DDR nVIDIA GeForce 3 TV-out
Monitor	17" 0.28dp 70 KHz	19" 0.28dp 70 KHz	19" 0.25dp flatscreen 110 KHz
Multimedia	16x DVD-ROM drive	16x DVD-ROM drive	16x DVD-ROM drive
Modem	56k v90	56k v90	56k v90
Removable Storage	Optional	CD-Rw CD-copier (8x4x32)	CD-Rw CD-copier (8x4x32)
Sound System	SoundBlaster 128	SoundBlaster 128	SoundBlaster 1024 Live
Speakers	Subwoofer + 2 satellites	Subwoofer + 2 satellites	Creative Labs 4 point surround
Common features	4 USB ports, 1.44MB floppy drive, ATX tower case, Microsoft Intellipoint mouse, Cyberlink DVD playback CD creation & copy software (CD-Rw systems), Windows ME, supanet Internet access		
Support Pack	3 years Total Warranty Package, 24 hour-online support Advanced system recovery disk, hotline technical support		
Price Ex VAT	£1039	£1299	£1829
Price Inc VAT	£1220.83	£1526.33	£2149.08
Popular Upgrades	• DDR PC 2100 memory to 256MB • Processors to 1400MHz • Graphics cards • Monitors • TFT screens • Storage • Software • Others - see page 4 for all price upgrades and pay the difference		



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1. Select the case/motherboard platform

	Ex VAT	Inc VAT
a. Flex Pentium® 4 platform	£439	£515.83
b. Power Flex platform with MSI 6330 SDRAM motherboard	£379	£445.33
c. Power Flex DDR platform with Gigabyte DDR ATX motherboard	£399	£468.83

All of these include - 56k V90 modem - 4 USB ports (2 on Intel)
- 1.44Mb floppy drive - ATX tower case - Microsoft Intellipoint mouse
- Cyberlink DVD playback - Windows ME - supanet Internet access
- 3 year total warranty package - 24 hour on-line support
- Advanced system recovery disk - Hotline technical support

2. Select the processor

a. Pentium 4 1.4GHz	£160	£188.00
b. Pentium 4 1.5GHz	£210	£246.75
c. Pentium 4 1.7GHz	£300	£352.50
d. AMD Athlon 1000MHz	£130	£152.75
e. AMD Athlon 1200MHz	£160	£188.00
f. AMD Athlon 1300MHz	£180	£211.50
g. AMD Athlon 1333MHz 266MHz	£240	£282.00
h. AMD Athlon 1400MHz 266MHz	£240	£282.00

3. Select the RAM memory

a. SDRAM 128MB	£40	£47.00
b. SDRAM 256MB	£80	£94.00
c. SDRAM 256MB x2 (512MB)	£160	£188.00
d. DDR 2100 128MB (flex DDR platform only)	£60	£70.50
e. DDR 2100 256MB (flex DDR platform only)	£120	£141.00
f. RAMBUS RDRAM 128Mb (64MB x2) (flex Pentium® platform only)	£80	£94.00
g. RAMBUS RDRAM 256Mb (128MB x2) (flex Pentium® platform only)	£160	£188.00

4. Select the hard disk

a. 40GB ATA-100 2MB buffer	£80	£94.00
b. 80GB (2x 40GB) ATA-100 2MB buffer	£160	£188.00

5. Select the multimedia/storage

a. CD-ROM Drive	£30	£35.25
b. DVD-ROM Drive 16x	£50	£58.75
c. CD-Rw Drive (8x4x32)	£80	£94.00
d. Combo DVD/CD-Rw	£120	£141.00

6. Select graphics system

a. nVIDIA TNT-2 M64 32MB SDRAM	£30	£35.25
b. nVIDIA GeForce 2 MX 200 32MB SDRAM	£50	£58.75
c. nVIDIA GeForce 2 MX 400 64MB SDRAM TV-out	£70	£82.25
d. nVIDIA GeForce 2 Pro 64MB DDR TV-out	£130	£152.75
e. nVIDIA GeForce 3 64MB DDR TV-out	£300	£352.50

7. Select internal cards

a. SoundBlaster 128 or 3D wavetable - fitted as standard	£00	£00.00
b. SoundBlaster 1024 Live	£40	£47.00
c. PC-TV system with Teletext & video capture	£30	£35.25

8. Select screen

a. 15" 0.28dp	£100	£117.50
b. 17" 0.28dp 70KHz	£130	£152.75
c. 19" 0.26dp 96KHz	£190	£223.25
d. 17" flatscreen 0.24dp 70KHz	£170	£199.75
e. 19" flatscreen 0.25dp 110KHz	£380	£446.50
f. 21" flatscreen 0.26dp 115KHz	£690	£810.75
g. 15" TFT	£350	£411.25

9. supanet unlimited, unmetered Internet access

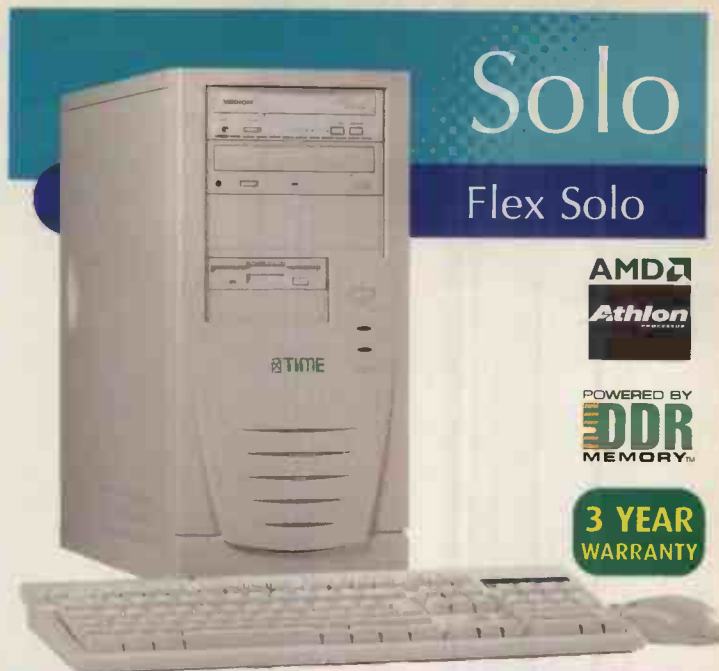
a. Unlimited, unmetered Internet access day and night with no call charges	£150	£176.25
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10. Other options

a. Standard speakers	£10	£11.75
b. Premium speakers	£20	£23.50
c. Subwoofer system and satellite speakers	£40	£47.00
d. Creative Labs 4 point speaker system	£60	£70.50
e. Lotus SmartSuite Millennium + ViaVoice + Std	£49	£57.58
f. Exec software	£99	£116.33
g. Microsoft Office Pro Student Licence	£99	£116.33
h. Microsoft Office Pro for business	£229	£269.08

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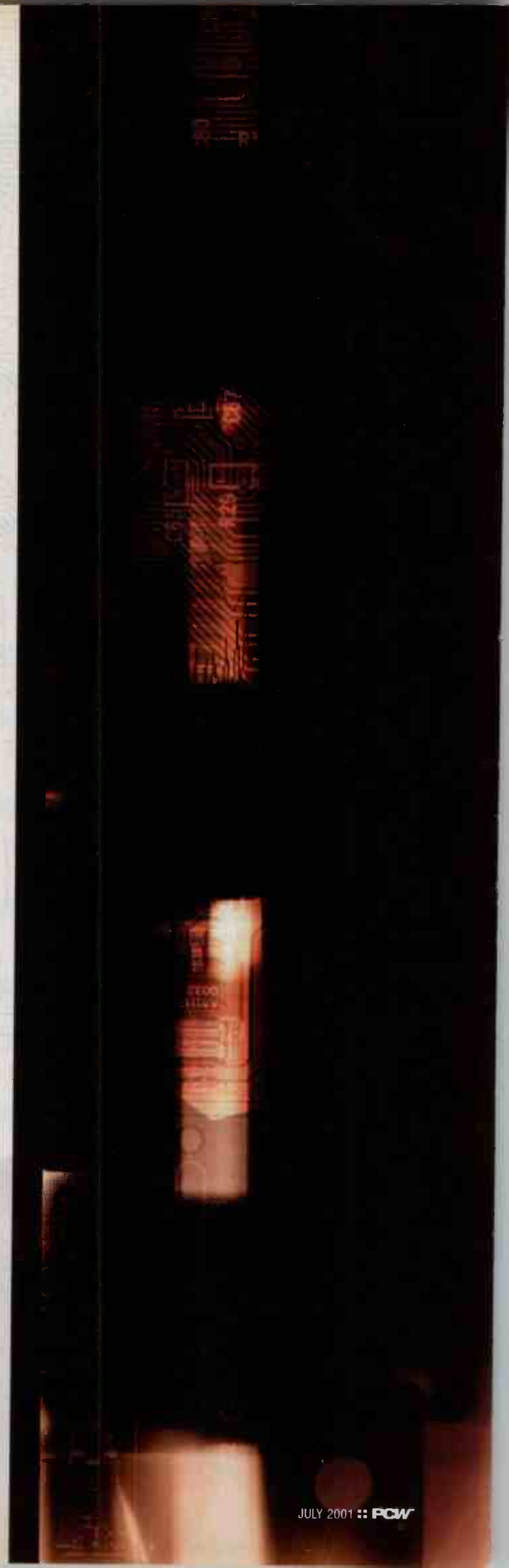
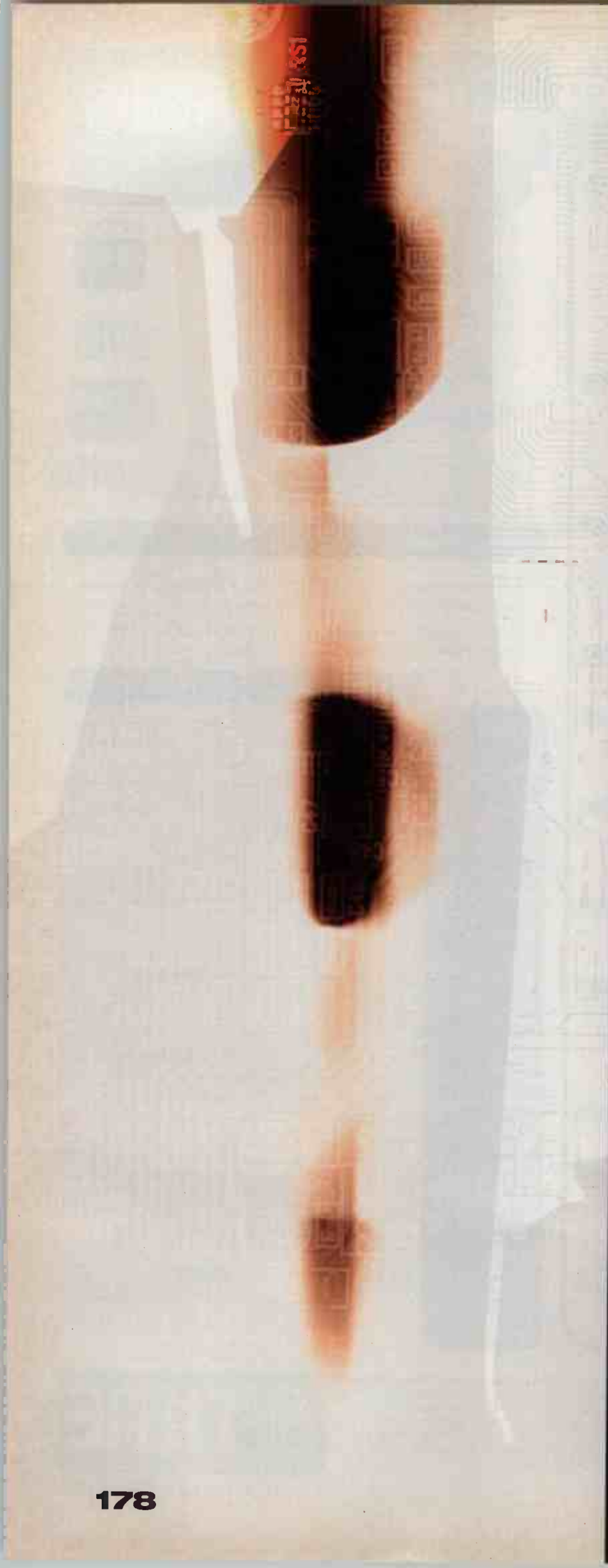
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WARRANTY

Solo Key Features

- Ideal base unit upgrade system - ideal for upgrading your PC
- All the technology - none of the peripherals and screens
- 3 year comprehensive support package
- Tailor made with a range of options

	Solo 1000	Solo 1333 DDR
Processor	AMD Athlon 1000MHz	AMD Athlon 1333MHz 266bus
Motherboard	MSI 6330v3 ATX	Gigabyte DDR ATX
Memory	128MB - PC 133	256MB DDR - PC 2100
Hard Disk	40GB UDMA 100 with buffer	40GB UDMA 100 with buffer
Graphics System	32MB nVIDIA GeForce 2 MX 200	64MB nVIDIA GeForce 2 MX 400 with TV-out
Monitor	None	None
Multimedia	16x DVD-ROM drive	16x DVD-ROM drive
Modem	56k v90	56k v90
Removable Storage	Optional	CD-Rw CD-copier (8x4x32)
Sound System	3D wavetable	SoundBlaster 128
Speakers	None	None
Common features	4 USB ports, 1.44MB floppy drive, ATX tower case, Microsoft Intellipoint mouse, Cyberlink DVD playback CD creation & copy software (CD-Rw systems), Windows ME, supanet Internet access	
Support Pack	3 years Total Warranty Package, 24 hour-online support Advanced system recovery disk, hotline technical support	
Price Ex VAT	£729	£1049
Price Inc VAT	£856.58	£1232.58
Popular Upgrades	Add the appropriate upgrade (see opposite)	

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Pitch perfect

A quality sound card can add atmospheric effects to your 3D games and turn your PC into a powerful home entertainment system. To ensure you get the best, we've reviewed seven of the latest sound cards around

Sound cards have come a long way since the simple bleeps and pings of early video games. Of course, most people know that they can play music CDs on their PCs, or MP3 files that they've downloaded from the Internet, but even this is child's play for a modern sound card. Mere CD-quality stereo is simply the starting point for the modern versions.

The latest computer games boast 3D effects that can reproduce the sinister sound of a monster creeping up behind you, or a laser-beam zapping overhead, but you'll need a sound card that supports up-to-date 3D audio technologies to get the full effect from these games. Sound cards aren't just for playing, though. With a DVD-ROM drive and a good card your PC can become the centre of a powerful home entertainment system.

And, as more of us start to use digital recording devices like MiniDiscs and MP3 players, many sound cards now come equipped with digital interfaces that provide perfect digital recording facilities.

But all of these new technologies mean that buying a sound card these days can be a confusing business. Just playing games involves wading through a mess of techno-jargon – EAX, A3D and I3DL2 to name just a few. The still-immature DVD market has its own language as well, in the form of competing standards such as Dolby Digital and DTS. And where on earth are you supposed to put six speakers anyway?

It's worth taking some time to familiarise yourself with these new audio technologies, though, as a good sound card can really enhance the gaming and home entertainment capabilities of your PC. So we've rounded up the latest cards here, and explained some of the more confusing terminology.

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GROUP TEST SOUND CARDS

Creative

SoundBlaster Live! Platinum 5.1

PRICE £176.25 inc VAT **CONTACT** Creative 0800 973 069 www.europe.creative.com

PROS Excellent hardware/software balance **CONS** Live! Drive unit is tricky to install

OVERALL Needs ample PC expansion space, but it will have a long life

SCORE ■■■■

There are several cards available in the SoundBlaster Live! range, but the Platinum 5.1 model sits right at the top of the pile with an impressive set of input and output options.

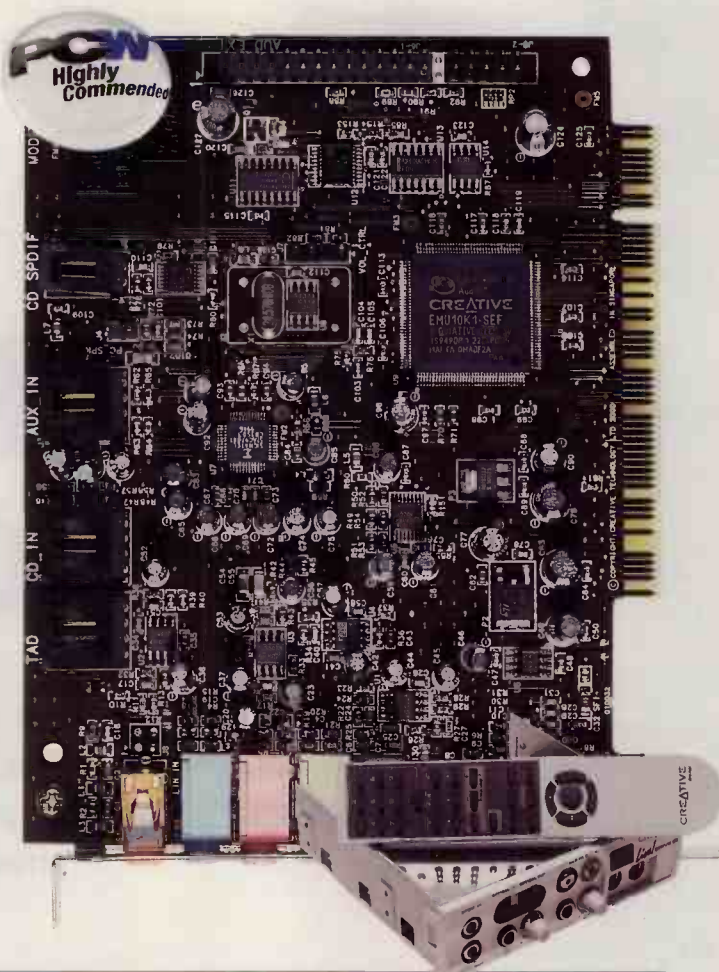
The package consists of a PCI sound card and a separate unit called the Live! Drive. The card is easy to install and provides connectors for up to six speakers using the Dolby Digital format, so it's a good option for playing DVD films, games and music. Also tucked around the back of the card are a microphone socket, an additional analog audio input, and a combination MIDI/joystick port.

And that's just the start of it. The Live! Drive carries two optical inputs and two optical outputs, plus a set of left- and right-channel analog inputs. There's another pair of microphone and headphone sockets, and both MIDI input and output ports. For home-cinema buffs the Live! Drive has a hand-held infra-red remote control unit.

The only minor drawback is that the Live! Drive needs to be installed into a spare PC drive bay. So, not only do you need a large machine with enough room, but you have to contend with an assortment of screws and cables in order to install the unit and connect it to the main card.

However, Creative does score higher marks for its software bundle. There are full copies of Rage Rally and MDK2, while the PlayCentre software provides a good set of MP3 playing and encoding tools. There's an interesting program called Future Beat 3D, which acts as a kind of 3D mixer, so that you can experiment with the card's 3D and surround sound capabilities, plus copies of Cubasis VST, WaveLab Lite and Recycle Lite.

It could be a little easier to install, but the SoundBlaster Live! has all the hardware and software features that any gamer, DVD buff or musician is likely to need.



Genius SoundMaker Live 5.1

PRICE £34 inc VAT **CONTACT** A-To-Z Computers 01509 215 435 www.genius-kye.com

PROS Inexpensive; six-channel support **CONS** No Dolby Digital processing

OVERALL Ideal for gamers, but not quite ready for the home cinema/DVD market

SCORE ■■■

Its admirably low price clearly puts it at the budget end of the market, yet the Genius SoundMaker Live 5.1 is a good option for gamers who are looking for a new sound card.

This sound card has two analog output connectors. The first is for use with ordinary stereo speakers, while the second provides six-channel output for 5.1 speaker systems. An adaptor cable is supplied for two-, four-, or six-speaker setups to the second connector.

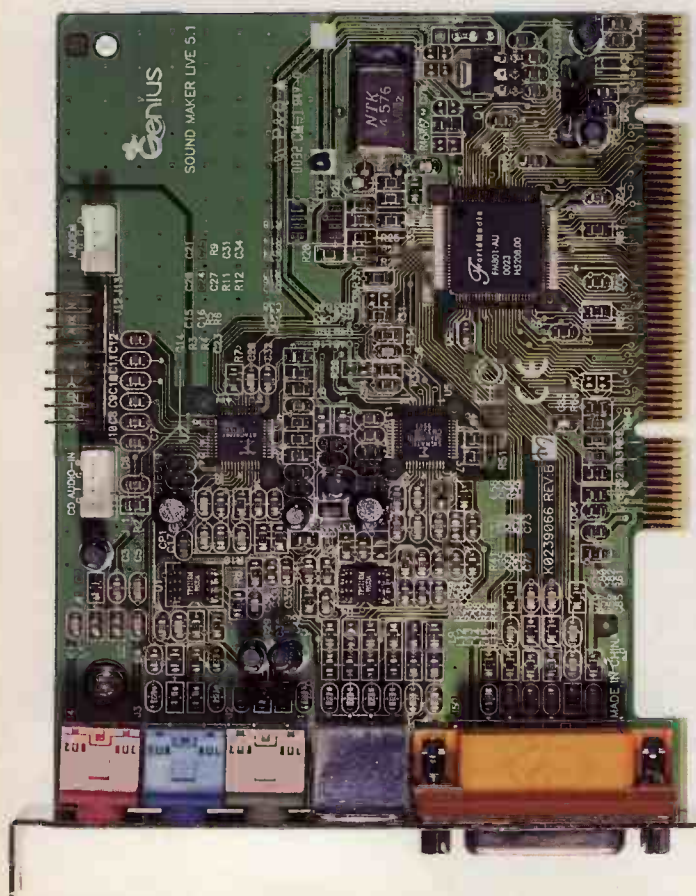
There's also a microphone input, separate analog line-in and a combined MIDI/joystick port. The card supports just about every version of Windows going, except 3.1. But it does provide SoundBlaster emulation for DOS games, so it will work equally well with the old classics or the latest 3D shoot-'em-ups.

The drivers support both Aureal's A3D and Microsoft's Direct Sound for 3D audio in games. There's not much in the way of bundled software apart from a few demos, but Genius does

include an interesting utility called Q3D. This works with older games that may only have a conventional stereo soundtrack and attempts to convert it into an approximation of 3D. The one drawback is that the card only provides four- or six-channel sound when used with 'consumer' versions of Windows – Windows 9x and Me. The 'professional-level' Windows 2000 and NT are limited to stereo output.

But while the SoundMaker is a good card for gamers, it's less suitable for home cinema or digital audio recording work. It doesn't provide any digital inputs or outputs, so you can only record or play back using its analog audio connectors. And, while it supports six-channel audio output, it doesn't support the Dolby Digital format used for DVD soundtracks.

However, its low price, six-channel output and support for DOS and Windows games makes the SoundMaker Live 5.1 a good choice for diehard games fans.



Hercules Game Theater XP

PRICE £150 inc VAT **CONTACT** Hercules 020 8686 5600 www.europe.hercules.com

PROS Versatile external rack **CONS** Software bundle is rather basic

OVERALL This is an excellent sound system for gamers and DVD fans

SCORE ■■■■■

Hercules is well known for its gaming peripherals and 3D graphics cards, so it's no surprise that its latest sound card is aimed precisely at the hardcore games fan. However, the Game Theater XP is crammed with so many features that it will also appeal to home cinema buffs and even those wanting to experiment with home music recording.

The best part of this sound card, though, is that all its controls and input and output options are conveniently located on an external 'rack' unit. The card itself simply slots into a spare PCI slot and is immediately detected by the New Hardware Wizard in Windows 95 or above. Installing the drivers takes just a few minutes and you then connect it to the rack unit with a single large cable that carries multiple audio signals.

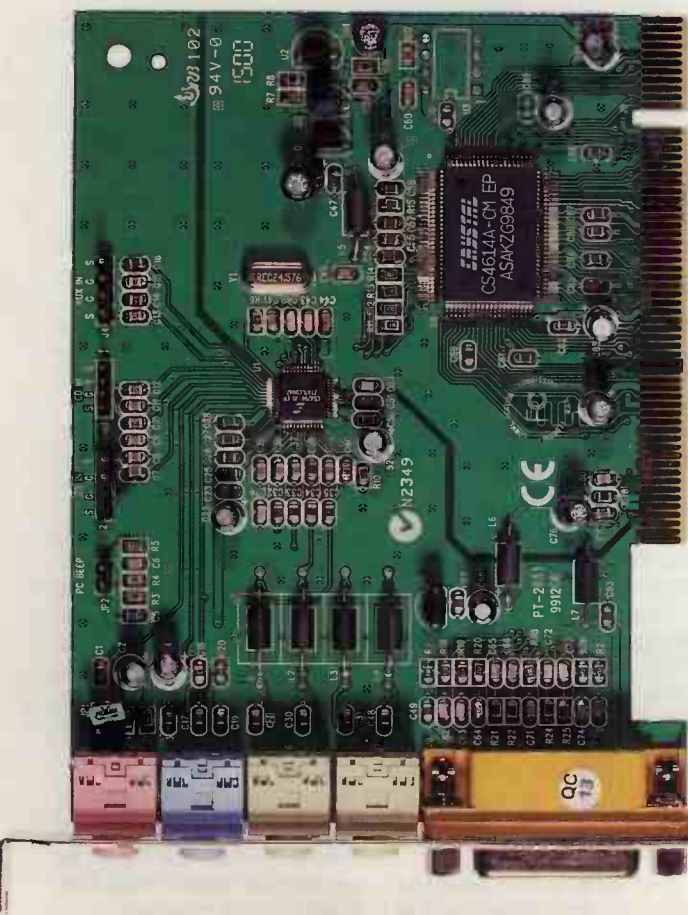
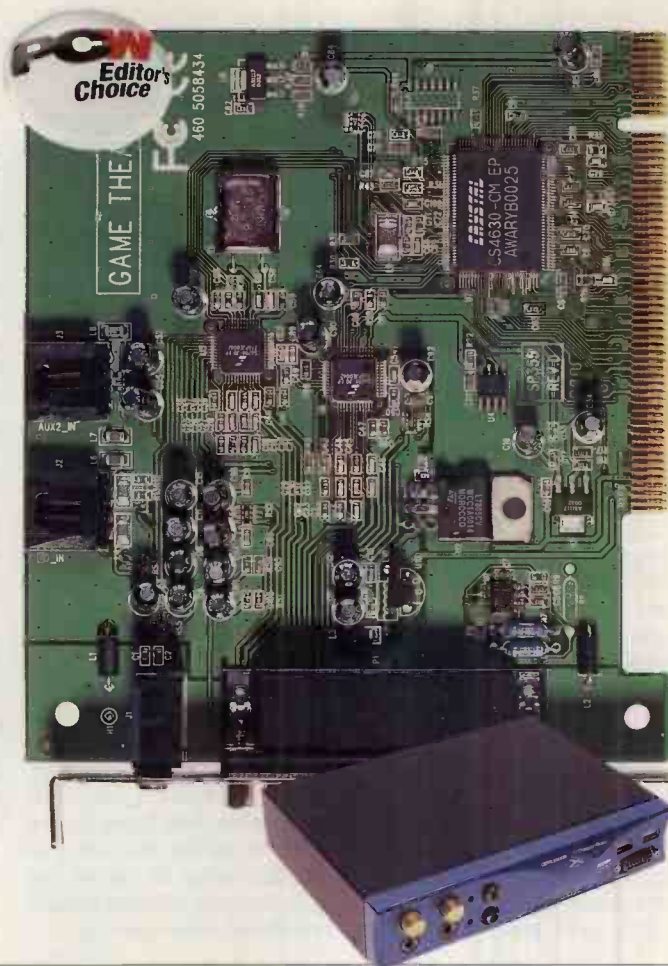
The Game Theater XP supports Dolby Digital output for DVD films, so there are outputs for five speakers and a sub-woofer. There are two analog inputs, two digital inputs, and

two digital outputs for connecting your PC to digital audio devices, such as a CD player or MiniDisc. The Game Theater's rack has a dedicated joystick port and separate MIDI input and output ports, instead of the normal shared port.

There are headphones and microphone connectors, with volume dials for each of these, and the rack even doubles up as a USB hub with four USB ports. Hercules has crammed just about every audio widget you can think of into this device, yet the use of the external rack makes it really easy to set up and use.

Our only criticism is that Hercules' software bundle is a bit on the cheap side. The package includes a Dolby Digital-compatible DVD player, MP3 jukebox and karaoke programs, which is all stuff you could download from the web for free.

However, it's difficult to find fault with a product that provides so many useful hardware features in such a compact and convenient fashion.



Pine PCI Digital 2633

PRICE £11.75 inc VAT **CONTACT** Simply Computers 020 8498 2100 www.simply.co.uk

PROS Inexpensive **CONS** Limited I/O; hardly any bundled software

OVERALL Cheap and cheerful upgrade for gamers with older PCs

SCORE ■■■■■

Pine operates at the cheap and cheerful end of the market, but its PCI Digital card is still a worthwhile option for gamers on a tight budget, or users who want to upgrade an older PC.

This is the cheapest card we came across that still provides support for 3D audio. It supports Microsoft's DirectSound 3D, Creative Labs' Environmental Audio (EAX), and the lesser-known Sensaura 3D system. It also provides four-channel output, so you can use it with a four-speaker surround sound system for playing digital, so DVD fans who want to use 5.1 speaker systems should look at more modern rivals from VideoLogic, Creative and Hercules.

The card has a microphone jack and an analog input socket, plus a combined MIDI/joystick port. There are no digital inputs or outputs so you can't make digital recordings from devices such as a CD or DAT drive. You can still record from these devices using the card's analog inputs, but there will be some loss of quality.

There is also an internal 'AUX' (auxiliary) connector on the sound card, so you could connect it to a DVD drive, but you'll be limited to just four-channel sound with no support for a sub-woofer or Dolby Digital 5.1.

The bundle comprises basic drivers and the MusicMatch MP3 player, but at this price you can hardly criticise Pine for that. The drivers provided with our review unit only catered for Windows 9x and NT4.

One word of warning: there are three different versions of this card, and they can only be told apart by their part numbers. So make sure you ask about any specific features that you need before buying your card.

It seems churlish to criticise such an affordable product as the PCI Digital 2633. Its input and output options are limited, and it's not ideal for playing DVD films, but its low-cost 3D audio support may well appeal to gamers who don't want to pay for expensive cards with features that they don't need.

GROUP TEST SOUND CARDS

Terratec DMX Xfire

PRICE £49 inc VAT **CONTACT** SCV 020 7923 1892 www.terratec.net

PROS Price; good 3D support **CONS** No Dolby Digital processing

OVERALL OK for games and audio, but too limited for DVD and home cinema

SCORE ■■■■

Terratec may not be well known in the UK, but it does have a reputation for producing high-quality sound cards. Its DMX Xfire card is primarily aimed at the gaming market, and at less than £50 it's a good option for home users on a tight budget.

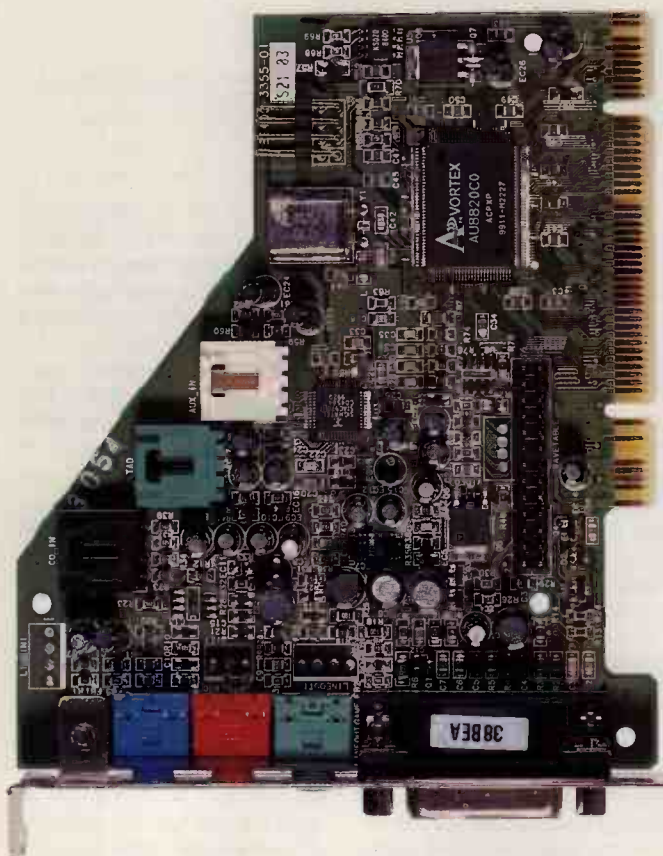
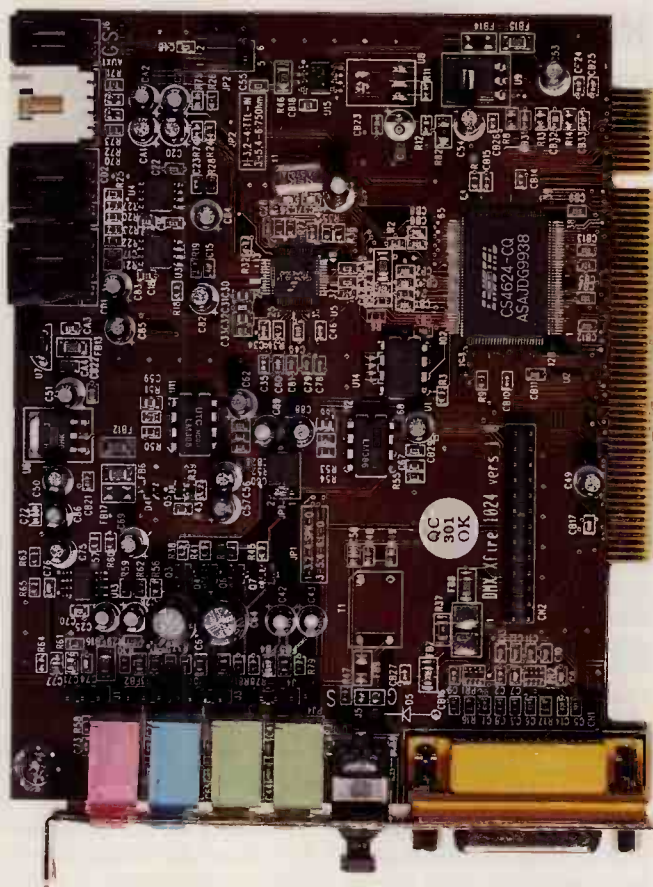
It has two analog output sockets to drive up to four speakers for surround sound effects. The card also supports main gaming 3D audio formats, such as Creative's EAX, A3D and Direct-Sound 3D. Drivers are included for Windows 95, 98, Me, 2000 and NT4, and Terratec's manual provides specific installation instructions for each version of Windows.

There's a dual-purpose MIDI/joy-stick port, microphone socket and a separate analog line-in. There's no dedicated headphone socket, but you can plug a set of headphones into one of the standard analog outputs. The DMX control panel software includes a feature called MultiDrive that allows you to configure the card's audio output for different

speaker setups or headphones. A little less convenient is the odd positioning of the digital connectors. There's an external digital output port on the back, which allows you to record onto DAT or MiniDisc. However, the card's digital input connector is situated on the card itself.

This may cause problems if you want to record digital-quality audio from an external device onto your PC. The location of the digital input might have made sense if the card supported six-speaker Dolby Digital, as this would have allowed you to connect it to an internal DVD drive. But, unfortunately, it doesn't.

Nonetheless, the DMX Xfire provides good audio quality for playing music CDs, as well as comprehensive support for 3D audio in games. Home cinema buffs may prefer a card that supports Dolby Digital for their DVD films, but the DMX Xfire is an affordable option for gamers and those of us who still listen to music with ordinary stereo speakers.



Turtle Beach Montego Xstream

PRICE £55.21 inc VAT **CONTACT** Simply Computers 020 8498 2100 www.simply.co.uk

PROS Affordable 3D audio for games **CONS** Stereo output only; no digital I/O

OVERALL OK for gamers with old PCs, but lacks features found in modern alternatives

SCORE ■■■

Turtle Beach's Montego A3D Xstream is one of the older sound cards in this test, but it's a popular brand and an affordable option for anyone who wants to upgrade an older PC.

The card provides good quality for standard stereo recording and playback, with sampling rates of up to 48KHz. It has a single analog output jack for connecting a set of stereo speakers, an analog input jack and a microphone input. It also offers a dual-purpose MIDI/joystick port, an internal input connector for a CD-ROM drive, and an internal AUX connector.

There are no digital input or output connectors, although there is a connector on the body of the card that allows you to add a separate S/PDIF (Sony/Philips Digital Interface). This may disappoint home-cinema fans who want to use the latest all-digital sound systems, but won't worry those who want to play games or listen to CDs on their PC.

The Montego doesn't support the latest audio technologies, such as

six-channel Dolby Digital, or four-channel surround sound, so it's not a good complement for a four- or six-speaker home cinema setup.

The card does support the Aureal 3D system to provide 3D audio for games, though, and works well with a standard two-speaker stereo setup. This is the only card in the rest that still provides support for both Windows 3.1 and DOS games, so it's a good option if you've got an old PC.

Turtle Beach merged with music software developer Voyetra a year ago, and the Montego card comes with a good bundle of Voyetra software. The emphasis is more on music making than games, with programs such as the MIDI Orchestrator sequencer, and AudioView Plus for editing digital audio files.

Its compatibility with old Windows and DOS games makes this a good upgrade for an older PC, but its lack of digital interfaces and support for surround sound mean it's much more limited than most of its rivals.

VideoLogic Sonic Fury

PRICE £79.90 inc VAT **CONTACT** VideoLogic 01923 260 511 www.videologic.com

PROS Software bundle; versatile I/O **CONS** Only one digital output

OVERALL Provides all the main features at a very attractive price

SCORE ■■■■■■

It's not equipped with the same extravagant features as some of its more expensive rivals, but the Sonic Fury still manages to provide high-end features at a mid-range price.

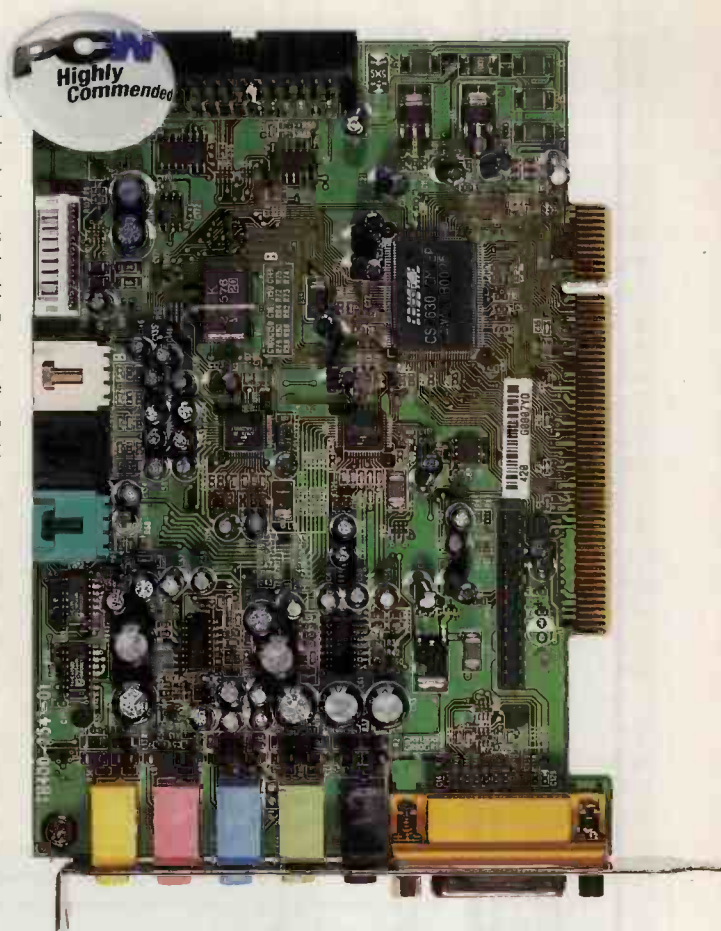
We did experience a minor problem when installing this compact PCI card, as its drivers weren't detected initially by Windows. However, we quickly reinstalled the drivers and the card worked perfectly.

The rear panel on the card has five audio connectors, plus a MIDI/joystick port. One of the audio connectors is the multifunctional VersaJack that can work in a number of different modes. There are two analog outputs, which can be used to drive four-speaker surround sound systems. You can also use the VersaJack in conjunction with these outputs to connect a sub-woofer and a sixth speaker, allowing you to use six-speaker Dolby Digital systems. Alternatively, you can use either of the analog outputs as a headphone socket.

The VersaJack can also be used as an analog stereo output for another set of headphones, or you can use it as a digital output for connecting to digital devices. To prevent confusion, the driver software includes a control panel with a simple mixer and a set of pulldown menus that allow you to select the required mode for each set of connectors.

The rest of the bundled software is pretty good. There's the usual collection of MP3 players and karaoke programs, plus a number of powerful audio and music programs. There are no games, but it does support all the main 3D audio technologies and its DSP provides a range of atmospheric environmental effects.

It may lack the multiple digital inputs and outputs found on more expensive cards, but the Sonic Fury supports the latest 3D and surround sound technologies, and throws in a good software bundle for under £100. At that price it really is hard to beat.



SENSORY OVERLOAD: 3D AUDIO

When buying a new sound card or speakers you will often hear the terms 'surround sound' and '3D audio' used as though they're interchangeable. They're actually quite different, though, and employ widely differing technologies.

Surround sound formats, such as Dolby Digital 5.1, are used to record and play back the soundtracks of films. A film such as *Starship Troopers* can make excellent use of surround sound to create the effect of spaceships zooming all around you. The film's soundtrack, however, is fixed. It never changes. The film isn't interactive, so there's nothing you can do to alter the action you see on screen or the soundtrack that accompanies that action.

Gaming audio is different, because games are interactive. If you're stomping around in a game like *Quake III*, you're constantly reacting to the actions of your opponents. And they, in turn, are reacting to your movements. This means that the course of the game is not predetermined. It's constantly changing – unlike the predetermined course of action in a DVD film.

So, instead of simply playing a pre-recorded soundtrack, your sound card has to create the effect of 'live' sound effects in a constantly changing 3D environment. One of the first 3D

audio technologies designed for this purpose was A3D, developed by Aureal. Recognising the potential of 3D audio for games, Microsoft developed its own 3D audio technology called DirectSound 3D (D3D). However, the first version of D3D wasn't very good.

It was only when Creative developed its



Environmental Audio Extensions technology (EAX) that 3D audio really started to take off in the games market. To be accurate, EAX is actually an extension of D3D, rather than an entirely new technology in its own right. However, EAX added many new features, such as

the ability to simulate the acoustics of different rooms or environments. A game that supports EAX can use this ability to create the effect of echoing dungeons, claustrophobic corridors, or the intimate hubbub of a smoky jazz club.

Creative's EAX is probably the most widely used form of 3D audio in games at the moment, although D3D is quite well supported, and there are still plenty of games and sound cards that support A3D as well. Just to confuse matters, there are other companies, such as Sensaura, that offer their own 3D audio technologies.

With so many rival technologies floating around, it made sense to try to come up with a common standard that would make life simpler for both games developers and consumers. The result of this was yet another piece of jargon called I3DL2, which stands for Interactive 3D Audio Level 2.

This new standard is gradually gaining support, although EAX still seems to rule the roost for the time being. This means that you won't go wrong if you buy a sound card that supports EAX. However, Microsoft's much-hyped Xbox will support I3DL2, so it's possible that this could become the standard for 3D audio in games over the next few years.

IMMERSION THERAPY: SURROUND SOUND

Most computers and home music systems are still equipped with a standard two-channel stereo sound system. So, if you use your computer to play games or listen to audio CDs, your sound card will split the output into two channels – left and right. You'll have two speakers connected to your computer and you can adjust the balance to create the illusion that the sound is moving from left to right, but you always know that the sound is basically coming from somewhere right in front of you.

Now that's fine if you're listening to a Madonna CD, but it's not very realistic. In real life sound comes from all around us, and if you want the most realistic sound effects when playing 3D games or DVD films, you need a 'surround sound' system that can put sound all around you.

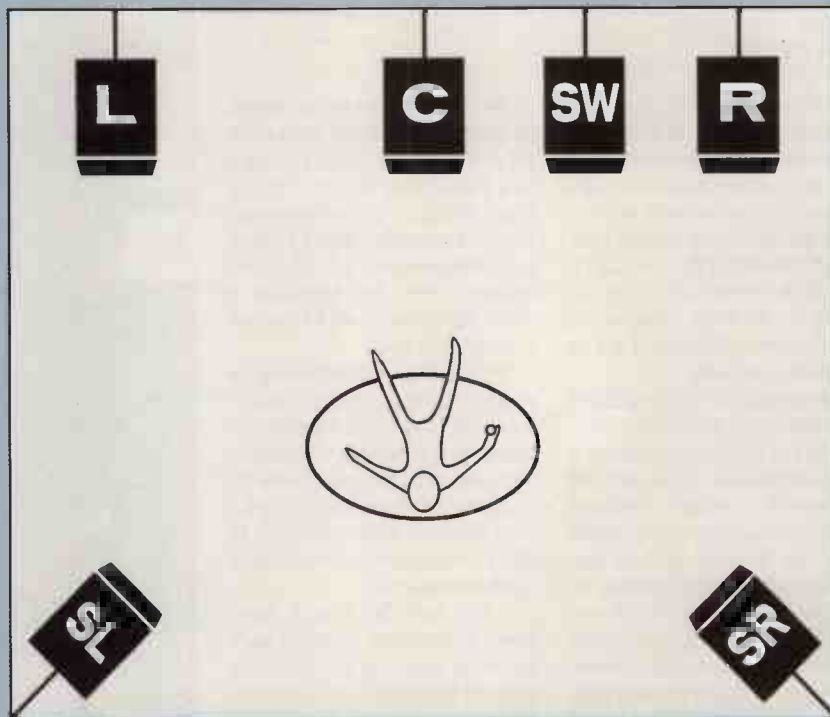
There have been several systems developed to achieve this in the past, going right back to CinemaScope in the 1950s. However, the market these days is pretty much dominated by Dolby Laboratories, the company that developed the Dolby sound system used in cinemas all over the world.

In the early 1980s, Dolby developed a system called Dolby Surround that allowed filmmakers to record four separate channels. This would then be played back by a four-speaker system that positioned two speakers in front of the audience and two behind. Each speaker had its own separate audio channel, so by altering their balance you can create the effect of sound realistically moving around the listener.

Dolby Surround has been further refined and enhanced over the years, and there are various different names used to describe this evolving system, such as Dolby ProLogic, Dolby Digital and many others.

Forget the jargon, though. The best way to tell one type of surround sound from another is simply to count the number of channels produced by your system. A basic surround-sound setup, sometimes known as 'four-point surround', produces four channels of sound, played back on four speakers – front left and right, and rear left and right. It's quite common for this type of system to also include a sub-woofer, but the sub-woofer doesn't have its own sound channel. Instead, the sound coming out of the sub-woofer is a kind of pseudo fifth channel that is created by combining low-frequency sounds taken from the other four channels.

There is also a four-point system known as '4.1'. This consists of four channels, just like ordinary four-point surround, but also provides a proper fifth audio channel specifically



Dolby Digital 5.1 surround sound comprises two front and two rear speakers, a fifth between the front two speakers, and a sub-woofer, each hosting a separate audio channel

for the sub-woofer. That '.1' added after the first number indicates that the sound system provides a dedicated audio channel for the sub-woofer. And that brings us to Dolby Digital 5.1, which is very much the technology of the moment.

Dolby Digital 5.1 consists of two front and two rear speakers, plus a fifth speaker positioned between the two front speakers (used in DVD films to 'centre' dialogue more accurately onto a particular point on a large screen). Finally, there's a sub-woofer that has its own dedicated sound channel as well.

But, just to confuse matters, there's also a rival 5.1 system called DTS, named after its developer, Digital Theatre Systems. This uses the same 5.1 speaker arrangement, but employs a 20bit sound format that provides higher-than-CD-quality output (CDs only use 16bit sound). There are even 6.1 and 7.1 systems available, although we've never come across a sound card that supports these. Don't be surprised, though, if new 6.1 and 7.1 sound cards appear from Creative and VideoLogic before the end of this year.

These huge speaker systems will, admittedly, be rather over the top for many people. If you just want to play games you may well be happy with a four-point system that lets you hear when there's a monster creeping up behind you. However, Dolby Digital 5.1 and DTS are becoming increasingly

important because of the arrival of low-cost DVD players.

Dolby Digital 5.1 is the standard sound system used by most new DVD films, and there are some discs that also feature a DTS version of the soundtrack. So, if you want your PC to act as the focus of a state-of-the-art home cinema system you'll definitely need a sound card that supports Dolby Digital 5.1, and possibly even DTS as well.

Remember, though, that your PC's sound system consists of two separate elements – the sound card and the speakers. There's no point in buying a six-speaker setup for Dolby Digital 5.1 or DTS if your sound card can only provide two or four channels of sound. Many less expensive sound cards still only provide two-channel stereo sound. Four-channel sound is relatively common, but it's only top-of-the-range sound cards, such as the ones we've reviewed here, that provide six-channel output for Dolby Digital 5.1.

We've not yet come across any sound cards that support the DTS format, but you do have the option of buying a speaker system that has a combined Dolby/DTS decoder built in. These self-contained systems can also be used with many domestic DVD players or games consoles, such as the PlayStation 2, that can play DVD films, so they're still worth buying even if you don't plan on using them with your PC.



TABLE OF FEATURES



MANUFACTURER	CREATIVE	GENIUS	HERCULES	PINE
PRODUCT	SOUNDBLASTER LIVE! PLATINUM 5.1	SOUNDMAKER LIVE 5.1	GAME THEATER XP	PCI DIGITAL 2633
Telephone	0800 973 069	01509 215 435	020 8686 5600	020 8498 2100
URL	www.europe.creative.com	www.genius-kye.com	www.europe.hercules.com	www.simply.co.uk
Price inc VAT (ex VAT)	£176.25 (£150)	£34 (£29)	£150 (£126.65)	£11.75 (£10)

SYSTEM REQUIREMENTS

Slot type	PCI	PCI	PCI	PCI
Processor speed	200MHz	200MHz	233MHz	200MHz
Operating system	Windows 9x, Me, 2000, NT4	Windows 9x, Me, 2000, NT4	Windows 9x, Me, 2000	Windows 9x, NT4
RAM	64MB	64MB	64MB	64MB
Other	Spare internal drive bay	X	X	X

FEATURES

DSP (digital signal processor)	EMU10K1	FortMedia FM801	Cirrus Logic 4630	Cirrus Logic 4614
Synthesis	Wavetable	Wavetable	Wavetable	Wavetable
Environmental audio	EAX, D3D	A3D, D3D	EAX, A3D, I3DL2	EAX, D3D, Sensaura
Four-channel surround sound	✓	✓	✓	✓
Six-channel (Dolby Digital)	✓	Six-channel output for games only, no Dolby Digital support	✓	X
Dual MIDI/joystick port	✓	✓	✓	✓
Additional hardware	Live! Drive	X	External rack unit	X

INPUT/OUTPUT

Dedicated microphone jack	✓	✓	✓	✓
Dedicated headphone jack	✓	X	✓	X
Analog line in/out	✓/3	✓/2	✓/3 (up to six speakers)	✓/2
Digital input/output	2/2	X/X	2/2	X/X
Dedicated MIDI	Input and output	X	Input and output	X



MANUFACTURER	TERRATEC	TURTLE BEACH	VIDEOLOGIC
PRODUCT	DMX XFIRE	MONTEGO A3D XSTREAM	SONIC FURY
Telephone	020 7923 1892	020 8498 2100	01923 260 511
URL	www.terrtec.net	www.simply.co.uk	www.videologic.com
Price inc VAT (ex VAT)	£49 (£41.70)	£55.21 (£46.99)	£79.90 (£68)

SYSTEM REQUIREMENTS

Slot type	PCI	PCI	PCI
Processor speed	200MHz	200MHz	200MHz
Operating system	Windows 9x, Me, 2000, NT4	Windows 3.1, 9x, NT4	Windows 9x, Me, 2000, NT4
RAM	64MB	Requires 16MB for Windows 3.1, otherwise 64MB	64MB
Other	X	X	X

FEATURES

DSP (digital signal processor)	Cirrus Logic 4624	Aureal 8820	Cirrus Logic 4630
Synthesis	Wavetable	Wavetable	Wavetable
Environmental audio	EAX, A3D, D3D, Sensaura	A3D, D3D	EAX, D3D, A3D, I3DLS
Four-channel surround sound	✓	X	✓
Six-channel (Dolby Digital)	X	X	see * below
Dual MIDI/joystick port	✓	✓	✓
Additional hardware	X	X	X

INPUT/OUTPUT

Dedicated microphone jack/headphone jack	✓/X	✓/X	✓/see *
Analog line in/out	✓/2 (up to 4 speakers)	✓/1	✓/see *
Digital Input	Internal digital input port on body of card	X	X
Digital output	✓	X	see *
Dedicated MIDI	X	X	X

*VersaJack connector acts as line in, headphone out, digital out or third line out for six-channel sound

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Editor's Choice

The main requirement of any sound card is, of course, that it produces good-quality sound. Yet all the cards reviewed here provide the 16bit, 44.1KHz stereo output required to produce CD-quality sound. And that even includes Pine's PCI Digital 2633 which, at just over £10, actually costs less than most new CDs.

This means that sound quality alone is no longer the sole factor that you have to consider when buying a card. The thing that really sets the top-of-the-range devices apart from their low-cost rivals these days is their sheer range of features. A headphone or microphone socket tucked away at the back of the card is no longer considered state of the art. Some of these cards boast a quite dazzling array of input and output options, with multiple analog connectors sitting alongside digital ports that allow you to make perfect digital recordings for use with CD players or portable MP3 players.

Many of these sound cards are also looking to the future, with support for surround sound and 3D audio technologies that are still in their infancy. The days of two-speaker stereo arrangements aren't over yet, but the popularity of DVD films points to a time when surround-sound speaker systems will be common in our homes. With this in mind, most of these cards support four-speaker surround-sound systems, and some even support six speakers, complete with Dolby Digital 5.1 decoding facilities.

Sound card manufacturers have also got their eye on the games market, and gamers should look closely at the small print on a card's packaging to see which of the many 3D audio technologies are supported before buying.

Some less expensive cards in this review are clearly aimed at the gaming market, providing support for 3D audio and up to four speakers, but not going that extra step to six-speaker surround sound required for the home cinema market. These less expensive cards also keep their prices down by omitting digital input and output facilities, but again these are features that you won't need if you only plan to play games with your PC. Terratec's DMX Xfire card clearly falls into the gaming category, as do the cards from Pine and Genius. All three cards cost less than £50, so if you're a games

fan looking for a low-cost upgrade then these three all represent very good value for money.

However, PCs are increasingly being used as the centrepiece for home entertainment systems that go beyond simply playing games. If you want to use your PC as a digital jukebox you'll need a more fully featured card that also provides digital recording facilities.

The winners

You don't have to spend a fortune to buy such a card. **VideoLogic's Sonic Fury** card thoroughly deserves a **Highly Commended** award as it manages to provide 3D audio for games and six-speaker Dolby Digital surround sound for DVD films at under £100. Its multipurpose VersaJack can be used for both input and output, although it can't do both at the same time. It doesn't have digital input facilities either, so it's not quite as versatile as the rival cards from Creative and Hercules.

Creative has been the king of the sound card market for years, and the **Creative SoundBlaster Live! Platinum 5.1** boasts a truly impressive range of features – so many, in fact, that it can't fit them all into a single board and has to complement the card with the additional Live! Drive unit. We can't fault the SoundBlaster's features, and its 3D audio, Dolby 5.1, and multiple digital inputs and outputs are certainly worthy of a **Highly Commended** award.

However, our **Editor's Choice** award goes to Hercules for its **Game Theater XP**. It supports 3D audio for games, but it also provides six-speaker Dolby Digital playback for DVD films and matches the SoundBlaster Live! Platinum 5.1 feature for feature. Like the SoundBlaster it puts most of its input and output connectors on a drive unit that is separate from the actual card. That said, the Game Theater XP nudges ahead of the SoundBlaster on price and ease of use, as its external, single-cable rack unit is easier to install and set up than the SoundBlaster's internal Live! Drive. The Game Theater's rack unit even acts as a USB hub as well.

The SoundBlaster has a better software bundle, but Game Theater XP's combination of features, ease of use and price pull it ahead as the best all-round choice for games, music and home cinema use.

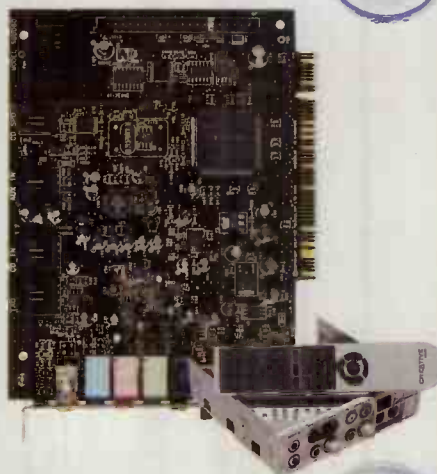
These cards support a dazzling array of input and output options



Hercules Game Theater XP



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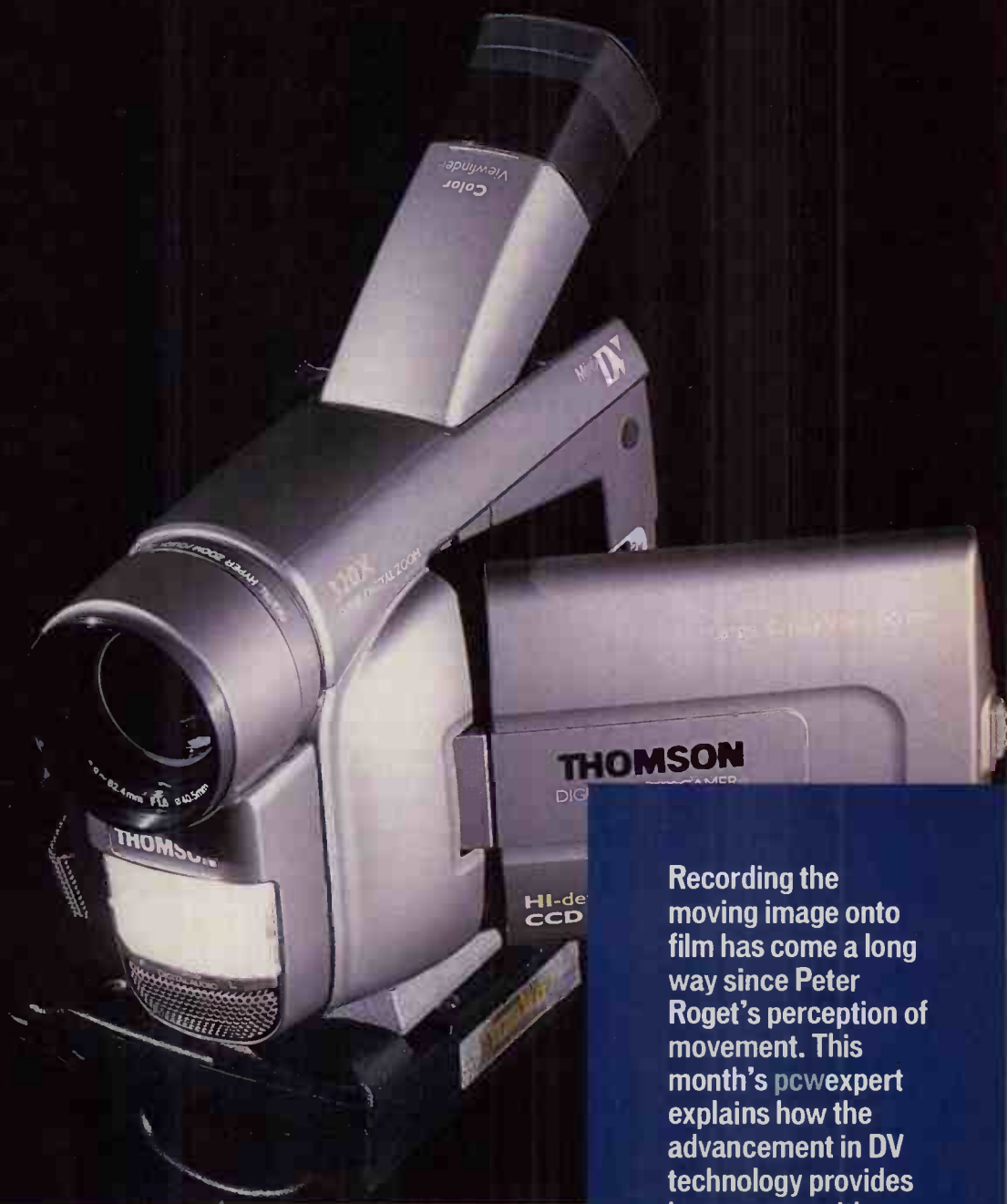
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Recording the moving image onto film has come a long way since Peter Roget's perception of movement. This month's **pcwexpert** explains how the advancement in DV technology provides home users with professional editing facilities. While our workshops will help you to produce even better quality videos.

PHOTOGRAPH Patrick Llewelyn-Davies

Digital video

Written by Ken McMahon

Recording movement through time

The advances of digital video enable home users to edit their own recordings on the computer. But where did it all begin?

The story of digital video is fascinating and varied. It begins with one man's curiosity about how we perceive movement, takes in the birth of cinema and TV, witnesses proprietary format wars between competing technologies, and culminates in the co-operative efforts of corporations to create a range of sophisticated products all based on a set of agreed standards.

All movies rely on a peculiarity of optical perception; they are, if you like, an optical illusion. As anyone who has played with a flipbook, or produced a simple animated gif for a website will know, a series of still pictures displayed in quick succession gives the appearance of movement.

This idea gained widespread acceptance after the publication in 1824 of a paper by the English physician Peter Roget (of Thesaurus fame) called *The Persistence of Vision with Regard to Moving Objects*. Roget's discovery spawned a succession of bizarrely named Victorian animation toys from the simple 'Thaumscope' from John Paris to the 'Zoetrope' invented by William Horner. The latter used a removable strip of paper on which the animated sequence was drawn. This was

placed on the inside of a drum that was rotated by hand, and the moving image was viewed through a series of slits.

In 1878 photographic images, rather than hand-drawn illustrations, became the subject of early animators' inventions.

In that year, Eadweard Muybridge proved to Leland Stanford (founder of the university that bears his name) that during a gallop, all four legs of a horse were off the ground at the same time. Muybridge arranged 24 cameras alongside a track, each with a thread attached to the shutter release, and stretched across the horse's path. When the horse broke the thread, the shutter was triggered and an image recorded.

Ten years later, Étienne-Jules Marey took the multiple exposure idea a step further by using one camera to take all the pictures. His 'Photographic gun' took 12 pictures in one second arranged radially on a paper disc. He later developed the 'Chronophotographie', which recorded successive images to a paper strip of film.

The next problem for early cinematographers was to find a strong, flexible medium as a base for the photographic emulsion.

Paper wasn't strong enough, and large glass plates, used by stills photographers, were clearly impractical for moving pictures.

In 1889, Hannibal Goodwin and George Eastman developed a celluloid-based emulsion that is essentially the same as that used today. Goodwin was also responsible for the sprocket method of film transport that remains in use in modern film and 35mm stills cameras.

The link between film and video was provided by TV. Early broadcasts were live as there was no easy way of recording. Various systems were devised using film, but all suffered from quality loss and other problems caused by the differing frame rates of film and TV. The breakthrough came in 1951 when Bing Crosby Enterprises demonstrated a black and white videotape recorder.

One of the major problems with early video recorders was the speed at which it was necessary to advance the tape past the recording head (measured in metres per second!) in order to record the high-bandwidth TV signal. Ampex overcame this problem by developing the Quadruplex format, which used four recording heads arranged on

a drum spinning at right angles to the tape. Instead of writing one track along the length of the tape, the Quadruplex system wrote four vertical tracks across it.







The Ampex VR-1000, launched in 1956, used the Quadruplex system and recorded onto 2in tape made by 3M. Over the next four years Ampex sold 600, mostly to TV stations, at a cost of more than \$50,000 (£31,250) each.

The Quadruplex system was superseded by helican scanning where the record/playback heads are mounted at a narrower angle, producing diagonally recorded tracks and resulting in a slower tape-to-head speed. The first helical scan recorder, the VTR-1, was demonstrated by Toshiba in 1959. JVC and Sony were quick to follow. The helican scan system is still used today in virtually every format of video recording, including home VCRs and DV camcorders.

Over the next 20 years there were attempts to market a device for home recording and playing of videotapes, but none of them set the market alight, because they were big, expensive, unreliable and used reel-to-reel tape.

The key to success in the home market lay in a robust cassette,

pcwexpert timeline

1824	1878	1888	1889	1891	1895
					
<i>The Persistence of Vision with Regard to Moving Objects</i> by Peter Roget proves that the human eye retains an image for a fraction of a second after it has disappeared.	Using 24 cameras stretched across a track, Eadweard Muybridge proves that all four of a running horse's legs are off the ground at the same time.	Étienne-Jules Marey designs a 'Photographic gun' capable of taking 12 pictures and the 'Chronophotographie' which takes a rapid succession of pictures.	Americans Hannibal Goodwin and George Eastman develop celluloid-based high-speed emulsion film.	Thomas Edison and William Dickson set up 'The Black Maria', the world's first movie studio and patent the Kinetoscope: a single-screen movie viewer.	Louis and Auguste Lumière invent the cinématographe, a multi-function camera, projector and printer and produce a number of short films.

like Philips' audio cassette, and throughout the 1970s and 1980s a profusion of competing formats vied for supremacy. In the UK, the battle was between JVC's Video Home System (VHS) and Sony's Betamax. VHS emerged victorious, largely due to its dominance of the video rental market.

With domestic VCRs gaining in popularity, the race was on to produce a video equivalent to the cine camera, combining camera and recorder in one unit. The main problem was size and Sony, Philips, JVC and Matsushita co-operated to agree a common standard based on 8mm tape that was to become Video 8.

JVC also developed a compact version of VHS - VHS-C. It was essentially the same as VHS but in a mini-cassette that could be inserted into a full-sized holder and played in a VHS VCR.

The first Video 8 cameras appeared in 1985. First out of the blocks (though it never took off) was Kodak's Kodavision. Made by Panasonic, the Kodavision 2400 had a 7-42mm power zoom autofocus lens, a Newwicon image tube, weighed around 5lb and cost \$1,899 (£1,187).

Cheaper, smaller and better quality models followed, in which the cathode-ray image tube was replaced by a CCD. In 1988, JVC introduced the Super-VHS format, and in 1989 Sony followed suit with Hi-8. Both of these systems produced better quality

recordings by separating the luminance and chrominance signals, and thereby producing higher luminance resolution.

DV camcorders have evolved from their analog predecessors largely as a result of developments in methods for encoding and storing analog signals in digital format. Digital video generates massive amounts of data and if it wasn't for compression, we would be back to the metres/sec tape speeds of the early magnetic tape systems.

At 640 x 480 resolution, uncompressed digital RGB video at 25 frames per second would require nearly 23MB of data per second. The DCT-based (Discrete Cosine Transform) algorithm used in DV compresses this by around five times and, combined with the conversion of data to component video form,

reduces this to around 3MB, or 25Mbits/sec.

Even at this lower bit rate, incredible accuracy is required of the miniature components in a DV camcorder. The multi-headed recording drum spins at 9,000rpm and writes tracks 10microns wide and 33mm long at an angle of nine degrees to the horizontal. 'Pilot' tones, created by flipping unused tracks in the data, keep the head on course.

In 1995, Sony and Panasonic announced DV camcorders. Sony's DCR-VX1000 was aimed at consumers and cost just over £2,500, but was quickly adopted by broadcast professionals impressed by the quality.

The following year, Sony and others, including JVC, Panasonic and Sharp, introduced further

DV camcorders. Unlike the other models, Panasonic's camcorders featured an IEEE 1394 connector. Many of the new models also had a fold-out LCD monitor panel.







Connectivity was the key to success. Although size, ease of use and superior quality were big selling points, consumers were excited by the editing possibilities digital video promised. The high-speed interface adopted was FireWire, developed by Apple, standardised in 1995 as IEEE 1394-1995, and implemented by Sony as i-Link.

FireWire's maximum data transfer rate of 400Mbits/sec is more than adequate for DV, which uses a 100Mbits/sec implementation. The light, flexible cable, small connector, and the ability to connect and disconnect devices without rebooting, made it ideal for connecting camcorders to PCs.

The final part of the DV puzzle was provided by analog video-capture cards. Until now the only way users of analog camcorders could get their footage onto a PC was to buy a capture card that digitised incoming analog video signals and recorded them to the hard disk either in a proprietary format, or as MPEG files. By the turn of the millennium PCI FireWire cards appeared with up to three IEEE 1394 ports usually bundled with a non-linear editing application. The age of digital video had truly arrived.



Camcorders have come a long way since the early days of movies

1898	1926	1956	1962	1965	1980
					
Valdemar Poulsen invents the Telegraphone - a telephone answering machine that uses a magnetised wire to store voice messages. It was a commercial failure.	Scotsman John Logie Baird demonstrates his mechanical TV system. Though the first practical system, it was quickly superseded by electronic methods.	Charles Ginsberg, Ray Dolby and a team of scientists at Ampex develop the world's first VCR. It used 3M magnetic tape.	RCA and Sony introduce solid-state VCRs.	Sony Launches the CV-2000, the first domestic VCR. It features a 0.5in tape, helical scan head (invented by Toshiba), weighs 30lb and costs around \$500	Sony launches the first consumer camcorder and in 1985 follows up with the Sony Video 8 camcorder.

Advanced home movie making

Digital video technology has changed the face of home video editing, providing home users with professional editing facilities

Broadly speaking, when people talk about digital video they are referring to the introduction of digital technology into the business of capturing and editing video material. As we've come to see in other areas where this has happened, the benefits are enormous and have radically changed the way we do things, for the better.

The DV format was originally developed for the consumer market although, in one form or another, professional video makers and broadcasters have embraced it enthusiastically.

There are actually several DV formats, but when people talk about DV they usually mean the consumer Mini-DV format (originally called DVC). Both Panasonic (DVCPro) and Sony (DVCam) have introduced variations that use higher-quality tape running at up to twice the speed of Mini-DV. Sony has also muddied the waters with its Digital-8 format that supports both analog and digital recording on Hi-8 tapes.

In the bad old days before affordable DV camcorders existed (about two years ago), most consumer video was shot on one of several 8mm analog formats. Once the footage was shot, editing it was no easy task.

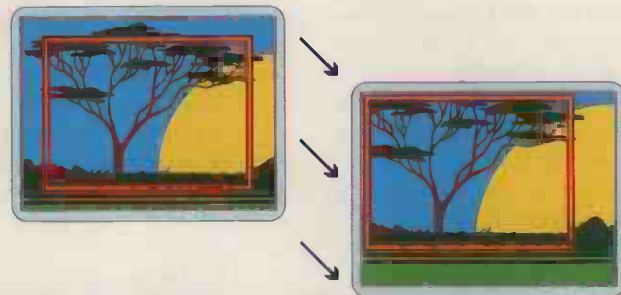
A DV camcorder is a capture device. Like a digital camera or scanner, its job is to record and digitise images, albeit moving ones

At its simplest it involved connecting the camcorder to a VCR and re-recording the clips with the resultant loss in quality, sometimes called generation loss. If you wanted to do some simple editing you needed an expensive deck to help with the task of locating the start and end points of your clips, and copying them all in the correct sequence to the new tape. If you wanted to make a copy of your edited master, the quality degraded yet further.

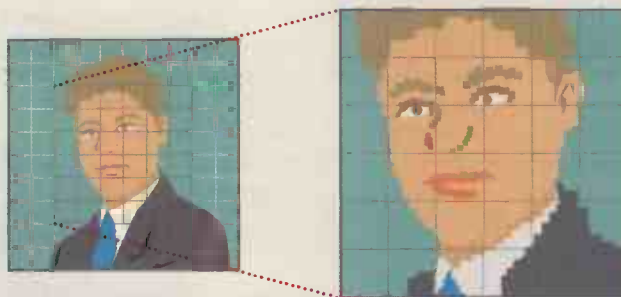
Faced with this, most camcorder owners satisfied themselves with making a warts-and-all copy of their shooting and got on with their lives. But DV has changed everything. First, the quality is better and it stays as good as the original, no matter how many copies you make. Then there are the editing possibilities. Once DV is transferred from the camcorder to your PC, the software tools available to edit it provide the kind of control that only a few years ago professional production editors would have killed for.

A DV camcorder is a capture device. Like a digital camera or scanner, its job is to record and digitise images, albeit moving ones. In terms of their external appearance and operation, DV camcorders differ little from their analog predecessors.

In terms of the technology, the components are similar. Light enters through a lens and is



A digital stabiliser compensates for camera movement



Digital zoom enlarges the image but severely reduces quality

focused on a CCD matrix that converts it to an electric signal. In an analog camcorder the signal is recorded to magnetic tape; in a DV camcorder it's sampled by an A/D converter and the data stream is compressed and stored on magnetic tape.

The DV format is of a far superior quality to anything in the analog world. While VHS and 8mm video deliver about 250 lines of horizontal resolution, and S-VHS and Hi-8 manage around 420 lines, DV delivers over 500 lines.

But quality is not the only advantage of DV. Most DV camcorders provide a lengthy menu of special effects that you can add to your movies. Having spent anything from £500 to £2,500 on a DV camcorder you can instantly make your video look like it was shot with a 50-year-old Super 8 camera using out-of-date black and white film.

More usefully, most DV camcorders have an image stabiliser that irons out unwanted movement caused by an unsteady pair of hands. It's



How a DV camcorder works

As any photographer will tell you, the main determinant of image quality in any camera is the lens. The DV format has brought the quality of consumer video close to that of professional formats, but the two components that really make a difference are the lens and the CCD. With lenses, it's largely a question of getting what you pay for, and the lens on a consumer DV camcorder that costs under £1,000 is quite clearly not going to match up to a professional model that costs even five or 10 times as much.

One technology that is beginning to appear on consumer models is 3-CCD architecture. Rather than using a single CCD (charge coupled device) and filtering to produce red, green and blue components, 3-CCD camcorders use a dedicated CCD matrix for each colour channel. Models such as the Sony DCR-VX200E and Canon XM-1 use 3-CCDs, but not everyone is convinced the improved picture quality justifies the expense.

Having passed through the lens, the image is focused on the CCD and each pixel generates an electric current in proportion to the intensity of the light. This electrical data is then encoded into black and white information (Y), red minus the black and white information (R-Y), and blue minus the black and white information (B-Y).

By splitting the black and white from the colour signal in this way it's possible to devote more of the available bandwidth to the black and white data than the colour data. Why? Because the human eye is less perceptive to a loss in colour detail than a loss in image detail.

Next comes quantisation, where the data, still in analog

format, is sampled and converted to an 8bit value providing 256 levels. The black and white signal is sampled at 13.5MHz and the two colour signals at 3.375MHz.

Next comes the compression, which involves three stages: discrete cosine transform (DCT); adaptive quantisation (AQ); and variable-length encoding (VLE). DCT re-orders the data into a more compressible form. First, the data is split into 8 x 8 pixel blocks and grouped together in columns called macro blocks. These are then shuffled to make the data more homogeneous and provide a more even data flow.

Then, each pixel in the block is indexed with reference to the one in the upper-left corner; if the pixel value is the same as the base pixel it is given a value of 0, otherwise the difference is recorded. Adaptive quantisation and variable length encoding is where the real compression work takes place. Variable-length encoding compresses the data by counting frequently occurring blocks of data and indexing them. In other words, if it came across a string of 100 zeros it would store them as 0 x 100 rather than using a bit for each zero value.

Because some blocks of data will be more complex than others (despite DCT), variable length encoding may not yield the required level of compression for all the data. Adaptive quantization rounds off values to make the data more compressible. If, for example, there was a one in the middle of our string of a hundred zeros, AC would round it off to zero.

Finally, before recording to the DV tape, the data is deshuffled back into its original order. The result of this process is to reduce the original data by a factor of 5:1, with little appreciable loss in quality.

The main determinants of picture quality are inside the DV camera. These are the lens and the CCD onto which light falls. However, consumer models of DV cameras still have some way to go before matching the picture quality of professional digital cameras



Most consumer models of DV cameras feature both a regular viewfinder and an LCD monitor in order to view what's being filmed

Streaming

Delivering video on the web is not without its problems. When you consider that compressed DV generates 25Mbits/sec of data and an average modem can receive 56Kbits/sec, you begin to get the size of the problem. Even ADSL's maximum download speed of 2Mbits/sec is inadequate.

Partly, this can be overcome by even greater compression and reducing the size of the playback window, but compression doesn't get round the problem of varying bandwidth. Data on the Internet is sent in packets and some take longer to reach their destination than others. For text and still images you just have to wait a few seconds, but audio and video interruptions in the data stream are more serious because your movie grinds to a halt. You could download the whole file and then play it, but you might be in for a long wait and this isn't an answer for live broadcasts.

Streaming, which enables you to start watching a video before it has completed downloading, has two forms: progressive and real time. With progressive streaming you can view the part of the file that has downloaded, but the video files don't adjust to match the bandwidth of the viewer's connection. Progressive streaming is also called HTTP streaming because the video files can be stored on an HTTP server.

Realtime streaming continually matches the quality of the video to the bandwidth of the connection, so the video is always seen in real time. This makes it suitable for live broadcasts and it also supports random access so you can skip forward to the end of a movie without having to wait for the whole thing to download. In theory, realtime streamed video should never pause, but in practice it's not unusual to see the message 'net congestion' below the frozen video image while the audio continues to play.

Realtime streaming media needs special servers such as a QuickTime Streaming Server or Windows Media Server, but this can be complicated to set up. An alternative is to use an ISP that provides space on such a server for your video files.

There are currently three streaming media technologies: Apple's Quicktime, RealNetworks' RealSystem and Microsoft's Windows Media Technologies. To view realtime streaming media you need the Quicktime Player 4.1.2 from www.apple.com/quicktime/download, RealPlayer 8 Basic from www.real.com or Windows Media Player 7 from www.microsoft.com/windows/windowsmedia.

If you want to author streaming video Premiere 6 includes a special plug-in version of Terran's Media Cleaner 5 EZ. For details of the full version go to www.terran.com.

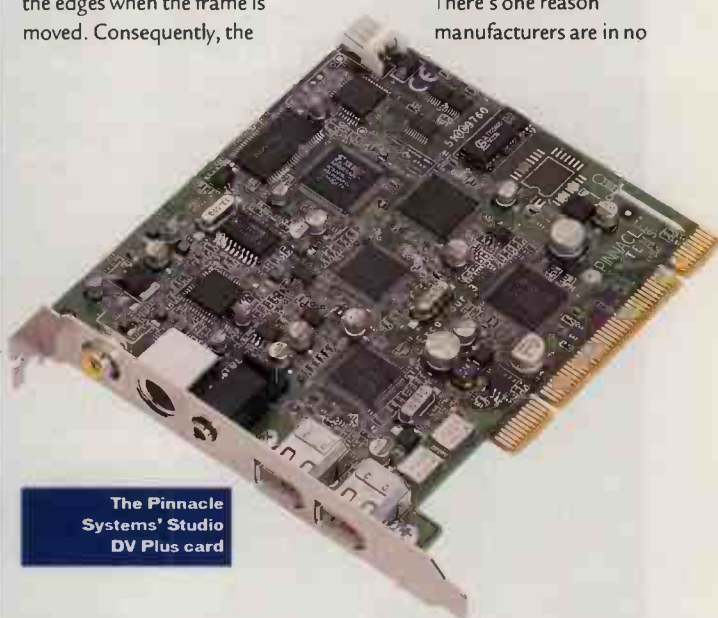
particularly difficult to hold the camera steady at high zoom ratios and, while it's no substitute for a tripod, a digital image stabiliser can compensate to a degree.

Digital stabilisers work by looking at the image and analysing adjacent frames for signs of frame (rather than subject) movement. They then shift the frame in the required direction to compensate for the camera movement. The CCD needs to be larger than the image area so that you don't get gaps at the edges when the frame is moved. Consequently, the

digital zoom will extend it to 20-times; beyond that, image quality will degrade to an unacceptable level.

As a digital image capture device, you would expect DV camcorders to handle still pictures with consummate ease, but this is only just beginning to be the case. The limiting factor is the imaging CCD. Whereas three megapixels is becoming the standard for digital still picture cameras, video CCDs are, in most cases, struggling to reach the one megapixel mark.

There's one reason manufacturers are in no



The Pinnacle Systems' Studio DV Plus card

resolution of the CCD image, and hence the quality, will drop when the image stabiliser is in use.

Another feature made possible with the introduction of DV is the digital zoom. Most camcorders these days have at least a 10-times optical zoom, and a digital zoom that can magnify the image by anything up to a staggering 400 times augments this. Pretty impressive, you might think, and just the thing for capturing footage of wild birds at distances of a mile or more.

The problem is that digital zooms merely enlarge the central portion of the image and, with the resultant loss in resolution, image quality suffers drastically and rapidly. In fact, a digital zoom provides a reasonably good quality image only up to a factor of about two. So, if the maximum optical zoom is 10-times, the

hurry to pack expensive multi-megapixel CCDs into DV camcorders: they get perfectly good quality video from the 800,000pixel units they currently use. But unless the pixel count rises significantly, a DV camcorder will never be a substitute for a still camera. And there's one other bonus that bigger CCDs would confer – a digital zoom that went beyond two-times magnification.

Despite the lack of resolution, DV camcorders can be used for low-resolution still images and there's an emerging trend to incorporate multimedia cards for still picture storage and transfer. As well as being easier to offload to your PC, this method of storage makes it possible to combine still and moving images in the camera. You can, for example, use a still image as a background for video, or paste a

video image within part of a still picture.

These tricks are all very well, but the whole point of digital video is that you can get it on to your PC where, with a moderate degree of processing power and hard disk space, and the right software tools, you can really make movies.

On a typical DV camcorder you'll find a composite video output marked yellow, stereo audio outputs marked red and white, and S-Video output. These are all analog ports for connecting to a TV or VCR. But by far the most important socket on a DV camcorder is the one marked i-LINK, or 1394.

IEEE1394, or FireWire, or i-LINK as the Apple and Sony versions are called, is an interface standard that was initially developed by Apple to replace SCSI on the Mac. It is ideally suited to DV because, at 50Mbytes/sec it easily provides the necessary bandwidth required for DV at 3.6Mbytes/sec. It's simple to configure and can be plugged and unplugged without the need to reboot.

To avoid an EU tax levied on VCRs produced outside Europe, camcorder manufacturers have for some time disabled the input on many DV camcorders made for the European market (known as nEUtered products), making them exempt from the tax. As a result of this, for a long time it has been close to impossible to buy a camcorder in this country with a FireWire port that could be written to, as well as read from.

Not being able to record edited video back to DV tape is a serious drawback. DV tape not only provides cheap, convenient storage for completed movie projects, but it is a crucial link in the distribution chain – the means by which you get your video into a format that anyone with a VHS VCR can view.

It doesn't take long to work out that using your hard disk for permanent storage of video projects is an expensive way of doing it. At 3.66Mbytes/sec, a minute of DV will fill up 220MB of your hard drive. To put it

another way, per gigabyte you'll squeeze in just over four-and-a-half minutes of DV, and your half-hour documentary on the gritty realities of life for students at West Runton Sixth Form College will eat up 6GB. Even with a 30GB hard drive, you can't afford to leave too many of those lying around.

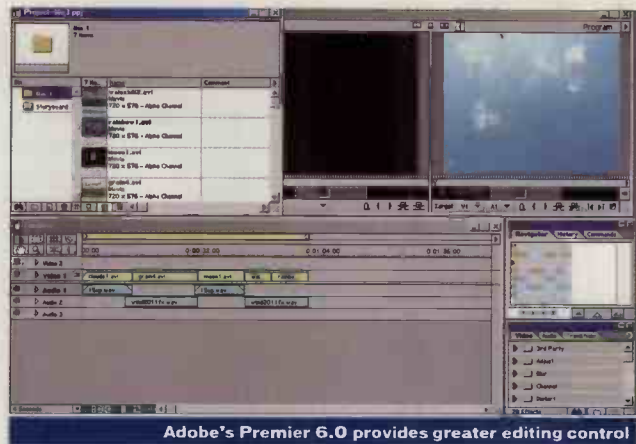
Next, there's the question of what to do if every member of West Runton Sixth Form College wants a copy of your documentary masterpiece. Even one copy will be impossible to produce unless you can find a way to get the digital video off your hard disk and on to a standard VHS cassette. As we saw earlier most, if not all, DV camcorders have analog outputs through which you can record what's on the DV tape to any VCR with equivalent inputs.

Fortunately, manufacturers are slowly coming round to the idea that consumers want DV-in and six of the seven DV camcorders we reviewed in March 2001 were not nEUtered! If you already own a camcorder that's had its FireWire port disabled, all is not lost. A number of companies produce 'widgets' to re-enable the port and several websites document the experience of adventurous types whose DIY efforts have proved successful. To purchase widgets for Sony, Panasonic, Canon and JVC cameras, go to www.datavision.co.uk.

To transfer DV footage from the tape in your camcorder to the hard drive on your PC, all you need is a FireWire interface on the PC and a drive big enough, and fast enough, to store the data.

DV is written in a constant uninterrupted stream, at 3.6Mbytes/sec. Much used to be made of the relative merits of SCSI over EIDE and the necessity of 7,200rpm drives for DV capture, but in practice most modern hard disks are more than up to the task of writing DV.

Unless you've bought a PC specifically for video editing, however, or a Mac, it is unlikely to have a FireWire port and you'll need to buy a PCI FireWire card.



Adobe's Premier 6.0 provides greater editing control

FireWire cards can be bought for less than £100 and are often sold accompanied by video-editing software.

Pinnacle Systems' Studio DV Plus card (PCW, March 2001, page 98) has composite and S-Video analog ports, in addition to two FireWire ports and an editing application called Studio DV. Other highly rated cards are the ADS Pyro 1394 and DataVision DV Capture.

The process of transferring DV footage from the camcorder to your hard drive is called capture – a term that has stuck from the days when this also involved the digitisation of analog signals. Software tools for DV capture, which are usually provided as part of an editing package, enable you to easily locate the video footage you want and transfer it to your hard disk.

The FireWire interface provides a means of controlling the tape transport mechanism on the camcorder through software on the PC. Device control means you don't have to fiddle with the VCR buttons on your camcorder or remote, but can instead handle everything from the capture application.

At its simplest, device control allows you to fast-forward and rewind the tape to locate the start point, press the Play button, then press Stop when you get to the end of the section you want to capture. Alternatively, you can specify the start and end points of the clip and the software will do the rest automatically.

Taking this one stage further, you can go through several tapes

specifying the start and end points of the clips you want to capture, then have a cup of tea while the software gets on with the job of batch capturing. All you need to do is insert the required tape in the camcorder when asked for it.

For device control and batch capture to work successfully, the DV tape must have a timecode track that identifies every frame. Timecode is represented in the form 00:00:00:00 – each pair of digits respectively representing hours, minutes, seconds and frames. There are 25 frames per second in PAL video, so when the right-most counter reaches 24 the seconds increment by one.

Timecode is not present on new tapes, but is recorded in the camcorder on first usage. Capture software uses the timecode for device control and to position the tape for batch capture. For this reason, it's important that the code runs uninterrupted from the beginning to end of the tape.

If there's a gap in the timecode – which might be caused, for example, by replaying recently shot footage, then repositioning the tape slightly forward of the end of the last shot – neither device control nor batch capture will function correctly, if at all. To avoid this problem it's advisable when you buy a new tape to record it from beginning to end with the lens cap on to 'stripe' uninterrupted time code to the entire tape.

The job of putting all your clips back together again, adding a soundtrack, special effects and

Recording tips

While DV makes the business of editing video much easier, a little forethought and planning before you actually press the record button can make a difference to the quality of your movies. Good technique and thinking about what you're going to shoot before you shoot it - sometimes called in-camera editing - will mean you have a lot less to do later.

Without being rude, probably the best advice is to stand still and keep quiet. Although DV camcorders have pretty good digital image stabilisers, they don't completely remove camera shake. Apart from the news, you rarely see handheld shots on TV or in the movies, so if you want your video to look professional, use a tripod. There are plenty of alternatives if you don't have one with you - a table, bookshelf, wall or even the roof of a car work well, but make sure to take it off before driving away!

Camcorder microphones are very sensitive and the nearest thing to them is usually the mouth of the person doing the shooting. If you want to add a voice over, this is one thing that's better left to the editing stage. And even if you're not talking, the sound of heavy breathing probably won't do much to enhance the mood.

Built-in mics are pretty good at recording voices up to a distance of about 10 feet, beyond that you might want to consider an external mic. Also, bear in mind that ambient noise from wind, traffic, the sea and crowds can drown out voices. If you're shooting handheld in a windy location, even cupping a hand around the mic to protect it can produce a big improvement.

Think about focus. Most autofocus systems work superbly, but shots where everything is pin sharp aren't always ideal. If you want to focus attention, say, on the main subject or away from a distracting background, use a long zoom setting to reduce the depth of field. Alternatively be daring; turn off the autofocus and experiment with different aperture and shutter settings. Use wide aperture settings (small numbers) to reduce the depth of field and small ones (big numbers) to keep everything sharp. Try moving the attention from foreground to distant subjects using focus.

Plan your shooting in terms of shots and sequences. You might want to start with a wide shot to establish location, before moving in for a close-up look at the subject. Before you record your shot think about whether it will be a static shot or whether you're going to pan the camera to take in a scene or a moving subject.

Consider the camera angle - high up or low down can make things look more interesting - and decide what's going in the frame by using the zoom, or moving. It's generally not a good idea to zoom in and out while shooting, though.

Decide where your shot is going to start and end. Editing software makes it easy to trim clips, but treat this as a margin for error rather than an excuse to keep the camera rolling indefinitely in the hope that something interesting will happen.

All this may seem like a lot to remember, but if you get into the habit of thinking about what you want from a shot before you press record, it will soon become second nature. You'll spend much less time editing, and your videos will be more enjoyable to watch - for you and everyone else.

here is that you can view all of your effects and transitions in real time.

The cost of such cards is falling rapidly and high-quality realtime 3D effects that only a couple of years ago were outside the budget of all but professional production studios can now be bought for under £1,000. The Matrox RT2000 and Pinnacle's DV500 plus are two examples.

If you're just getting started in DV and you already own a PC that's less than a couple of years old and a DV camcorder, you can get up and running with a complete DV editing system for around £100. For under £1,000 you can add the kind of 3D effects - page curls, particle effects, tile transitions and distortion effects - that you see on TV.

The golden rule that should always be followed when editing your first videos is that 'less is more'. The temptation is to put every effect at your disposal into your video, but the result can be an overwhelming mess that distracts from your content, in the same way that using more than two fonts to a page in desktop publishing is considered nothing short of a crime.

But even if all you want to do is record family events for posterity and be able to easily edit, store and play back your videos, DV provides the opportunity to do it with unprecedented ease.

titles is known as editing.

Applications for this purpose are often called non-linear editors (NLEs), which merely refers to the fact that on a PC you are able to assemble the clips in any order and instantly make edits at any point without having to worry about the physical limitations of linear tape.

Video-editing software varies in complexity, from packages aimed at novices to those used by professionals in the broadcast media industry. The former are usually storyboard-based, providing a user-friendly interface that allows you to capture and assemble clips, add transitions, effects and titles and export the project to tape or disc. Ulead VideoStudio 4, MGI VideoWave

III, Digital Origin's Intro DV, and Apple's iMovie all fall into this category.

Programs such as Adobe Premiere 6.0, Ulead MediaStudio 6, and Apple Final Cut Pro have a much steeper learning curve, but offer a far greater degree of control over the editing process. These programs are timeline-based. Video and audio clips, transitions and special effects are added to the timeline on one of several layers. The ability to trim and arrange clips on the timeline, together with sophisticated layer control and precise editing tools, makes it possible to achieve professional-quality results in a fraction of the time and at much lower cost than before.

Adding transitions and

special effects to video is a processor-intensive task and often one of the most time-consuming aspects of digital video production. Even basic transitions like dissolves, fades and wipes take time to produce, and complex 3D transitions take even longer. So that you can get an idea of how things are working out, editing software provides a preview of these effects in the project window, but before your project can be written to disc or tape all of these effects must be rendered.

You can avoid the render overhead by investing in a card that offloads the task of rendering from the CPU and handles all of the transitions in hardware. The big advantage

Video editing software varies in complexity, from packages aimed at novices to those used by professionals in the broadcast media industry

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Converging into a digital pot

The success of digital video relies on a combination of digital cameras, camcorders, the Internet and broadband connectivity

The future for digital video is, like that of so many digital technologies, rapidly approaching from several different directions. Advances both in camcorder technology and PC hardware are occurring that will make the process of capturing and editing video ever easier.

Convergence is a word you hear a lot these days. It means the way in which new technologies enable us to combine what used to be separate processes in one digital pot. Nowhere is the evidence for convergence more obvious than in the case of the digital still picture camera and the DV camcorder.

While they can take quite good still pictures, camcorders fall short in two respects: physical size and resolution – but they are catching up. Camcorder models like JVC's GR-DVX10 are little bigger than most digital cameras and can manage 962 x 768 resolution. Sony's TRV20E manages 1,152 x 864 on its megapixel CCD.

Many of the latest models feature megapixel progressive scan CCDs, built-in flash for stills photography, and digital memory cards for still image storage and transfer. Sony's DCR-PC110 lets you record MPEG video to the Memory Stick and provides a USB interface for still picture transfer to a PC.

Moving in the opposite direction, digital cameras are encroaching on video territory providing the ability to capture audio and short video clips that last a few seconds.

As CCD technology advances and the cost comes down, we can expect to see improved image stabilisers and optical zooms as a result. Digital image stabilisers use a buffer area to smooth out bumps and jerks caused by camera movement. Advances in algorithms to remove unwanted camera movement will also play a part. For an example of what's

possible using such software see www.xzone-radio.com/UFODigest/evil_doers.html, where image stabiliser software developed by NASA has been used by the FBI to clean up shaky footage from security cameras for use in criminal investigations.

Given that DV editing on the desktop is a relatively new phenomenon, tools for getting the job done have developed remarkably quickly, from basic

realtime processing. The RT2000 is a two-card solution that makes use of 'Flex 3D' architecture built into the Matrox Millennium AGP graphics card. Flex 3D maps video onto 3D shapes as animated texture. Because Flex 3D is programmable, new effects can be added as they are developed and, in December last year,

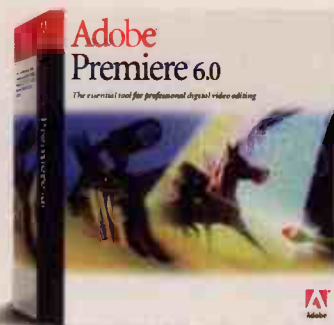
also be able to process it online. Companies like Sonic Foundry, Pinnacle Systems, Terran Interactive, Avid and Adobe see this as a significant part of what they'll be doing with video in the future.

There is, of course, one other option for distributing your video that doesn't involve a VHS cassette and that's DVD. The market for recordable DVD is a mishmash of competing incompatible technologies and, as was the case with the first recordable CDs, it will take a year or two before the dust settles and we can take advantage of competitively priced products that conform to a standard.

There are five recordable DVD formats: two forms of DVD-R, a DVD-RAM, DVD-RW and DVD+RW. The last three of these are rewritable. Of the rewritable formats DVD-RAM has a three-year development lead over the others. Version 2 drives, like the Panasonic models in new G4 PowerMacs, have a capacity of 4.7GB per side. Interestingly, the DVD-RAM specification includes an 8cm disc and cartridge format suitable for digital camcorders. Panasonic is currently developing a blue laser version of DVD-RAM with a capacity of 15GB per side.

DVD-R is more expensive than DVD-RAM. Pioneer's DVR-S201 costs around £3,500 inc VAT, but this is the drive home video makers are waiting to see fall in price. DVD-R uses the same organic dye technology as CD-R, has the same 4.7GB capacity as DVD-ROM, and is compatible with most DVD-ROM drives and domestic players.

When it was launched, the S201 cost nearly \$17,000 (£10,625), so it has already reduced in price massively. If the price trend for DVD-R hardware and media emulates that of CD-R in the mid-1990s, it's a sure bet this is the medium you'll be using to show friends your holiday videos by the end of the decade, if not sooner.



Matrox released 600 new effects that can be previewed and downloaded from www.matrox.com/video.

But capturing and editing video is only two-thirds of the story, and the means by which we distribute and view our movie-making efforts is the area that is likely to see most change.

More than any other kind of Internet content, video needs broadband connections if it is to be anything other than a frustrating experience for the viewer. While streaming technologies such as QuickTime, RealVideo and Windows Media make it possible to view video on a 56Kbits/sec modem, it's not a fulfilling experience. As the take-up of ADSL spreads we will undoubtedly see the quick emergence of video server sites offering services akin to Kodak's Photonet at www.photonet.com and Sony's ImageStation at www.imagestation.com.

If you can upload your video for online viewing, then you'll

home-editing programs such as IntroDV, VideoWave and iMovie to Premiere (above) and Final Cut Pro. But one drawback everyone has to suffer, regardless of software, is the dreaded render.

Even today's gigahertz processors aren't up to the job of rendering video effects in real time at 25 frames per second. Currently, if you want to avoid the wait you need to invest in some expensive hardware, though boards like the Matrox RT2000 (pictured above) and Pinnacle's DV500 Plus have started the trend for affordable

Digital video terminology

Can you distinguish between a high-band and hi-8, or VHS and VCD? The *pcwexpert Glossary* reveals all

A/B roll editing: A conventional editing method using a controller and two VCRs. Duplicated in timeline-based NLE software applications, though the video sources are on disc, not tape.

A/D converter: Chip that converts analog voltages to bit values. Used in digital camcorders and analog video capture cards.

Alpha channel: Image channel used to store transparency or masking information.

Aspect ratio: Width to height image ratio. Usually 4:3 or 16:9.

Assemble editing: Linear analog editing method involving copying clips from your camcorder to a VCR.

AVI (Audio Video Interleaved): Windows video file format.

B-Frame (BI-directional): An MPEG frame based on the contents of both the previous and next frame.

CCD (Charge Coupled Device): Light-sensitive chip used in camcorders, cameras and scanners.

Chroma key: The process of replacing a plain background (usually blue) with a video image. Famously used to put the weather map behind TV forecasters.

Chrominance: The colour component of a video signal.

Codec (Compressor/decompressor): Software that translates video or audio data between its compressed and uncompressed formats, such as MPEG in all its variants, Cinepak, Sorenson, Indeo and RealVideo. **Compression:** The process of reducing file size by reorganising data into a format that can be stored more efficiently (lossless).

Digital 8: Sony format that records in DV format on 8mm Hi-8 tape.

DV (Digital Video): Standard consumer digital video format, but also used as a generic term for digital video.

DVCam: Proprietary Sony variation on DV aimed at the professional market.

DVCPro: Proprietary professional DV format developed by Panasonic to compete with Sony in the broadcast news and documentary markets.

Edit Decision List (EDL): A computer-generated list of edits produced on an offline editor that is then applied to full-resolution video to produce the final cut.

Field: Half of an interlaced video frame that, in the PAL system, is drawn every 1/50 of a second creating 25fps video.

FireWire: Apple's hi-speed interface adopted as a standard (IEEE 1394) by the Institute of Electrical and Electronic

displayed on a TV or a monitor with an aspect ratio of 4:3.

Linear editing: Sequential copying from a camcorder, or VCR to another VCR.

Low-band: Standard analog camcorder formats: 8mm, VHS-C.

Luminance: The brightness component of a video image.

Marker: Used to define in and out points, for timeline navigation, or to add event-based controls, such as web links.

MPEG (Moving Picture Experts Group): Standard file formats. Widely used in video editing, digital broadcasting, and DVD.

the final cut. Used for most DV editing.

PAL (Phase Alternating Line): UK TV broadcast standard also used in many other European countries. 720 x 576, 25fps.

P-Frame (Predictive): An MPEG frame based on the contents of next frame.

Progressive streaming: Online media that can be viewed while it is being downloaded. Unlike realtime streamed media it doesn't require a special server, but can't adjust to take account of the bandwidth of the connection.

QuickTime: Apple's cross-platform multimedia architecture.

Realtime editing: System that renders and previews edits and special effects in real time.

Rendering: Recalculating pixel values for a video image after applying edits and effects.

Spatial compression: Used for still images to remove redundant data within an individual frame of a video image.

Streaming: Network delivery of video and audio that matches data delivery rate to the connection bandwidth to maintain realtime playback.

S-VHS-C: Hi-band compact analog video format developed by JVC.

Temporal compression: Removes redundant data by comparing frames and storing the differences between them.

Timecode: A system of numbering each frame in a video sequence in the format hours:minutes:seconds:frames to enable frame-accurate editing.

VCD: Video CD format that uses MPEG-1 files and supports menu-based clip selection. VCDs can be played in CD-ROM, Video CD, and some consumer DVD players.

VHS (Video Home System): Ubiquitous home video format developed by JVC and used in VCRs and analog camcorders.

YUV: Colour model that describes video in terms of a luminance (Y) and two chrominance (U and V) channels.



Engineers. Also known as i-Link.

Hi-8: High-band camcorder format developed by Sony.

High-band: Good quality analog video formats that produce a higher resolution signal with better colour fidelity by separating the luminance and chrominance signals.

I-Frame (Intraframe): See Keyframe.

Keyframe: Video frame that has undergone spatial compression. Does not rely on other frames in the sequence to generate its content.

Letterboxing: Adding black bars to the top and bottom of a 16:9 aspect ratio image when

Non-linear editing (NLE): DV editing on a computer. The video is stored on disc and manipulated in RAM, so NLE software allows you to edit and rearrange any segment at any time.

NTSC (National Television Standards Committee): North American TV Broadcast Standard. 720 x 486, 29.97fps.

Offline editing: Using low-quality clips to speed up the editing process. When completed the edits are re-applied to the full-resolution footage by means of an EDL.

Online editing: Editing using the same full-resolution video clips that are used to produce

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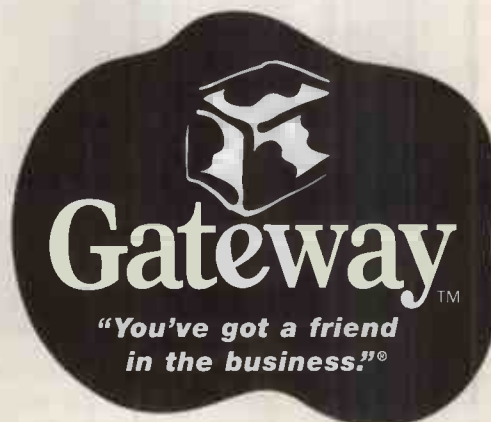
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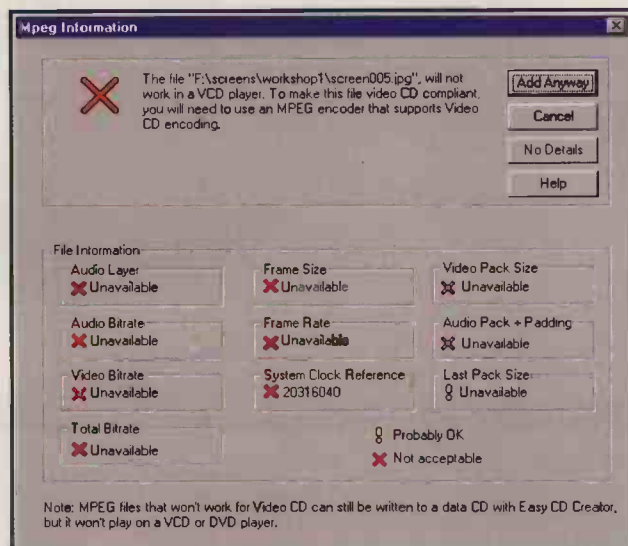


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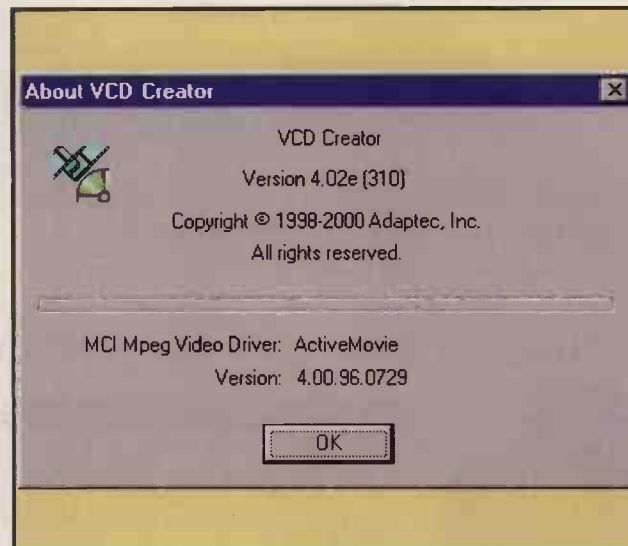
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Creating a Video CD with Adaptec Easy CD Creator

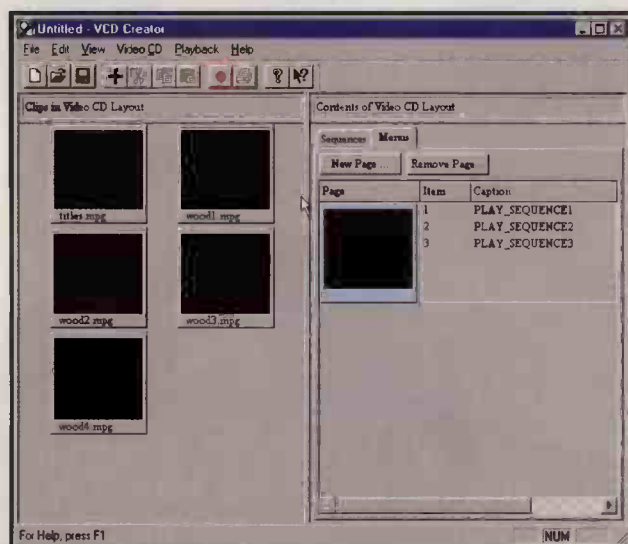
How to turn your MPEG files into a recorded video CD that can be played on a CD-ROM or DVD player



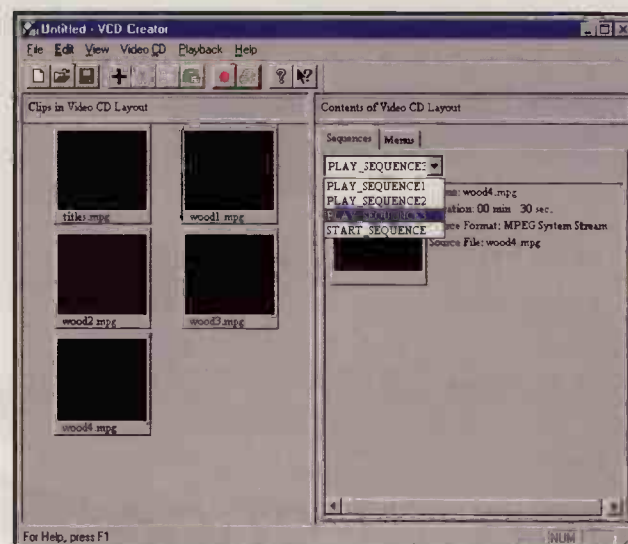
1 Start Easy CD Creator, click on Photo and Video, then Video CD (VCD). Cancel the wizard and you'll see the VCD interface on the left. Drag all your MPEG files onto the clip window. If you get an error message like the one shown in the screen above it probably means there's a problem with your MPEGs. Go back and check the export settings in your encoder software. Obvious problems are incorrect frame rate and audio settings, and too high a video bit rate. The MPEG information panel provides specific feedback on where the problem may lie.



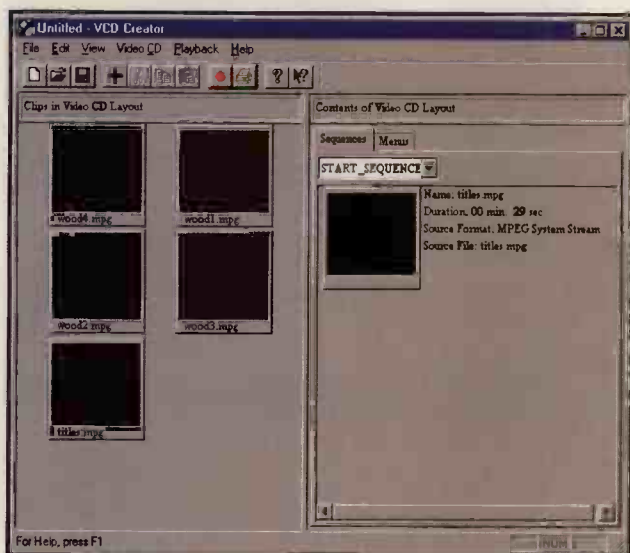
2 If you're sure your MPEGs are sound it could be that you have no MCI video driver installed, or the default Microsoft driver has been overwritten with an incompatible one. Select 'About' from the Help menu. If the panel doesn't indicate 'MCI MPEG video driver: Active Movie', you need to re-install Windows Media Player, or add MPEGVideo=mcitqz.drv to the MCI section of the system.ini file. You'll have to disable any others by removing or putting a semicolon in front of them. Remember to back up the system.ini file first.



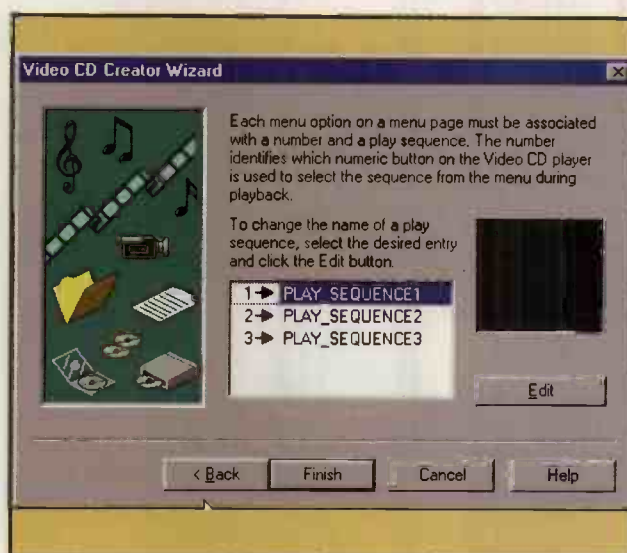
5 You can edit the play sequence names, but they don't appear on screen so, unless you're creating a complicated multi-level menu project, it's probably not worth bothering. The Menu tab now shows the Menu page (though, irritatingly, there's no easy way of telling what it is) and the play sequences in order. Now we have to define a clip for each play sequence.



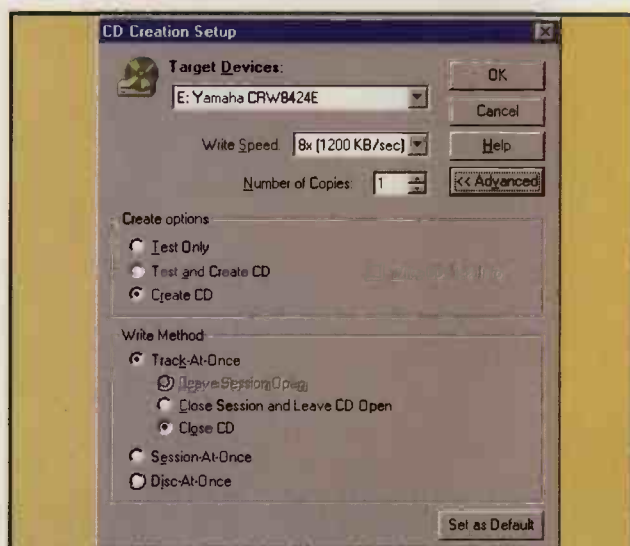
6 Click the Sequence tab, select PLAY_SEQUENCE1 from the pulldown menu and drag your first clip, or clips, from the Layout window onto the Sequences tab. Then select PLAY_SEQUENCE2 and do the same for this and every subsequent play sequence. You have now created a structure and allocated clips for the start sequence, menu and all of the play sequences. To check it all works OK select VCD Layout from the Play menu.



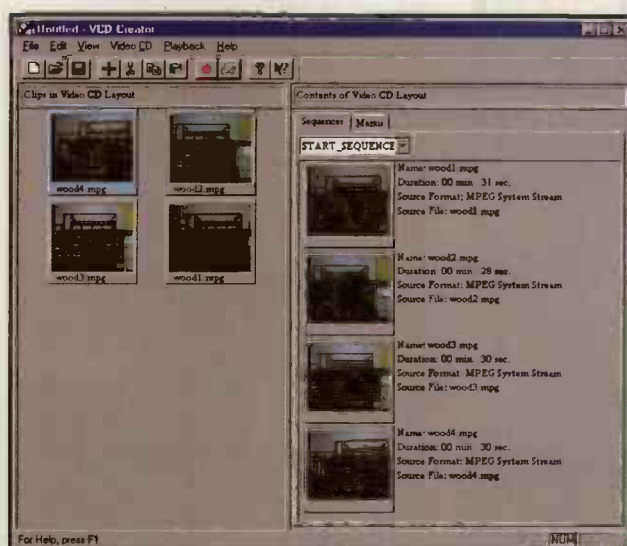
3 Easy CD can create either a simple VCD or one with an interactive menu screen. In a simple VCD all the clips go in the start sequence and are automatically played in order. In a menu-based VCD the clip defined as the start sequence plays once then the menu clip loops indefinitely until a numbered selection is made. We are going to create a single-level menu structure. Click on the Sequences tab and drag the start sequence clip, or clips into the panel on the right.



4 Now click on the Menus tab, then the New Page button. This will invoke the wizard and you are asked to select a background. This is the menu screen so you should choose the clip that explains the menu choices. If you didn't drag this into the clips window in step 3 press the Add From File button and get it now. Click Next and enter the number of menu choices you need, click Next again and you'll see the menu numbers and their associated play sequences.



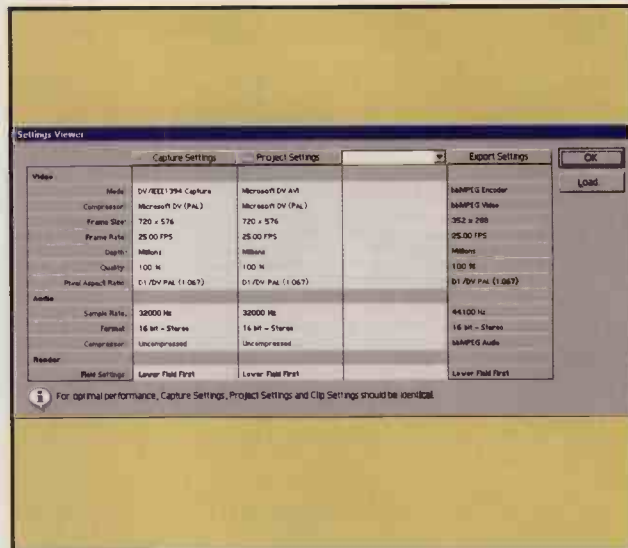
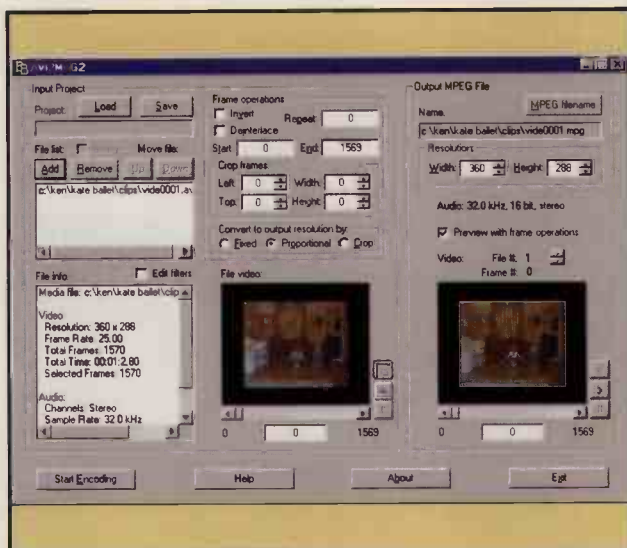
7 You can burn the VCD directly by selecting Create CD from Layout on the Video CD menu. A safer bet, and quicker if you want to make multiple copies, is to Create Disk Image from Layout and burn the CD subsequently. Your VCD can be played on a PC CD-ROM drive, on standalone VCD players and on some standalone DVD players. Some DVD players, while comfortable with the VCD format, have difficulty reading CD-R discs.



8 As an alternative to recording short movies to VHS tape, you can quickly create a simple sequential VCD that has no menu structure and in which all the tracks play automatically one after another. Select New VCD Layout from the File menu (Ctrl & N) and drag all your clips onto the Layout window. Then drag them from the Layout window onto the START_SEQUENCE panel, and arrange them into the correct order. From the Video CD menu select Create CD from Layout, or Create Disk Image if you want to be more cautious, and that's it.

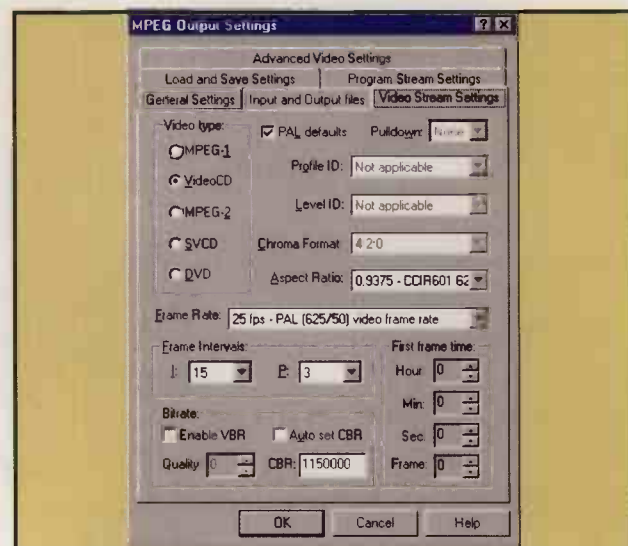
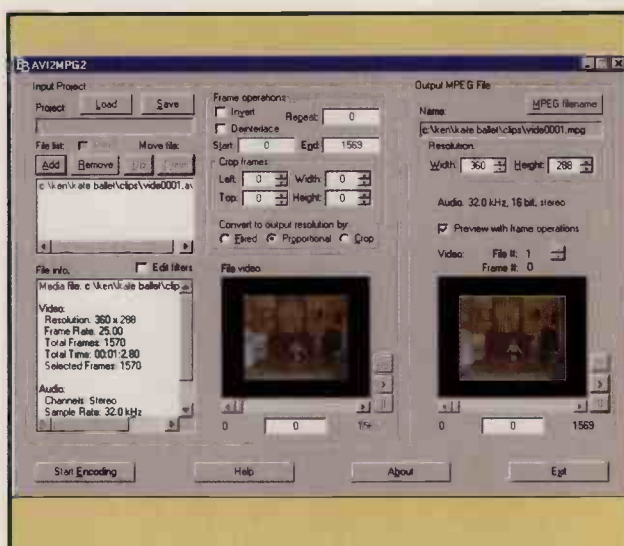
Exporting Video CD-compliant MPEG-1 files

Here's a simple way to convert video clips into bbMPEG files using the bbMPEG encoder - and it's free!



1 The first step is to start with White Book standard MPEG-1 files. A number of utilities can convert video into MPEG-1 format and offer cropping and resizing features. Some, like Panasonic's MPEG-1 encoder, produce very good results and are priced at \$79.95 (about £50) for either the plug-in, or standalone version at www.networkserve.co.jp/mpeg/index_e.html. But Brent Beyeler's bbMPEG 1.23 is free. It works either in standalone format using the avi2mpg application (shown here), or there's a plug-in, so you can export from Adobe Premiere's timeline.

2 We used bbMPEG 1.23 to export from the Premiere 6 timeline, but the plug-in will work with version 5.x. Rename the file bbmpeg.dll as bbmpeg.prm and put it in the Premiere plug-ins folder. Then select the settings viewer from the Project menu, click on the Export Settings header, and in the General tab select the bbMPEG encoder as the export file type. Choose 'work area' in the range field. Set the frame size to 352 x 288 and 44.1KHz 16bit stereo audio. If you don't get this right your MPEG-1 file will not be VCD compliant and any authoring application will reject it.



3 Drag the work area bar to cover the part of the timeline you want to export and select Export timeline/movie from the File menu. Name the file in the Save dialog, click Save and then click the Settings button on the bbMPEG dialog.

4 Select the video stream settings panel and check the Video CD radio button. Check the PAL defaults radio button and make sure that 25fps PAL is shown in the frame rate field. Click OK and press the start button. Your clip will take around four times the play length to encode, so a one-minute clip will take about four minutes to process. The encoding time will vary depending on the complexity of the clip and any effects you may have used. Repeat the export process for each section of the project you want to export as an MPEG clip.

Adding a soundtrack in MGI VideoWave III

Create your own background music to your video clip by attaching your favourite CD track



1 Launch VideoWave III and open your storyline file – ours consists of four short clips with default dissolves. Click the Capture button and in the Mode Console below the viewscreen click the Settings button to open the Capture Setting dialog. Select your sound card in the Audio Capture Device pulldown menu, check Enable CD Control and Autostart During Capture, then click the Audio Mixing button to display the Audio Input mixing panel. Make sure that the CD player is selected and click OK twice to close both panels.



2 The Control Panel should now be displaying Audio CD Control. Press the Play button and you should hear the first track on your CD (providing you've put one in the drive!) Select the track you want using the pulldown menu. You can use the VCR controls to fast forward, rewind and skip tracks and the time slider to quickly position the playhead within a track. Pause playback just before the point where you want to start recording and press the Audio button once to start, then again to stop capture.



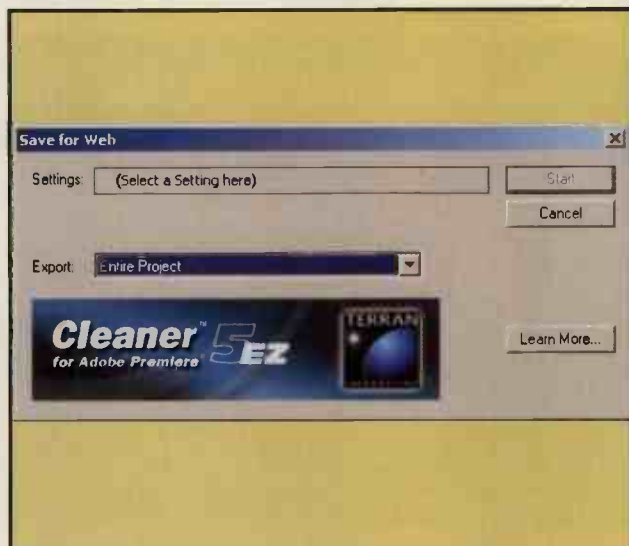
3 Click the Audio tab and your clip will appear as noname_001.wav. To hear it, right-click and select Play from the menu. Close the capture window, click the first clip on the storyline then the Audio Studio button. The audio track for the selected video clip is displayed at the top of the audio tracks list; drag noname_001.wav below it. Applying this track to the first clip means it will play through all the scenes. Click the clip button to use the audio trimmer. On the timeline the blue line shows the video clip length; the white line is the audio clip length.



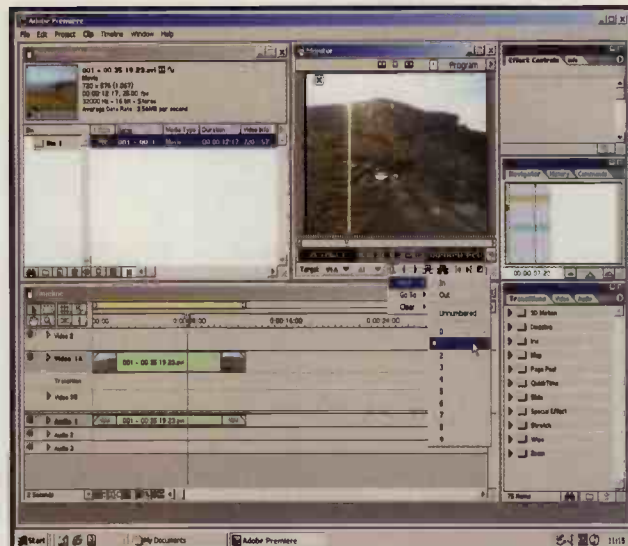
4 Use the Control tools to set the in (start) and out (end) points for the audio clip and click OK. Our audio clip is longer than the first video clip, but shorter than the entire production. Check the Repeat box to loop the audio clip. Check the Mix box so the background audio overlays the video soundtrack, and press Play. Set the background audio to fade in and adjust the volume using the slider. To fade out sound, go to the last storyline clip, click the Audio Studio button and check the Fade Out box. It's illegal to reproduce copyrighted material other than for personal use.

Producing web video in Adobe Premiere 6

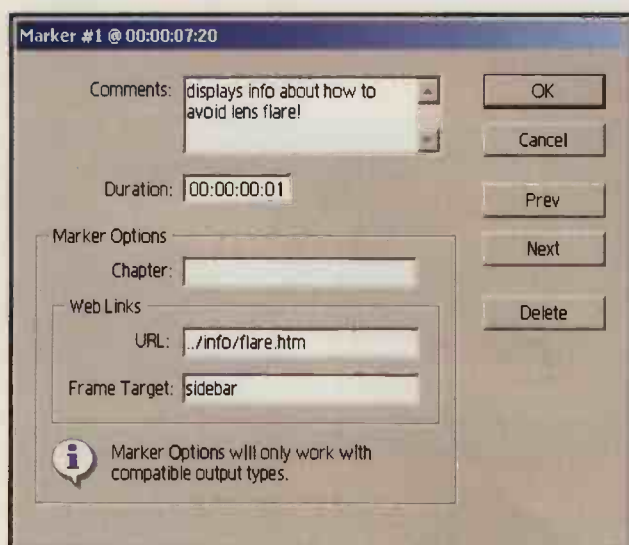
Export QuickTime, Real62 and Windows Media clips using the Cleaner 5 easy plug-in streaming media encoding tool



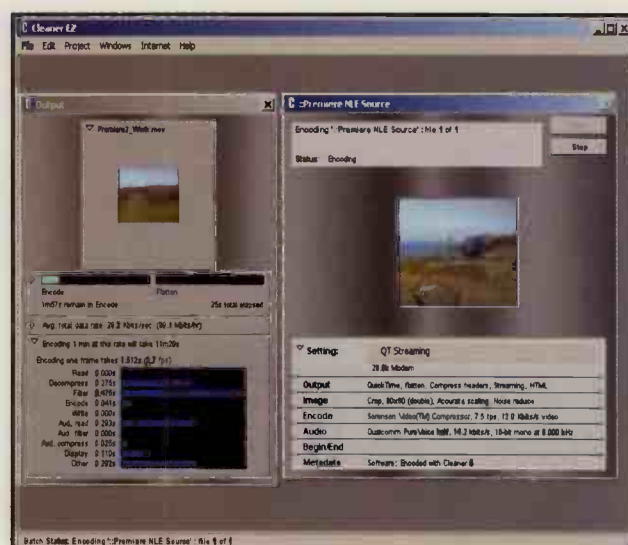
1 Premiere 6 includes a customised version of Terran Interactive's Cleaner 5 streaming media encoding tool. The Cleaner 5 EZ plug-in allows you to export numerous streaming and progressive download web video formats including QuickTime, Real62 and Windows Media, in addition to other video codecs. You can also take advantage, albeit to a limited degree, of Cleaner's EventStream authoring feature to add interactivity to your web video. In this workshop we're going to export a short QuickTime clip with an embedded event that links to a website.



2 First, capture your clip or open it and drag it onto the timeline. Events are attached to markers and you can add the marker to either the clip or the timeline. To add a timeline marker use the Marker menu in the Program view of the Monitor window. You can use a numbered or unnumbered marker and you can insert as many as you want. If you are creating a complex project in which the clip appears more than once, adding the marker to the clip will ensure the event takes place in every occurrence of the clip, rather than only once in the entire movie.



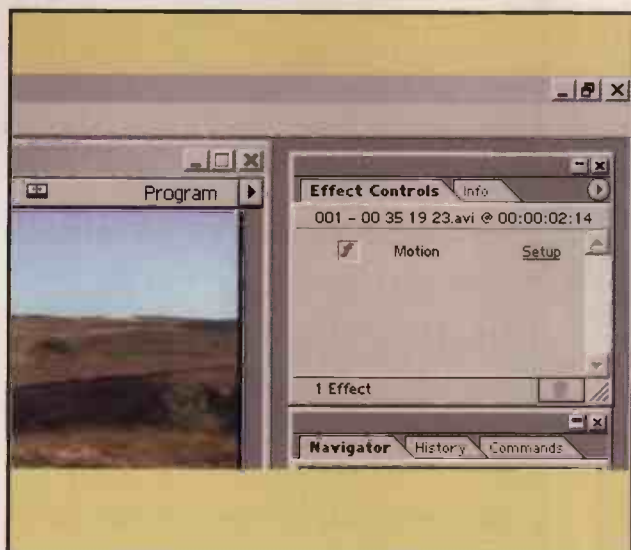
3 Double-click the marker to edit it and add the web address to the URL field. If your video is going onto a frames-based page you can specify a frame target. You could, for example, run the video on one part of the page and display text commentary at specific points next to it. A product video might display features, specifications or prices, or a wildlife documentary could display additional information about featured animals.



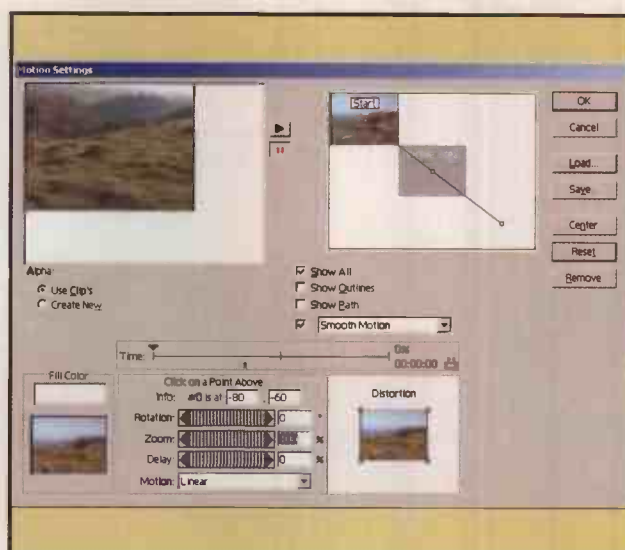
4 Select Export Timeline/Save For Web from the File menu. The Cleaner 5 EZ Export dialog provides a number of template settings for each format based on the likely bandwidth of the viewer's connection. If you're using one of the streaming media formats you need to specify the dedicated streaming server where the files will reside. Not all formats support interactive features, but you shouldn't have any problem with QuickTime, RealVideo and Windows Media. Click the Start button, specify a server address and filename and that's all there is to it.

Animating clips in Adobe Premiere 6

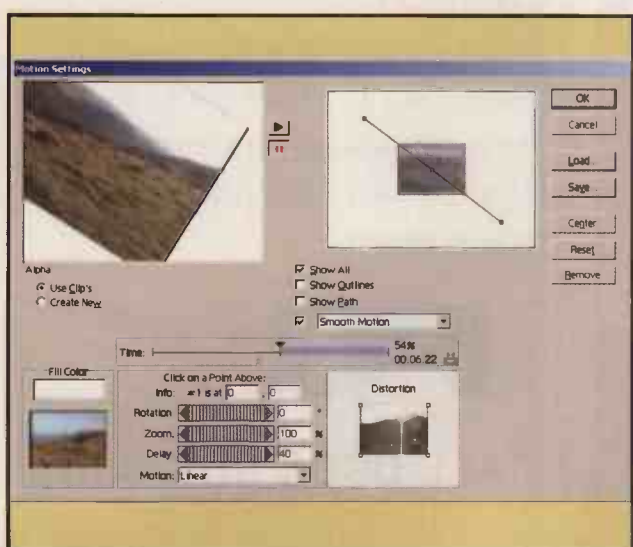
Have fun manipulating your movie clips by applying distortion and rotation techniques



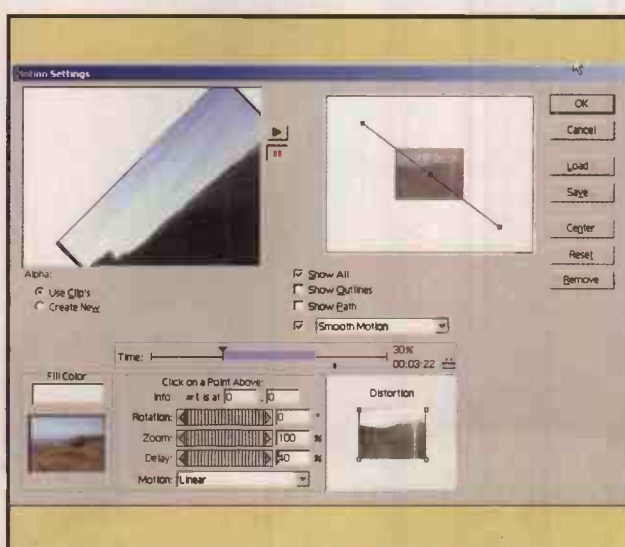
1 In Premiere you can animate a clip by creating a motion path in the Motion Settings dialog box. This versatile tool lets you control several aspects of a clip's appearance, such as rotation, zoom and distort as well as its line of movement. Select a clip in the timeline and click the Enable Effect button to the left of the word Motion in the Effect Controls palette, then click the word Setup to the right of it.



2 In the Motion Settings dialog box the top left window previews the effect and the top right window is used to set keyframes. Initially, the start keyframe is to the top left of the visible area and the end keyframe is at the bottom right. To add keyframes just click anywhere on the path between two existing keyframes. We've added one bang in the centre of the visible area – you can position precisely using the arrow keys or by entering co-ordinates in the Info field.



3 Click the start keyframe and rotate it until it's upside down by entering 180 in the Rotation field or by using the slider, then click the end keyframe and enter -180 in the Rotation field. If you hit the Play button to preview the effect you'll see that the clip now rotates anti-clockwise as it moves along the diagonal path. To make it stop when it gets to the middle, select the Centre keyframe and enter 40 per cent in the Delay field. The blue line indicates the delay.



4 The problem is that the delay is all in the second half of the animation, because the middle keyframe is positioned at the midpoint on the motion timeline. Drag the keyframe position marker on the Motion timeline to the 30 per cent point, so that the delay occurs in equal parts before and after the midpoint. Play the preview and the clip should rotate into view, stay there for a few moments, then rotate back out. You can experiment with additional keyframes and with zoom and distort effects to produce more involved clip animations.

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While the rest of *PCW* deals with the latest products that are just about to hit the market, *Hands On* is the section where we try to help you get the most from the hardware and software that you already own.

All the writers in this section are experts in their chosen fields and have years of experience getting to grips with new technology. They're here to pass on some of this hard-earned knowledge, point out features in software or hardware you may have missed, or just teach you new techniques.

But it's not all about our experts, perhaps the most important aspect of *Hands On* is reader feedback. All our contributors encourage you to participate in the columns by emailing in your questions or offering solutions to other people's problems.

While we can't promise to reply to each email with a personal response we do read all the mail that we receive, as it is key to helping us keep in touch with what subjects you would like us to cover.

Niall Magennis, Features 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.

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.

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.

Chris Bidmead is a former TV script writer for *Doctor Who*. Nowadays, Chris is an IT consultant with a broad knowledge of the computer industry. A Linux aficionado for the past seven years, he's been involved with Unix since the 1980s.

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.

Nigel Whittfield 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.

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.

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.

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.

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.

Simon Rockman worked on *PCW* from 1989 to 1995 before leaving to establish his own magazine. He has an extensive knowledge of the technologies and products available for mobile voice and data communications.

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.

Ian Waugh has been making music with computers since sequencers were first available. He has written over 2,000 articles and 11 books on the subject, but is still searching for a program to turn out a Top 10 hit.



Advice from our experts

Our *Hands On* experts answer your questions and solve your problems

Unix

Q I'm having trouble with Mandrake 7.2. The first time I logged in it fired up KDE perfectly. The next time I was greeted by a simple xterm window. I assume something is missing from an X config file, but I don't know where to look.

Alan Raison

A No, X has nothing to do with this. The fact that you have an xterm running suggests that X is working fine.

You're offered a choice of session types in the box on the bottom left of the KDM login screen. Did you pick the wrong one by mistake (it defaults to the previous session type)? It sounds as if you've ended up with the 'failsafe' session. But if this still happens when you select the KDE session then, Houston, we have a problem.

Check that you have the full complement of session startup config files in `/etc/X11/wmsessions.d`. There should be one for each type of session offered (KDM, Gnome, whatever). These sessions should also be listed in `/usr/share/config/kdmrc`.

When KDE was coming up correctly, the KDM login screen would have started up a script called `/usr/bin/startkde` when you logged in (picking this up from the config file `/etc/X11/wmsession.d/01KDE`). For some reason it's no longer doing that.

If you need to trace the whole mechanism, the starting point is the script `/etc/rc.d/init.d/mandrake_everytime`. You will notice a stanza in the script that begins:

```
# Build KdmSession
```

You can't get bored with the Linux desktop, when you can have a completely different one each time you log in. The KDM login screen lets you pick from a selection of different session types

This calls a script entitled `/usr/sbin/fndSession`. This in turn calls `/usr/sbin/chkSession`. The scripts are pretty readable, so you should find the problem without too much trouble. But get back to me if you need to know more.

DTP

Q I edit a newsletter for a local amateur radio group using Pagemaker 6.5. I try to send out a pre-release pdf copy to members, this file is also placed on the group's website (www.gb3pl.org.uk) for download. The format of the printed newsletter is an A5 booklet, which is why I like Pagemaker, for its page imposition facility.

Being of a technical nature, the newsletter contains quite a few graphics, but when I create the pdf file with Distiller (upgraded to 3.02) the right-hand margin of the graphic will disappear. This also happens to a spreadsheet that is included in every issue – I get round this by 'pasting special' in two halves. If I reduce the size of the graphic by dragging the handles I can improve the situation, but in the most recent issue this rendered a complex mechanical diagram almost unreadable at A5 size.

I've tried changing the Distiller export settings (Printer styles) which helped a little but didn't solve the problem. Do you have any ideas?

Terry Bickell

A It looks very much like the problem is with your printer settings and, in particular, the page size. The trouble is most likely to be with your PostScript file, not the graphics or Acrobat.

Go to File/Print and in the dialog box check that you have the distiller PPD selected, and that the page orientation is correctly selected (ie it should be portrait if you are printing portrait pages). Then you have to click the paper button and make sure you have the correct paper size selected. One possibility is that you've set up a custom A5 page, but the orientation is landscape instead of portrait and that's why your pages are being cut off. Selecting A4 portrait paper and activating the printers' marks check box should solve the problem.

Hardware

Q How do you find the processor speed of a PC if for some reason it can't be seen during the booting process?

Joe Leaf

A No problem – just get a copy of H Oda's legendary CPU ID utility from the download section of www.h-oda.com. It's only 178KB and supplies a wealth of information about the installed CPU – a great tool for all PC enthusiasts.

Q Is it possible to run two PCs from one keyboard and mouse?

Mervyn J Sims

A Yes, head over to the KVM (Keyboard Video and Mouse) section of the Belkin website at www.belkin.co.uk. There you'll find loads of adaptors, cables and switching boxes that let you control multiple PCs with one keyboard, mouse and monitor.

The two-port OmniCube sounds like it'll fit your bill, and costs £79 ex VAT, while a four-port version is also available for £93 ex VAT. You'll also find plenty of KVM switchers at your local computer fair – have a browse around www.britishcomputerfairs.com for more details.

Q I have a four-year-old Vectra VL5/166 that I would like to upgrade. I have tried using a Hypertec AMD upgrade chip, but it wouldn't work on my system, and now I am told that an Intel 233MHz Pentium is the best alternative. Is this my only option in the age of 1.5GHz chips?

Bob Monroe

A Companies such as Hypertec (www.hypertec.co.uk) and Powerleap (www.powerleap.com) offer processor upgrade solutions for older systems, often using modern chips with special adaptors to fit in aging sockets. The AMD K6 processor is a popular upgrade option for owners of Socket 7 motherboards but, sadly, they don't work on all systems.

If your Socket 7 system won't talk to an AMD K6 upgrade chip, then you're pretty much limited to fitting Intel's fastest Socket 7 CPU, which was the



Pentium 233MHz. In terms of raw clock speed, this is almost 50 per cent faster than your 166MHz Pentium, but it also supports MMX extensions, which will greatly speed up applications and games that support them.



Previous *Hands On Hardware* columns have described

UltraDMA issues with Windows 2000. Do these problems also apply if you're using a separate UltraDMA controller card in a PCI slot?

George Tully



The problem concerned

UltraDMA100 hard disks that were operating in slow PIO Mode when connected to the standard chipset EIDE controller. Fortunately, separate hard disk controllers such as yours are supported by a MiniPort driver, which treats them independently to the standard chipset – in your Device Manager, they're actually listed under the SCSI controller section. Even better news is that the compatibility problems with chipsets have also been solved by driver updates from Intel and VIA for their respective chipsets.

If you have an Intel chipset, download the latest drivers from <http://support.intel.com/support/chipsets/driver.htm>, and if you're using a VIA chipset, go for the most recent 4-in-1 driver from the driver section of www.viatech.com.

Windows



I need to format my hard drive every so often, as I have a habit of installing/uninstalling a large amount of software. I have, at present, a very complex mail filter in place within Outlook Express 5, which extends to almost 37 topics with variations and order importance, and every time I format it takes about one and a half hours to set up the filters and get them in the correct order.

Is there a way that I can copy/export the filters so that I can just copy a file or a subdirectory to a specified place and have the filters return, as I do with my mail and address book?

A Farhad



Rules are stored in the Windows Registry at HKEY_CURRENT_USER\Identities\{number}\Software\Microsoft\Outlook Express\5.0\Rules (see screenshot 2), where 'number' is a long hexadecimal number that varies between installations and users. What you have to do is highlight the Rules branch, then Export it from the Registry menu. You'll

end up with a plain-text file with a .reg extension, containing the rules settings.

When you want to restore these to a clean Windows installation – or transport them to another machine – first, you'll have to check the Identity number for the user concerned. This is the long hexadecimal number previously mentioned. Extract this from the corresponding entry in the target Registry and, if it differs from that in the .reg file, use a search-and-replace in a text editor to change all instances of the number in the .reg file to that of the new value.

Next, make sure you have a recent Registry backup, or have created a Windows Me restore point, then double-click on the .reg file to merge it into the Registry.



Would you please explain by how much files are compressed when inserting them into a Compressed Folder? Would this help in sending a short webcam video as an attachment to an email? Having tried, a short video of approximately 20 seconds appears to be 32MB in size, which would take ages to send as an attachment to an email.

Ian Stoker



The answer to the first question is that it depends on the type of file. For example, Word documents, to quote a Microsoft Office spokeswoman, are 'mostly air', and so compress quite effectively. However, most sound, picture and video file formats, such as MP3, jpeg, gif, mpeg and avi, are already compressed, so little, if any, further compression can be achieved, which answers your second question.



How can I stop the annoying message in Windows 98 that I have 'run out of space' on a drive, and offering to 'clean up', when I have at least 50MB free?

Toby Webber

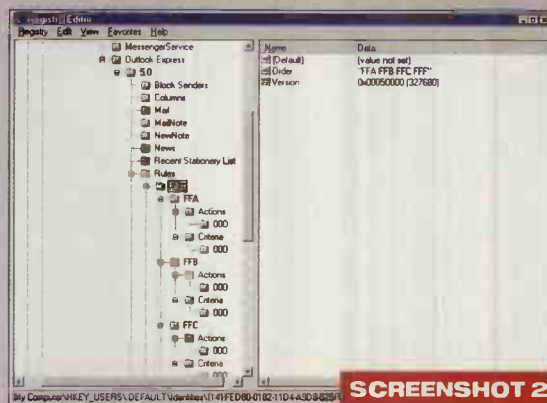


If you go with the flow and don't cancel the message, you'll get to the Disk Cleanup dialog. Here you will find a 'Settings' tab where you can turn off the automatic running of Disk Cleanup (see screenshot 3). This doesn't, however, appear to be possible in the nanny state of Windows Me.

Windows 2000

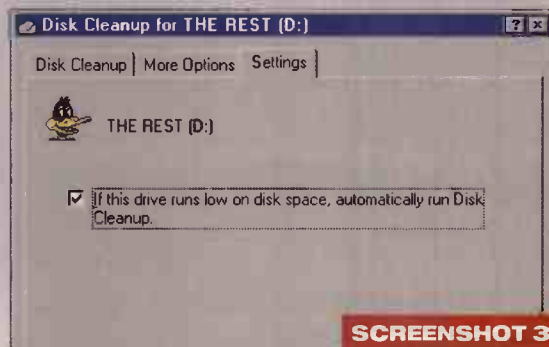


I have Windows 2000 Professional with Service Pack 1 and was working in Word 2000 when it



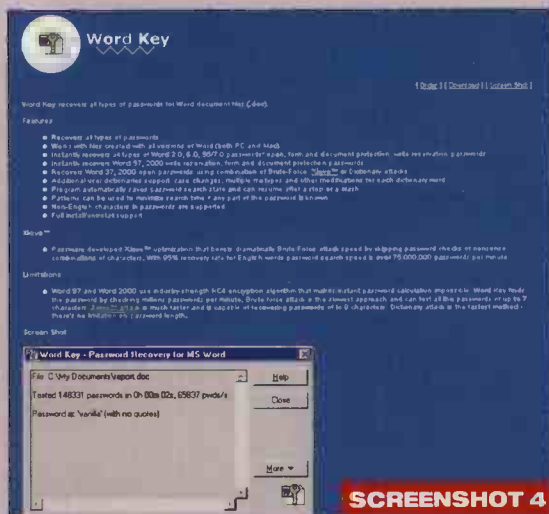
SCREENSHOT 2

Where Outlook stores its rules



SCREENSHOT 3

Untick here to stop those 'Out of space' messages



Forgotten your password? This website may be able to retrieve it



Teaching Word new words

crashed with this message:
STOP:0X00000050,0X85B53A8L4,0X0000000,0XF9DE07DL,0X0000002
PAGE_FAULT_IN_NON_PAGED_AREA
ADDRESS F9DE07DL BASE AT F9DD7000,
DATESTAMP 39DA2C5C VSDATANT.SYS.

I couldn't do anything at all and had to turn it off at the socket in the wall!

Rupert Walden

A A STOP error is often known as a BSOD (Blue Screen of Death) because the error message nearly always appears on a blue background; sometimes it has a black background. A BSOD occurs when Windows 2000 (or NT) encounters a fatal system error from which it cannot recover. They are frequently caused by drivers but can also be hardware-based.

STOP errors generally reveal two or three pieces of information which may help diagnosis. The first is the number (0X00000050 in this case), the second is the message (PAGE_FAULT_etc), and the third is a reference to the file or driver that was being accessed (vsdatant.sys) when the STOP error occurred.

If you're lucky, plugging this data (without the underscores in the message, for example, PAGE FAULT, not PAGE_FAULT) into a search of the KnowledgeBase at <http://search.support.microsoft.com/kb/c.asp> may reveal what the problem is. If it doesn't, try a Usenet search at <http://groups.google.com/>.

In this case the KnowledgeBase search drew a blank, but Google threw up loads of messages about a conflict between Windows 2000 Service Pack 1 and an old version of the ZoneAlarm TrueVector service, vsdatant.sys. In order to fix it, you should follow the advice in the ZoneAlarm install/uninstall FAQs at www.zonelabs.com to completely remove ZoneAlarm and the TrueVector service.

After removing the older ZoneAlarm software the STOP error will go away and, once you are sure that all is well, you can download and install the latest version of ZoneAlarm. Version 2.1.44 or later does not cause this problem. Always keep your ZoneAlarm versions up to date by checking for new releases regularly.

Word Processing

Q I am proud to be a regular reader of your magazine, in Chandigarh, India. I'm facing a problem in MS Word. I had a document in Word, put password protection on for forms,

but have now forgotten the password. Could there be any solution (free if that is possible)?

Manish Gupta

A If the entire document is protected, then you are at the mercy of third-party solutions, and they, unfortunately, are not free: try www.lostpassword.com (see screenshot 4) If it's just forms that have been password protected, then the following seems to work. Save the protected file in rtf format, and then close it. Reopen the rtf file and you'll find you will be able to unprotect the forms without being prompted for a password.

Q How can I specify my own words in the suggestions list when checking the spelling? I have a number of technical terms that are not in Word's dictionary: I know I can add the words to the custom dictionary, but they don't always produce the right suggestions when misspelled. Ideally, I'd like to be able to autocorrect them but it seems to be a prerequisite that the words be in the suggestion list first.

Graeme Morton

A It sounds as if you are trying to do this through the choices on the right-click menu with the 'Check spelling as you type' feature. If you go instead to the 'Spelling' item, you'll see the offending word highlighted in red in the top pane. Change it here, and you should find that subsequent similar misspellings add your typed correction to the list of suggestions (see screenshot 5).

You can also bypass the spelling checker and go straight to Tools, Autocorrect, to define your own entries. Note that you'll still have to add unknown words to the user dictionary, as the two lists are kept in separate files.

Spreadsheets

Q Is there any way to put my own choice of message in the Excel Status Bar?

Iki Ahmed

A You can create a macro that does it. Press Alt & F8. In the displayed dialog box choose 'Macros in: This Workbook' at the bottom. Give your macro a one-word name, like StatusBar, at the top. Click the Create button. In the new right-hand window you'll see Sub StatusBar(), a line space, then End Sub. In between them type Application.StatusBar = "Happy birthday,

Vikki" substituting your preferred message for Happy birthday, Vikki (see screenshot 6). Click the Save button on the VBA Standard toolbar. Then click the Excel button to the left of it to return to your worksheet. Press Alt & F8 and then Alt & R (for Run). Your message will appear.

Q How can I make my favourite macros become available whenever I open Excel?

Nicholas Wood

A Put them in one workbook and rename it Personal.xls. Using Explorer, transfer this file to the following sub-directory: C:\Windows\Application data\Microsoft\Excel\XLSTART. Next time you start Excel, this file will open first. Any new workbooks you create in that session will contain your macros. Any workbooks you open from shortcuts will have them available, too.

Q Rather than having to press a keyboard shortcut key, or click an icon, how can I get a macro to run automatically when an Excel workbook file is opened?

Susie Cormack

A Excel understands the keyword, Auto_Open. So in the introductory Sub line of your macro, instead of having, say, Sub Macro1 (), substitute Sub Auto_Open ().

Windows NT

Q I have two hard disks and I have been told that if I want to edit my videos I need to use NTFS in order to defeat the 2/4GB file size limit that occurs with FAT32. Can I use Windows NT when video editing but use Windows98/Me for everything else?

I have Partition Magic but could someone please give me step-by-step instructions on how to achieve a dual operating system so that I may choose which one to use at start up?

L Maule-Cole

A You're right. FAT has a 2GB file size ceiling, FAT32 has a 4GB limit and NTFS' maximum file size is determined by the size of the partition, so it could be as big as 2TB. However, hard disks aren't quite that capacious at the moment, so RAID aside, there is a hardware ceiling on file sizes – the largest hard disk currently available is 80GB, so that's your maximum file size.

We've covered dual booting in the NT column before, but I'm indebted to

another PCW reader, Peter Bryant, who has gone one better and has set up his PC to 'quad boot' four operating systems.

Here's how he did it. First, create a small 500MB FAT partition, and then two 4GB FAT or FAT32 partitions afterwards. Install DOS 6.22 to the first partition. Next, boot from Windows 2000 Professional Installation CD and install Windows 2000 on to the third partition. You now have a dual-boot machine for DOS and Win2K

Then boot back to DOS and copy the System and Hidden file bootsect.dos to bootsect.sav. Install Windows 98SE to the second partition having booted from the DOS partition.

Now at this point the Windows 98 install has trashed the bootsect.dos that was previously present, so rename the bootsect.dos to bootsect.w40, and copy bootsect.sav to bootsect.dos. Then edit the boot.ini, adding the lines:

```
c:\bootsect.dos="MS-DOS v6.22" /win95dos ✓
c:\bootsect.w40="Windows 95/98" /win95 ✓
```

(Key: ✓ code string continues)

Boot to Windows 98 and upgrade to Windows Me. Note that once again your bootsect.dos gets trashed, so rename bootsect.dos to bootsect.w40 again, and copy bootsect.sav to bootsect.dos. Now you should have a triple-boot machine.

At this point install Windows NT4 to other partitions as you wish and they will work fine. And since Windows 9x is working you can go back to DOS and Install Windows for Workgroups 3.11.

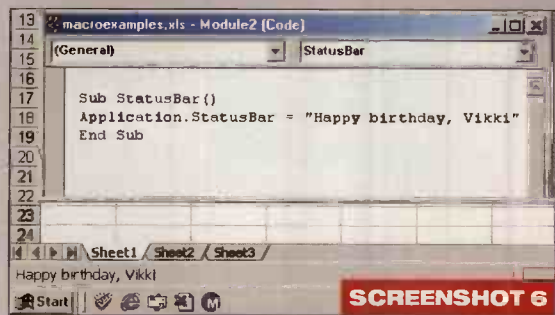
The boot.ini Peter finished up with is shown in figure 1.

Finally, you might want to check out NTFS for Win98, a utility that lets FAT32 systems read and write NTFS partitions. A read-only trial version can be downloaded from www.sysinternals.com/ntw2k/freeware/ntfswin98.shtml.

Networks

Q I recently purchased a top-of-the-line PC from Evesham, complete with Windows Me and a network card. After installing the system and the network, I tried installing AOL 6 but this would not run and additional attempts at installation resulted in the computer crashing.

So I uninstalled AOL 6 and installed AOL 5, which works. Great, but now the computer (with Windows Me) cannot find the network until I remove/repower the hub. All the Win 98 machines function as before and can see each



SCREENSHOT 6

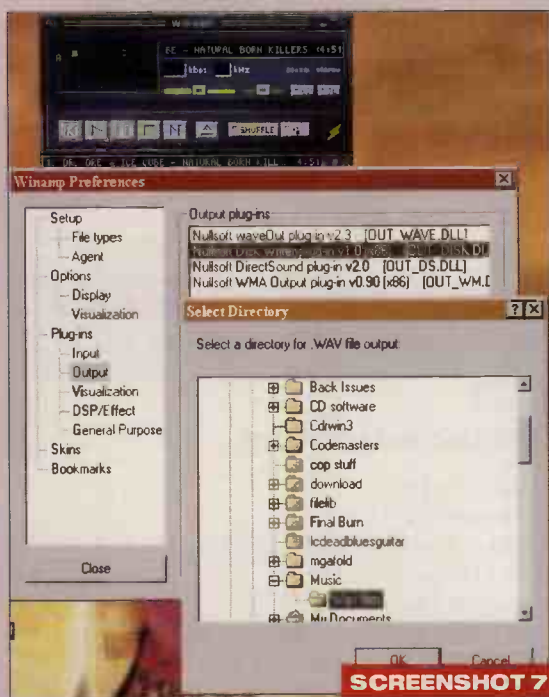
Personalise your message in Excel's StatusBar

Fig 1

Peter's boot.ini

```
[boot loader]
timeout=30
default=multi(0)disk(0)rdisk(0)
partition(4)\WINDOWS
[operating systems]
c:\bootsect.dos="MS-DOS v6.22" ✓
/win95dos
c:\bootsect.w40="Windows 95/98/ME" ✓
/win95
multi(0)disk(0)rdisk(0)partition(3)✓
\WINNT="Microsoft Windows 2000 ✓
Professional" /fastdetect
multi(0)disk(0)rdisk(0)partition(4)✓
WINDOWS="Microsoft Windows Whistler ✓
Professional" /fastdetect
```

(Key: ✓ code string continues)



Burn tracks from Winamp to avoid getting a pile of coasters

other but not the Win Me machine until the hub is repowered. As the hub is in another building this is inconvenient to say the least.

What has AOL 6 got that affects the network and how do I uninstall it? I have asked AOL but received no reply.

David Gynn

A As you now know, David, AOL doesn't recommend installing version 6 of its software on a networked PC – and with good reason. AOL 6 makes an astonishing number of unnecessary and potentially dangerous changes to your system's networking setup. At best, AOL 6's changes are likely to make your system less stable; at worst, it may render your system wide open to hackers.

Its fundamental, nay arrogant, mistake is to assume that it is going to be the only Internet connection on your computer, and proceeds accordingly, which is bad news for your PC if it's not. It alters the DUN (Dial-Up Networking) protocols to actively block other ISP connections from functioning and installs a raft of software on top of this. The worst problem reported by users is the wholesale deletion of TCP/IP and network adaptor settings, and the trashing of the Winsock DLL.

So, if your computer is connected to a network or is connected to the Internet via a cable-modem or ADSL, or uses another ISP to connect to the Internet, then AOL 6 may wipe out Windows' DUN settings used to access your network, cable/DSL service, and/or other ISP. You might, for example, find your modem has 'disappeared' or that the default network adaptor is now the AOL TCP/IP adaptor.

A patch of some sort does exist, and can be accessed by using AOL Keyword: Step5. This keyword will take you to a download page for the patch, called step5fix.exe, which, according to the instructions, 'should enable you to connect to the AOL service and restore your ability to browse the web'.

Sound

Q I have a large collection of music in both vinyl and prerecorded music cassette formats, and I recently purchased a CD writer complete with Easy CD Creator v4.01 software. A colleague, with a similarly extensive collection of music, particularly Tamla Motown, told me that he had many of these albums in MP3 format, and would gladly give me a copy, which I could transfer from MP3 to CD using the aforementioned software.

I burned my first CD from his master copy, checked it, and everything was fine. When I came to burn the second CD, one of the tracks wouldn't attach itself to the track list, and the following message was issued: '[file name] is not a valid audio file, and will not be added to the track list'. This occurred many times on other album tracks on the master CD.

I used his second master CD, and this time found a different problem. When I dragged a three-minute, 30-second track on to the track list it registered as less than two minutes long, and only recorded as two minutes on the CD that I was burning.

Both these problems do not occur if I play the problem tracks in MP3 format using Winamp. Therefore, the problem must be in the way that the files are converted from MP3 to CD music. Can you offer any advice, please?

Bob Jones

A This sounds like Easy CD is having problems decoding the files into wav format. You need to check to see if there is an update for the software on Adaptec's site (www.roxio.com, Adaptec's new name for its software division).

Other than that, you could try expanding the tracks to wav format using Winamp and then burning them from there onto CD (see *PCW* February 2001, page 236). At least that way you'll know whether the tracks are converting properly or not, and won't end up with loads of coasters.

CONTACT

All of our experts welcome your queries, simply respond to the appropriate address below:

Windows: win@pcw.co.uk

Windows 2000: win2000@pcw.co.uk

Windows NT: nt@pcw.co.uk

Unix: unix@pcw.co.uk

Hardware: hardware@pcw.co.uk

Word Processing: wp@pcw.co.uk

Spreadsheets:

spreadsheets@pcw.co.uk

Databases: database@pcw.co.uk

Sound: sound@pcw.co.uk

Graphics & DTP: graphics@pcw.co.uk

3D Graphics: 3d@pcw.co.uk

Visual Programming:

visual@pcw.co.uk

Web Development: webdev@pcw.co.uk

Ecommerce: ecommerce@pcw.co.uk

PDA & Mobile Devices: pda@pcw.co.uk

Networks: networks@pcw.co.uk

Please do not send unsolicited file attachments.

Peak performance

Leo Waldoock shows you how to get the ultimate output from your graphics card

You may have spent a small fortune on your graphics card, but are you getting the best performance from it?

Most graphics cards sell on 3DMark scores, Quake III frame rates, the graphics chip, the amount of memory and, possibly, a feature like dual-monitor support or TV-out. That covers the hardware and the basics of the drivers, but a bit of tweaking on your part will improve your graphics performance, and help you get the maximum out of your investment.

The graphics card is so fundamental to your PC that it won't even boot up if the card isn't installed, however, the card relies on layers of software and hardware to work effectively. Before you start tweaking the settings for your graphics card it's best to get the basics sorted out first.

At the bottom of the stack we have the motherboard chipset, which dictates whether or not your PC has an AGP bus or is restricted to a PCI graphics card. AGP 1.0 is a relatively new technology from 1996, and there was a grey period until AGP 2.0 in 1998 when the Intel LX and VIA MVP3 chipsets simply wouldn't work with certain graphics cards.

Visit your motherboard manufacturer's website and check that you have the most appropriate BIOS and chipset drivers, alternatively try <http://support.intel.com/support/chipsets/driver.htm> if your board has an Intel chipset or www.viatech.com/drivers/ if it's based on VIA technology.

You don't necessarily want the most recent software. An older release can sometimes be more stable on your particular system, depending upon the components it is built from. Check what motherboard chipset you have, when it dates from and what OS you are using. Then read the FAQ pages for all three.

We've found that there are slightly more potential problems you can face with a VIA chipset in comparison to those from Intel. To illustrate, if you have a Super Socket 7 motherboard with the MVP3 chipset and Windows 98, you'll likely find that VIA 4-in-1 driver pack version 17 is stable and performs well, even though version 25a is the current official release. On the other

hand, a KT133 motherboard and Athlon combination running Windows Me is best off with beta release 28.

It is a safe bet to get the latest version of DirectX from Microsoft at www.microsoft.com/directx although this takes a while to download, as it is 11.5MB in size. Microsoft is adamant that DirectX cannot be uninstalled or changed back to an earlier version.

There is a useful download available from www.VoodooFiles.com called, confusingly, DirectX. This is an 88KB Control Panel Extension file that you drop into the Windows\System directory. This adds a DirectX icon to the Control Panel and saves you having to mess about with the Start/Run command line to change settings and perform diagnostics.

We're now ready to think about tweaking the settings of the graphics card itself. Essentially, all graphics cards are built around the GPU (graphics processing unit). The majority of performance GPUs currently come from nVidia thanks to the success of its TNT and GeForce chips.

However, ATI, SiS, Intel and VideoLogic (as well as a recently deceased 3dfx) all play their part with their own GPU chips. The difference is that these companies make cards as well as GPUs, whereas



Top: nVidia's GeForce3 is the latest in its successful family of graphics cards

Bottom: Games like Quake III test a graphics card's performance to its limits

nVidia only creates GPUs and then sells them on to other manufacturers who create their own cards based on the nVidia chips.

As a general rule, your first port of call for drivers for any graphics card is the manufacturers' website. Here, you should find the choice of supported and beta drivers. Unless a beta driver offers a specific fix to a specific problem that you're experiencing, stick with the supported driver. Uninstalling graphics drivers cleanly can be difficult, so trying a beta driver before you revert to a supported driver may not be as easy as it seems.

However, if you have a card that uses an nVidia chip, you may be better off heading straight to nVidia's website. nVidia is responsible for the reference card design and specification, as well as the reference drivers, so it plays a major part in the product that you actually buy from a



OFFICE SETTINGS – MATCHING YOUR DISPLAY TO YOUR SCANNER AND PRINTER



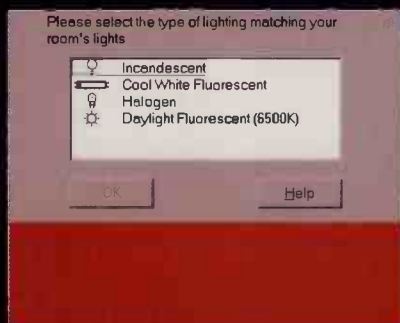
1 Right-click on your desktop and adjust your screen resolution, colour depth and monitor refresh rate in Display Properties to suitable settings. Your graphics card, monitor and monitor size all make a significant difference here. As a general rule to working with a monitor make sure the room is brightly lit, without reflections on the monitor. A worst case would be sunlight shining through a window directly onto the display.



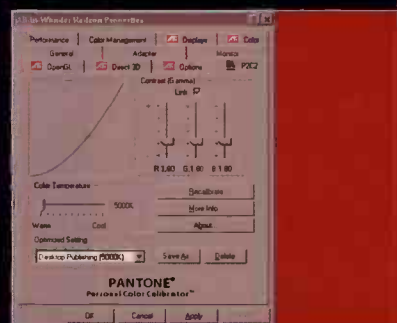
2 Use a graphics calibration package such as Pantone Personal Color Calibrator, which retails for about £40. Granted, that's not an exciting picture, but the first step is to set brightness and contrast levels.



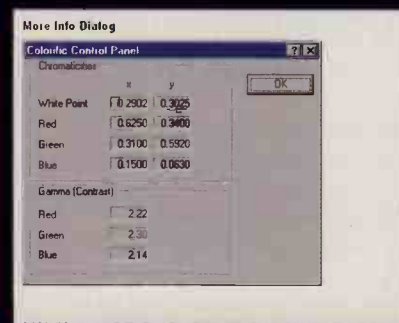
3 Each of the three colours of the display – red, green and blue – are calibrated individually at the bright and dark ends of the scale. This probably tells you more about your eyesight than it does about the PC's display, but it's all crucial data.



4 The final part of the calibration process is to adjust for the lighting level of your working space. PC showrooms have high ceilings, pale colours and lots of light. Most setups look very good under these conditions, but your house or office environment is likely to be much different.



5 You can see that the Pantone package has added a tab to the ATI Radeon Properties. It includes a number of preset schemes to change the appearance of the display to represent the finished appearance of your work. It's a bit like a chef slaving for hours, then the diner getting busy with the salt, pepper and mustard.



6 Once the calibration package has worked out what settings are best for your environment, they are broken down into numbers and can be exported to a professional package such as Photoshop 5. This avoids you saving a graphics file in one place and opening it on another PC to find it looks completely different.

manufacturer that uses nVidia chips on its cards.

nVidia produces a unified driver called the Detonator. In principle, any Detonator driver will work with any nVidia-based graphics card from the TNT to the GeForce3. Naturally, some drivers work better with some hardware and software than others.

Detonator drivers have a three-digit number to identify them and start at 0.48, but we're only interested in 5.xx, 6.xx and

7.xx series. The 5.xx series supports TNT and TNT2 and stretched to the GeForce 256 era. The 6.xx series covers the GeForce2 GTS and Ultra, while drivers marked 7.xx and above require DirectX 8.0 and are really intended for the GeForce3.

nVidia did some rather decent work in the 6.xx series that boosted performance by about 30 per cent for the GeForce series of GPUs, and driver 6.50 is definitely the obvious choice for Windows 98/Me/NT/2000. If you have an older

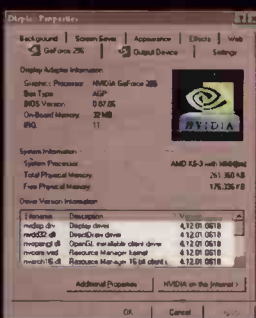
nVidia GPU you're better off with an appropriate driver such as 5.32.

You may wonder why you'd stray from drivers written specifically for your graphics card and switch to a Detonator. Glance at our second workshop and you'll see one answer: overclocking. The other answer is a simple matter of testing. Detonators are used in a vast array of PCs, but mainly for gaming. The user base is huge and the drivers are frequently updated. This results in both boosted

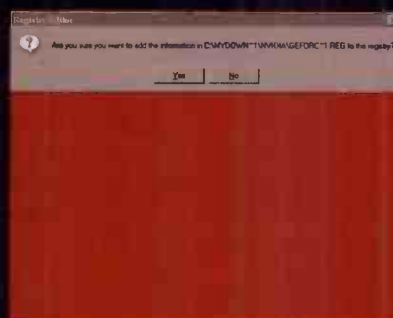
OVERCLOCKING NVIDIA-BASED GRAPHICS CARDS



1 If you currently use the 'correct' graphics driver for your graphics card, first download a suitable nVidia reference driver and unzip it to a directory you can find easily. Open Display Properties and change your current graphics adaptor to 'Standard VGA'. Reboot. Then open Display Properties and change your adaptor again, but this time guide Windows to the Detonator directory.



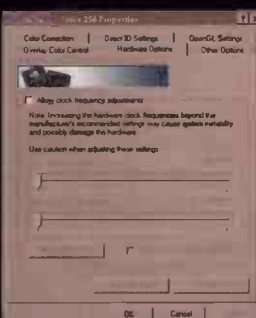
2 If you now open Display Properties you'll find it all looks a bit different. The branding for your graphics card manufacturer will have been replaced by a rather cute spinning nVidia logo. Functionality of the new driver screen will be very similar, but we can change that. Select the tab for your graphics card, and then the Additional Properties button.



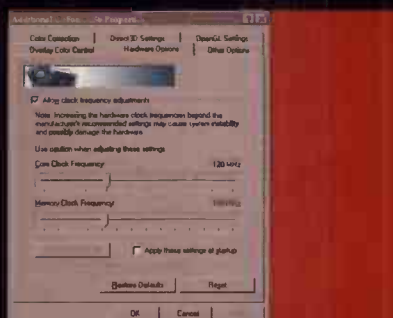
3 Change your Registry manually (ensure it's backed up first) by downloading and installing the CoolBits file from www.hardocp.com/files/cool_stuff/GeForce_OC.reg. This is only used for overclocking nVidia reference drivers, and fooling with your Registry for no good reason is a bad idea.



4 With CoolBits enabled and Windows rebooted, re-open Display Properties, and select your graphics adaptor and Additional Properties as before. Note that a new tab Hardware Options has appeared. This is what you've been working for, and you're about to reap extra performance for no expense whatsoever. Click the tab, you know you want to.



5 At the top left of the screen is a tick box to Allow Clock Frequency Adjustments. Tick it and click 'Apply'. Read the warning from nVidia that basically says any damage you cause is your fault. This, of course, is true of any overclocking you are going to try, so if you're scared, don't do it.



6 Two sliders will have appeared that allow you to alter the core and memory clock frequencies. It's best to move these sliders in increments of no more than 10 per cent and preferably adjust both memory and GPU together. After you've made an adjustment the driver will perform a test. The percentage by which you can tweak your card will depend on what chip it uses. Newer chips can generally be tweaked more than older chips. If the test is successful click OK and go and play Quake III.

performance and reliability. Specific OEM drivers always incline towards the cautious, low-performance end of the scale. If you don't have an nVidia GPU there are still options available to you for adjusting settings.

3dfx (may it rest in peace) had a very similar setup to nVidia's, but a far smaller choice of drivers. Run the Registry patch (see contacts box) and open up Display Properties and a slider control similar to nVidia's appears.

If you have an ATI Radeon card there is a piece of software from Radeon Tweaker that gives you the ability to adjust dozens of settings (see contacts box for web address). ATI's own drivers include most of these settings, but the Radeon Tweaker software actually explains what the settings do, so it's much easier to use.

Those of you outside the nVidia, Voodoo and Radeon fold can download Power Strip to adjust GPU speed, memory speed, OpenGL and 3D settings.

CONTACTS

Official and beta graphics drivers www.hot-wars.com, Hard OCP's 3dfx Registry edit www.hardocp.com/files/cool_stuff/3dfx_oc.reg, Hard OCP's CoolBits Registry edit www.hardocp.com/files/cool_stuff/GeForce_OC.reg, Radeon Tweaker <http://radeon-tweaker.sourceforge.net>, Power Strip www.entechtaiwan.com/ps.htm

We welcome comments on the workshop. You can contact us via the PCW editorial office or email: letters@pcw.co.uk. Please do not send unsolicited file attachments.

Tweak your heart out, UI

Tim Nott gets his fix from a new tweaking tool, and demonstrates how to block unwanted cookies

Tweaking is addictive. What starts out with a little harmless fun in the Display Settings, or experimenting with 'soft' Folder Options, can soon turn to full-blown Tweak UI abuse or even, in some tragic cases, mainlining straight into the Windows Registry with Regedit.exe.

As a fully registered addict, I bring you news of a new tweaker I have discovered. It's called X-Setup, it's free, and you can get it from www.xteq.com. It claims not to interfere with any other system utility or change anything by its installation. It is not advert-based or spyware, but it does recommend you look at the read me file before you start inhaling – a sentiment that I fully endorse.

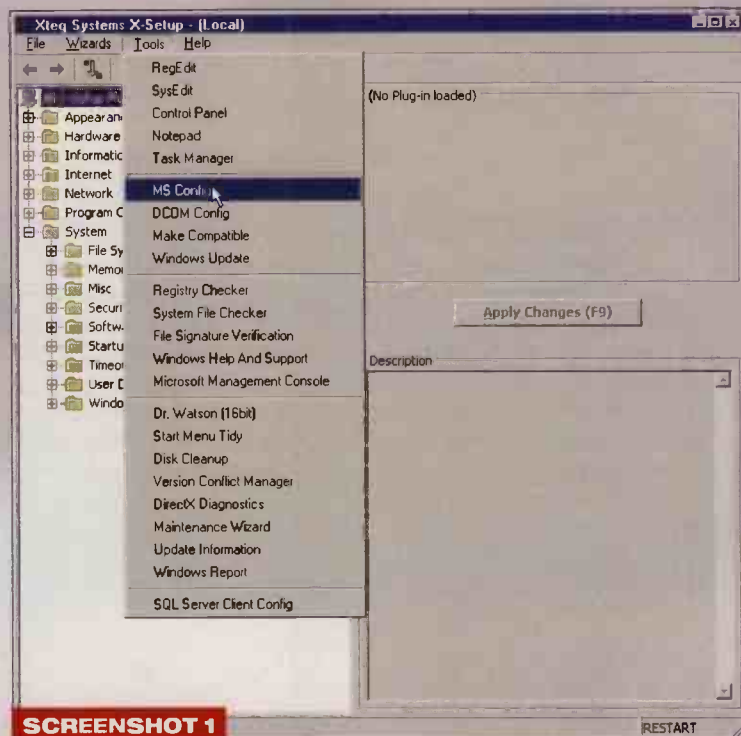
There are two ways of using X-Setup: the wizard and plug-in modes. Wizard mode is designed for softies, and takes you through a cascading menu leading to a familiar-looking multiple-choice sequence. The first wizard on the list is one to configure the colours of the Blue Screen of Death (BSOD) – a trick we covered in December 1999. Other familiar friends include customising the OEM information seen in System Properties (March 2001). There's a lot that duplicates Tweak UI, some of which, such as the Autostart CD wizard, gives added choices, which include what program you use to Autoplay music CDs – again, a subject we tackled manually as recently as February.

Some of the features are covered elsewhere in Windows 98 and Me. This includes two wizards that control what is loaded on start-up, which we've tackled with the System Configuration Utility. Other stuff, such as configuring the sounds AOL makes, is completely new, although I am heartily sick of hearing a female voice say 'Au revoir' every time AOL spontaneously disconnects itself (which is often).

A very useful separate menu provides one-stop access to just about every Windows tool and diagnostic there is, including the System Configuration Utility, DirectX diagnostics, and even old 16bit Dr Watson, whom I assumed had retired from practice years ago.

Readers of this column will probably skip the wizard stuff in favour of the plug-in mode. This is far more direct, with a tree-like structure of items on the left, and the associated options on the right. Once

X-Setup links to those hard-to-find Windows tools



SCREENSHOT 1

again, the same areas are covered as in Tweak UI, but there's a lot more. To take one example, even with 'Show file extensions' enabled in Windows Folder Options, some extensions, such as .lnk (shortcuts) or .url (web links) are never shown. X-Setup will let you show these.

There's much more, and I could waffle on for the entire column about X-Setup, but I'm just going to mention one more thing. 'Plug-in' in this context means exactly what you think: X-Setup can have its functionality extended by third-party

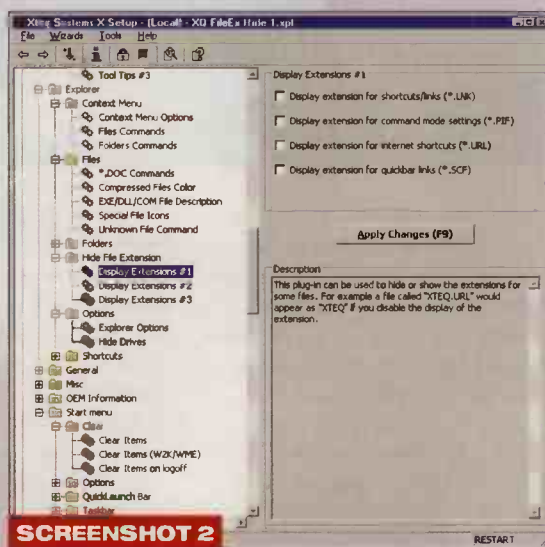
contributors. There are many extra plug-ins available that do anything from forcing a Windows log-in (so you can't just hit the Cancel button) to killing off Microsoft Office Assistants one by one (Yessss!). If you can't find the plug-in you are looking for, then download the X-Setup Software Developer's Kit (SDK) and create your own. Like X-Setup itself, the SDK is completely free.

Fax FAQ

Personally, I gave up using fax some time ago. I've never had a standalone fax machine, and the concept of rendering a page of text as a bitmap, sending the bitmap over a phone line, then printing it out as a grainy low-res mess has never really captured my imagination. However, some readers of this column may like faxing and being faxed – or, more likely, they have to deal with people who have yet to get to grips with email.

Windows 95 came with fax capabilities built in, but these got shuffled off into the sidelines of Windows 98. However, they are still available in both the first and second editions. If you look on the CD-ROM under Tools\oldwin95\message\intl you will find a text file that explains how to install fax capabilities, so I won't duplicate that information here.

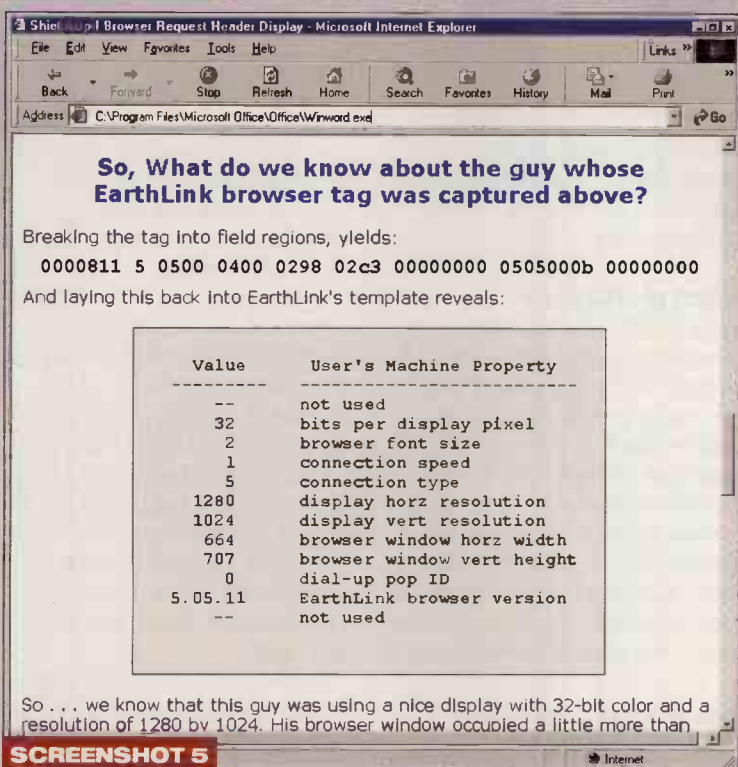
The X-Setup plug-in mode reaches the parts that Tweak UI can't



SCREENSHOT 2



SCREENSHOT 3



SCREENSHOT 5

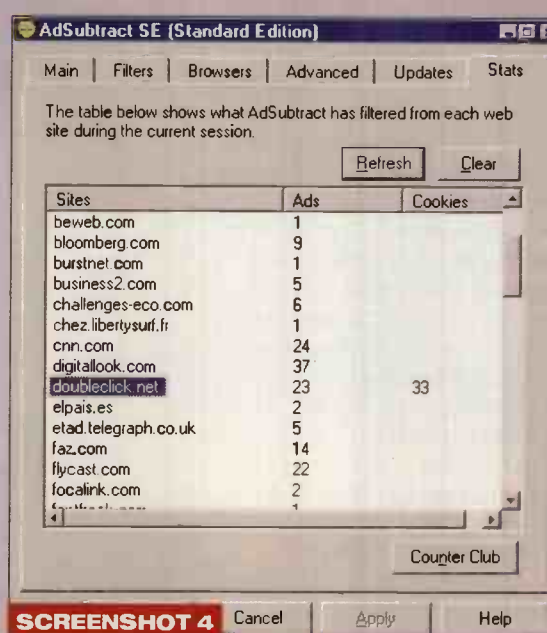
Windows Me users don't have this, however. What they do have is a trouble-shooter entitled 'Microsoft Fax Not Supported on Windows Millennium Edition'. This actually connects to the Microsoft KnowledgeBase where an article tells you that you shouldn't even think about trying to sneak that old Windows 98 or 95 fax on to Me as it's incompatible; your computer may stop responding; you may lose data; and that 'this behaviour is by design', which is Microsoft's ever-so-polite way of saying 'up yours'. So, what's the alternative?

The 'acknowledged market leader' is Winfax Pro. This will set you back around £55 and 57MB of disk space, and it does everything. But if you don't want to dedicate so much of your hard disk and wallet to faxing, or you just want to send

and receive faxes, then a popular choice seems to be Mighty Fax. It costs \$19.95 (around £14), involves a 1.6MB download and is available for a 30-day free trial from www.rks-software.com/mfinfo.htm.

Cookie update

The warning on cookies in April's column struck a wide resonance. Matthew Finch wrote that he also had paranoid tendencies, and ran Zone Alarm and Norton Anti-Virus to protect his system from the 'unscrupulous nasties that lurk around the Internet'. In addition, he uses a nifty utility called Cookie Pal, which you can find at www.kburra.com. This prompts you each time you visit a new site and a cookie is offered – you can block by site or by session. It builds up an editable list of which sites are allowed or



SCREENSHOT 4

Above right:
When it comes to cookies DoubleClick takes the biscuit

Above Left: For fax sake – cheap and cheerful for Me users

Left: Earthlink gets the OK from GRC – and the hard way to run Word

disallowed from tendering cookies, and makes it easy to block offerings from advert servers such as DoubleClick. It costs Aus\$15 (about £5.25) and there's a 30-day free trial. Ron Lowenbein suggested Cookie Manager, by Pierre-Marie Devigne, which is available from <http://home.nordnet.fr/~pmdevigne/>. This manages existing and new cookies and is free.

Bob Andersson has developed his own application, Burnt Cookies, to deal with the problem, and you can find this at www.andersson-design.com/bcookles/. With the correct options set, this will only prompt you if it thinks you have received a cookie from a third-party (ie not from the website address you have requested). It will also silently delete any cookies from sites you have added to your 'Burn List' and let you manage cookies already on your system.

Finally, veteran *Hands On* correspondent Bob Monroe recommends AdSubtract, which you can find at www.adsubtract.com. I have been using this for several weeks now, and it will block adverts as well as cookies, on a global basis or by site. In the free 'light' version, you can have up to five custom sites, which makes it easy to just block DoubleClick and similar cookies. A 'pro' version adds more options, and will also block Java applets, animations and background music. A log of an Internet session shows just how persistent these things can be: in three hours of surfing news sites, 33 attempts to lodge a DoubleClick cookie were made.

Is no rat – is hamster

However, just as one has that comforting feeling of being ahead of the game, along

comes the Supercookie. This sounds rather like those giant mutant rats that have developed an immunity to poison and are lodged in the Channel Tunnel from whence they will emerge to take over the world. The scare story this time concerns the Earthlink web browser. In late March, a group of researchers at Steve Gibson's GRC site discovered that the users of Earthlink's browser appeared to be receiving a unique and persistent tag which was presented to every website, advertiser, and tracking bug that the browser came into contact with.

Here's a sample tag:

```
User-Agent: Mozilla/4.0 ✓
(compatible; MSIE 5.0; ✓
Windows NT)
::ELNSB50::00008115✓
05000400029802c300000000✓
0505000b00000000
```

(Key: ✓ code string continues)

Running a search on 'ELNSB50' shows that there are thousands of these tags at large, and that users are apparently leaving clear trails behind them. Gibson and his crew swung into action and asked Earthlink exactly what was going on. And it turns out that there is a perfectly innocent explanation.

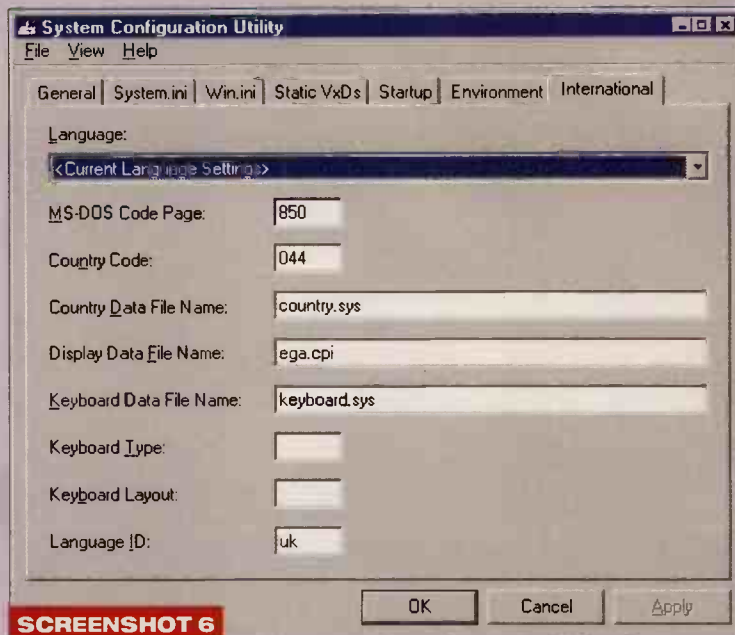
The 'serial number' is not a unique identifier but a summary of non-sensitive information about the user's PC and installation. For instance, the template used by Earthlink reveals that the user above has a 32bit display, medium fonts, a connection speed in group 1 and connection type of 5. The horizontal resolution is 1,280 (that's the 0500 bit in hexadecimal) and the vertical resolution is

Supercookie is not, after all, a hideous, giant, mutant rat - it's a cute, harmless, gormless hamster

1,024 (0400H). The 0298 and 02c3 give the window size, again in hex, and the next eight digits are all zero. This section is reserved for the dial-up pop ID, so this person wasn't using a dial-up connection; they were connecting via cable or DSL. The 0505000b gives the version of the browser and the following zeros are not used.

Having examined the evidence, and a number of such tags, Gibson confirms that it all checks out as per Earthlink's explanation. However, he does observe that it is 'perhaps unfortunate that every web server on the planet is sent this information for every request made by any

Goodbye
config.sys, hello
msconfig.exe



SCREENSHOT 6

Earthlink user'. So, this alleged 'Supercookie' is not, after all, a hideous, giant, mutant rat - it's a cute, harmless, gormless hamster.

A test of character

March's mention of ansi.com and character-based screens brought more feedback. The first big problem is that many people were unable to find the animated *Star Wars* masterpiece at telnet blekko.com. For those of you who asked 'What am I doing wrong?' the answer is nothing - blekko.com appears to have gone belly-up.com. My heartfelt thanks, therefore, to Roderick Starksfield, who has found the animation at www.ascimation.co.nz. This version - though again strictly

to the International section, and make sure that the Code Page is 850, the Country Code is 44, and the Language ID is UK. And no, I don't know how to get a Euro symbol in a DOS session.

Here's a wonderfully daft tip, straight from the horse's mouth - the horse in question being the Microsoft Windows Me website. Do you know that you can run programs from the address bar in Explorer or Internet Explorer? Next time you are surfing the web, and want to run, say Microsoft Word, then just type in C:\Program Files\Microsoft Office\Office\Winword.exe. How that beats clicking on a shortcut I'm not sure, but maybe it's just one of those 'because it's there' things.

A rather more useful tip is that when dragging a file you can expand the tree on the left of the Explorer window by holding the file above a folder. In the fullness of time the subfolders will appear. Both these tips also appear to work in Windows 98.

Finally, a quick tip that sounds obvious once you've heard it, but has saved my bacon on many occasions. If you're not really sure what you are doing in the deeper recesses of a Windows dialog, take a screenshot by pressing the Alt & Print Screen keys before you alter any settings. Paste this into your usual bitmap editor (Windows Paint will do just fine) and save it as a visual reminder of the way things were.

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. Please do not send unsolicited file attachments.

character-based - can be viewed in a normal browser. Roderick added: 'It would appear to be the whole film! I watched about 15 minutes and only got to where Luke met C3PO.'

On a related matter, Chas Gaskin was unable to get the UK keyboard layout in MS-DOS boxes under Windows Me, and therefore couldn't get characters such as the pound sign. So, he asked, as there is no config.sys file in Windows Me, how do you solve this problem? The answer is that it's tucked away in the very wonderful System Configuration Utility, which is probably easiest to get hold of by typing msconfig.exe into the Start, Run... box. Go

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(OEM part numbers for reference only)



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	extra black £1.75 or colour £2.85
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	extra black £11.49 or colour £7.95

Ref:		Comp	OEM
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BC-05	Tri colour	-	17.95

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Epson Ink Jet Print Media

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OEM Hewlett Packard Ink Jet Cartridges

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51625A	Colour	21.25
51626A	Black	20.95
51629A	Black	20.95
51645A	Black	20.95
51649A	Colour	20.45
C1823D	Colour	23.75
C6615D	Black	22.50
C6578D	Colour	25.25
C6614A	Black	21.25
C6625A	Colour	24.75

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51629A	Black	12.75
51645A	Black	12.75
C1823D	Colour	15.75

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Add Delivery	5.95	Call

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- FREE Media http protocol Streaming
- FREE Web site logging and statistics

Domains from £4 pa/\$6 pa inc. InterNIC/Registrar fees

.tv .com .net .co.uk
.vg .tc .ac .nu

Dalliances with drivers

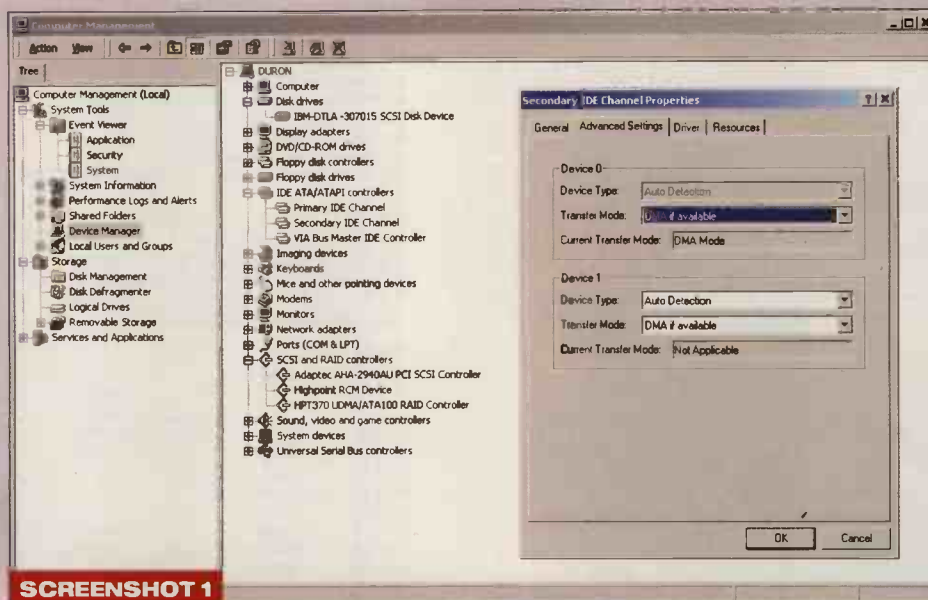
As we await the launch of Whistler beta 2 Terence Green checks out SP2 and some improved drivers

By the time you read this the sun will be beating down (we hope!) and the Whistler beta 2 (Windows XP) that was released as we went to press will be in circulation, with product release due in the early autumn. Windows XP (see feature p130) is the long-awaited point at which DOS-based Windows 95/98/Me is subsumed into NT-based Windows 2000. Convergence has been promised many times before. Had it happened on schedule there would never have been a Windows 98 or Me, but this time it seems to be real. Windows XP Home and Professional editions will ship first, with Server versions following later. Users of Windows 2000 should avoid the Home edition. Aimed at consumers, it will effectively downgrade Windows 2000 Professional by dumbing down the interface and capabilities.

Windows XP Professional edition is a potential upgrade option. It has the new interface, some networking improvements including a basic personal firewall, and much-enhanced support for digital media. The big question is whether the benefits are sufficient to encourage Windows 2000 users to upgrade right away. If you must be seen to be using the latest interface you don't have a choice, but if you already have Windows 2000 running sweetly, you might want to wait a while. Hanging back for the first few months after Windows XP's release will also give the Windows Product Activation anti-piracy device time to prove itself a disaster area or not, as the case may be.

My personal recommendation to Windows 2000 users considering an upgrade to Windows XP is to buy more RAM. That isn't to say that Windows XP is a RAM hog, but all those new features have to go somewhere, and the more real memory you have the more responsive your system will feel.

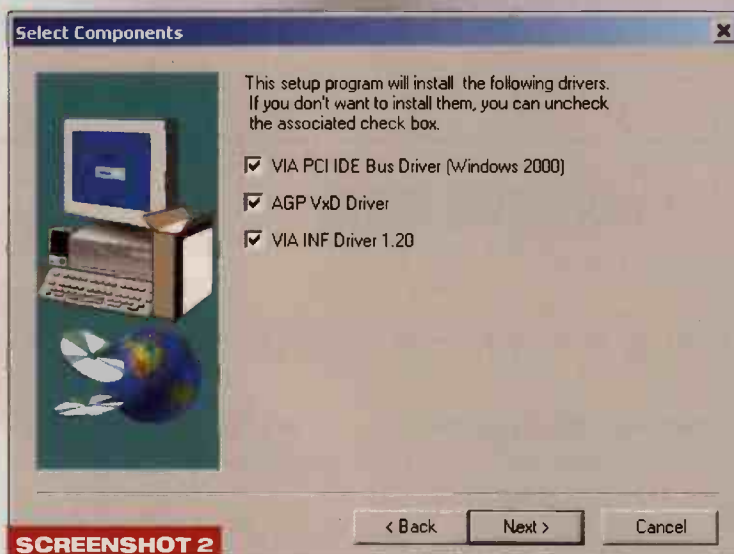
In the race to release beta 2, Windows 2000 Service Pack 2 slipped again but should arrive before this copy of *PCW* hits the doormat. As always, wait a while and see what others say about it if your Windows 2000 PC is your only computer, and the one on which you depend. Although Service Pack 2 had a long beta test cycle, new quirks always turn up when software gets into the hands of real people. The absence of support for UltraDMA100 drives has been a long-running saga in this



SCREENSHOT 1

Above: After installing the new VIA EIDE driver DMA could be switched on for the CD drive

Right: You can choose to install only the new VIA EIDE driver if you like



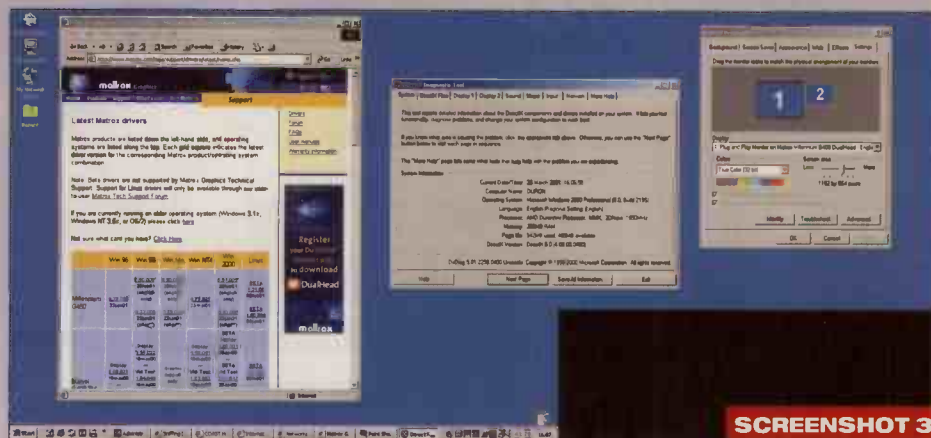
SCREENSHOT 2

column. Service Pack 2 includes a fix for this. An early, untested version of this fix can be downloaded from the link in the KnowledgeBase article at <http://support.microsoft.com/support/kb/articles/Q260/2/33.ASP>, but it's best to wait for SP2.

If you have a VIA chipset and apply the VIA 4-in-1 drivers mentioned below, you do not need to install the Q260233 Hotfix. Remember also that the UltraDMA100 deficiency only affects standard motherboard interfaces, the Primary and Secondary EIDE channels under the 'IDE ATA/ATAPI Controllers' heading in Device Manager. Third-party controllers with their own drivers, such as HighPoint and Promise, shouldn't be affected as they

install under the 'SCSI and RAID Controller' heading in Device Manager.

There's some good news at last for those of us with VIA chipsets. VIA has shipped an improved set of Windows 2000 drivers in the VIA 4-in-1 version 4.29 chipset drivers, which can be downloaded from the official www.viatech.com site or the unofficial www.viahardware.com. After installing the new Busmaster EIDE driver that comes in the 4.29 driver set, I managed to enable DMA on my CD and CD-R drives for the first time (screenshot 1). It doesn't make a huge difference to performance but it's the principle that matters! Unfortunately for readers who placed their faith in my powers of



SCREENSHOT 3

prediction, IDTool is nowhere to be seen, while the old familiar SETDMA utility remains firmly ensconced in the 4.29 4-in-1 driver set. VIA occasionally releases separate versions of the EIDE drivers and IDTool appeared in a 3.11 beta release. This can be found on www.viahardware.com underneath the 4-in-1 drivers, but it didn't make it into the official release of 4.29. The official EIDE drivers work well but do not support IDTool so it's best left aside as a curiosity.

Excellent news, too, for those of us with Matrox G400/G450 DualHead display cards – Matrox now has a workaround that enables true independent DualHead displays (see screenshot 3). Now you can run two monitors and adjust the display settings for each independently of the other, instead of being limited to stretching one display over the two monitors. This feature was first implemented with the version 5.51 drivers released at the end of February. In order to achieve this miracle, Matrox has worked around a Windows 2000 limitation (a single video chip cannot support two displays) by installing the drivers twice.

After installing the 5.51 drivers you will see two entries for the Matrox under the

'Display' heading in Device Manager. Because of the way Matrox implements independent displays, it's very important to follow the installation procedures exactly and to use the Matrox uninstall utility to completely remove all traces of previous Matrox drivers before installing the 5.51 drivers. Full instructions are provided with the drivers at www.matrox.com/mga/support/drivers/latest/home.cfm.

After a month in use the 5.51 drivers have proved reliable and only slightly buggy. On a few occasions the display has dissolved and I've had to reboot, but apart from that the only problems have been the limitations. Those include a maximum refresh rate of 85Hz, no Direct3D hardware acceleration, no hardware OpenGL support, and no support for flat panels or TVs as the second display. Matrox says these limitations will be removed in future releases of the drivers.

Windows 2000 compatible

Reader Nils Andreas Erstad unfortunately discovered the hard way that one should always consult the Windows 2000 Hardware Compatibility List at

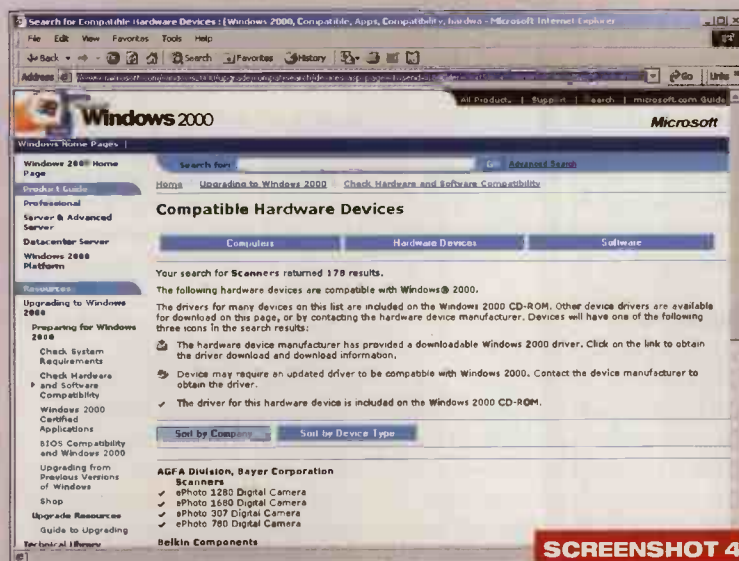
New Matrox G400 DualHead drivers support true independent displays

www.microsoft.com/windows2000/upgrade/compat/ before buying new hardware for Windows 2000 (see screenshot 4). After upgrading from Windows 98 to Windows 2000 he ran into a problem with his Agfa SnapScan 310 and was told that Agfa doesn't plan to produce Windows 2000 drivers for it.

So Nils bought an Agfa SnapScan e40 USB because, as he says, it had a Windows 2000 badge on the box. But, after installation, he discovered that the Agfa e40 software can only be used when logged in with administrative privileges. This problem typically occurs when software does not have an installation routine that conforms to Windows 2000 requirements. The installer either adds Registry keys or installs software components to locations that are only accessible to users with administrative security privileges. Usually this happens when the vendor supplies Windows 98 software on the assumption it will work with Windows 2000. Sometimes it does, sometimes as Nils discovered, it doesn't.

Although Agfa says that the e40 is 'compatible with Windows 2000' this probably means that it has a USB connector and can therefore be detected by Windows 2000. The fact that the box has a Windows 2000 badge on it is *not* a guarantee unless the flying Windows logo is accompanied by the words, 'Designed for Windows 2000 Professional'. If it says that, then the product should be on the Windows 2000 Hardware Compatibility List. The Agfa SnapScan e40 is not.

The quickest way to work around a problem like this is to use the free FileMon and RegMon utilities from www.sysinternals.com to find the file or Registry locations the program is unable to access when being used under an ordinary user login. If you can pinpoint these locations, you can change the security permissions to enable access for the Everyone group. In order to locate the points where the scanning software is being denied access you log on as a regular user but use RunAs (hold the Shift key and right-click on the executable) to run RegMon and FileMon with administrator privileges. You will also need to enable a few filters in order to limit the extraneous output of RegMon, which might mask the 'Access Denied' bits you're looking for.



SCREENSHOT 4

Always check the Windows 2000 Hardware Compatibility List before buying new hardware and software

CONTACTS

Terence Green welcomes your comments on the Windows 2000 column. Contact him via the PCW editorial office or email: win2000@pcw.co.uk. Please do not send unsolicited file attachments.

Batten down the hatches

NT4 was designed as a secure OS, but you have to do the hard graft, says Roger Gann

We've covered quite a few things in the NT column but something we haven't really dwelt on is the operating system's much vaunted security features. Microsoft was justifiably proud back in December 1999 when NT4 received an Orange Book security rating of C2. This is a basic security rating that is one of several evaluations awarded by the National Security Agency, based on its Trusted Computer System Evaluation Criteria, or Orange Book.

Sounds impressive, huh? Well, no, actually – the claim was resoundingly debunked by security guru Bruce Schneier of Counterpane. In his excellent book, *Secrets & Lies*, he says: 'Microsoft made a big deal about Windows NT getting a C2 security rating. They were much less forthcoming with the fact that this rating only applied if the computer was not attached to a network and had no network card, and had its floppy drive epoxied shut, and was running on a Compaq 386.' And switched off – no, I just made that last bit up! To be fair, he was equally scathing about Solaris as well!

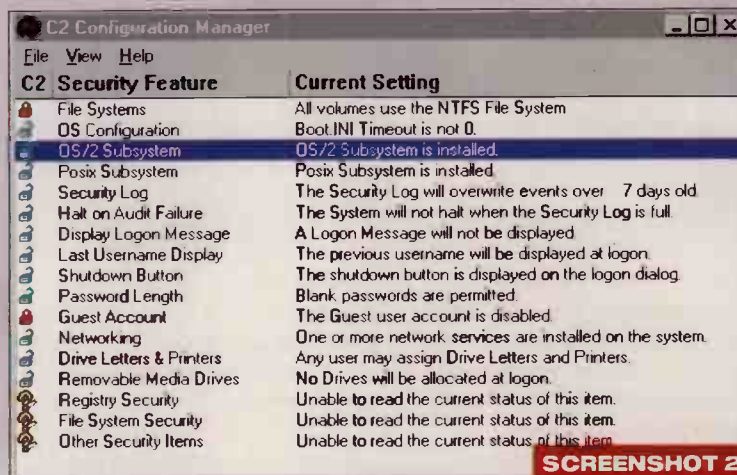
Nevertheless, NT was designed as a secure operating system, more or less. There are provisions to make NT a very secure operating system, such as privilege levels in separate user accounts, file permissions and kernel object access control lists. However, the configuration that makes NT secure is a long way from the default installed one, and Microsoft admits this. You have to make a surprisingly large number of security checks and modifications to NT to make it safe. Put bluntly, NT could be secure, but Microsoft refuses to ship the OS in that condition.

Battening down the hatches

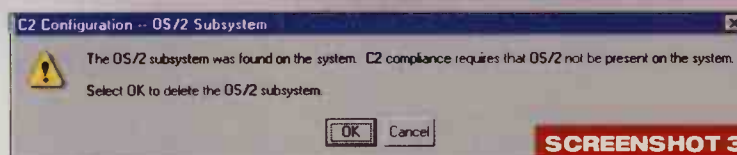
So, what are the changes that need to be made to NT to make it resistant to attack, to make it more secure? For my subject I'm going to pick a particularly vulnerable NT machine, an NT server running Internet Information Server (IIS), permanently connected to the Internet and acting as a web host – it doesn't get any more exposed to risk than that!

The trick here is to turn your vulnerable web server in to what's called a 'bastion host' – calling on ancient castle terminology, this means a hardened node

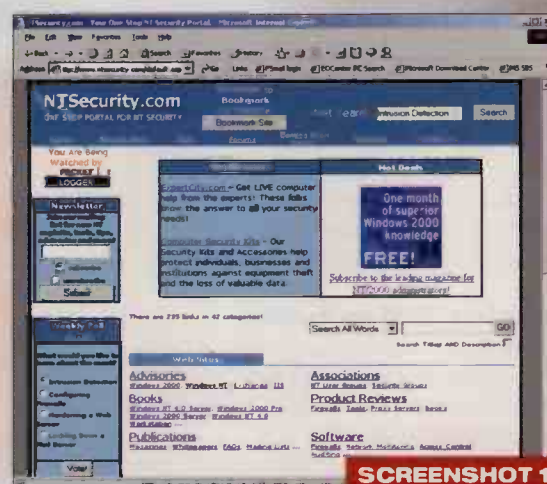
You will need to disable the OS/2 subsystem – and audit the bastion host system with the C2 Configuration Manager



SCREENSHOT 2



SCREENSHOT 3



SCREENSHOT 1

Check out the NT security sites, such as NTSecurity.com, to keep your server absolutely up to date

on your network, a critical strong point in your network's security that is exposed to attack. Examples of bastion hosts include web, DNS and FTP servers. Because of their extreme exposure and hence vulnerability to attack, they have to be made especially resilient. Here's how to rustle up a bastion host.

Installation

It's best to start with a clean slate, so we'll install NT4 Server on a freshly formatted hard disk. This must be disconnected from any public network, and preferably from all networks. This is simply to prevent any hacking while it's in a vulnerable state. Avoid a dual-boot configuration and be sure to select NTFS as your file system –

under no circumstances select FAT. NTFS is what's known as a 'journalled' file system, with extensive logging and error checking to ensure consistency. When the install is complete, remove all extraneous Windows programs except, say, Notepad and WordPad – the rest won't be needed.

On the networking front, be sure to install only the TCP/IP protocol and no other network services. Also, configure it as a standalone server because it can't be a member of a domain for security reasons.

Obtain and install Service Pack 6a at this point. You're given the option of backing up the files it overwrites to permit an uninstall at a later date – avoid this if possible but if you do want to keep a hold of the uninstall files, move them off the server. Install additional features such as the Option Pack in order to get IIS. Don't forget, if you add any services or features later, you'll need to re-apply the Service Pack. Check to see if any hotfixes are available; if there are, download and install them.

You need to keep this server utterly up to date with regard to security patches and updates, so you ought to keep a weather eye on the various NT security sites, such as Windows IT Security (www.windowsitsecurity.com), NT Security (www.ntsecurity.com) (see screenshot 1), NT BugTraq (www.ntbugtraq.com), the SANS

Institute (www.sans.org) and Microsoft at www.microsoft.com/security.

Strip down the configuration

There's an awful lot of excess baggage in NT's default configuration, baggage that could be potentially useful to an intruder. And if it isn't needed, it has to be dispensed with. So, open up the Network applet in Control Panel, head for Services tab and start wielding the knife. You should remove the following services:

NetBIOS interface
Workstation service
Server service
Computer Browser.

This should leave you with just RPC Configuration.

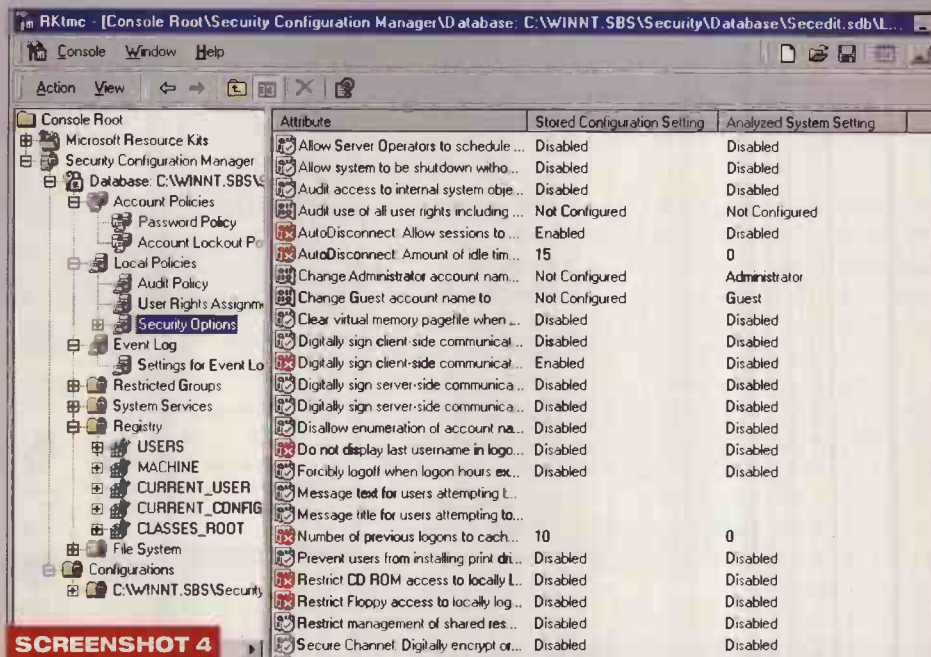
Next we have to dispense with the User Manager for Domains, usrmgr.exe. Instead, we need to copy over the NT4 workstation copy of User Manager, musrmgr.exe, and use that. Why? Because the User Manager for Domains won't work if the Workstation service is removed.

You should also disable NetBIOS over TCP/IP. Do this by removing all the bindings to it, so first unbind the WINS client from all network interface cards (NICs). Then disable the WINS client for TCP/IP in Control Panel – open Devices, select WINS Client, click the Startup button and select Disable. This closes the ports 137-139 NetBIOS loophole.

Microsoft made a big deal about NT getting a C2 security rating... but this only applied if the computer was not attached to a network

Stay in Control Panel and turn your attention to the Services applet. We have to go to town here, disabling all those 30 or so services except the following:
Event Log
NTLM Security Support Provider
Plug and Play
Protected Storage
Remote Procedure call service
Schedule
UPS – if you have one, that is.

We now need to disable the Load Web Check process and the Network DDE agent process by editing the Registry at: HKLM\SOFTWARE\Microsoft\Windows\CurrentVersion\Browser\WebCheck and at: HKLM\SOFTWARE\Microsoft\WindowsNT\CurrentVersion\Winlogon\UserInit.



SCREENSHOT 4

Strip components

As we have no need for them and they could provide ammunition for intruders, we also have to disable the DOS, Win16, OS/2 and POSIX subsystems, so remove the Registry entries for OS/2 Warp 4.0, POSIX and WOW at: HKLM\SYSTEM\CurrentControlSet\Control\SessionManager\Subsystems.

Set the entry at: HKLM\SYSTEM\CurrentControlSet\Control\SessionManager\Subsystems\Optional to 00 00.

The SCE gives you a snapshot of all your security settings – check out the MSSCE folder in SP4

Your new bastion host system should be audited with Microsoft's NT Resource Kit's C2 Configuration Manager (see screenshot 2). If you haven't bought NT's Resource Kit, you may want to, since it contains many useful tools for NT, from security tools, to disk utilities, as well as manuals on how to run certain aspects of the operating system. Microsoft publishes a Windows NT C2 Configuration Checklist at www.microsoft.com/technet/security/C2config.asp.

It's also a very good idea to make use of Microsoft's Security Configuration Editor (SCE), which is an MMC snap-in that allows you to edit a wide range of security settings in one place. Once this is installed it gives you a global snapshot and analysis of all your current security settings. The utility comes bundled with a range of predefined security templates, offering three levels of security for workstations, servers and domain controllers. In addition it lets you create custom templates for use on other servers. I installed my copy of SCE from the SP4 CD-ROM – it's in the MSSCE folder (see screenshot 4). Refer to www.microsoft.com/TechNet/winnt/Winntas/technote/scmnt4.asp for more details on this very useful utility.

Anyway, that's enough on bastion hosts for this month – we'll look into yet more security next month!

CONTACTS

Roger Gann welcomes your comments on the Windows NT column. Contact him via the PCW editorial office or email: nt@pcw.co.uk. Please do not send unsolicited file attachments.

TCP/IP configuration

We also need to tighten up our TCP/IP settings and we do this by enabling the TCP/IP packet-filtering tool, TCP/IP Security. To do this, open Control Panel, double-click on the Networks applet, select Protocols, TCP/IP, Advanced, Enable Security and click on the Configure button. The suggested settings are – Permit All TCP Ports, Permit Only UDP ports – None and Permit Only IP protocols – None.

Many of the steps I've outlined are examined in more detail at Stefan Norberg's website, which is at <http://people.hp.se/staor/hpntbast13.pdf>. Finally, check out the Windows NT4 Security FAQ at www.it.kth.se/~rom/ntsec.html.

Compiling that code

Turning source code into binaries is a simple matter of DIY, as Chris Bidmead explains

Several of your emails (keep 'em coming) complain that some of the newer applications I mention in these columns aren't available as pre-packaged binaries, and the only way to get the latest version is to download the source code and compile it yourself. I gather that some of you don't feel up to this, while others who have bravely tried have run into insuperable obstacles.

Don't panic! If you haven't tried compiling before, my advice is simply to give it a go. There will be plenty of time for panic afterwards.

Why compile? Because the ability to turn source code into binaries on your own system is one of the single most powerful features of a fully-fledged Unix system. It's the difference between being a couch-potato living on junk food and a gourmet with a fully equipped kitchen.

In fact, with a free software Unix implementation like GNU/Linux, I'm inclined to put on my hardcore hacker's hat and argue that it should probably be seen as the standard way of installing new software, with RPM or DEB binary packages as the fallback. Incidentally, I'm not a hardcore hacker myself – I just have the hat – but I hope you'll see my point when you've read what follows.

Binary packaging systems do a couple of really useful things: they ensure that all the dependencies (this binary can't run without these libraries) are in place, and they make it as easy to take applications off the system as to put them on. They're also capable of running pre-installation and post-installation scripts that prepare the ground for the installation and clean up afterwards. But properly organised source tarballs can do all these things too.

I'll admit that many of the source tarballs you're likely to come across will be in a fairly ragged state. This isn't because the authors are lazy, or out to get you. In the white heat of development there may not be time to add refinements like configure – the author just wants to get the code out there so others can test it. If you're not keen to be at the cutting edge, it might be a good idea to avoid this kind of source code.

However, best-case source tarballs can be almost as easy to install as their binary package equivalents. They'll take a little or a lot longer, because the source

RPM makes it very easy to install binary packages, and GUI versions like GnomeRPM make it even easier. But you'll learn a lot more about your system if you descend below the GUI, at least from time to time

Here's another GUI for RPM, Mandrake's own RPMDrake. Binary installations are fine for absolute beginners, but installing and compiling source code is well within the reach of the ordinary user, thanks to the Autoconfig tool and the scripts it generates

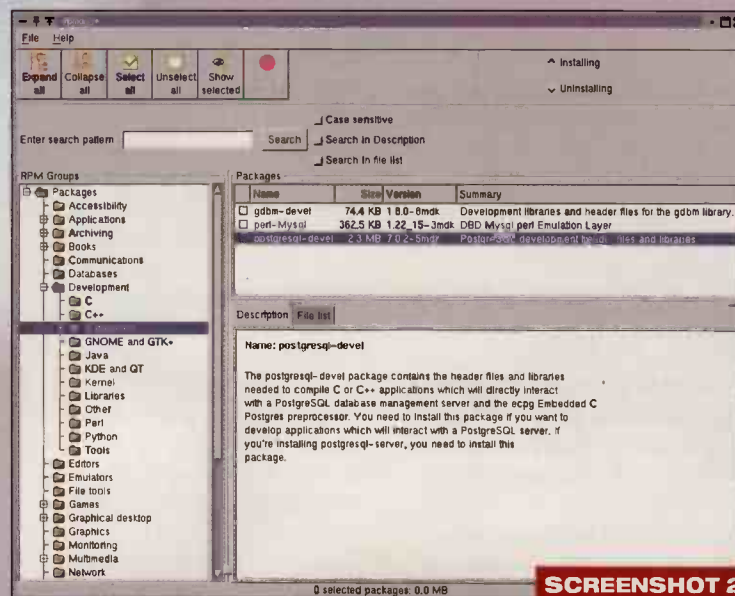


SCREENSHOT 1

has to be turned into binary on your system. But their huge advantage is that each source package can be cross-platformed. This means it will work for many different operating systems using the same processor, or even across different processors.

During the 30-year history of Unix there have been many attempts at achieving this nirvana of cross-platform packaging. But arguably the most widely used today, and easily the best, is the GNU programming utility autoconfig, written by David MacKenzie of the Free

Software Foundation (FSF). In the early 1990s MacKenzie was responsible for testing the source code for the GNU suite of software tools across multiple platforms. He began by writing a configure script for each tool. The script would know the requirements of the source code for that particular tool, and would test the environment it was running in to see what resources were available on that specific platform. Then it created compiler configuration scripts that matched these requirements and resources.



SCREENSHOT 2



SCREENSHOT 3

A lot of manual cutting and pasting went on as MacKenzie generated scripts for each tool. The sensible thing, surely, he thought, would be to delegate this job to the computer. Thus began what MacKenzie calls in his quasi-Biblical chronicle of the project 'the journey from the slavery of hand-written configure scripts to the abundance and ease of Autoconf' (See the History chapter at www.gnu.org/manual/autoconf).

Autoconf is a tool the source code author can use for producing special shell scripts that will be bundled with the distribution tarball. When these scripts are run on the target machine (the end user's own computer) they will automatically

to see whether there are any 'auto-confiscated' (MacKenzie's word for it) tarballs in there by changing to this directory and running this one-liner:

```
$ for A in *.tgz *.tar; do
  tar -tzf $A | grep -q configure.in; done
```

(Key: *q* code string continues)

tgz and tar.gz are the two commonest suffixes for tarballs, so what we're doing here is taking all the filenames that fit this description (\$A) and running tar's list (t) function on them to see what files each tarball contains. The z is necessary here because the tarballs have been compressed. Then we pipe the output of that through the search tool, grep,

Unfortunately, the only software available for the Creative DAP runs on Windows or the Mac – at the moment. Until free software versions become available, VNC provides a valuable standby for Linux users

can dispose of the subject in three very short steps.

- 1) Untar the tarball (`tar xzf <tarballname>`) and change into the resulting directory.
- 2) Type `./configure` and watch the script check out your system, printing a one-line message for each check 'so the user doesn't get too bored' (MacKenzie).
- 3) When that's done type `make`. The compiling system will read the config files generated in step 2 and create your binaries.

Job done. For convenience, there may be an optional `make test` you can do to ensure the binaries are working properly, followed by `make install`, which will place the executables in the proper directories for your system.

The Creative DAP

OK, I confess. The other day I installed Microsoft Windows 98 on an old laptop of mine. The nice people at Creative have sent me one of their gorgeous MP3 Digital Audio Players (DAP) in connection with some other stuff I'm writing. The bad news is that it only works with Windows and Macintosh software. A couple of months ago I mentioned I was exploring the idea of covering MacOS X here, as it's a Unix variant, but I've heard nothing from Apple since. So Windows it had to be.

The DAP (silly name – elsewhere in the world it's called the Nomad Jukebox, or NJB for short) has to interoperate with my Unix network. The idea is that the MP3s originate from my CD collection, ripped using Joerg Schilling's excellent `cdrecord` utility on one of my Linux boxes, then go through the Windows 98 laptop and onto the DAP through a USB connector. As I can't connect the DAP directly into the Unix network, I started to view the DAP/Win98 laptop combination as a single external unit. Call it the DapLap.

Looked at in this light, the DapLap is eminently connectable, thanks to Samba, the free software SMB file server (www.samba.org). Samba lets me use Windows' own SMB filesharing to share directories on one of my Linux servers with the Windows 98 laptop. The way I rip go straight to the Samba server, and once they're there I use the lame command line utility (<http://lame.sourceforge.net>) under Linux to crunch them down to 192Kbits/sec MP3s. And from that server I can play them on any MP3 player on the network. Or, of course, pick them up from the DapLap to create music on the move.

Smart readers may notice I've cheated slightly in introducing the concept of the DapLap. To transfer files between the

The ability to turn source code into binaries on your own system is one of the most powerful features of a fully fledged Unix system

configure the source code packages to adapt to the operating system that's running and the hardware it's running on. The generated scripts are designed to work across a whole variety of Unix-like systems, which can even include Windows systems if they have the full Cygwin environment (<http://sources.redhat.com/cygwin>).

I download all my non-kernel source code tarballs into a directory called `/usr/src/other`. I can run a quick check

looking for a file named `configure.in`, which is the special config file generated by Autoconf. Its presence is a pretty sure indicator that the package has been autoconfiscated.

Those are the basics of Autoconf. This is the point where you might expect me to break off and say something like 'next month, we'll walk through some actual examples'. But I won't keep you in suspense – from the target machine's point of view the thing is so simple that we

network and the DAP I still need to be working with the Windows 95 interface. Only if I can do this from anywhere on the network does the DapLap make sense as a single entity.

Happily, though, I can do just this with VNC. We've talked before about this free software from www.uk.research.att.com/vnc, but I'll remind you that VNC (or Virtual Network Computing) is a remote display system which (in this case) can take the whole of my Windows 98 desktop and display it on any other machine on the network that is running VNC client software. You'll see from screenshot 3 how this allows me to control the transfer of files across the USB DAP-Lap link, from a Linux machine.

Even so, it's a serious downer that there's no Linux software for the DAP, and James Ball, Creative UK's marketing manager, told me the company has no plans to develop any. But does this matter? In the case of gadgets like the Palm Pilot the free software community has proved lively and ingenious enough to produce its own software, which sometimes can be more flexible and better than the commercial product. But to do this programmers need information on the interfaces.

Earlier this year Creative launched a Windows-based Software Development Kit (SDK) for the DAP. A kit like this will typically include implicit, and perhaps explicit, information on the interfaces, and possibly for this reason Creative made SDK recipients sign a non-disclosure agreement. Despite this setback, a free software initiative aimed at the DAP has got under way (www.aracnet.com/~seagull/NJB), as an extension of the LibPDMP effort (www.pointless.net/libpdmp).

That's the good news. Now for the very



SCREENSHOT 4

It's the same problem with the Psion Wavefinder, a Digital Audio Broadcast (DAB) radio for your PC. Windows only – but you can control it under Linux using VNC to display the Windows machine on the Linux desktop

(Mandrake 7.2) on my PC. When I write a script and make it executable using `chmod 700 filename`, I get an error message saying 'command not found', just after the command prompt. However, the same example works at university but not on my PC. I'd be grateful for any suggestions.'

This one can be baffling. Using `chmod 700` to set the file permissions will make the file executable (and read-writeable) for the owner only. So the first question we have to ask is, are you running it as the owner? I presume the answer to that is

directories listed in the \$PATH environment variable to find your script. Some people like to include "." in this path (meaning 'the current directory', whichever that may be).

But this isn't secure, and most distros don't do this by default. In this case, the current directory won't be searched for your script. So it'll be 'not found'. If this is what's happening you need to type `./<scriptname>` instead of just `<scriptname>`, to tell the shell exactly where to find it.

Another possibility is that it's something other than the executable script itself that is 'not found'. If it's a shell script it might begin with a 'hash-bang' line that looks like this:

```
#!/bin/bash
```

This means 'invoke bash and use it to run the rest of the script that follows'. But what if bash isn't on your system, or is, but isn't in the /bin directory? Similar remarks apply to any other tools or utilities your script may be trying to invoke. Are they all there?

CONTACTS

Chris Bidmead welcomes your comments on the Unix column. Contact him via the PCW editorial office or email: unix@pcw.co.uk. Please do not send unsolicited file attachments.

A twist that frequently fools people is: 'How can my script not be found, when I've just created it, and I can clearly see it sitting in my directory?'

good news. The buzz in the newsgroups as I write this is that Creative has very wisely decided to scrap the non-disclosure requirement for its SDK. So we can expect the interface information it contains to be filtering down through the free software development community very soon.

Where's my script gone?

Robb Maddocks (robbmaddocks@hotmail.com) writes: 'I've just installed linux4win

yes, because otherwise you would see 'Permission denied' on a typical Unix system.

So the second question is – and this is a twist that frequently fools people coming to Unix from Windows – 'how can my script not be found, when I've just created it, and I can clearly see it sitting in my directory?'

The answer is that the shell that is executing the script will look through the

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A feeling of space

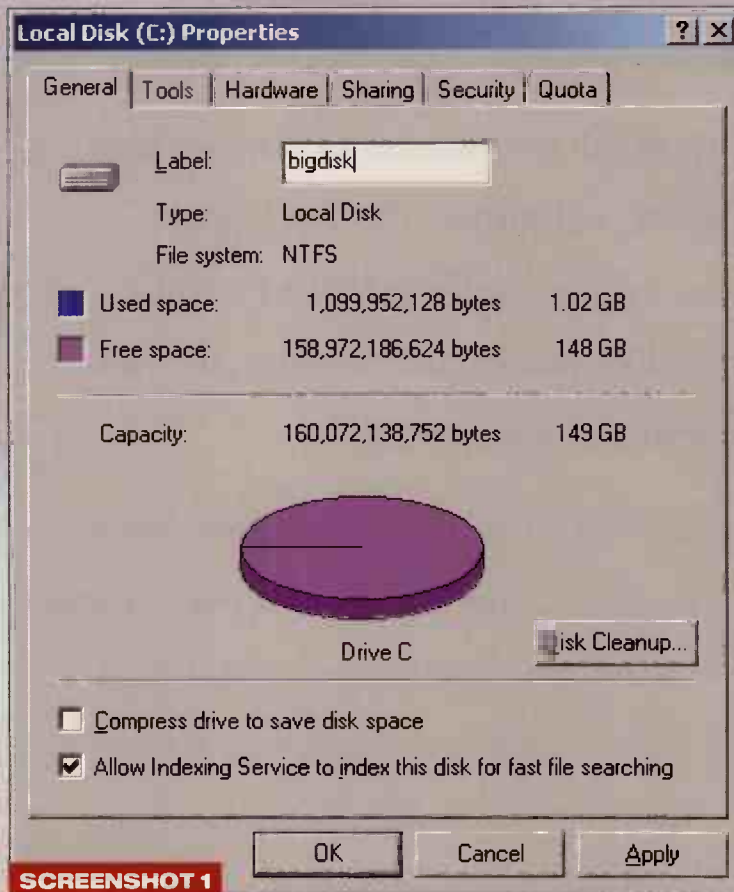
Gordon Laing investigates the pros and cons of RAID striping and mirroring and tests out CAS2 memory

In 1988, David Patterson, Garth Gibson and Randy Katz published a paper entitled *A case for Redundant Arrays of Inexpensive hard Disks*, or RAID for short. It explained how several cheap hard disks could work together to deliver greater capacity, performance and/or fault tolerance. The authors came up with five configurations and named them RAID Levels 1 through 5. In 1993, four more configurations were devised, with the Levels of 0, 6, 10 and 53.

In practice, RAID takes multiple hard disks and makes them act as one higher performing drive. Consequently, even though there may be two or more physical disks in the PC, the operating system sees just one single drive, with one drive letter.

The most common implementations of RAID are Levels 0 and 1, known as striping and mirroring respectively. Striping takes multiple drives and distributes the data evenly between them. Consequently when reading or writing, the system is in fact accessing not one, but two or more drives simultaneously, which theoretically improves data throughput. There's no loss in storage either, with the total capacity equalling the sum of the separate disks – consequently, a pair of striped 40GB hard disks will result in a single 80GB volume,

Wow, look at the size of that disk! With four 40GB disks striped into one RAID array, Windows has 149GB of formatted space to play with!



SCREENSHOT 1

You can combine several RAID levels at a time. If you have four hard disks, you can stripe two then use the second pair to mirror them

which could perform twice as fast as a single disk.

The downside to striping is that RAID and the OS treat the multiple drives as a single volume, so if anything goes wrong with just one of the physical disks, you effectively disrupt the entire volume. Statistically speaking, a pair of striped hard disks relying on each other is therefore more likely to fail than a single disk.

The answer to that is RAID Level 1, or mirroring, where a second hard disk literally makes a copy of everything on the first. If one disk fails, then the other one takes over seamlessly. You can then install a replacement disk, and have the RAID system use this as the new backup volume. The upside is higher reliability

than a single disk, but with little or no benefit in performance. The real downside, though, is that a pair of mirrored 40GB disks will only be treated by the OS as a single 40GB volume, so you'll have paid twice as much just for the additional reliability.

The beauty of RAID is that you can combine several levels at a time. If you have four hard disks, you can stripe two of them, then use the second pair to mirror them. If you started with four 40GB hard disks, you'd now have a single 80GB volume that performs very well, and is reliable too. This is known as RAID Level 0+1, although performance nuts may find the temptation not to stripe all four disks too much to bear.

RAID requirements

Of course, you're going to need something that treats these disks as a single volume, and that's the RAID controller. While it's possible to create software RAID volumes using some server operating systems, it's not advisable in terms of the stress on your CPU and OS itself. It's much better to have a dedicated hardware RAID controller on an expansion card, or integrated onto the motherboard.

If you have two, four or even more hard disks all firing at the same time, the bandwidth of the controller bus becomes very important. This is why, in the past, RAID has been limited to the world of SCSI, where bus bandwidths are traditionally higher. Today, however, the common UltraDMA100 EIDE standard has no less than 100Mbytes/sec of bandwidth at its disposal, and better still, access to hard disks that are much cheaper than their SCSI counterparts.

Consequently, companies like HighPoint, Promise and Adaptec have produced hardware RAID controllers for

EIDE hard disks, and the latest models operate with the full UltraDMA100 bandwidth. RAID chipsets from HighPoint and Promise in particular are being integrated onto more sophisticated motherboards as an additional selling point. For example, Abit's VP6 (dual FC-PGA) and KT7A-RAID (single Socket A) motherboards both use HighPoint's HPT370 RAID controller, which offers RAID 0, 1 or 0+1.

Enter the VP6

While RAID can theoretically support any number of hard disks, the electronic limitations of an EIDE controller restrict support to only four. Since RAID performs at the lowest common denominator, it's also advisable to use identical disks where possible. I took four Seagate Barracuda ATAIII 40GB UltraDMA100 hard disks, at £120 ex VAT each, and set to work.

Setting up RAID

Throwing caution to the wind, I ignored the reliability of RAID Level 1 and opted instead to see what benefits there were to striping two or four hard disks, compared to using just a single drive. Each configuration used Windows 2000 Professional and the NTFS file system. The latest updates were installed, with the HighPoint controller BIOS at 1.0.3b1, and the VIA 4-in-1 driver at 4.29V.

Setting up RAID on the HighPoint controller was extremely simple. Just connect your drives to the appropriate EIDE channels on the motherboard, enter the main CMOS and ensure the RAID controller is enabled and that ATA100RAID is set as one of your boot devices, then press Ctrl & H to enter the specific HighPoint BIOS when instructed.

Within the HighPoint BIOS, simply choose the Create RAID option, then follow

Abit's VP6 motherboard was joined by 256MB of CAS2 P133 SDRAM

Results

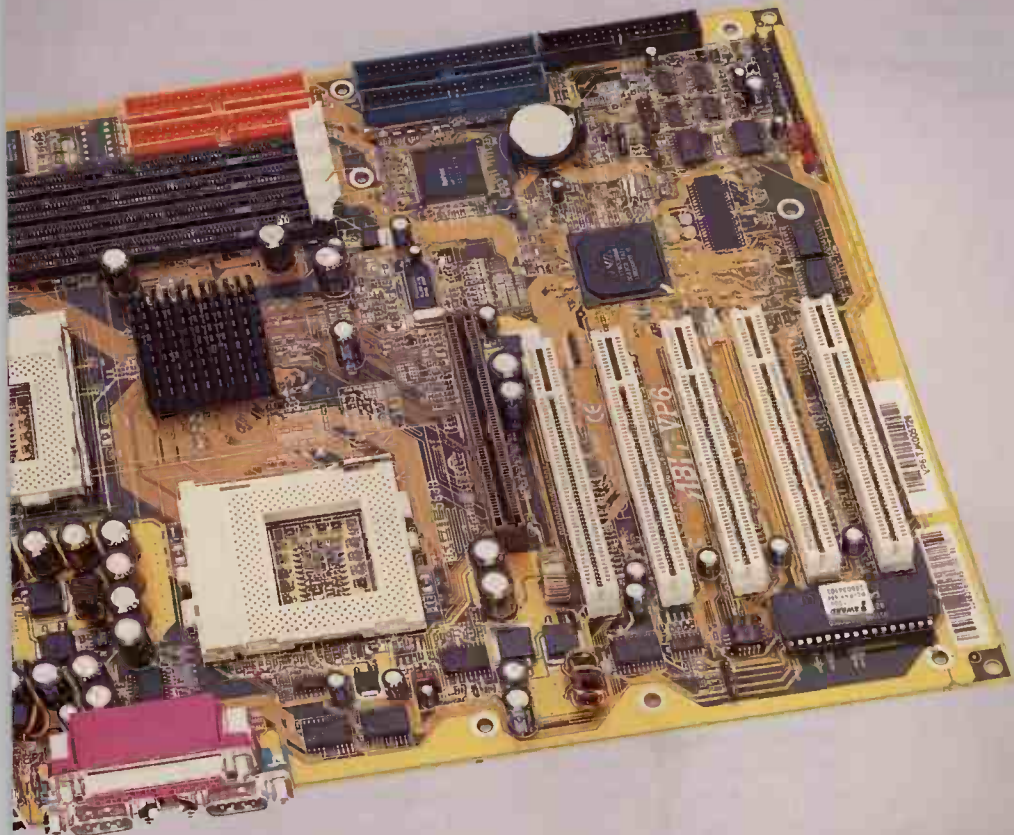
First things first: as I explained earlier, striping two or more disks produces a single large drive. With four 40GB hard disks striped together, Windows saw them as a single 149GB formatted drive (see screenshot 1), which is undeniably huge! Obviously, anyone who requires single huge disks for editing massive video files will see the benefit of RAID striping.

But what about those block sizes? The HighPoint controller offers block sizes of 4, 8, 16, 32 and 64KB, which refer to the smallest amount of data that can be addressed on the array. As far as I understand it, if you choose a block size of 64KB, any file smaller than this will still occupy 64KB of your disk – larger block sizes are therefore less efficient, especially if your typical files are small, but they do offer greater performance. It's up to you, although if in doubt, why not go for 16KB in the middle?

Under SYSmark 2000, a single Seagate disk set up as a normal drive scored 203. Two disks, connected to separate channels and striped with a 4KB block size, scored 190, although testing again with a 64KB block size increased the score significantly to 208. Four drives, striped with a 4KB block size scored 201, which rose to an impressive 215 with a 64KB block size (see graph below).

From these results, I'd say that striping with EIDE RAID certainly offers quite a performance increase, especially with larger block sizes, or with four drives if you can afford it. Striping also gives you a large single volume, which is great for certain applications, although don't forget about the lower reliability, which statistically reduces with a greater number of drives striped. Obviously, disk-intensive applications like database or AV editing work will benefit most from RAID striping.

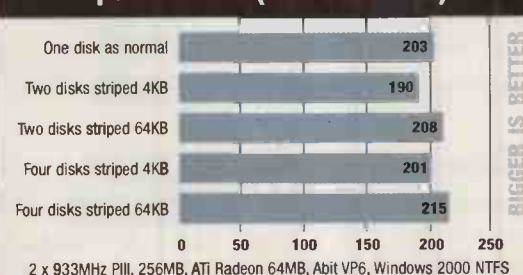
With a striped system I'd certainly back up my data regularly, although the performance geek in me would probably still use all my available drives exclusively in a striped configuration. It's your call, although if you're dealing with a server,



My test system used the Abit VP6 motherboard, a pair of 933MHz Pentium III processors, 256MB of CAS2 PC133 SDRAM and an ATI Radeon 64MB graphics card. With dual CPUs, a hungry graphics card and up to four high-performance hard disks, I used the muscle of an Enermax 431w ATX power supply, bought from www.overclockers.co.uk for just under £100 inc VAT and delivery. Results from the Socket A motherboard will appear in next month's column.

these four steps: first, choose between RAID Level 0, 1 or 0+1 (I chose 0 for striping). Second, select the connected disks you'd like to use in this array. Third, choose the block size (see later), and fourth, start the creation process. Striping is instant, although it will delete any information on your disks, and create a single space that subsequently needs to be partitioned and formatted. Mirroring requires existing data to be duplicated, so it could take some time.

Seagate UltraDMA100/HighPoint RAID performance (SYSmark 2000)



mirroring is obviously the most sensible use of multiple drives. Remember that you can always go for four disks in a RAID 0+1 (striping and mirroring) configuration, giving you the best of both worlds!

At the end of the day, RAID striping offers an excellent performance option for anyone with a suitable controller, especially when you consider that additional EIDE disks cost around £100 each. Promise also sells its EIDE RAID controller on a PCI card for £86 ex VAT. If you've had any experiences with any kind of RAID, I'd like to hear them!

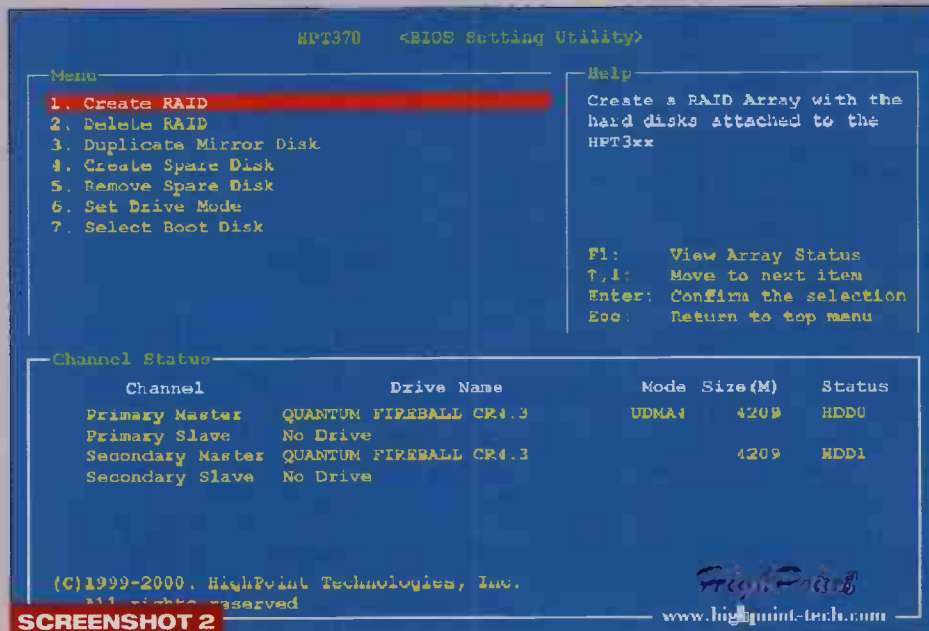
Fast memory

The speed of your PC's memory has a massive impact on overall system performance, but it's not just tied to the clock of your system bus. As any regular visitor to their CMOS knows, there are tons of memory options that can greatly improve performance, and just like comedy, it's all in the timing.

Without getting too bogged down in detail here, the main thing to worry about is the latency setting, which defines the time delay between SDRAM receiving data and actually reading it. Essentially, there are two common latency settings for SDRAM, known as CAS2/CL2 and CAS3/CL3 and since these refer to actual timings, it won't surprise you to learn that the shorter CAS2/CL2 is preferable.

Sadly you can't just go into your CMOS and change the latency setting from CAS3 to CAS2 and reap the benefits. Your actual memory itself must be capable of being accessed that bit quicker, and sadly yours may not be up to the job – it doesn't matter whether it's PC66, PC100 or even PC133 SDRAM, as all are available in either CAS2 and CAS3 versions.

If you've got CAS3 memory, I'm afraid you'll be asking for trouble if you run it at CAS2 latency – even if your system starts up, it will become very unreliable, forcing you to pop back into the CMOS and change it to CAS3 again. If your memory is rated for CAS2, it will almost certainly have a sticker on it saying as much. The bad news is that unless you specifically



SCREENSHOT 2

The main options presented by the HighPoint HPT370 RAID BIOS

asked for CAS2 memory, you'll almost certainly have been sold the slower and cheaper CAS3 flavour.

In the past, CAS2 SDRAM always carried quite a price premium over conventional CAS3 SDRAM. Today, however, the situation has changed, and at the time of writing, you're looking at spending less than a fiver extra for the CAS2 version of a 256MB SDRAM DIMM. But the big question is how much faster is

Under SYSmark 2000, the CAS3 system scored 178, while the CAS2 scored 182. Under Quake III Arena, the CAS3 system scored 94.1fps, compared to 102.3fps with CAS2. The SYSmark score is certainly only fractionally better, but then I've become used to seeing small performance increases under standard Office application benchmarks when using new types of memory.

However, the Quake score is much more

In the past, CAS2 SDRAM always carried quite a price premium over CAS3 SDRAM

CAS2 over CAS3 anyway? I took the plunge and ordered a stick of 256MB CAS2 PC133 SDRAM to find out – it cost me £65.69 ex VAT from www.dabs.com in March.

My test system consisted of a 933MHz Pentium III running on an Abit VP6 (VIA 694X) motherboard, with a GeForce2 GTS graphics card and an 18GB Seagate Cheetah XL Ultra160 SCSI hard disk, formatted with FAT32. I installed Windows 98 SE with the latest drivers, including the VIA 4-in-1 4.29V.

I ran SYSmark 2000 and Quake III Arena (XGA 16bit) first using 256MB of CAS3 PC133 SDRAM, then again with 256MB of CAS2 PC133 SDRAM; both featured their full 256MB on a single DIMM. When using CAS3, the advanced CMOS settings were left on their SPD defaults, while the CAS2 configuration was used with a Turbo setting and, of course, a latency of two.

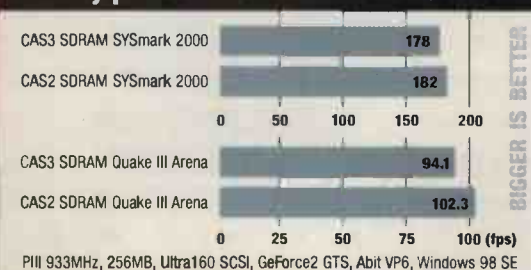
impressive, producing almost a 10 per cent increase just by changing the memory. I would also bet that intensive graphics applications will see the benefit.

So should you buy CAS2? Well, if you were considering swapping your existing CAS3 SDRAM for it, then I'd say the benefits will not outweigh the cost of reinvestment. If you were buying or building a new system, though, I'd definitely go for CAS2, as it's measurably faster and only fractionally more expensive – just ensure that your CMOS is driving it with the latency of two that it deserves.

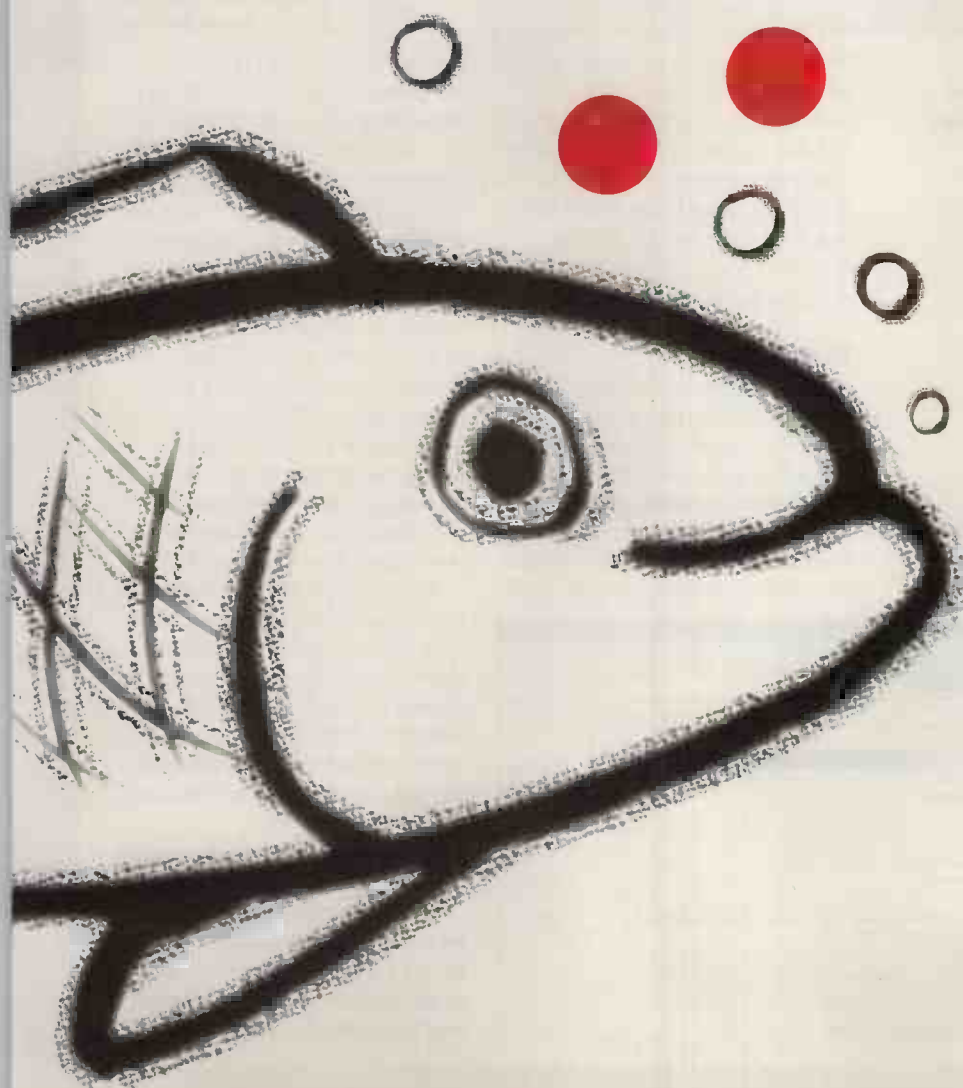
CONTACTS

Gordon Laing welcomes your comments on the Hardware column. Contact him via the PCW editorial office or email: hardware@pcw.co.uk. Please do not send unsolicited attachments.

Memory performance: CAS2 vs CAS3 SDRAM



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SPOT ON FOR BUSINESS ONLINE





Macro magic

Tim Nott explains how to use ready-made code to create macros, and takes a look in the mirror

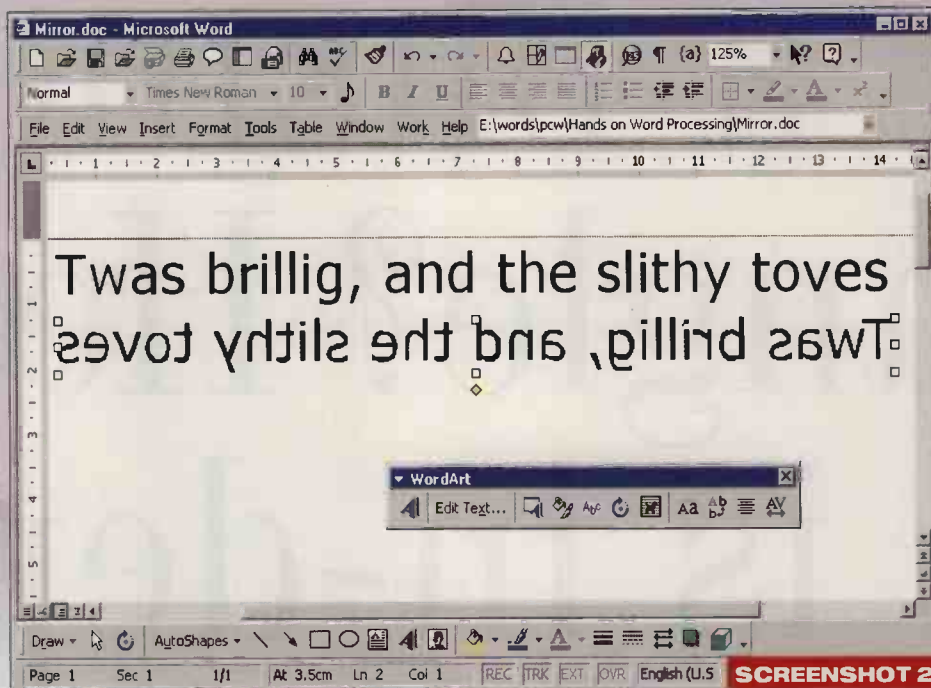
The traditional approach to coarse macro-writing in Word has been to record a macro, then slap it around a bit in the VBA editor, removing all the unnecessary bits and polishing it up. This may have purist VBA developers looking down their noses, but it is, in fact, a great way to learn and often a lot faster than trying to find the correct objects and methods in the Help file. (It's called the Help file, by the way, because that's what you start shouting when its impenetrability starts to take its toll on your sanity.)

There is a rather neat alternative – or rather a supplementary method – of grabbing chunks of ready-rolled code. Let's say, for example, you want to incorporate a routine to increase the font size of the selection by one point in your macro.

Here's what you do. Go to Tools, Macro, Macros, and from the 'Macros in...' list box, choose 'Word Commands'. Now scroll down the command list and select the one you want – in this case GrowFontOnePoint. Now comes the crafty bit. Go back to the 'Macros in...' list box and change it back to show the template or document where you want to store the finished macro. Now you can optionally change the name that appears in the 'Macro name' box – it defaults to the command name. Next, hit the 'Create' button, and the VBA editor will pop up, already populated with the code corresponding to the command. You can then build around it, or copy it into other projects (see screenshot 1).

Apart from being quicker than the recording technique for extracting single commands, it also has the advantage of being able to reach the commands that the keyboard or menus can't. The 'GrowFontOnePoint' command does have a keyboard shortcut, Control & J, but I'll bet few people can remember this. Other commands just don't have a menu or keyboard assignment at all, or the default may have become unassigned. Which brings us neatly to the obvious question – what are all these commands and how can we see which are assigned to what, and where?

The answer, once again, lies in Tools, Macro, Macros. Again, choose 'Word Commands' from the 'Macros in...' list box. Scroll down, select 'ListCommands',



Writing backwards with Wordart

then hit the 'Run' button. You'll get a dialog asking if you want a list of all the commands, or just those that have current keyboard and menu assignments. Having made your choice you can sit back as Word creates a new document and then prepares a neat, tabled list of all the relevant commands and their keyboard, menu and toolbar assignments.

Mirror, mirror

An unusual request came from Bob Turvey, who wanted to get mirror writing in a Word document. If you're going to make a habit of this, then you can get mirror-writing fonts such as Sdrawkcb (geddit?) which you can find at www.masterstech-home.com/The_Library/Font_Samples/Font_Indices_Other/Ingrimayne_Type/

S.html. This is a Courier-style font, and there's also a facsimile of Leonardo da Vinci's mirror writing script, which is at www.p22.com/products/davinci.html.

However, if you want to match the existing fonts you use in your documents, there's another way that is free and works well with short pieces of text.

All you do is insert a Wordart object, choosing the sample with the least effects (top left in the palette) then format the fill and outline to suit. Now grab the centre-left Wordart object handle and pull it over to the right, passing the right handles. You'll find that this turns the contents 'inside out' as if it were a sock, and the letters are reversed (see screenshot 2 above).

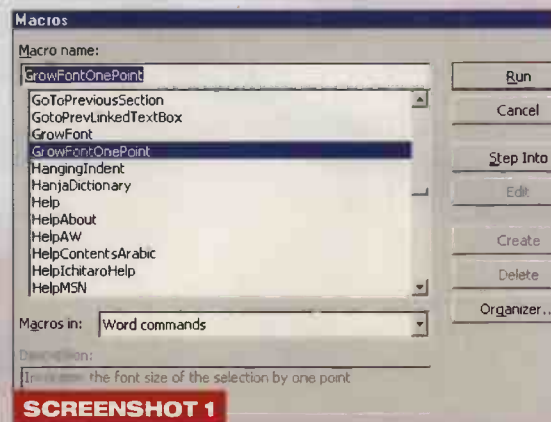
You may have to adjust the handles further to get the text proportions right. It helps with this fine-tuning if you have a normal version of the text in the same font and size: you can delete this when you've got the mirror version right. Although the screen appearance of the Wordart object may look a little rough, it should print out as smoothly as normal text.

CONTACTS

Tim Nott welcomes your comments on the word processing column. Contact him via the PCW editorial office or email: wp@pcw.co.uk. Please do not send unsolicited file attachments.

Writing backwards with Wordart

Capture that code for your own macros



SCREENSHOT 1

Selling and sorting

Stephen Wells eases the pressure on the trading floor, sorts some data and puts path names in footers

A lun Shakespeare posed an irresistible question: 'How would I create a formula to calculate trading percentages throughout a working day? The day is split into four periods: Opening until noon; noon until 3pm; 3pm until 6pm and 6pm until close of trade at 10pm. Sales figures are taken at 12pm, 3pm, 6pm and 10pm.'

Here's an example:

	Readings	% of trade
Opening-12pm	£25	25%
12pm-3pm	£50	25%
3pm-6pm	£75	25%
6pm-10pm	£100	25%

To get the formula enter the sales periods in cells A3 to A6, as in screenshot 1. Readings from the cash till are taken at noon, 3pm, 6pm and 10pm, so enter those readings in cells B3 to B6.

Format cells C3 to C6 as a percentage. The formula in C3 is B3/B6.

In C4 enter $=(B4-B3)/\$B\6 and drag this formula down to C6. If the consecutive accumulative readings are £25, £50, £75 and £100, the total for the day is £100 and each period produced 25 per cent of sales.

Getting sorted

Both Martin Wigginton and Paul Carroll have asked questions about sorting. Martin is sorting biological data in Excel 5 and Paul has a parts list in an unspecified version of Excel. Other readers may also appreciate a refresher in the modus operandi. By default, Excel uses specific sort orders to arrange data according to values and ignores the formatting of the cells.

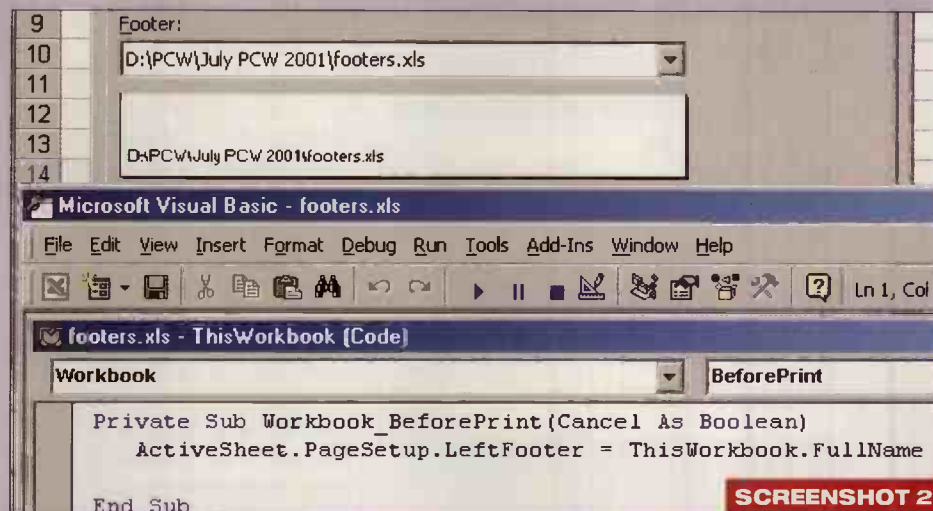
With the exceptions that blank cells are

always placed last, and descending sorts work in reverse order to the following rules, Excel follows this protocol: numbers are sorted from the lowest negative number to the largest positive number and alphanumeric text is sorted left to right, character by character. For example, if a cell contains the text 'A100', Excel places the cell after one that contains the entry 'A1' but before a cell that contains the entry 'A11'.

Cells containing text, and cells holding text that includes numbers, are sorted in the following order:

0 1 2 3 4 5 6 7 8 9 (space) ! " # \$ % & ()
* , . / : ; ? @ [\] ^ _ { | } ~ + < = > A B
C D E F G H I J K L M N O P Q R S T U V W
X Y Z.

Apostrophes and hyphens are ignored, with one exception: if there are two identical text strings except for a hyphen, the text without the hyphen is sorted first. In logical values, FALSE is placed before TRUE. All error values are equal.



SCREENSHOT 2

A short macro adds the path and filename into the footer when you print a worksheet

File paths in footers – again

Stuart Clarke raises a common complaint: 'In Word 97 an Auto text function inserts the file name and its path into the header or footer. Is there an equivalent in Excel? At the moment I copy and paste the information into the footer from the web address tool, which I have customised on to the toolbar. This takes time and is a lag.'

One quick way is to choose File, Properties and enter the file name and path under Title. It will then become available in the Header and Footer dialog box. But if you like macros, press Alt & F11 and enter under ThisWorkbook:

```
Private Sub
Workbook_BeforePrint(
Cancel As Boolean)
ActiveSheet.PageSetup.
LeftFooter =
ThisWorkbook.FullName
End Sub
```

(Key: ✓ code string continues)

Choose File, Page Setup, and the dialog box will display the path in the Footer box, and in the preview box beneath it, as in screenshot 2. The path will similarly be available in every worksheet in the workbook. You don't have to run the macro. It runs automatically when you print or preview printing.

CONTACTS

Stephen Wells welcomes your comments on the Spreadsheets column. Contact him via the PCW editorial office or email: spreadsheets@pcw.co.uk. Please do not send unsolicited file attachments.

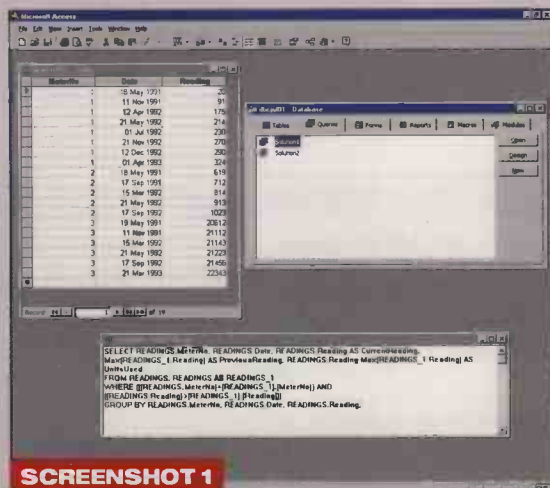
Calculating the percentage of takings during set periods of a day's trading

	A	B	C	D
1				
2	Sales period	Accumulative takings	Percent of day's trade	
3	Opening-12pm	£ 25.00	25%	
4	12pm-3pm	50.00	25%	
5	3pm-6pm	75.00	25%	
6	6pm-10pm	100.00	25%	

SCREENSHOT 1

Meter is ticking for euro compliance

Mark Whitehorn raises a frightening euro issue and solves the meter-reading problem



SCREENSHOT 1

Electricity meter readings

Meter number	Date	Reading
1	18/05/91	20
1	11/11/91	91
1	12/04/92	175
2	18/05/91	619
2	17/09/91	712
3	19/05/91	20612
3	11/11/91	21112
3	15/03/92	21143
3	21/05/92	21223

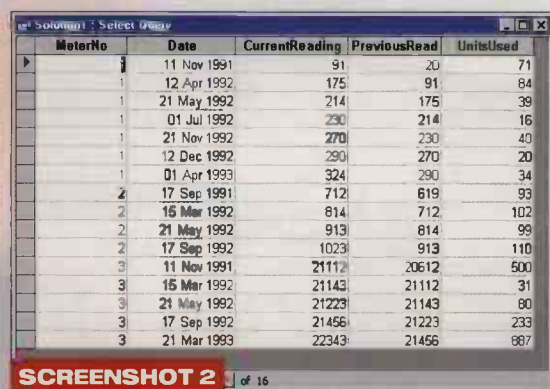
FIGURE 1

Electricity units used

Meter number	Date	Current reading	Previous reading	Units used
1	11/11/1991	91	20	71
1	12/04/1992	175	91	84
2	17/09/1991	712	619	93

...and so on

FIGURE 2



SCREENSHOT 2 of 16

I have just returned from the Link2001 conference in Las Vegas. That sentence was, of course, designed not to make you jealous but to try and swap you over to sympathy mode: remember that journalists are honour bound to attend the keynote speech and they are traditionally tedious... let alone when they are given by John Major. Yes, the real one, not just an IBMer with an unfortunate name.

I was looking forward to reporting how incredibly inept he was, but he totally bowled over the audience by being engaging, informed and, well, almost charismatic. Once I'd got over the shock I started wondering why he hadn't bothered to display these abilities when we were paying him to run the country.

His speech focused on how the business world will alter in the next five to 10 years, and you will be relieved to hear that databases are going to be in heavy demand. Then I felt to talking to Andy Williams (no, really; but this one was an IBMer) who reckons that euro support in software generally (and databases specifically) is going to be the next major problem – one to rival Y2K.

It's a frightening thought. By the first of January 2002 every business within the euro zone must conduct all business transactions in euros. That's it. No ifs, no buts. Now, I know that we in the UK are outside the euro zone, but lots of your customers may be inside. If they pay in euros, your database needs to be able to cope with that. Unlike the Y2K problem this one doesn't seem to be getting much airtime and there is painfully little time left. For more information see www.ibm.com/euro.

Screenshot 1:

Taken from the sample file.

This is a slightly larger set of data, together with the first solution

Screenshot 2:

The answer table that it generates

Meter-reading solution

In the May issue, we set a meter-reading problem first covered in 1996. Here's a quick recap. You store information about readings taken from multiple electricity meters in a large organisation as shown in figure 1.

No meter is ever read more than once on any given day so [Meter no] and [Date] form the primary key.

The problem is, how do you get the database to display the data as shown in figure 2?

It turns out that there are lots of solutions (some of which are discussed below); so the trick isn't so much to find yet another one, but to understand why none of the solutions can ever be entirely satisfactory. Once you understand that, you will be able to spot similar problems that arise in your own work and be prepared for them.

For a human being, the solution is easy. All you have to do is to order the rows in the first table. In fact, I happen to have ordered them already (by [Meter no] and [Date]), so the generation of the second table is easy. You use the information in the first two rows to generate the first row in the second table. Then you just work your way down the table, remembering to skip two rows every time the value in [Meter No] changes. It really is this simple; so where's the difficulty in getting a database to do the same? Well, the big problem is that relational databases do not have any understanding of the concept of rows being in any particular order.

'But the tables always appear sorted by primary key value!' I hear you say. True, they appear this way on screen, but the database engine only displays them like this, it has no commands that allow the data to be processed in row order.

'But I can command the database to sort the rows using a query!' True, but again this only affects the way they appear, not how they are processed.

'This is a ridiculously pedantic distinction!' you cry. I know, but we are stuck with it and it does have serious implications for the way in which we use data in a database.

Since we can't rely on the records being sorted, we have to tell the query to find, in effect, the record that corresponds to the previous reading for the specific meter. It is this notion of some type of inter-

connection between the records that makes the query tortuous – as demonstrated by the following SQL:

```
SELECT READINGS.MeterNo, READINGS.Date, READINGS.CurrentReading, Max(READINGS_1.Reading) AS PreviousReading, READINGS.Reading - Max(READINGS_1.Reading) AS UnitsUsed
FROM READINGS, READINGS AS READINGS_1
WHERE (((READINGS.MeterNo)= [READINGS_1].[MeterNo]) AND ((READINGS.Reading)> [READINGS_1].[Reading]))
GROUP BY READINGS.MeterNo, READINGS.Date, READINGS.Reading;
```

(Key: ✓ code string continues)

This solution is fine in terms of the relational model, however it is one of those solutions that scales appallingly badly. If you double the number of records, you much more than double the time taken to perform the sort. Even processing about a thousand records becomes very slow. So, how can we make it faster?

One answer is to alter the structure of the base table by adding an extra column, as shown in figure 3.

Since each row now contains the information that is needed in order to perform the calculation, the SQL needed to generate the answer table becomes both much easier to write and much, much more scalable:

```
SELECT DISTINCTROW READINGS.MeterNo, READINGS.Date, READINGS.CurrentReading, READINGS.PreviousReading, READINGS.CurrentReading - PreviousReading AS UnitsUsed
FROM READINGS
WHERE (((CurrentReading - PreviousReading) Is Not Null));
```

So, we've fixed the problem. Well, not really, because in solving one we have introduced another. The table in figure 3 is 'fragile', by which I mean that if you insert a record into it, you risk destroying the integrity of the data it contains. For example, suppose you discover that Meter no 1 was also read on 13/11/91 and yielded a reading of 120. You can add the record (see figure 4).

The addition of this latest record has

Screenshot 3:
The second solution...

Screenshot 4:
...and its answer table

rendered the pointer in the record dated 12/04/92 incorrect; in other words the value that it has in PreviousReading is now wrong. So, unless we locate the errant record and correct it, the table now has an internal inconsistency. It should be reasonably apparent that deleting records introduces the same sort of problem.

This is a serious difficulty. Simple changes to one record are causing anomalies. In others so, in order to ensure internal data integrity, the entire table has to be checked for integrity after every update. This makes the maintenance of the database a nightmare, adds extra work for the developer and may well slow the database down, particularly in a multi-user environment.

Incidentally, for those of you who are interested in normalisation, a quick check should reveal that this table is in (at least) third normal form and yet it still displays insertion and deletion anomalies. This is an excellent illustration of the fact that normalisation doesn't, despite what some books say, guarantee to remove insertion and deletion anomalies. Instead it guarantees to remove those that can be removed by lossless decomposition.

Yet a third way to solve this problem is to use a device that is implemented in many RDBMSs, the cursor. This is essentially a pointer that you can programmatically move down (and up if you so desire) a table. The cursor keeps track of where you are in the table, which in turn enables you to solve the problem in the 'human' way described above. This is an excellent solution, the only problem is that it offends purists because the relational model refuses to even acknowledge the existence of cursors.

As I say, there are multiple other ways of solving this class of problem; all of which have one or more problems. So, be careful out there.

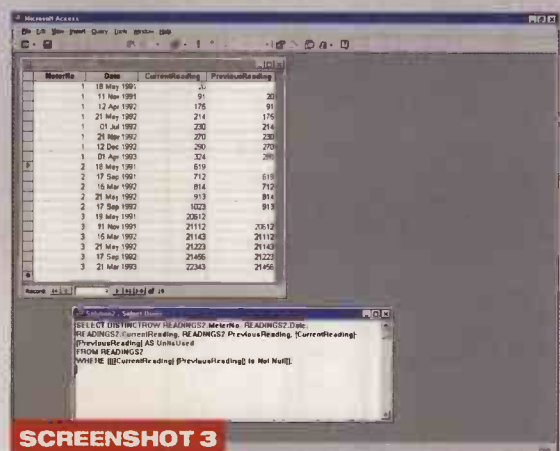
CONTACTS

Mike Whitehorn welcomes your comments on the Databases column. Contact him via the PCW editorial office or email: database@pcw.co.uk. Please do not send unsolicited file attachments.

Adding an extra column

Meter number	Date	Current reading	Previous reading
1	18/05/91	20	
1	11/11/91	91	20
1	12/04/92	175	91
2	18/05/91	619	
2	17/09/91	712	619
3	19/05/91	20612	
3	11/11/91	21112	20612
3	15/03/92	21143	21112
3	21/05/92	21223	21143

FIGURE 3



SCREENSHOT 3

Adding a record

Meter number	Date	Current reading	Previous reading
1	18/05/91	20	
1	11/11/91	91	20
1	13/11/91	120	91
1	12/04/92	175	91
2	18/05/91	619	
2	17/09/91	712	619
3	19/05/91	20612	
3	11/11/91	21112	20612
3	15/03/92	21143	21112
3	21/05/92	21223	21143

FIGURE 4

SCREENSHOT 4

Five alive!

Ian Waugh examines the many new features available in version 5 of Cubase VST

It's been quite a while since the previous version of Steinberg's Cubase VST was released, but users have now been rewarded with VST 5. Mac users (hands up if you have a Mac — OK, you can both put your hands down now) have actually had a lot of VST 5 functionality in version 4.1, but they had to wait a few months longer than PC users to get the full version 5. Now that it's here, what's in it that's new?

One of the main new features is that all versions of VST now support 24bit recording. You'll need a 24bit digital audio card, of course, but there is an increasing number to choose from, and all versions still work with common or garden 16bit cards, too. The flagship release, VST/24, has been upgraded to VST/32 and supports — you guessed it — 32bit recording.

In case you're wondering whether or not it's worth using 24 or 32bits rather than 16, the answer is 'it depends'. All of yesterday's records and many of today's are still recorded at 16bit, and that's certainly fine for demos. However, it's all to do with sound quality and capturing the nuance of natural audio.

Even though 16bits, so-called CD quality, is commonly regarded as the dog's dangly bits in audio recording, it cannot capture the full dynamic range of many events, such as the differences between an orchestra playing *pppp* and *ffff*, for example. But 32bit recording can. It's as close to 'real sound' as it's possible to get, and far closer than most listeners will appreciate, certainly those without super hi-fi systems.

Right: The new MIDI Mixer — at last a proper mixer for MIDI parts

Below: VST/32's TrueTape emulates the warmth of analog tape recording

Apogee's UV22 in VST/32 offers professional dithering to maintain quality when reducing down to 16bits



SCREENSHOT 2



SCREENSHOT 3

You're probably thinking that if a recording is going to be reduced to 16bits for an audio CD, what's the point in using 24 or 32bits? Recording at a high bit rate and then reducing the sample to 16 produces a better recording than working with 16bits throughout the project, which is why the pros are turning to it. Also, there's the possibility that commercial audio formats based on 24 or 32bits, such as SuperAudio CD, will arrive, so you'll have the recordings all ready to go.

To reduce a recording down to 16bits, VST has a new dither feature. Dithering is a strange process that adds a special type of low-level noise to a recording that improves the quality during the reduction process. VST/32 includes Apogee's UV22 dithering algorithm, which is one of the most popular dithering methods in the recording industry (see screenshot 1).

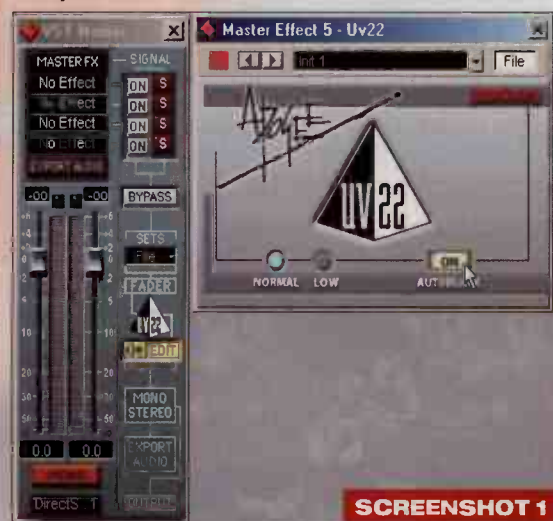
One of the complaints the analog recording luddites have about digital recording is that it lacks the warmth of tape recording. When recording to tape you can overdrive the recording levels, which produces a saturation effect similar to compression, making the sound warmer. Tape recording also lacks the dynamic range of digital recording so

out go a few more 'harsh' frequencies. VST/32 includes a feature called TrueTape which 'brings the warm sound of analog tape machines to the cool world of precision digital recording'. In other words, it adds a touch of compression. Yes, it does make a recording sound warmer but you can also do this after recording by running the sound through a compressor.

There are lots of new goodies for MIDI users too, not least of which is the long-overdue MIDI Track Mixer (see screenshot 2). No longer do you have to suffer the GM/GS Mixer; this one is more like the audio mixer with faders, pan sliders, mute and solo buttons and automation support. What's more, each single channel strip can be extended to reveal a set of customised controls. Several sets are supplied including both XG and GS effects sends and global setting, and XG drum sound controls. You can create your own layouts for other parameters and instruments, but this is not for the beginner.

Also new is an extended set of track columns on the Arrange page. You can choose from a list of 20 including volume, pan, program, transpose, velocity, delay, compression and more. A neat addition is the use of a slider to change parameters such as volume.

A new Controller Editor generally makes controller editing easier, although some aspects are not as intuitive as they might be. A major boon is the inclusion of Windows Sets in the PC version, which lets you save the positions of all the windows as a layout. This makes it so easy to flip



SCREENSHOT 1

between dedicated layouts, such as MIDI or audio recording, mixing, score editing and so on. Great!

Internet users will be delighted to know that VST can now decode MP3 files and convert them directly to wav files, and an optional encoder allows you to do the reverse. All versions of VST now support live Internet sessions via the InWire system supported by Rocket Network. This allows VST users to collaborate with others wherever they may be, as long as they have an Internet connection. Jam with your mate in Monte Carlo or collaborate on an album with a musician in New York. How popular this facility will be is yet to be proved, but let's say, for example, that a record producer wants to use a musician on the other side of the world – it's far easier, cheaper and quicker to plug him into the Internet than to hire a private jet to fly him to the studio.

VST 5 has lots of other new features including a collection of new tools in the Arrange window, and a new Groove Control window (see screenshot 4) where you can mess with the timing, velocity and duration parameters of a groove by adjusting sliders. This is so easy it ought to encourage users to experiment more with grooves – it certainly wasn't easy before. And we don't have time to mention the host of new plug-in effects and new VST instruments.

Check the Steinberg website (www.steinberg.net) and you'll find an upgrade to version 5.03 which features an updated ReWire protocol. ReWire can be used with certain pieces of software such as ReBirth to sync them to Cubase and to route their audio through Cubase's audio mixer. The update allows the program to

The new Groove Control makes it easy to tweak grooves and create new ones



SCREENSHOT 4

be used with Propellerhead's Reason and is a must for any Reason user. It also adds multi-processor support for PCs under Windows 2000, and extended settings to make VST run more efficiently, while adding yet another set of parameters users have to juggle with to achieve optimum results.

In all, VST 5 is certainly a major upgrade and well worth having even if you're happy working with 16bits. Cubase VST 5 is available in three versions: the standard version is £299 inc VAT, Cubase VST Score is £449 inc VAT, and Cubase VST/32 is £599 inc VAT. Upgrades are available for all earlier versions from £99. More information is available from Arbiter Pro Audio on 020 8207 5050 and the Steinberg website.

Finally, if one may be allowed modestly to mention four new books which might

interest readers of this column. They form a new series and are *The Quick Guide to Analogue Synthesis*, *The Quick Guide to Digital Audio Recording*, *The Quick Guide to Dance Music*, and *The Quick Guide to MP3 and Digital Music*. A review by the author would be improper, so we'll make do with a few comments and let interested parties pick up more details from the web.

The books are designed not just as an introduction to the subjects, but also as practical guides. *Analogue Synthesis*, for example, describes the essential synthesis modules and explains how to connect them to produce a wide range of sounds and effects on any hardware or software synth.

The Quick Guide to Dance Music includes drum and bass lines for several Dance styles including House, Garage, Techno, Trance, Hip Hop, Trip Hop, and Drum & Bass. *The Quick Guide to Digital Audio* includes tips on recording, mixing, mastering, processing and adding effects, and *The Quick Guide to MP3 and Digital Music* book covers MP3 basics, legal issues, where to find MP3s, alternative formats, webcasting and MP3 software and hardware.

All books are modestly priced at £6.95 each – PCW readers get a small discount, see this issue's *Special offers* page. You can glean more info from the publisher's website at www.pc-publishing.co.uk or call on 01732 770 893.

CONTACTS

Ian Waugh welcomes your comments on the sound column. Contact him via the PCW editorial office or email: sound@pcw.co.uk. Please do not send unsolicited file attachments.



SCREENSHOT 5

Dodging and burning

Ken McMahon demonstrates how to bring back detail to overexposed areas of a photograph

Last month we took a look at how to improve the tonal range of an image using levels and curves.

This is a good way to improve things throughout the image, but often poor shadow or highlight detail is a localised problem, and if you attempt to make global changes you introduce problems elsewhere.

This is where the dodge and burn tools can be useful. These tools are located on the right side of Photoshop's toolbox about halfway down. The dodge tool looks like a lollipop and has two flyouts: the burn tool, which is a hand forming an 'O' shape; and the sponge tool, which looks like a sponge.

Dodging and burning are darkroom techniques. When making a photographic print from a negative using an enlarger you can give some areas more exposure to light by making a mask with your hands, or a piece of card with a hole cut in it and 'burning' the required spot with an additional few seconds' exposure.

Likewise, you can hold back, or 'dodge' areas that would otherwise be overexposed using a paddle – the lollipop in Photoshop's toolbox.

One of the reasons people tend to ignore the dodge and burn tools is that it's quite difficult to achieve good results with them. But it's not always an impossible task.

However, the first thing to be aware of is that it's not possible to create detail where none exists, and if areas of your image are pretty much solid black or white, it's unlikely that you'll be able to bring out any detail using dodge and burn, or for that matter any other tool.

Where detail does exist you can get quite good results, providing you take things slowly and in small steps. If you overdo it the tampering is quite obvious, so the key is not to be in too much of a hurry.

Let's take a look at dodging first. Screenshot 1 shows a landscape that has good sky detail, but the foliage in the foreground is too dark. If we were to use the levels or curves controls on this image we would improve the foreground detail, but at the expense of the sky.

In Photoshop 6 the choice of brush and dodge tool options is set in the tool options bar; in earlier versions you'll need to access the tool options palette by double-clicking the tool icon. First, select a soft-



SCREENSHOT 1

Nice sky, but it's a shame about the shadows

edged brush that's big enough to cover the area you want to dodge with a few short strokes. The bigger the brush the better, as a broad swathe of dodging is less likely to show up than small thin strokes.

Set the exposure somewhere between five and 20 per cent. This will vary depending on the nature of the image and the only way to get it right is to try out various settings. It will take several attempts, so before you start it's a good idea to take a snapshot.

If you can see a difference with the first brushstroke, then you're probably

overdoing it, so set the exposure lower. You should also make sure you have the range set to midtones, which will give the best results even if you are working on shadow detail.

The trick is in knowing when to stop. Take snapshots at regular intervals so that when you've gone too far you can easily backtrack. Eventually, what happens is that you run out of detail, and the image noise starts to become apparent. Detail will start to look washed out and very grainy. At this stage there's nothing more to be gained by further dodging and you



SCREENSHOT 2

Using the dodge tool to restore detail in the undergrowth. Be careful not to overdo it



SCREENSHOT 3

need to return to the stage before the noise became visible.

In screenshot 2, you can see how much detail can be brought out using the dodge tool. As well as the foreground detail under the shrubs that was previously in shadow, I have also brought out some of the detail in the trees on the left. If anything I've gone a little too far with the foreground, which is now beginning to show a little noise.

Screenshot 3 shows how you can use the burn tool to bring out detail in highlight areas in a similar fashion. The original is on the left, with the retouched version on the right. This black and white image has

been taken facing into the sun. As well as lack of detail in the sky there's a nasty highlight on the stair-rail and flare on the right-hand side.

I've used the burn tool with a large brush and an exposure setting of 15 per cent to get back some detail in the clouds. The most important thing to remember is to set the range to midtones. It's easy to think that because you're retouching highlights the range should be set to highlights. In fact, there is no highlight detail to restore and all you'll succeed in doing is painting flat grey onto the clouds. By setting the range to midtones you'll bring out what little detail there is.

If areas of your image are pretty much solid black or white, it's unlikely you'll be able to bring out any detail



SCREENSHOT 4

Bringing back highlight detail using the burn tool; before on the left, after on the right

Next, I've used a variety of smaller brushes to bring out the detail in the trees on the right, the pathways and the stair-rail in the foreground. One thing you'll find is that it's much easier to dodge and burn monochrome images than colour ones. This is because in mono images you've only got tone to worry about. In colour images excessive dodging and burning leads to colour imbalances, as detail in some channels is enhanced more than in others.

One thing they didn't have in the darkroom, other than for mopping up spilt developer, was a sponge. Photoshop's sponge tool works in a similar fashion to the dodge and burn tool, except it changes the colour saturation rather than the tonal values of affected pixels.

Take a look at screenshot 4, which shows how you can quickly liven up dull colours using the sponge tool. There are two options for the sponge: saturate and desaturate, and a pressure setting. As with the dodge and burn tool, the watchwords are little and often. You'll get better results with a five to 15 per cent setting using a large soft-edged brush and applying lots of strokes. Here I've greened up the grass on the right-hand side of the runway, but the sponge is equally good at increasing saturation in distant hills, pale seas and anywhere else where strong vibrant colours have deteriorated.

Win a book

Now that Photoshop 6 has been with us a few months, there's a rapidly expanding range of books to choose from if you want to develop your expertise. Most of these are the thickness of telephone directories and cover everything from Actions to the Zoom Tool. *Inside Photoshop 6* by Gary David Bouton, published by New Riders (ISBN 0735710384), is no exception. It's aimed at the Photoshop novice, has a good range of projects, and explains the more complex stuff such as layer masks and colour management in simple language.

I liked it so much I'm going to give my copy away to the first reader to spot the sneaky bit of retouching (in addition to the grass) I carried out on screenshot 4. You can enter by emailing the answer and your full postal address to the address below. Happy landings!

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. Please do not send unsolicited file attachments.

The grass is always greener. Spot the other difference and win a book (see right)

New kid on the block

Blender has a rival, OpenFX. Benjamin Woolley finds out whether it's good enough to pose a threat

The generosity of some people knows no bounds. As mentioned in past columns, there is already one fully fledged 3D package available to anyone who wants it, absolutely free. It's called Blender and, though quirky (it does, after all, come from Holland, and there is a distinct aroma of Amsterdam's coffee houses about its design), it will do just about any job you ask of it. NaN (Not a Number, the publisher of the software) has now announced version 2.12, a substantial revision that you can download from its website (www.blender.nl).

Blender now has a rival, a little-publicised program called OpenFX. Very few details are given about the origins of OpenFX on the official website (www.openfx.org), beyond the fact that it was published by Dr Stuart Ferguson, from the Electronic and Software Engineering department at the Queen's University of Belfast. Originally part of a product family called SoftFX, he released it under the open-source GNU licence as OpenFX in 1999. And God bless him, because it is a stable, simple but powerful program – in fact, an entire suite of them, including tools for designing and animating models, utilities for converting file formats, and even for building animation sequences and adding sound tracks (though these are very basic).

These are obviously early days for OpenFX. The release I downloaded is version 1 and is a substantial 44MB. You can download a smaller version without the sample files, but even that is more than 20MB. Unusually for an open-source program, it does not run under Linux, only Win32 (ie Windows 95/98/NT/2000).

The setup is simple and straightforward, though you do have to install the software in a folder in the root directory (ie c:\openfx) rather than in the Program Files folder, because if you don't, the sample files apparently lose track of themselves (a fix is promised for this).

Unlike Blender, OpenFX looks quaintly old fashioned. To begin with, it's not 'modeless' – in other words, the modeller, animator and renderer are separate programs or modules, as they were in the early days of Lightwave and the like. This is not too much of a problem, as all the modules can be accessed via the main Animator Interface, which is used to

The Interface for OpenFX's Animator module, showing a toolbar on the right and the OpenGL rendered preview in the top right-hand window pane



SCREENSHOT 1

assemble, light and view the scene as well as animate it.

The Animator screen is (unlike Blender's) immediately recognisable to 3D veterans, with four window panes; three show the usual top/front/side views of the scene, and one a perspective view (see screenshot 1). The perspective pane can show the scene rendered in real time using OpenGL, and there are options to ensure that it can cope with complex geometry.

You create and edit models in Designer, and then insert them into the scene using Animator. Designer is a decent modelling package, with facilities for creating nurbs,

for subdividing surfaces (very useful for turning simple primitives into more complex shapes), for drawing and lofting shapes. In fact, it offers more or less everything you would expect to find in a commercial package, though it lacks some of the more exotic tools you will find in Truespace 5, 3D Studio Max and Lightwave.

There were a few elements in the design of Designer that worked in an unfamiliar way. The materials editor, for example, requires you to use one dialog box to edit texture maps, and another to apply them to a particular object – but, confusingly, you set mapping co-ordinates

An example of OpenFX's output, including post-production effects



SCREENSHOT 2

(how the map is applied to the object) using the Edit Map command. Having said that, the map editor has just about all the tools you would need to create complex (though not multi-layered, as far as I could work out) textures. For example, there is a 'Fixed-to mapping' option, which will apply the map direct to the geometry rather than project it, though I have to say that my efforts to get this working properly in the few days I was using the software were not very successful.

Once you have created your models in the Designer, you assemble them, light them and 'film' them (using a virtual camera) in Animator. This uses familiar conventions, such as paths, morphing and keyframe animation, and seems to work well. Again, it is fully kitted out, offering even post-production effects (to add, for example, motion blur or lens flares). There appeared to be no facility for animating with inverse kinematics, though there was a tool in the Designer for creating hierarchies of sub-objects.

Like Blender, what OpenFX has in terms of facilities it lacks in documentation. The online help is pretty useful – certainly better than Blender's – providing a brief commentary on all the menus and tools. However, the tutorials are perfunctory, and



it would have been nice if all the required files were included among the samples.

OpenFX is powerful, stable (more so than Blender, particularly if, like me, you have a Matrox graphics card) and could easily take off. However, for the time being Blender benefits from having a much bigger user base, and develops yet further with this latest release. As keen readers

Blender 2.12 with a scene featuring a canon to demonstrate 'physics'

will remember from my January 2001 column, Blender 2 is aimed at being a games production platform, and 2.12 enhances this capability (see screenshot 3). At the time of writing, you could find some very useful sample games files at www.blender.nl/gdc (though as usual the documentation is minimal).

VIRTUE3D

Efforts continue apace to find some way of delivering 3D content across the web. The latest, which boasts its very own US patent for compression and rendering algorithms, is called Virtue3D (www.virtue3d.com). The patented rendering algorithm uses 'occlusion culling' to cut down on the scene information sent, confining it to the views

of the objects visible from the camera's viewpoint. On the company's website is an example of how its technology could be used. It is called the 'Room Designer' and uses Macromedia Flash in combination with its own 3D plug-in viewer to allow the user to select and arrange furniture in a variety of different rooms. Notwithstanding its patents, I cannot say that in terms of 3D performance Virtue3D showed any obvious benefit over Viewpoint's better-established alternative (previously called Metastream). In an effort to test their relative performance, I compared Room



Designer with a US furniture seller's website (www.eddiebauer.com) featuring Viewpoint. I have to say the Viewpoint models were easier to manipulate and had better textures – though that may simply be down to the quality of the models, rather than the efficiency of the technology that delivered them.

It is noteworthy that, at the same time as Virtue3D was publicising its Room Designer, Viewpoint was featuring Eddie Bauer's use of its technology on its own website (www.viewpoint.com). Coincidence? I think not.

More freebies

And the free-for-all just goes on and on. I have been trying out yet another free 3D program called Yet Another Simple Ray Tracer (YASRT). It is basic, to say the least. Like the veteran freeware renderer PovRAY, there is no fancy interface – indeed, barely an interface at all, just a command line. You type YASRT in a console window, adding some parameters (including the name of an input file), and off it goes. It takes the scene described by the input file and sends a rendered image to an output file (by default as a bmp bitmap, though you can choose another image format).

YASRT was written by Emmanuel Viale. You can download a small archive that contains all the executables, plus some documentation and a few example files, from www.yasrt.org. The program uses a fairly simple scene description language, and (of particular interest to those with multi-processor systems) supports multi-threading.

CONTACTS

Benjamin Woolley welcomes your comments on the 3D Graphics column. Contact him via the PCW editorial office, or email: 3d@pcw.co.uk. Please do not send unsolicited file attachments.

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Fun with DarkBASIC

Tim Anderson looks at Dark games programming, and searching Outlook contacts from other applications

Anyone remember STOS and AMOS? These were versions of BASIC, for the Atari ST and Amiga respectively, that were dedicated to games programming. At the time there were two opinions of these products: some thought they were great because they demystified games programming and had plenty of built-in features for handling sprites; others scoffed at what was a rather poor implementation of BASIC and chose better ones from the likes of GFA and HiSoft.

Now comes DarkBASIC, a BASIC games compiler and in one sense little has changed. There is even a connection, in that DarkBASIC's lead programmer, Lee Bamber, was an enthusiastic AMOS developer. DarkBASIC is a blast from the past from a language point of view, with hardly a shred of object orientation. Even so, the tricks you can do with just a few lines of code are impressive.

Here's a quick look at the Matrix commands, which let you create a 3D landscape armed with nothing more than a single bitmap to use as a tile. The first task is to load the bitmap (screenshot 1) into memory and store it to a DarkBASIC image:

```
Rem declare variables
mybitmap = 1
mymatrix = 1
myimage = 1
```

```
load bitmap "grass.bmp", mybitmap
Rem load bitmap and assign it a number
get image myimage, 0, 0, 128, 128
Rem copy current bitmap to memory image
delete bitmap mybitmap
Rem clean up bitmap
```

(Key: « code string continues)

The next bit of code creates a 'matrix', which is the DarkBASIC term for a landscape. The randomise function shakes the matrix blanket, giving it a true landscaped appearance:

```
sync on
Rem turns off screen update
hide mouse
make matrix mymatrix, 10000, 10000, 25, 25
Rem create 10000x10000 grid, and divide into 25x25 tiles
```

```
prepare matrix texture mymatrix, 1, 1, 1
```

```
randomize matrix mymatrix, 200
Rem give grid squares random height up to 200
do
Rem here is where the action code goes
sync
Rem refresh the screen
loop
```

The next step is to populate the world. This is done using DarkBASIC's 3D Object command set. You can also use 2D sprites, but 3D ones are more interesting. You can construct 3D objects in code using commands like Make Object Sphere, or load them from disk provided they are in the .x file format used by DirectX, the Windows multimedia API. Getting a 3D object on the screen is a matter of using Load Object to retrieve a .x file, and common-sense commands like Set Object Speed to specify its animation speed.

The action takes place within a loop, where you inspect key presses or input from other devices and respond using commands like Position Object or Turn Object Left. A good feature is the ability to get the ground height using the command 'Get Ground Height', so that the object can easily walk the surface of a landscape. Another critical element is the Camera object, which determines what you see on the screen. You set the camera's position and direction to modify the viewpoint.

To build from a single object on a landscape to a shoot-'em-up game is a matter of adding further objects including bullets, detecting collisions by comparing object positions, or using the built-in



SCREENSHOT 1 in the Help Menu.

The starting point for a DarkBASIC landscape

Object Collision function, and using suitable sounds and visual effects from DarkBASIC's library. Screenshot 4 shows a completed game from the supplied demos – another blast from the past, 3D invaders. It takes around 1,000 lines of code, which is modest considering what is achieved.

DarkBASIC does a great job of simplifying the DirectX API, and offers some interesting insights into 3D programming. The problem is that some aspects are not amenable to simplification. Creating 3D models is an example, and you will need third-party software such as the rather expensive 3D Studio Max, or one of several shareware options. Some mathematical skill is also essential for most game programming.

The DarkBASIC EIDE is certainly simple, and its editor is little more than DirectX Notepad. You can download a better editor, called DarkEdit, but the only debugging facility is the ability to step through code line by line, and in this mode you cannot see the code being executed – only its line number. There are other gaps in DarkBASIC too, in particular the lack of support for multiplayer gaming. Even so, it is capable of excellent results. When you are done, distribution is a snap, using Build Final to create a standalone executable that requires only DirectX to run.

There are, of course, other options for easy game creation. The original AMOS authors are still around, and have a new

A textured landscape ready for action



SCREENSHOT 2



Fig 1

Searching an Outlook contact folder

```
Dim oapp As Outlook.Application
Dim ns As Outlook.Namespace
Dim fld As Outlook.MAPIFolder
Dim contact As Outlook.ContactItem
```

```
Set oapp = CreateObject("outlook.✓
application")
Set ns = oapp.GetNamespace("MAPI")
```

```
Set fld = ns.GetDefaultFolder✓
(olFolderContacts)
```

```
Set contact = fld.Items.Find("✓
[BusinessTelephoneNumber] = '"
+ Text1.Text + "'")
```

```
If Not (contact Is Nothing) Then
Text2.Text = contact.FullName ✓
+ vbCrLf _
+ contact.CompanyName + vbCrLf ✓
+ contact.Body
Else
Text2.Text = "Not found"
End If
```

(Key: ✓ code string continues)

project called Jamagic, now in beta, which offers a far more sophisticated EIDE, a JavaScript-like language, and the promise of cross-platform Linux and Mac compatibility. For fun and quick results, though, DarkBASIC is hard to beat.

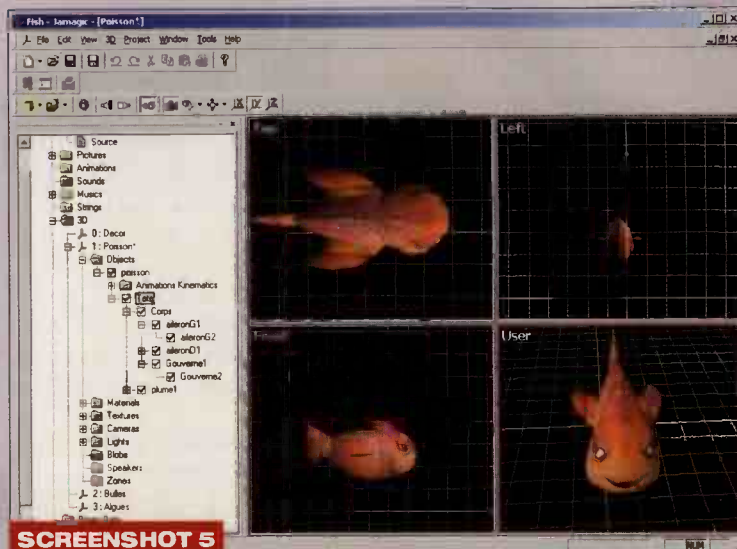
Searching Outlook

Jeremy Whilde asked: 'I am trying to find a more efficient way of searching Outlook contacts by telephone number. At present, I trigger the Advanced Find within Outlook and paste in the calling line identity (telephone number). However, this process is very distracting to the user. Is there a way to perform a search through all the contact phone numbers and then only make the contact form visible when a match has been found?'

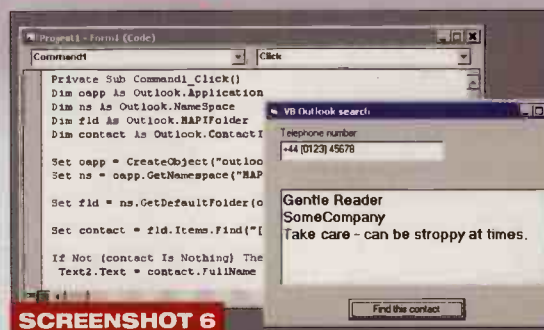
3D Invaders, all done with DarkBASIC



SCREENSHOT 4



SCREENSHOT 5



SCREENSHOT 6

Above: Jamagic is the new games creator from the same stable as AMOS

Left: Searching an Outlook contact from Visual Basic

Writing code to search Outlook is fairly straightforward, using either the Outlook object model or else CDO (Collaboration Data Objects). You can use any language that is able to access COM automation servers, including Visual Basic, Visual Basic for Applications, Visual C++, and Delphi.

Figure 1/screenshot 6 show an example, which returns the first contact with the number entered in the text box. To use it in Visual Basic, first set a reference to the Microsoft Outlook 9 object library (or the equivalent, if you have a version earlier than Outlook 2000). If you are using VB Script, all variables are different and you will have to define any constants yourself.

There is a problem with the code in figure 1. The Find method of the Items collection only returns an exact match. It supports a few other operators, but not wildcards or VB's Instr() function. Particularly awkward in this instance is that Outlook formats the number according to its own settings, so you may need to search for '+44 (0123) 45678' or something like that. You will probably need to iterate through the whole collection with a loop like this:

```
For Each contact in ✓
fld.Items
If Instr(contact.✓
BusinessTelephoneNumber✓
,"012345678") <> 0 then
```

End If

Next contact

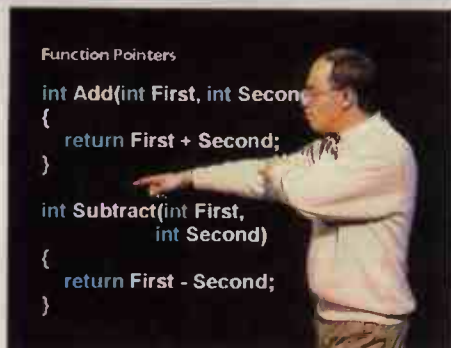
Then you can be flexible at the expense of a slower search. You might also want to strip out spaces from both the searched and searched-for number. Another tip is that Outlook folders can contain any kind of item, so you cannot assume that every item in the folder is a contact. It pays to check the MessageClass first, which for a contact is generally 'IPM.Contact'. Why only generally? If you are using a custom form for contacts, then the MessageClass will be something else again, perhaps 'IPM.Contact.MyContact'. The rule of thumb with Outlook is that you can probably do what you want, but it may be more awkward than you first imagined.

CONTACTS

For information on DarkBASIC see www.darkbasic.com, or call FastTrak on 01923 495 496. The online version is priced at £35 inc VAT, and the CD version costs £45 inc VAT. For more information on Jamagic go to www.clickteam.com.

Tim Anderson welcomes your comments on the Visual Programming column. Contact him at the PCW editorial office or email: visual@pcw.co.uk.

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To Flash or not to Flash

Tim Anderson looks at the uses and abuses of Flash scripting and investigates frameset problems

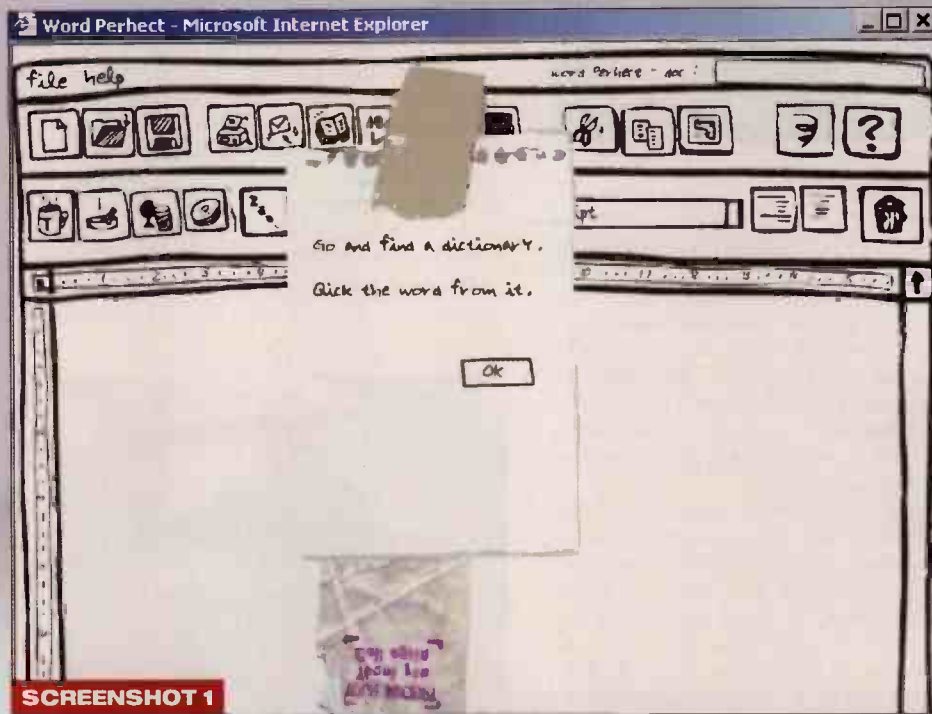
A reader's query about problems with their browser's Back button when using framesets (see panel overleaf) got me thinking about changing web standards. The Back button may seem a minor detail, but the problem raises a fundamental issue. The World Wide Web was conceived as a way of presenting content as pages with hypertext links, and in that context Forward and Back buttons make a lot of sense. It is the power and simplicity of this navigational model that gives the web much of its appeal.

But the web is changing, and the page-by-page model doesn't always fit. Some websites use the browser as the host for a web application, which might be a Java applet or a Flash movie. All the action takes place within the hosted application. The same can be true of a dynamic HTML application, where the page stays the same but its content is modified on the fly. Another example is Acrobat pdf documents, which undermine the HTML concept by delivering an accurate simulation of a printed page within a hosted viewer, again frustrating the browser's navigation buttons.

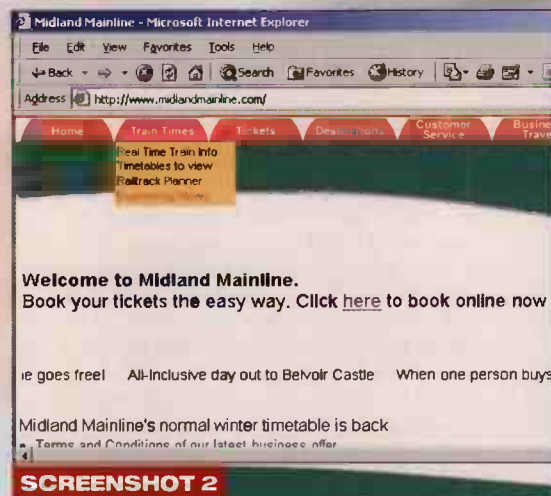
It is easy to see why many web designers abandon pure HTML. Advantages include richer functionality, a more predictable environment, and greater security for your code. The downside is a reliance on proprietary technology and breaking the concept of a structured mark-up language that degrades gracefully and empowers the user with diverse viewing options. In reality, web authors use both. Flash movies have many features that are not available elsewhere. What matters is to be aware of the trade-off, using standards like DHTML and CSS where possible, drawing on resources like Flash only when there are compelling reasons (see screenshot 1).

An application platform

If you embed a Flash movie in a web page, it is rendered not by the browser but by the Flash plug-in or ActiveX control. This is an exceedingly smart piece of code that displays vector graphics and animations, minimising the necessary file size by use of client-side processing. The most recent version of Flash goes beyond animation and multimedia by including a complete scripting language, based on JavaScript. This means you can now build entire



SCREENSHOT 1



SCREENSHOT 2

Unnecessary Flash: the Midland Mainline website (www.midlandmainline.com) uses a Flash menu and some simple animations, serving no useful purpose except to frustrate non-Flash browsers

applications in Flash (see screenshot 2 for an example).

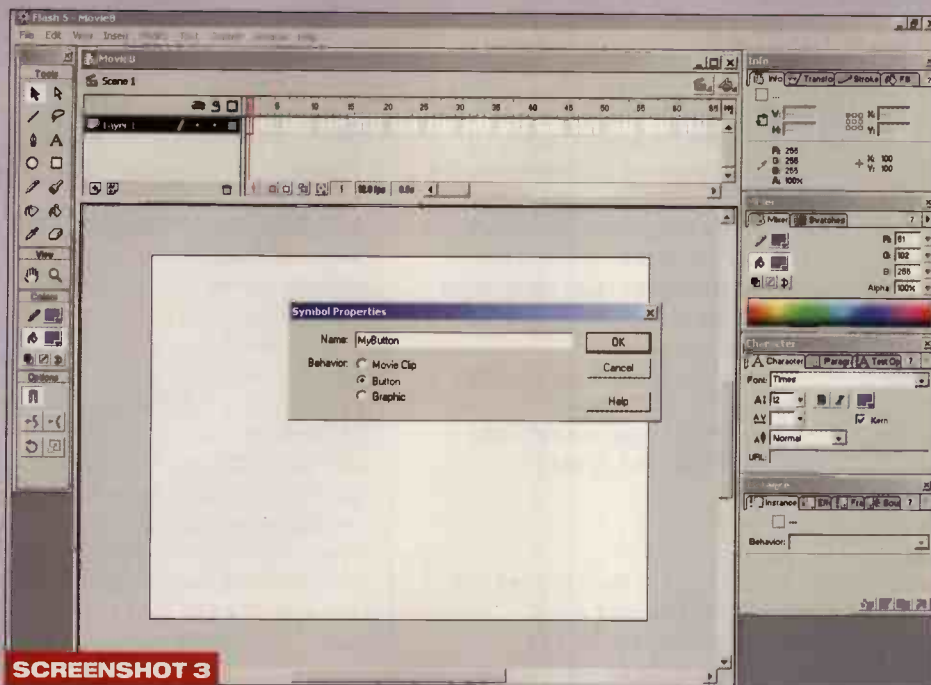
The Flash development model is based on events and actions. A Flash movie represents a series of frames played back over time. Frame events are triggered when the movie reaches a particular frame. There are eight button events, including press, release and dragover. Finally, there are nine movie clip events, including load, unload, mouseDown and keyDown.

A Flash movie clip is essentially a movie object, or a movie to be used within other movies. Buttons and movie clips are created as Flash symbols, which let you wrap a

Good use of Flash: the famous Word Perfect (sic) is a delightful online word processor created entirely as a Flash movie www.e-2.org/word_perfect.html

complex piece of Flash content into a single re-usable object. Flash also supports text input fields. Other input widgets such as checkboxes, menus or radio buttons are custom-built using other Flash objects. Since Flash makes it easy to create re-usable objects, this is less inconvenient than it sounds. It does encourage enormous diversity of appearance, which is a good or bad thing depending on how highly you value consistency in relation to creativity. Flash 5 comes with a small range of examples, including a CheckBox, a Menu, and a RadioButton, and you can either use these as they are, or explore them in the editor to see how they are put together, and further customise their appearance.

Buttons are the building blocks of many Flash interactive interfaces. Here's how to create a button: Run Flash 5, Start a new movie, and from the Insert menu choose New Symbol. Give the symbol a name and choose the Button type (see screenshot 3). Choose OK to enter the button editor. The timeline now shows four states, Up, Over, Down and Hit. The first three are for frames that let you draw different images for the normal, mouseover and depressed button



SCREENSHOT 3

states, while the fourth lets you specify the area that responds to a click. There is no necessity for the button to be a grey rectangle: you can draw whatever you like. In this case (screenshot 4) I've chosen an oval shape. Draw the initial shape in the Up frame, and then insert keyframes in the other three frames (a quick way is to click in the frame and press F6).

Next, modify the Over and Down states to give the user feedback. For this example, I used a lighter fill colour for the Over state, and a darker shade for the Down state. There is no need to amend the Hit state, since the default is fine. Hit becomes more important when the button is a text object, to avoid requiring the user to click on an actual stroke in a character.

Now go back to the main timeline and display the Library window. Your button appears there as a symbol, which you can drag into a frame. When you drag a symbol into a frame, you create an instance of the symbol. If you right-click an instance and choose Edit, you will be editing the symbol itself, and if you have more than one instance in your movie they will all change. This can be awkward if, for example, you need several buttons with different labels. You can either create a new symbol for each button, or simply draw labels on each instance. Another option is to use the Effects panel to edit instance colour effects. Instance effects do not change the underlying symbol.

Once you have some buttons on a frame, you can attach them to actions. To try this out, add several buttons and a text field to a frame. Select the text field, and in the Text Options panel specify Dynamic

text. You also need to enter a variable name, say MyText, so that you can change it programmatically. Now select a button, right-click and choose Actions to display the Actions window, if it is not already open. This window has two modes, Normal and Expert. In Normal mode, there is a list of Basic actions, such as Go To, which moves to a specified frame in a movie, GetURL, which navigates to a specified web page, and Load Movie for opening a Flash movie. Another interesting option is FSCommand. If the movie is playing within a web page, this lets you call a JavaScript function called: `yourmovieinstance_DoFS`

Insert a symbol of Button type to create a new Flash button

Defining an event handler for an Action, using Normal mode



SCREENSHOT 4

Command(command,args)

(Key: ✓ code string continues)

By specifying different arguments, you can have a Flash movie call any number of different JavaScript functions within a web page, thus integrating Flash code with other interactive elements.

If you are working in Normal mode, the first step is to select the action required. For this text, the idea is to set the text in the text box. The appropriate action is Set Variable, which inserts an empty event handler like this:

```
on (release) {
```

In addition, a dialog area opens at the foot of the Actions window. Here you can modify the action using a visual interface. For example, if you wanted the action to be triggered by a mouseover, select the function header and check the Roll Over box. Then it is a matter of building up the body of the function using the expanding lists of Actions, Operators, Functions, Properties and Objects. In this case, select the <not set yet> line of code, and in the dialog enter MyText for the variable and "You clicked" as the Value. Now try out the movie using Control - Test movie. When you click the button, the displayed text changes. It is a small step from here to have your script do more interesting things like calculating values, querying a database, or controlling other Flash and non-Flash objects.

Many developers find it tedious to write code using point-and-click and, fortunately, Flash also provides a conventional editor. In the Actions window, click the arrow at top right and select Expert mode. Now you can type directly



FRAMESETS AND THE BACK BUTTON

PCW reader Steve Troughton has a multi-frame site and some links load content into two frames simultaneously. He uses JavaScript, setting the location property of each frame to load the content. His problem is that when the user clicks Back, only one of the frames resets its content. To reset both, the user has to click Back twice.

This is a classic frameset problem. Browsers maintain a history stack which is referenced when the user clicks Back or Forward. When confronted with a frameset, some early browsers used to ignore frame contents and navigate away from the frameset if the user clicked Back. That was not normally what the user expected, so browsers now maintain history for each frame, and the Back button works on a frame-by-frame basis. Where this falls down is if you want to keep two or more frames synchronised.

It's worth understanding how the Location object relates to browser history. If you change a frame's contents with a line like this:

```
parent.myframe.location.  
href="somecontent.html"
```

(Key: ✓ code string continues)

then the new document is added to the history stack.

On the other hand, if you do:

```
parent.myframe.location.  
replace("somecontent.html")
```

the new page replaces the old in the history list. This could be a partial solution, in that if you

display all your content using the replace function, the browser's Back button won't touch it.

Another possibility might be to handle the load or unload event of frame documents. For example, imagine you have a frameset in which content of the top frame needs to match the content of a central frame. In documents that are to be loaded into the central frame, you can include a script like this:

```
<html><head>  
<script language="javascript">  
function synchframe()  
{ parent.topframe.location.  
  replace("match1.html");  
}  
</script>  
</head>  
<body onload="synchframe()">  
<p>This is the 2nd  
&quot;page&quot; in the  
middle frame.</p>  
</body></html>
```

Every time this document is loaded into a frame, the document called match1.html is loaded into the sibling frame called topframe. Since this second document is loaded with the replace method, it will not add to the history stack.

Provided that every occupant of the central frame contains a similar bit of code, the Back and Forward buttons will work as expected. This is messy. A better idea is to use only one frame with changeable content, or not to use frames at all.

into the script window. Armed with the Flash ActionScript reference and some knowledge of JavaScript, you can write some powerful applications. It is ideal for games, highly interactive multimedia sites, or business uses such as ecommerce.

Interact with server-side code

Not all Flash applications are self-contained. You may also need to interact with other websites or execute server-side code, such as database queries. One key function is GetURL. Using this function you can call CGI scripts, Active Server Pages, or other server-side technology. This is fine if you want to open a new web page, but what if you need to query a database and display the results in the current Flash movie? The solution is another function, loadVariables. An example would be:

```
loadVariables("http://  
www.itwriting.com/  
myscript.asp",_root.  
MyClip,GET)
```

This function expects a response in the form of a string:

```
myvar1=somevalue&myvar2  
=anothervalue...
```

When the response is received, the named variables in the specified movie clip are set to the returned values. If no movie clip is specified, the current movie instance is used. Another variation is that the URL could simply be a text file on the server, which can be a powerful technique if the file is regularly updated by some other process. The loadVariables function is asynchronous, so typically the next frame would have a loop that checked for the return values. Another option is to handle a movie clip's onClipEvent(data) event handler, which fires when the response returns. This is preferable, since it avoids the possibility of an endless loop waiting for a server that has gone down.

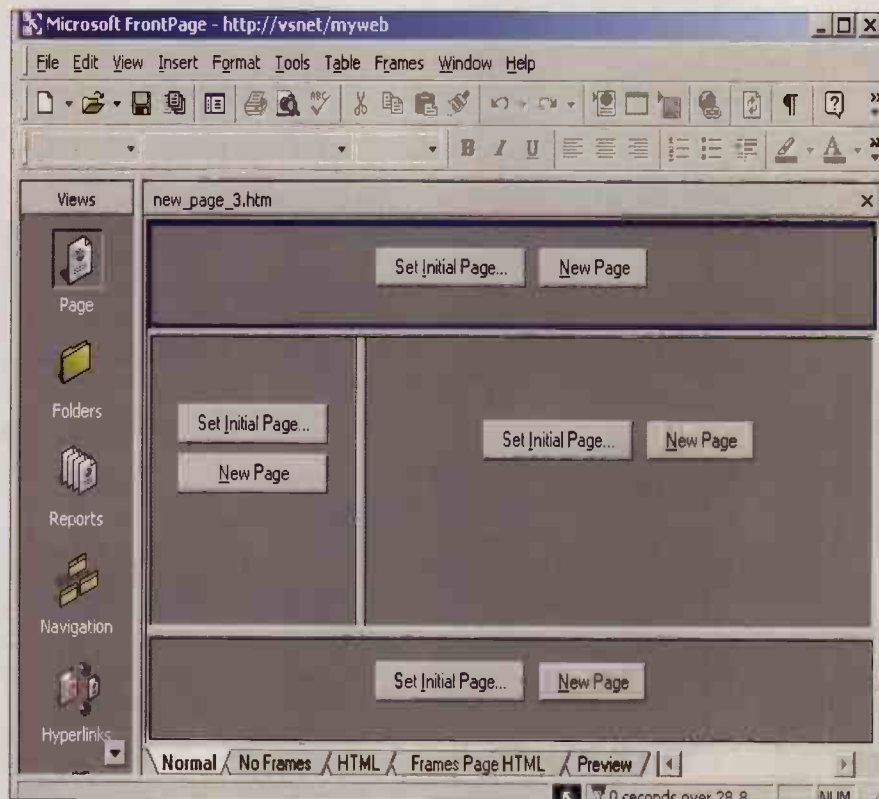
Flash 5 also has an XMLSocket object that enables you to open a continuous socket connection with a server, and an XML object for storing and parsing XML data. This is a more complex but powerful solution for realtime apps such as chats.

CONTACTS

For more information on Flash, see www.macromedia.com.

A useful resource for Flash scripting is *Flash 5 Interactivity and Scripting* by Nigel Chapman (ISBN 0471497819), published by Wiley, priced around £20. Tim Anderson welcomes your comments on the Web Development column. Contact him via the PCW editorial office or email:

webdev@pcw.co.uk.



Heavily framed pages create problems for browser navigation buttons

Catalog shopping

Nigel Whitfield experiments with Actinic's Catalog software, and investigates phantom URLs

Those of you who read *PCW* regularly will have seen the recent ecommerce workshop feature (*PCW*, June 2001), in which I looked at some of the issues surrounding setting up your own online business, including credit card processing, which is one of the things that I receive many emails about. I also looked at two packages designed to make it simple to get your business online. One, Actinic's Catalog (www.actinic.co.uk), is based around an application you run on your own PC to manage orders, while WorldPay's Click And Build is web-based, allowing you to create your own store simply by uploading images and filling in pages on the website.

I've looked at Click And Build in the ecommerce column before, and those of you who are thinking about using it – especially if you're planning to use the bulk import facility to add a large list of products – would be well advised to check out the back issues of *PCW* for some of the hints and tips that arose.

It's also worth bearing in mind that, since the workshop was written, Click And Build has been slightly revised, with the addition of a new tutorial that should guide users more easily through the process of setting up their store. I'm told, too, that the creation of a demo store for people to try out is more or less instantaneous.

As promised, there are a couple of issues that arose from experimenting with Actinic's Catalog software. For those who aren't familiar with it, Catalog is a program that allows you to build a database of your products on a PC, complete with variations such as colour and other options. You can preview the pages that will be generated on the PC before they are uploaded to your web server.

Unlike many other packages, that can require extensive configuration on the web server, Catalog is pretty clever. All you need is a bit of web space and the ability to run Perl scripts. All the scripts run under your own user ID, so there's no need to have an account with special privileges. You just fill in a few bits of information in Actinic's wizard, and it does all the rest for you.



Once it's uploaded, you'll find that your website has a folder called *acatalog*, for example www.nigelwhitfield.com/acatalog, containing automatically generated pages making up a shopping basket. If you have a secure certificate for the server you can use that, otherwise Actinic uses a Java applet of its own to encrypt credit card information.

When an order is processed, you'll be sent an email to let you know, then you

Click And Build enables businesses to create their own web store with ease

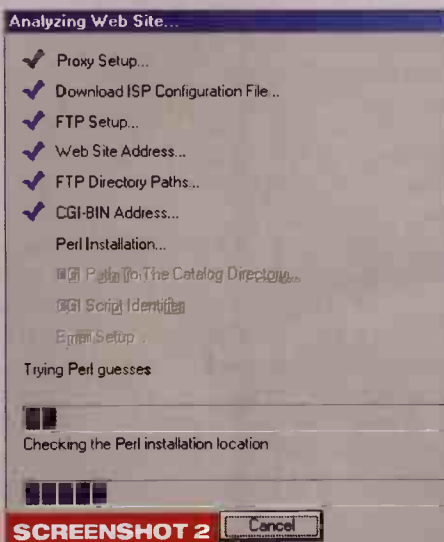
can connect using the Catalog software, and download the details. You can print off orders from within Catalog, or export them as a csv file, so that you can integrate it with any existing order processing system that you may have. It's all very neat, and pretty simple to get to grips with, as we showed in the workshop.

However, there was one niggle. When the wizard runs, it checks to see that the scripts can be executed correctly on the web server, just as you'd expect. But when I tried it out, it kept failing at that stage, reporting that there had been an unexpected 403 response from the web server.

Tracking this down was a little fiddly, since as soon as the scripts failed to execute correctly, they were deleted from the web server. A check through the server's error log, however, revealed lines saying 'File permissions deny server execution'.

The problem is quite clear – Actinic's scripts are uploaded to the server, but don't have the execute bit set, and the default settings on the web server (Apache, running on a Solaris system) don't allow scripts to be run unless this bit is set.

Actinic's Catalog is more or less self-configuring, but it's a good idea to choose the option to confirm each stage of the setup wizard for site settings





A simple `chmod +x` ought to do the trick, but there's a problem here; the wizard assumes that a file can be uploaded with executable permissions set, and that's not something that all web servers allow. The `umask` command (or `SITE UMASK` on stricter FTP servers) can set a default set of file permissions, in the usual Unix manner, but not all FTP servers support it. Things can be complicated further by options in some FTP servers that force uploaded files to be saved with particular permissions.

As a result, although Actinic Catalog was correctly uploading its scripts to my server, and had configured them with the location of the Perl interpreter and so forth, they still wouldn't run, regardless of whether I told it to use `.pl` or `.cgl` as an extension. The file permissions needed fixing.

How to do that, though, when the wizard tries and then deletes the files? Ideally, the wizard needs to wait after uploading the files and then ask if you need to do anything on the server to make them executable, before sending the http requests to check that they're running OK.

Since it doesn't do that, a little lateral thinking was called for, in the shape of a telnet session to the host, and a simple bit of Unix shell scripting. I connected to the server, changed to the appropriate directory and, using the Korn shell, typed this (if you're using `csh`, then the incantations will be slightly different):

```
while true
do
  chmod +x *.pl
done
```

This did the trick, and the wizard completed correctly, uploading all the files.

Since our recent workshop feature, Click And Build has had a makeover, with a new '10 minute store' guide to help make creating your shop more straightforward

You can also access your Click And Build demo store immediately after requesting it online

30 Day Free Demo

Thank you. Your demo store has been set up.

You can now log in to your store for the first time. This window will remain visible and contain dynamic instructions to guide you through a '10 Minute Store' building exercise. For future reference you can download and print a copy of the exercise [here](#).

Please note your Username and Password:
Username is **admin**
Password is **admin**

Once you have logged in, you may ensure that no one else has access to your store by changing your password through Click and Build's 'Users' area once you have logged in.

You will shortly receive an email confirming the details provided on this page.

Useful Downloads:

- Click and Build 'Store Builders Guide' [PDF](#) (804kb) [DOC](#) (820kb)
- '10 Minute Store' Guide [HTML](#) (11kb)

[Click here to visit your store now >](#)

SCREENSHOT 3

It's not the only solution, however. There is a check box labelled 'Confirm each setting' and if you choose that, then the wizard should stop, giving you the opportunity to change the file permissions manually.

That small niggle aside, Actinic's Catalog was incredibly straightforward to use, and shows how a little intelligence can make even setting up scripts on a Unix server relatively painless. As always, I'd be interested to hear comments from readers of their own experiences with the software.

search engine to return results that are valid. The question is where is this URL being generated – by the search engine, or elsewhere?

A similar trick is to employ misleading Meta tags in the headers of web pages, hoping to fool search engines into listing a site on as large a number of searches as possible. And already there's been a court case on the subject, with a company having to remove the names of its rivals' products from their own Meta tags.

If any readers can shed a little technical light on the issue of Tony's 'Phrase Echoing', I'd like to hear from them (he was, incidentally, searching a number of engines simultaneously, using Copernic).

Views on this matter are welcome too. Is this sort of activity a valid tactic to direct shoppers to the front page of your web store, even if you don't have exactly what they're after? Or isn't directing people, who only wanted information to help narrow down their choices, to online stores likely to aggravate them and cause frustration? After all, a user may only be searching for an objective article that compares a selection of digital cameras rather than wanting to be sold one.

CONTACTS

Nigel Whitfield welcomes your comments on the Ecommerce column. Contact him via the PCW editorial office or email: ecommerce@pcw.co.uk. Please do not send unsolicited file attachments.

Step 1. Getting Started

Everything you will need is provided and this should take you a little over 10 minutes to complete. Please follow the instructions exactly and don't be tempted to experiment along the way. You can go back to any section later once you have finished, to expand and experiment with your store if you wish. Also, please ignore any on screen instructions and stick to the sequence in this Intro.

Please [download this zip file](#) containing example images (you won't be required to unzip this file) and store it in an easily locatable place on your computer's hard disk.

[previous](#) [next](#)

[open complete guide for printing](#)

SCREENSHOT 4

Syncing superstars

Simon Rockman looks to the future where multiple devices will automatically update each other

The car industry used to talk about one-box and three-box cars to explain their shape. Now it's the mobile phone industry's turn. A one-box device is something like a Nokia 9110, an all-in-one pocket computer and phone. With a two-box device the mobile phone is separate from the pocket computer. There is no 'right' answer to what everyone wants. Two boxes are a very sensible solution with a Bluetooth link. You can keep the phone in your pocket while typing on the pocket computer. Ironically you end up carrying more around, since both devices need screen, keyboard and batteries – but in many ways it feels more portable.

What lies behind the fact that you are more likely to have a two-box device than one with a single box is the move to third-generation (3G) phones. However, this has everything to do with money and nothing to do with technology.

Two-box solutions let the mobile phone manufacturers concentrate on the bits they're good at, without worrying about operating systems and politics, and the pocket computer manufacturers can concentrate on what they do best. Mechanically this works well. You might, for example, want to talk to someone on the mobile while checking appointments on the computer. In a couple of years the computer will still be online, through the same phone, using GPRS for the data while you do this. The pressing reason for the rise of the two-box system, though, is price. Mobile phone manufacturers have become used to the idea that they make a phone for £100, pass it to a wholesaler who sells it for £130, and passes it to a dealer who sells it for £30, and then gets £150 from the network for doing so. The networks have been happy to pay this way because they knew that over the first year the customer would spend something like £400 on using the phone.

It all looked rosy for the one-box manufacturer. These were devices that would increase data traffic as well as voice traffic – if you get an email to your mobile you are just as likely to phone the sender as to email back. It was obvious that the networks would see the value of this and increase the subsidy. A dealer who sold one would get not £150 but £250. So if it cost the manufacturer £300 to build it could still sell for £200 – a



bargain compared with a £400 Compaq iPaq.

And then, in March 1999, 3G happened. The bidding started for the UK licences, all the networks overbid and spent £22bn. Then in April 2000 the Stock Market started to slide and the mobile phone networks, which were used to borrowing without problems, found money starting to get tight. Margins started to be squeezed and suddenly the need to build the number of users became less important than making money out of each one.

The result is that when a one-box manufacturer, say Mitsubishi with the Trium Mondo, presents it to Orange or whoever, they will be offered the same subsidy as an ordinary handset. Since the expected retail price of the device is something like £700, even after the £150 subsidy it becomes more expensive than an iPaq, and the buyer will have something with less memory and a mono screen. Suddenly one-box devices have become prohibitively expensive. A two-box solution is no cheaper, but because it's bought as two separate items it seems to deliver more.

So long as you just want your mobile phone to look like an ordinary Hayes modem to the computer, this is all OK. However, we've become used to much more than that. On the computer screen

Syncing two devices is today's way of getting your data where you want it



we'll want to see the signal strength and battery life of the phone, compose and send text messages and integrate the mobile's phonebook with the contacts in the PDA. To make all this happen, the PDA manufacturers are going to have to learn a lot about the remote devices.



My phone is syncing

Mixing different devices needs a standard for data interchange. The great thing about standards is that you have such a choice. Chief among these standards are Microsoft Activesync and the rival SyncML consortium. In practice everyone uses custom sync software to get information in and out of Outlook. To get data from my Psion 5mx to a Siemens SL45 I synced the Psion with Outlook (which I don't usually use) and then resynced the Siemens with Outlook to get the data in. It worked perfectly and then it dawned on me. The future isn't about one or two boxes, it's about multiples.

I'll wander round with a Handspring Prism, which I like for Avant Go and the colour screen, the Psion 5mx which I like for the great keyboard and because it's my central repository for data, and one of a host of phones – often an Ericsson R380. I don't want to keep all my data in one place, I want it in all of them. And I want another copy on my PCs at home and in the office.

Home and office are on permanent connections, so with a GPRS link from the phone all this is possible, but the key bit of software in all of this is Microsoft Outlook, the de facto sync standard.

This would mean that when I type a new contact into my Psion 5mx, it's automatically in my mobile phone. I wouldn't have to carry any one device everywhere; instead, I'd take whatever is best for the purpose. More importantly, when I'm out with just my phone I can add a contact – ideally by someone beaming it to me – and it will automatically find its way to all my other devices. It's not a system of centralised data accessible from lots of devices, but more the Lotus Notes model of replication that I want.

GPRS TARIFFS

Vodafone has announced prices of between £1 and £2.90 per megabyte over and above monthly allowances of between 5MB and 100MB. Without the experience to be certain, both Vodafone and BT Cellnet seem to have settled on a monthly fee of around £40 a month for 40MB of data as being sensible. This is on top of a standard voice tariff.

Games are pretty low bandwidth and so you'll get a lot more games out of a megabyte of data than out of 10 minutes of circuit-switched calls.



Top: Nokia's 3330 has downloadable games

Middle: The 8310's online games are only open to club members

The 6310, announced at CeBIT, will be able to sync with a PDA via Bluetooth

New Nokias

The first phone to really point the way to this is the Nokia 6310, which was announced at CeBIT. GPRS, HSCSD, Bluetooth, WAP 1.2.1 and SyncML are all the magic terms in the specification. Nokia will be running web-based services that the phone can sync with using WAP and SyncML. This data can be held in the phone or sent via Bluetooth to a PDA, such as the rumoured Psion device.

Nokia has announced other new phones that will be of interest to the mobile data user. The new low-end phone is the 3330. This supersedes the 3210, which in turn usurped the 3210. There are no infra-red or interesting modem features, but it does have a WAP browser – pretty much a prerequisite for new handsets since the networks that buy 70 per cent of all handsets want WAP to help encourage people to use their phones more. More interestingly, the 3330 has downloadable games.

The networks hate the idea that a handset might include software that could affect the way the phone behaves on the network, so you can be sure that these will be well isolated from the phone side of the unit, and will be single player. How you download the games will also be regulated; although it uses WAP to control them, it's possible that downloads will only be permitted from the network's own server. A well-regulated system is something the networks love, since you'll spend more time racking up a phone bill if you are downloading games.

Online games are offered by the Nokia 8310, but since these are only the games built into the phone, Nokia retains the control over software doing things online. The 8310 uses WAP for these, but it's only open to club Nokia members – a club that is free if you have a Nokia phone. The games are not heavily interactive; they're word and quiz games because GSM has a 750ms latency and WAP makes this far worse, so only turn-based games are feasible. WAP gaming isn't as lucrative a revenue stream for the networks using the 8310 as this phone uses GPRS – the always-on connection. Networks will be charging by the megabyte, but it's still much cheaper than using a circuit-switched connection (see box).

CONTACTS

Simon Rockman welcomes your comments on the PDA and Mobile Devices column. Contact him via the PCW editorial office or email: pda@pcw.co.uk. Please do not send unsolicited file attachments.

Networking infrastructure

Establishing a PC network is not merely a matter of connecting to a server, as Roger Gann explains

Linking computers to form a network involves more than simply buying a server and some workstation desktop PCs – what connects them is just as important. As many as two-thirds of all network problems are directly attributable to cabling problems, so it's important to get it right. Installing network cabling is something that requires some planning and forethought, even when commissioning a relatively small network.

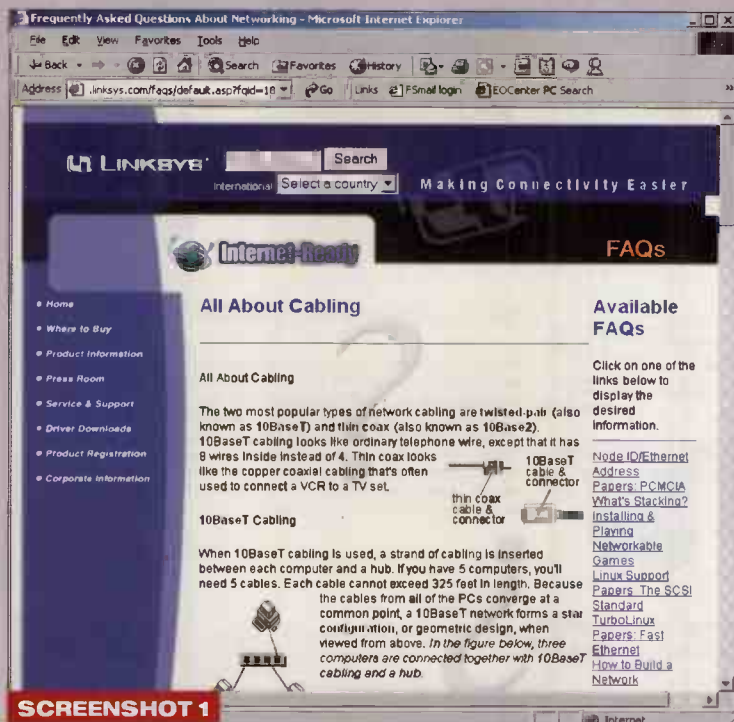
The connection hardware you must consider when configuring a LAN includes network interface cards (NICs) in the server and workstation, the cabling running around the office walls, and the hubs in the comms cabinet. Different network topologies, including Ethernet (10Base-T), Fast Ethernet (100Base-T), Token Ring, and Asynchronous Transfer Mode (ATM), use varying techniques to transfer data, though most networks opt for Ethernet, with Token Ring coming in a poor second.

Choosing which cable 'topology' best suits your needs depends mainly on the applications that you'll be running on your LAN. For most companies, the original Ethernet's 10Mbps/sec data rate is adequate for general-purpose network traffic; adding network switches can increase throughput slightly without costing the earth. However, bandwidth-intensive applications, such as multimedia and video-conferencing, demand high-speed topologies such as 100Mbps/sec Fast Ethernet or Gigabit Ethernet.

The man from the Leads

Before installing any wiring for your LAN, you should consult a qualified network-cabling contractor. Most LAN topologies can operate over several different cabling specifications, including telephone-style unshielded twisted-pair (UTP), shielded twisted-pair (STP), fibre-optic and coaxial cable.

Of these four types, UTP is the most popular and for three good reasons: it's cheap, flexible and can handle high-speed data. UTP wiring is available in three specifications, known as Categories 3, 4 and 5. Category 3 is voice-grade wiring and is commonly found in office buildings. It's mainly used for telephones, but can also be used in 10Mbps/sec Ethernet and 4Mbps/sec Token Ring topologies.



Category 4 UTP has been leap-frogged by Category 5, which has become the networking cable of choice because it can handle fast topologies such as ATM and 100BaseT. The extra cost of fitting Category 5 over its slower alternatives is close to non-existent, and so it should be installed even if you don't need its bandwidth right now. Category 5 cable, however, has some minor limitations: it can carry a signal only 300m in 10Mbps/sec installations and only 150m in high-speed topologies.

STP, or Category 1, wiring is a more expensive form of UTP, with a higher resistance to interference because of its extra shielding. Fibre-optic cabling and hardware, which is even more expensive, are, because they're based on light transmission, immune to radio-borne interference and can transfer data over longer distances.

Coaxial cable is similar in construction to the humble TV aerial cable. It consists of a thin wire with a polyurethane coating and shielding. Commonly referred to as Thin Ethernet, it's a cheap and easy way to connect Ethernet workstations that are relatively close to one another. T-connectors on each of the workstations' network cards allow them to be 'daisy-chained' together with no need for additional connectivity equipment, such as

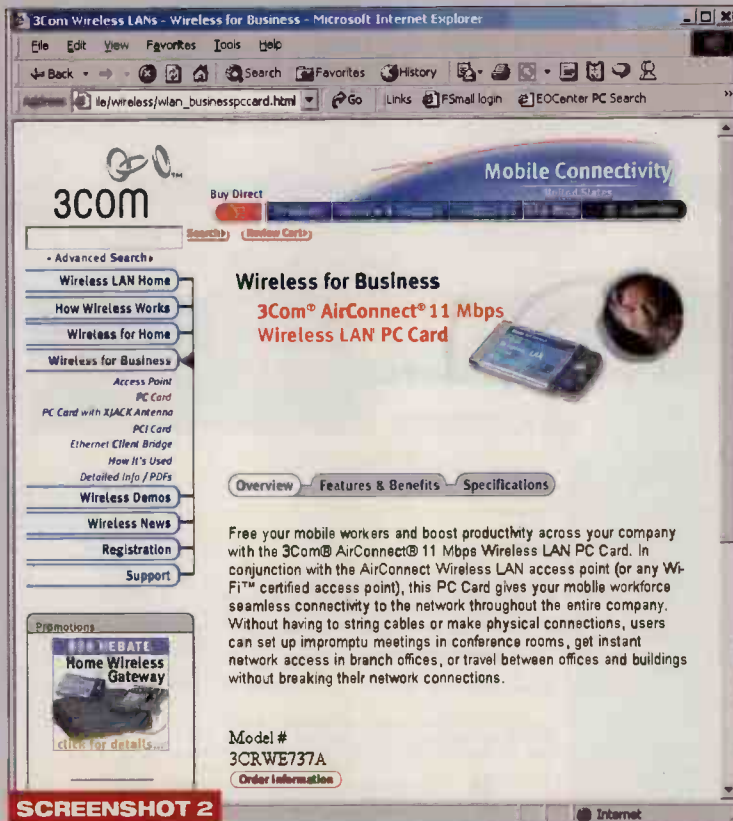
hubs. A terminator at each end of the daisy chain marks the beginning and end of the network. It, too, is not without problems – it can be unreliable if mistreated and, if there's a break or bad connection in the daisy chain, all of the nodes on that network segment lose access to the server. Cabling, while easy to lay down, is unsuitable to office conditions, trailing as it does between desks. Moreover, as its data rate is limited to 10Mbps/sec, coax is now effectively obsolete.

As an alternative to daisy-chaining, Ethernet 10BaseT and the faster 100BaseT networks are arranged in a 'star' or hub-and-spoke topology, in which a hub in the comms cabinet (where all the network cables connect to) connects the workstation nodes in a spoke design. Token Ring also uses the star method to connect network nodes. Hubs range in price from about £50 to £1,000, depending on the number of nodes they support, and their communication options and management features.

There's a bewildering array of hubs available – standalone, stackable and chassis-based hubs, to name but three. The cheapest offer basic 16-port Ethernet connectivity without management capabilities. Stackable hubs provide higher-end features such as expandability, hot-swappability, communications

There's a whole raft of useful information on installing networking infrastructure at the Linksys site – www.linksys.com

Most Wi-Fi wireless LANs are built around a common module based on the PC card form factor – desktop PCs will, of course, require a PC Card adaptor. Despite having fallen in price, they still remain costly



features and management capabilities. Unless you're considering a major network installation, you probably won't have to consider modular chassis hubs unless expandability and flexibility are your primary concerns and your budget is not a constraint.

On the cards

Network interface cards (NICs) are available for any topology and type of bus, from 16bit ISA cards for older PCs to PC Cards for notebooks. PCI cards, which support faster data rates and therefore faster LAN topologies, often provide a bus-mastering feature that enhances performance. This makes them the NIC of choice for servers, where throughput is more critical.

Some NICs, known as combo cards, offer multiple connectors for several different cable types, eg sockets for 10BaseT, 10Base5 and 10Base2. Combo cards cost more than single-connector adaptors, but are appropriate if a cable upgrade is imminent. Otherwise, buy NICs with just the connector that supports your cable topology.

Many NICs sold these days are of the 10/100 Ethernet variety. These hybrid network adaptors can operate not only at 10Mbps/sec but also at 100Mbps/sec, and so make for an easy upgrade path to 100Mbps/sec Fast Ethernet rates. All you have to do is upgrade the hub in the comms cabinet and, thanks to your



If you're feeling particularly geeky on the cabling front, the Cabling Installation & Maintenance website at clm.pennnet.com is the site for you

foresight in installing Category 5 cabling, the hybrid cards will automatically switch to the higher data rate. These NICs used to carry a small premium over their slower 10Mbps/sec alternatives, but now you can pick them up for less than £15, if you're not fussy about brand names.

Wireless

Virtually all networks use traditional cable media, but this isn't always the best solution and sometimes wireless LANs can be a better choice. Wireless LAN technology offers a number of advantages at various levels. For example, among small- to medium-sized networks, many LANs are installed without the benefit of a large, on-site support staff. Wireless LAN

technology considerably simplifies LAN installation where on-site technical assistance is limited. In some situations, particularly in larger enterprises, a traditional cable-based network can impose stiff overheads when it comes to adding extra nodes – It is often expensive, inconvenient and time-consuming.

Another consideration concerns companies occupying rented premises, which may be reluctant to invest in fixed cabling. Here, wireless LANs represent a one-time investment that can be carried from site to site without incurring any major installation costs. Companies often occupy older premises that were never designed to accommodate structured cabling without prohibitive expense and these too lend themselves to a wireless-based solution. The same goes for historic or listed buildings, which can't be altered without permission.

By their very nature, wireless LANs can be quickly and easily deployed, disassembled or reconfigured. The ease with which network installation and modification can occur using wireless LANs makes temporary network installations feasible, for things like ad hoc workgroups or for dedicated projects, for example.

They are perfect for factory or warehouse environments. Wireless LANs also offer 'ubiquitous connectivity' at a low cost, perhaps reducing the need for cabling to as little as one point per 10,000 sq ft.

To access the network, clients use an adaptor that generally comes in the form of a PC Card to transmit data to and from an access point that is connected to a network. Clients have to be within 100m in free air, 30m inside a building. As the client moves, its radio connection transfers to another access point, a process called roaming.

That's the upside, but the downside is cost and speed. Wireless networking is significantly dearer on a per node basis than conventional cable networks (though the price is dropping) and, by Fast Ethernet standards, offers relatively slow speeds of around 11Mbps/sec, about that of 10BaseT networks. Security is another issue; after all, your data is actually being broadcast. An old bugbear, interoperability, was finally laid to rest with the release of 802.11b, often referred to as 'Wi-Fi'.

CONTACTS

Roger Gann welcomes your comments on the Networks column. Contact him via the PCW editorial office or email: networks@pcw.co.uk. Please do not send unsolicited file attachments.

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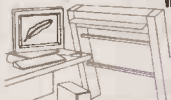
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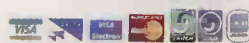
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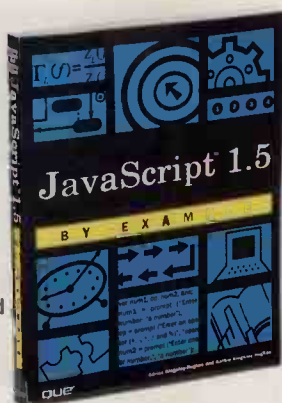
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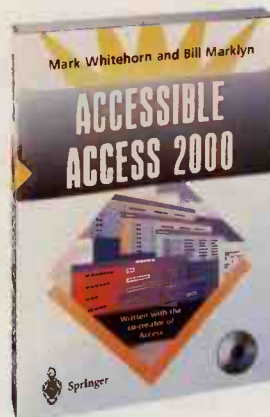
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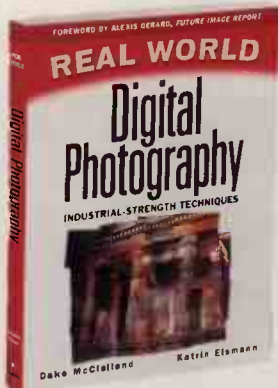
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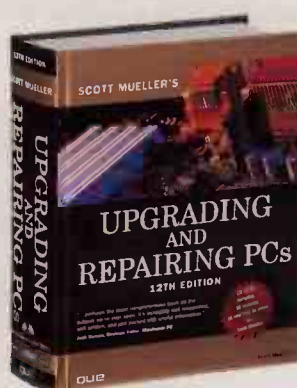
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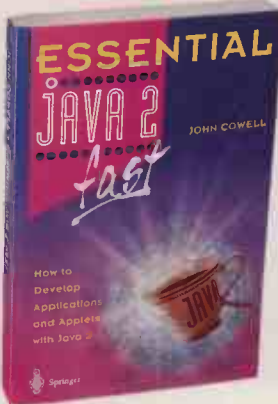
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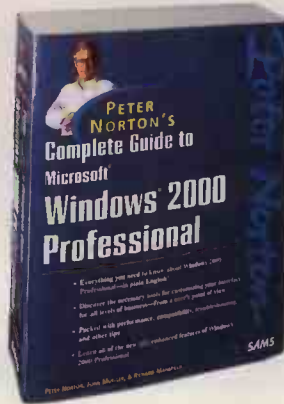
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Products are not supplied on a trial basis. Hardware and Software products featured in this catalogue are covered by their respective manufacturer's warranties, details of which are included with the product. Should you need to return any product to Simply Computers, a Returns Authorisation Number must be obtained in advance. All goods must be returned in the original manufacturers packaging complete with any accessories, manuals or other documentation in the condition in which it was originally received. Any return not complying with these terms will be rejected. Simply Computers cannot accept returns of software packages unless the package is unopened and the software seal is intact. Products supplied which are not featured in the catalogue or on our website are not subject to our normal returns policy. Please note that Simply Computers cannot be held responsible for incompatibility issues or accept any responsibility for any consequential or indirect loss no matter how incurred. Your existing consumer statutory rights are not affected by these warranties and conditions. Fast Track returns will be handled within 48 hours. Systemax PC Systems are supplied with a 3 year return to base warranty (Base unit only) – 1st year parts and labour, years 2 to 3 RTB labour only, unless an optional on-site warranty has been purchased. In any case, third party products (printers, scanners etc.) will be subject to manufacturer's warranty only.

Delivery

General. Notification may be telephone call/message, email, fax or by post on the due date which will be considered as notification. Delivery times are only estimates and deliveries can take place up until 6pm. Carriers first attempt to deliver will be regarded as the delivery date. Delivery charge refund claims must be made within seven days of the delivery date to Customer Services. Only one refund will be made to an order (by same method as payment). The delivery charge does not imply a guaranteed delivery time. Simply Computers cannot accept orders if time is of the essence.

Standard Internet Delivery Service. The despatch method is at our discretion. Offer applies to UK mainland and Northern Ireland only. May take up to 3 working days from shipment to delivery.

Delivery Charges. For orders under £50 ex VAT delivery from £6. £50-£100 from £8, Over £100 from £10.

Insurance. Add a delivery insurance charge of £2.95 per order. Delivery insurance will not be refunded.

PC Systems

The offer of free delivery on systems not shipped within 7 days applies to our standard advertised PC systems and custom-builds where stock availability is confirmed at time of order. It does not apply to custom-built systems where products are in constraint, and we advise you at time of order.

Replacement products

To receive a replacement product after 30 days, customers must confirm to Simply by fax or letter the date the product was received by Simply for repair, the returns number, and nature of the repair problem. Simply will deliver a replacement product as soon as possible. This does not apply to manufacturers that go into receivership. In the event of unavailable or discontinued items, we reserve the right to offer an alternative of the same or higher specification. The warranty period will apply from original date of purchase, not the date of replacement. If the list price of the replacement item is less than the original purchase price, no refund will be made.

Customer Service queries

We will either resolve the issue you have raised within 24 hours or acknowledge receipt of your communication by post, telephone, email or fax. Responding to your enquiry over the telephone will be regarded as an acknowledgement. Working day is Monday to Friday excluding Bank Holidays.

General

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Chassis	Systemax Midi Tower Case
Motherboard	Latest Socket 370 i810-E2
Processor	Intel® Celeron™ 766MHz
Memory	64MB SDRAM 133MHz
Hard Drive	10.2GB Ultra DMA
DVD/CDROM	Systemax 52x CD-ROM
Additional Storage	
Monitor	15" (13.8" viewable) Systemax
Graphics Card	On-Board Graphics
Speakers	Creative SBS52
Sound Card	On-Board Sound
Extra Software/Hardware	On-Board Intel 10/100 Fast Ethernet

Plus Standard Features

£499.00 EX. VAT
£615.70 INC. VAT+DEL.

Systemax Lifestyle P1000R

PRODUCT CODE I07266



Chassis	Systemax Midi Tower Case
Motherboard	Latest Socket 370 i810-E2
Processor	Intel® Pentium® III 1GHz
Memory	128MB SDRAM 133MHz
Hard Drive	30.7GB Ultra DMA
DVD/CDROM	Systemax 12x DVD-ROM
Additional Storage	
Monitor	17" (16" viewable) Systemax
Graphics Card	On-Board Graphics
Speakers	Creative SBS52
Sound Card	On-Board Sound
Extra Software/Hardware	Power DVD Playback Software On-Board Intel 10/100 Fast Ethernet

Plus Standard Features

£799.00 EX. VAT
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Systemax Premier P1400R

PRODUCT CODE I07268



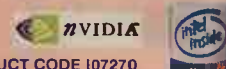
Chassis	Systemax Midi Tower Case 300W
Motherboard	Latest Socket 423
Processor	Intel® Pentium® 4 1.4 GHz
Memory	128MB PC800 RDRAM
Hard Drive	40.9GB Ultra DMA
DVD/CDROM	Systemax 12x DVD-ROM
Additional Storage	
Monitor	17" (16" viewable) Systemax
Graphics Card	nVIDIA Geforce2 MX 32MB with TV-Out
Speakers	Creative SBS52
Sound Card	On-Board Sound
Extra Software/Hardware	Power DVD Playback Software

Plus Standard Features

£899.00 EX. VAT
£1085.70 INC. VAT+DEL.

Systemax Premier P1500R

PRODUCT CODE I07270



Chassis	Systemax Midi Tower Case 300W
Motherboard	Latest Socket 423
Processor	Intel® Pentium® 4 1.5 GHz
Memory	256MB PC800 RDRAM
Hard Drive	60.0GB Ultra DMA 7200rpm 2MB Cache
DVD/CDROM	Systemax 12x DVD-ROM
Additional Storage	Systemax 8x4x32 CD-Writer
Monitor	17" (16" viewable) Systemax
Graphics Card	nVIDIA Geforce2 Pro 64MB with TV-Out
Speakers	Creative Sound Works Digital
Sound Card	Sound Blaster Live! Player 5.1
Extra Software/Hardware	Power DVD Playback Software Systemax 6 Game Mega Pack

Plus Standard Features

£1499.00 EX. VAT
£1790.70 INC. VAT+DEL.

Systemax 6 Game Megapack
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Systemax Value D850R

PRODUCT CODE I07265



Chassis	Systemax Midi Tower Case
Motherboard	Latest Socket A KM133
Processor	AMD Duron™ 850MHz
Memory	64MB SDRAM 133MHz
Hard Drive	10.2GB Ultra DMA
DVD/CDROM	Systemax 12x DVD-ROM
Monitor	17" (16" viewable) Systemax
Graphics Card	On-Board Graphics
Speakers	Creative SBS52
Extra Software/Hardware	Power DVD Playback Software Epson Stylus Color 480 Printer

Plus Standard Features

£599.00 EX. VAT
£733.20 INC. VAT+DEL.

Systemax Lifestyle A1000R

PRODUCT CODE I07267



Chassis	Systemax Midi Tower Case 300W
Motherboard	Latest Socket A KM133
Processor	AMD Athlon™ 1GHz
Memory	128MB SDRAM 133MHz
Hard Drive	30.7GB Ultra DMA
DVD/CDROM	Systemax 12x DVD-ROM
Monitor	17" (16" viewable) Systemax
Graphics Card	On-Board Graphics
Speakers	Creative SBS52
Extra Software/Hardware	Power DVD Playback Software Epson Stylus Color 480 Printer

Plus Standard Features

*£699.00 EX. VAT
£850.70 INC. VAT+DEL.

Systemax Premier A1300R

PRODUCT CODE I07269



Chassis	Systemax Midi Tower Case 300W
Motherboard	Latest Socket A 266FSB
Processor	AMD Athlon™ 1.33GHz 266FSB
Memory	128MB PC2100 266DDR RAM
Hard Drive	40.9GB Ultra DMA
DVD/CDROM	Systemax 12x DVD-ROM
Monitor	17" (16" viewable) Systemax
Graphics Card	nVIDIA Geforce2 MX 32MB with TV-Out
Speakers	Creative SBS52
Extra Software/Hardware	Power DVD Playback Software Epson Stylus Color 580 Printer Umax 2100u Flatbed Colour Scanner Hauppauge WinTV-GO Creative Webcam GO Mini Systemax 6 Game Mega Pack

Plus Standard Features

£1099.00 EX. VAT
£1320.70 INC. VAT+DEL.

Standard Features to all Systemax PC Systems

Input Devices	Systemax Wheel Mouse and Web Keyboard
Modem	56K PCI V90
Floppy Drive	3.5" 1.44MB
OS Software	Microsoft® Windows® ME (Millennium Edition)
Software	Microsoft Works Suite 2001 McAfee Virus Scan V5.13
Support	Systemax 3 year RTB (1 year parts)

Systemax on-site installation service – get started for just £65 ex vat.

If you don't feel confident about setting up your PC give us a call. Your PC will be set up by an expert with a demonstration of your PC to get you started.

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Computer Buyer - Best Buy - May 2001

"Systemax is great at putting together good, all round systems, but it has outdone itself this month. The specification is superb for the price. It has a number of impressive components, not least a 1.2GHz Athlon, the fastest chip ever seen in Labs."

PC Pro A list - PC for under £1000 - May 2001

"If you're struggling with a tight budget but are looking for the best deal, then buy the A1300RV Value 0580...the performance in our 2D benchmarks streaks ahead of many machines, and its 3D performance is superb for the price."

PC Direct - Recommended - May 2001

"This PC has most of the features people need. It can play CDs, play DVDs and games, and the monitor is pretty decent too. With a copy of the coveted Microsoft Office 2000 SBE, and a basic scanner and printer, everything you'll need is already there."

5/5 Features, 4/5 Value for Money. 5/5 Overall



June 2001

May 2001

New Systemax Server Options

Systemax™



Systemax Server P1000V-H

PRODUCT CODE 107267



Chassis	Systemax Midi Server 300w
Motherboard	Aopen Dx34 Plus Dual VIA 694x
Processor	Intel® Pentium® III 1GHz
Memory	128MB SDRAM 133MHz ECC
Hard Drive/s	Seagate 9.2GB 10K rpm U160 with 4MB cache
Graphics Card	ATI Xpert98 8MB AGP
Extra Software	-

Plus Standard Server Features

£1099.00 EX. VAT
£1320.70 INC. VAT + DEL.

Systemax Server P1000V-S

PRODUCT CODE 107230



Chassis	Systemax Midi Server with 337w redundant PSU
Motherboard	Aopen Dx34 Plus Dual VIA 694x
Processor	Intel® Pentium® III 1GHz
Memory	128MB SDRAM 133MHz ECC
Hard Drive/s	3x Seagate 9.2GB 10K rpm U160 with 4MB cache RAID 5
Graphics Card	ATI Xpert98 8MB AGP
Extra Software	6 bay Hotswap SCA Backplane Adaptec 2100s U160 RAID Controller

Plus Standard Server Features

£2199.00 EX. VAT
£2613.20 INC. VAT + DEL.

Systemax Server P1000V-E

PRODUCT CODE 107231



Chassis	Systemax Midi Server with 337w redundant PSU
Motherboard	Intel STL2 Dual Server
Processor	Intel® Pentium® III 1GHz
Memory	256MB SDRAM 133MHz ECC
Hard Drive/s	3x Seagate 9.2GB 10K rpm U160 5 with 4MB cache RAID
Graphics Card	On Board VGA
Extra Software	6 bay Hotswap SCA Backplane Adaptec 2100s U160 RAID Controller

Plus Standard Server Features

£2399.00 EX. VAT
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ALL SYSTEMAX SERVERS ARE RACKMOUNTABLE WITH OUR OPTIONAL KIT. AVAILABLE AT ONLY £70.00 EX VAT. PLEASE QUOTE CODE: SYS038

Standard Features to all Systemax Servers

I/O Controller	On-board Adaptec 7899 U160/ U2W Dual Channel SCSI
LAN	On-Board Intel 82559 10/100 Fast Ethernet
CD Drive	Systemax 40x CD-ROM
Input Devices	Microsoft Intellimouse Explorer and Systemax PS/2 Keyboard
Floppy Drive	3.5" 1.44MB

Support:
Systemax 3 year On-Site

Systemax™ PC Upgrade Options

Systemax Software

	Ex.vat	Inc.vat
S00035 MS Works 2000	£10.00	£11.75
SYS053 Microsoft Works Suite 2001	£25.00	£29.38
S00025 MS Office 2000 Small Business Edition	£90.00	£105.75
S00026 MS Office 2000 Professional Edition	£195.00	£229.13
S00024 Microsoft® Windows® N.T Workstation V4.0	£110.00	£129.25
S00027 Microsoft® Windows® 2000 Professional	£89.00	£105.75
S00048 Systemax 6 Game Mega Pack (Pharaoh, Vampire, FIFA 2000, Chicken Run, Home World, Tomb Raider 4)	£30.00	£35.25
S00036 Systemax Educational Bundle 2000 (Over 15 educational and reference titles!!!)	£30.00	£35.25

Systemax Warranties

	Ex.vat	Inc.vat
WA9002 Systemax 1 year on-site warranty 2 years RTB	£39.00	£45.83
WA9003 Systemax 2 years on-site warranty 1 year RTB	£69.00	£81.08
WA9004 Systemax 3 years on-site warranty	£99.00	£116.33

Monitors

	Ex.vat	Inc.vat
MN0004 15" (13.8" viewable) to 17" (16" viewable) Systemax Monitor	£30.00	£35.25
MN0014 17" (16" viewable) to 19" (18" viewable) Systemax Monitor	£60.00	£70.50
MN0094 19" (18" viewable) to 15.1" viewable Systemax TFT Panel	£220.00	£258.50

Miscellaneous

	Ex.vat	Inc.vat
KE0156 Logitech Cordless Desktop Solution Pro	£65.00	£76.38
JO0218 MS Sidewinder Game Pad	£11.00	£12.93
JO6970 MS Sidewinder Force Feedback 2 Joystick	£50.00	£58.75
TV5003 Intel Create & Share Cam Pack	£53.00	£62.28
SYS107 Systemax 8x4x32 CD-Writer	£75.00	£88.13
NE2003 Systemax 10/100Base Fast Ethernet Card	£18.00	£21.15
TV1230 Hauppauge WinTV-GO	£30.00	£35.25

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NOTEBOOKS

ACER

PWNAC115	TM351TE PIII700 128MB 10GB 13.3" M/LAN CD WMe	1329.00	1561.58
PWNAC116	TM352TE PIII750 128MB 10GB 13.3" M DVD WMe	1569.00	1843.58
PWNAC112	TM202T C650 5GB 64MB CD 12.1" TFT M WMe	759.00	891.83
PWNAC114	TM202TX C700 10GB 64MB CD 14.1" TFT M WMe	949.00	1115.08
PWNAC117	TM524TE PIII650 64MB 10GB CD M/LAN 13.3" WMe	995.00	1169.13
PWNAC118	TM524TE PIII650 64MB 10GB DVD M 13.3" WMe	1049.00	1232.58
PWNAC119	TM524TX PIII650 64MB 10GB CD M/LAN 14.1" WMe	1189.00	1397.08
PWNAC120	TM527TX PIII800 64MB 10GB DVD M/LAN 14" WMe	1519.00	1784.83
PWNAC121	TM603TER PIII700 128MB 12GB CDR 13.3" TFT W98	1569.00	1843.58
PWNAC122	TM604TER PIII750 128MB 12GB CDR 13.3" TFT W2K	1709.00	2008.08
PWNAC123	TM737TL PIII700 64MB 10GB CD M/LAN 15" TFT W2K	1429.00	1679.08
PWNAC124	TM739TLV PIII850 128MB 20GB DVD M/LAN 15.1" W2K	2669.00	3136.08

COMPAQ ARMADA

PWNC0055	Armada E500 PIII 700 12GB 64MB CD LAN/M 14" TFT W98	1519.00	1784.83
PWNC0101	Armada E500 PIII 850 20GB 128MB DVD LAN/M 15" TFT W98	2199.00	2583.83
PW51953	Armada M300 PIII 600 12GB 64MB 12.1" FT NT/W2K	1489.00	1749.58
PW51954	Armada M300 PIII 600 12GB 64MB 12.1" FT W95/98	1449.00	1702.58
PW51738	Armada M700 PIII 650 6GB 64MB CD 14" TFT W95/98	1779.00	2090.33
PW51955	Armada M700 PIII 650 6GB 64MB CD 14" TFT NT/W2K	1819.00	2137.33
PW51740	Armada M700 PIII 750 12GB 64MB DVD 14" TFT W95/98	1929.00	2266.58

FUJITSU SIEMENS LIFEBOOK

PWNF0168	B2154 C450 6GB 64MB 10.4" Touchscreen W98 M/LAN	1059.00	1244.33
PWNF0183	B2175 C500 10GB 64MB 10.4" Touchscreen W98 Mod / LAN	1239.00	1455.83
PWNF0184	B2175 C500 10GB 64MB 10.4" Touchscreen W2K Mod / LAN	1299.00	1526.33
PWNF0180	C4355 C700 6GB 64MB CD 12.1" TFT W98	779.00	915.33
PWNF0186	C6345 C650 6GB 64MB CD 14.1" TFT M/LAN W98	1159.00	1361.83
PWNF0185	C6565 PIII700 10GB 64MB CD 14.1" TFT M/LAN W98	1429.00	1679.08
PWNF0181	E6570 PIII750 20GB 256MB DVD 14.1" TFT M/LAN W98	1489.00	1749.58
PWNF0182	E6570 PIII750 20GB 256MB DVD 14.1" TFT M/LAN W2K	1539.00	1808.33

HP OMNIBOOK

PW52185	XE3 C650 64MB 10GB 12" TFT CD modem W98	759.00	891.83
PW52186	XE3 PIII 700 64MB 10GB 13.3" TFT CD modem W98	999.00	1173.83
PW52187	XE3 PIII 800 128MB 20GB 15" TFT DVD modem W98	1629.00	1914.08
PW52188	500 PIII 600 128MB 10GB 12" TFT CD modem W98	1599.00	1878.83
PW52189	6000 PIII 650 64MB 6GB 14.1" TFT CD modem W2K	1269.00	1491.08
PW52190	6000 PIII 650 64MB 6GB 14.1" TFT CD modem W98	1199.00	1408.83

SONY VAIO

PWNS0045	Z600HEK PIII800 128MB 20GB 12.1" TFT M CD W2K	1919.00	2254.83
PWNS0047	FX101 C600 64MB 10GB 13.3" TFT M CD WMe	819.00	962.33
PWNS0048	FX103 PIII650 64MB 10GB 13.3" TFT DVD M/LAN WMe	1119.00	1314.83
PWNS0049	FX105 PIII700 64MB 20GB 14.1" TFT DVD M/LAN W2K	1439.00	1690.83
PWNS0050	FX108 PIII750 128MB 20GB 15.1" DVD M/LAN W2K	1679.00	1972.83
PWNS0051	FX109 PIII850 128MB 30GB 15" CDR/DVD M/LAN W2K	2399.00	2818.83

TOSHIBA

PWNT0209	Satellite 1700-200 C650 64MB 6GB CD 12.1" STN Wme	771.99	907.09
PWNT0210	Satellite 1730 C650 64MB 6GB CD 12.1" TFT WMe	799.99	939.99
PWNT0211	Satellite 1700-300 C650 64MB 6GB DVD 13.1" WMe	769.00	903.58
PWNT0212	Satellite 35DVD C500 128MB 10GB 12.1" M/Fwire WMe	1269.00	1491.08
PWNT0213	Satellite 2800-200 PIII700 64MB 10GB DVD 13.1" WMe	1257.99	1478.14
PWNT0214	Satellite 2800-400 PIII750 64MB 20GB DVD 14.1" WMe	1555.99	1828.29
PWNT0218	Satellite 2800-500 PIII800 128MB 20GB DVD/CDRW 15.1" TFT WMe	1909.00	2243.08

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PALM

PW52128	Palm m500	265.00	311.38
PWPD070	Palm Vx 8MB	219.00	257.33
PWPD080	Palm M105	129.00	151.58
PWPD072	Palm IIc	215.00	252.63
PWPD076	Palm M100	95.99	112.79

HP

PW52063	HP JORNADA 525 (16MB)	239.00	280.83
PWCE0048	HP JORNADA 548 (32MB)	325.00	381.88
PWCE0072	HP JORNADA 720 (32MB)	559.00	656.83

PSION

PWPD0512	Psion 5MX Organiser 16MB inc PSiWin 2.3	299.00	351.33
PWPD0516	Psion Rev0 Organiser 8MB 7.7" VGA	239.00	280.83

HANDSPRING

PWPD0607	Handspring Visor 2mb Mono - Graphite	125.00	146.88
PWPD0606	Handspring Visor Deluxe 8mb Mono - Orange	165.00	193.88
PWPD0604	Handspring Visor Deluxe 8mb Mono - Blue	165.00	193.88
PWPD0602	Handspring Visor Deluxe 8mb Mono - Graphite	165.00	193.88
PWPD0605	Handspring Visor Deluxe 8mb Mono - Green	165.00	193.88
PWPD0603	Handspring Visor Deluxe 8mb Mono - Ice	165.00	193.88
PWPD0610	Handspring Visor Edge 8mb Mono - Silver	275.00	323.13
PWPD0601	Handspring Visor Platinum 8MB Mono - Silver	205.00	240.88
PWPD0600	Handspring Visor Prism 8MB Colour - Blue	329.00	386.58

COMPAQ

PW51446	iPaq H3630 32MB Colour	369.00	433.58
PW52110	iPaq H3130 16MB Mono	279.00	327.83

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- Intel® Celeron® 600MHz
- 64MB RAM (512MB Max)
- 10GB HDD
- 13.3" TFT, SVGA Display
- DVM 11MB Max
- Internal Modem 56K
- CD-ROM 24x
- VAIO World Software
- Microsoft® Windows Millennium



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWNS0047	FX101 C600 64MB 10GB 13.3" TFT M CD WMe	819.00	962.33

SONY VAIO PCG-FX108

- Intel® Pentium® III 750MHz
- 128MB RAM (512 Max)
- 20GB Hard Drive
- 8x DVD-ROM
- 15" TFT, SVGA Display
- NTSC/PAL TV Out
- Ethernet Connection (RJ-45)
- Internal 56k Modem
- VAIO World Software



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWNS0050	FX108 PIII750 128MB 20GB 15.1" DVD M/LAN W2K	1679.00	1972.83

Toshiba Satellite 1700 Series

- Intel Celeron 650MHz
- 64MB/160MB SDRAM
- 6GB HDD
- 12.1" DSTN/TFT and 13.1" TFT Display
- Floppy Drive
- 24x CDROM/DVD-ROM
- BitBLT, 3D graphic acceleration, 4MB Video RAM
- 3.2Kg in weight Rechargeable, removable NiMH battery. Up to 2.5 hours per charge Bass enhanced sound system Built-in stereo speakers; Integrated V.90 56k modem; System password; 1 year International Warranty



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWNT0209	Satellite 1700-200 C650 64MB 6GB CD 12.1" STN Wme	771.99	907.09
PWNT0210	Satellite 1730 C650 64MB 6GB CD 12.1" TFT WMe	799.99	939.99
PWNT0211	Satellite 1700-300 C650 64MB 6GB DVD 13.1" WMe	769.00	903.58

Toshiba Satellite 35DVD

- Intel Celeron 500MHz
- 128MB SDRAM
- 10GB HDD
- 12.1" TFT Display
- DVD-ROM & Floppy Drive
- BitBLT, 3D graphic acceleration, 4MB Video RAM
- 2Kg in weight
- Rechargeable, removable Lithium-Ion battery. Up to 3.5 hours per charge
- Bass enhanced sound system
- Built-in stereo speakers;
- Integrated V.90 56k modem; System password
- 1 year International Warranty



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWNT0212	Satellite 35DVD C500 128MB 10GB 12.1" M/Fwire WMe	1269.00	1491.08

SONY VAIO PCG-Z600LEK

- Intel® Pentium® III 700 Mhz
- 64MB RAM
- 15GB HDD
- Blue Memory Stick Slot
- 12.1" TFT, XGA Display
- External CD-ROM 16x
- Internal Modem 56K Built in RJ45 Ethernet Connection
- 8MB VRAM
- Jog Dial
- Touchpad Mouse
- W2000® Professional OS



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWNS0045	Z600HEK PIII800 128MB 20GB 12.1" TFT M CD W2K	1919.00	2254.83

Acer TravelMate 525TE Series

Value All-In-One Notebook

- PIII700MHz
- 128Mb
- 10Gb
- CD
- 56K
- LAN/Modem
- 13.3" TFT
- WME

Image shown with optional webcam



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CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PW52241	TM525TE PIII700MHz, 128Mb, 10Gb, CD13.3" TFT, WME	1039.00	1220.83
PW52242	TM 210T C700MHz, 128Mb, 10Gb, CD 12.1" TFT, WME	Call	

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The Flexible, Future-proof Portable Platform-Built to Satisfy Every Corporate Computing Need.

- Intel Pentium III 700/750MHz
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- 10/20GB HDD, Floppy Drive
- 13.1"/14.1" TFT Display
- 8x DVD-ROM
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- 3.3Kg In weight Rechargeable, removable Lithium-ion battery. Up to 3 hours per charge Bass enhanced sound system Built-in stereo speakers; Integrated V.90 56k modem; System password; 1 year International Warranty



TOSHIBA

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWNT0213	Satellite 2800-200 PIII700 64MB 10GB DVD 13.1" WMe	1257.99	1478.14
PWNT0214	Satellite 2800-400 PIII750 64MB 20GB DVD 14.1" WMe	1555.99	1828.29
PWNT0218	Satellite 2800-500 PIII800 128MB 20GB DVD/CDRW 15.1" TFT WMe	1909.00	2243.08

Fujitsu Siemens E-6570

- Pentium III 750MHz with Speedstep
- Intel 440ZX Chipset
- 14.1" TFT, 256MB SDRAM
- ATI Mobility-P
- 20GB HDD (Removable / Lockable)
- Modular Bay with CD, DVD, CD-RW, 2nd HDD, Battery available
- 56K V.90 Modem with 98 / LAN with NT
- Li-Ion Battery
- Port Rep II-L, LAN Dock II, Full Dock II
- MS Windows 98 OR MS Windows NT/2000
- MS Word and Works 2000 as standard



FUJITSU SIEMENS

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWNT0180	FSC Lifebook E6570 PIII750 20GB 256MB DVD 14.1" TFT	779.00	915.33

Iomega 250MB PPT Zip Drive

The compatible portable, storage solution making floppies obsolete

- 250MB uncompressed capacity per disk
- Compatible with 100MB zip disks
- 175 x larger and up to 56 x faster than floppy
- Easy to install and use software and one free 250MB disk
- Ideal for file transfer and backup
- Operates with Windows 3.x, Windows 95, 98, 2000 NT 3.51 or higher ■ With free Megakit software



WITH FREE MEGA
KIT II: SOFTWARE
COLLECTION*



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWHZ0014	Zip 250MB Parallel Ext Inc Media	109.99	129.24

Zip 100MB USB Next Generation

Share your ideas, Save your files, Organise your documents.

- Included software captures your creativity from photo albums to music compilations. Adobe Activeshare, Musicmatch Jukebox, MGI Photosuite, 30 day trial version Quiksync 2
- Easy to install, Easy to use: drag and drop simplicity
- Win 98/98SE/2000/Me, Mac OS 8.6 or higher



WITH FREE MEGA
KIT II: SOFTWARE
COLLECTION*



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWHZ0121	Iomega Zip 100MB USB + Megakit 2 Software	78.99	92.81

Iomega The BOX

The Iomega Box is the ideal money saving Bundle for your SOHO/SME backup solutions



- Iomega Zip 250MB USB Host Powered Drive
- Iomega Zip 250MB Parallel Port External Drive
- Iomega Zip 100MB USB New Generation Drive
- Iomega QuikSync 2 Backup Software
- 3 x Iomega 100MB Zip Disk Formatted Grey 10 Pack for PC
- 2 x Iomega 250MB Zip Disk Formatted Grey 4 Pack for PC

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWBD211	Iomega Box Bundle	479.99	563.99

Amacom Notebook Storage Solutions

The Amacom Flipdisk is the ultimate portable data storage device designed with the notebook user in mind.



- Backing up data on the move - With no external power required, using the supplied backup software store your confidential data, emails, digital images and video at lightning speeds in a small, compact and handy device which can be carried and used wherever you choose.
- Upgrading Storage for your Laptop - If you're running out of hard drive space, there's no need to upgrade the internal hard drive in your laptop when you can buy an Amacom Flipdisk for a fraction of the cost with a process that takes 2 minutes and saves needlessly throwing away your old hard drive.
- Security - Should your Laptop be stolen from your home, office or car, your confidential and vital data will not be compromised if it is stored on your Flipdisk, which fits neatly into your jacket pocket.
- IT Investment - Future proof your spend by using the Flipdisk external storage device that is not obsolete when your laptop becomes so.



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWCD0258	Flipdisk 6/2GB PCMCIA/Parallel/USB Hard Disk	224.99	264.36
PWCD0256	Flipdisk 10/20GB PCMCIA/Parallel/USB Hard Disk	248.99	292.56
PWCD0323	Flipdisk 20/40GB PCMCIA/Parallel/USB Hard Disk	323.99	380.69
PWCD0326	Flipdisk 30/60GB PCMCIA/Parallel/USB Hard Disk	528.99	621.56
PWCD0135	Amacom Flipdisk USB Cable	31.99	37.59
PWCD2074	Amacom Flipdisk Parallel Port Cable	29.99	35.24
PWCD2077	Amacom Flipdisk Firewire Cable	47.99	56.39

Maxtor - for maximum Storage

ENTRY LEVEL - DiamondMax VL40

- 20GB, 30GB and 40GB
- 5400rpm, Sub 9.5ms seek
- 373.6Mbits/sec
- Ultra ATA/100



HIGH CAPACITY - DiamondMax 80

- 60GB, 80GB
- 5400rpm, Sub 9ms seek
- 373.6Mbits/sec
- Ultra ATA/100

MAX PERFORMANCE - DiamondMax Plus 60

- 20GB, 40GB, 60GB
- 7200rpm, Sub 8.7ms seek
- 456Mbits/sec
- Ultra ATA/100



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWHMA206	DiamondMax 34098H4 40GB 9.5ms 5400rpm 2MB	79.99	93.99
PWHMA207	DiamondMax 96147H6 61.4GB 9ms 5400rpm 2MB	117.99	138.64
PWHMA216	DiamondMax 5T040H4 40GB 8.7ms 7200rpm 2MB	93.99	110.44

Western Digital Hard Drives

Speed and performance are the key features of Western Digital

Western Digital's WD Caviar EIDE hard drives are the performance champions for advanced desktop personal computers. The latest drives achieve world-class areal densities and a wide range of drive capacities ideal for storing Internet downloads, music and video files. WD Caviar drives offer Ultra ATA/100 and Ultra ATA/66 Interfaces, low seek times and up to 100 MB/s data transfer rates, all of which add up to a fast data delivery system



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWHW0010	Protege 20GB 12ms 5400rpm UDMA100 2MB	74.99	88.11
PWHW0011	Caviar 30GB 5.5ms 5400rpm UDMA100 2MB	77.99	91.64
PWHW0013	Caviar 40GB 5.5ms 5400rpm UDMA100 2MB	87.99	103.39
PWHW0012	Caviar 30GB 4.2ms 7200rpm UDMA100 2MB	98.99	116.31
PWHW0014	Caviar 40GB 4.2ms 7200rpm UDMA100 2MB	109.99	129.24
PWHW0015	Caviar WD600AB 60GB 5.5ms 5400rpm 2MB	139.99	164.49

Ricoh CDRW & CDRW/DVD

Ricoh high-speed CDRW and CDRW/DVD drives offer the highest performance and reliability.

- New CDRW 20x writing, 10x Rewriting, 40x Reading
- Ricoh drives feature buffer underun error prevention technology 'Just Link'
- Includes Nero CD writing software



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWCD9167	Ricoh MP7200A-DP EIDE 7200rpm int Retail Kit	199.99	234.99

Code	Description	£ Ex VAT	£ Inc VAT
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UDMA HARD DRIVES

MIRAI FUJITSU ULTRA DMA - RETAIL BOXED

PWHF0191	MPFG3102AH 10GB 9.5ms 7200rpm 2MB	66.99	78.71
PWHF0300	MPG3102AT 10.2GB 9.5ms 5400rpm 512K	62.99	74.01
PWHF0301	MPG3204AT 20GB 9.5ms 5400rpm 512K	68.99	81.06
PWHF0193	MPF3204AH 20GB 9.5ms 7200rpm 2MB	78.99	92.81
PWHF0302	MPG3307AT 30.7GB 9.5ms 5400rpm 2MB	76.99	90.46
PWHF0303	MPG3409AT 40.9GB 9.5ms 5400rpm 2MB	83.99	98.69

Retail boxed set includes: Installation guide, Disk Manager software, Data cable, Screws and 3 year warranty

IBM DESKSTAR ULTRA DMA

PWHI0148	DTLA307015 75GXP 15GB 8.5ms 7200rpm 2MB	76.99	90.46
PWHI0144	DTLA307030 75GXP 30GB 8.5ms 7200rpm 2MB	91.99	108.09
PWHI0145	DTLA307045 75GXP 45GB 8.5ms 7200rpm 2MB	104.99	123.36
PWHI0146	DTLA307060 75GXP 60GB 8.5ms 7200rpm 2MB	157.99	185.64
PWHI0147	DTLA307075 75GXP 75GB 8.5ms 7200rpm 2MB	202.99	238.51
PWHI0012	MicroDrive 340MB 1" 5mm Compact Flash II + TravelKit	143.99	169.19
PWHI0013	MicroDrive 1GB 1" 5mm Compact Flash II + TravelKit	275.99	324.29

Deskstar Drives are covered by a 3 year warranty

MAXTOR DIAMONDMAX VL40

PWHMA204	DiamondMax 32049H2 20.4GB 9.5ms 5400rpm 2MB	60.99	71.66
PWHMA205	DiamondMax 33073H3 30.7GB 9.5ms 5400rpm 2MB	71.99	84.59
PWHMA206	DiamondMax 34098H4 40.9GB 9.5ms 5400rpm 2MB	79.99	93.99

MAXTOR DIAMONDMAX 60

PWHMA207	DiamondMax 96147H6 61.4GB 9ms 5400rpm 2MB	117.99	138.64
PWHMA208	DiamondMax 98196H8 81.9GB 9ms 5400rpm 2MB	153.99	180.94

MAXTOR DIAMONDMAX PLUS 45

PWHMA215	15GB 8.7ms 7200rpm UDMA100 2MB	76.99	90.46
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MAXTOR DIAMONDMAX PLUS 60

PWHMA216	DiamondMax 5T040H4 40GB 8.7ms 7200rpm 2MB	93.99	110.44
PWHMA217	DiamondMax 5T060H6 60GB 8.7ms 7200rpm 2MB	133.99	157.44

Maxtor Hard Drives are covered by a 3 year warranty

MAXTOR UDMA - RETAIL BOXED

PWHMA218	DiamondMax ST1592000H 20GB 8.7ms 7200rpm 2MB	88.99	104.56
PWHMA170	DiamondMax ST1593000H 30GB 8.7ms 7200rpm 2MB	101.99	119.84
PWHMA219	DiamondMax ST1594000H 40GB 8.7ms 7200rpm 2MB	131.99	155.09
PWHMA169	DiamondMax ST1594000U 40GB 8.7ms 7200rpm UDMA66 2MB	129.99	152.74
PWHMA220	DiamondMax ST1596000H 60GB 8.7ms 7200rpm 2MB	189.99	223.24

Retail boxed set includes: Installation guide, Disk Manager software, Data cable, Screws, brackets and 3 year warranty

QUANTUM ULTRA DMA

PWHQ0022	Fireball Ict20 10GB 12ms <7200rpm 128K	54.99	64.61
PWHQ0023	Fireball Ict20 20GB 12ms <7200rpm 128K	60.99	71.66
PWHQ0024	Fireball Ict20 30GB 12ms <7200rpm 128K	70.99	83.41
PWHQ0025	Fireball Ict20 40GB 12ms <7200rpm 128K	79.99	93.99
PWHQ0017	Fireball Plus AS 10GB 8.5ms 7200rpm 2MB	61.99	72.84
PWHQ0018	Fireball Plus AS 20GB 8.5ms 7200rpm 2MB	75.99	89.18
PWHQ0019	Fireball Plus AS 30GB 8.5ms 7200rpm 2MB	86.99	102.21
PWHQ0020	Fireball Plus AS 40GB 8.5ms 7200rpm 2MB	98.99	116.31
PWHQ0021	Fireball Plus AS 60GB 8.5ms 7200rpm 2MB	143.99	169.19

SEAGATE ULTRA DMA

PWHH0231	ST320413A US 20GB 8.9ms 5400rpm 512K	58.99	69.31
PWHH0228	ST340823A US 40GB 8.9ms 5400rpm UDMA66 512K	80.99	95.16

Seagate Hard Drives are covered by a 3 year limited warranty

WESTERN DIGITAL ULTRA DMA - RETAIL BOXED

PWHW0020	20.5GB 12ms 5400rpm 2MB	74.99	88.11
PWHW0021	30GB 12ms 5400rpm 2MB	89.99	105.74
PWHW0022	30GB 8.9ms 7200rpm 2MB	106.99	125.71
PWHW0023	40GB 8.9ms 7200rpm 2MB	117.99	138.64
PWHW0024	45GB 12ms 5400rpm 2MB	108.99	128.06

Retail boxed set includes: Installation guide, Disk Manager software, Data cable, Screws, brackets and 3 year warranty

SCSI HARD DRIVES

FUJITSU

PWHF0222	MAJ3091MP 9.1GB 6.7ms 7200rpm U160 68P 4MB	120.99	142.16
PWHF0223	MAJ3091MC 9.1GB 6.7ms 7200rpm U160 80P 4MB	117.99	138.64
PWHF0224	MAJ3091MP 9.1GB 4.7ms 10Krpm U160 68P 4MB	122.99	144.51
PWHF0225	MAJ3091MP 9.1GB 4.7ms 10Krpm U160 80P 4MB	122.99	144.51
PWHF0226	MAJ3182MP 18.2GB 6.7ms 7200rpm U160 68P 4MB	153.99	180.94
PWHF0227	MAJ3182MC 18.2GB 6.7ms 7200rpm U160 80P 4MB	153.99	180.94
PWHF0228	MAJ3182MP 18.2GB 4.7ms 10Krpm U160 68P 4MB	172.99	203.26
PWHF0229	MAJ3182MC 18.2GB 4.7ms 10Krpm U160 80P 4MB	172.99	203.26
PWHF0230	MAJ3364MP 36.4GB 4.7ms 10Krpm U160 68P 4MB	323.99	380.69
PWHF0231	MAJ3364MC 36.4GB 4.7ms 10Krpm U160 80P 4MB	323.99	380.69

Fujitsu SCSI Hard Drives are covered by a 5 year warranty

IBM

PWHI0154	DPSS-309170 9.1GB 6.8ms 7200rpm U160 68P 4MB	118.99	139.81
PWHI0061	DDYS-T09170 9.1GB 4.9ms 10Krpm U160 68P 4MB	156.99	184.46
PWHI0062	DDYS-T09170 9.1GB 4.9ms 10Krpm U160 80P 4MB	138.99	163.31
PWHI0063	DDYS-T18350 18.3GB 4.9ms 10Krpm U160 68P 4MB	158.99	186.81
PWHI0064	DDYS-T18350 18.3GB 4.9ms 10Krpm U160 80P 4MB	167.99	197.39
PWHI0157	DDYS-T36950 36.7GB 4.9ms 10Krpm U160 68P 4MB	306.99	360.71
PWHI0158	DDYS-T36950 36.7GB 4.9ms 10Krpm U160 80P 4MB	345.99	406.54

Hard Drives are covered by a 5 year warranty

QUANTUM

PWHQ0160	Atlas V 9.1GB 6.3ms 7200rpm Ultra160 68P 4MB	126.99	149.21
PWHQ0161	Atlas V 9.1GB 6.3ms 7200rpm Ultra160 80P 4MB	126.99	149.21
PWHQ0162	Atlas V 18.2GB 6.3ms 7200rpm Ultra160 68P 4MB	165.99	195.04
PWHQ0163	Atlas V 18.2GB 6.3ms 7200rpm Ultra160 80P 4MB	212.99	250.26
PWHQ0164	Atlas V 36.4GB 6.3ms 7200rpm Ultra160 68P 4MB	299.99	352.49
PWHQ0165	Atlas V 36.4GB 6.3ms 7200rpm Ultra160 80P 4MB	306.99	360.71
PWHQ0166	Atlas 10K II 9.2GB 4.5ms 10Krpm Ultra160 68P 8MB	126.99	149.21
PWHQ0167	Atlas 10K II 9.2GB 4.5ms 10Krpm Ultra160 80P 8MB	152.99	179.76
PWHQ0168	Atlas 10K II 18.4GB 4.5ms 10Krpm Ultra160 68P 8MB	180.99	212.66
PWHQ0169	Atlas 10K II 18.4GB 4.5ms 10Krpm Ultra160 80P 8MB	191.99	225.59
PWHQ0170	Atlas 10K II 36.7GB 4.5ms 10Krpm Ultra160 68P 8MB	325.99	383.04
PWHQ0171	Atlas 10K II 36.7GB 4.5ms 10Krpm Ultra160 80P 8MB	360.99	424.16
PWHQ0172	Atlas 10K II 73.4GB 4.5ms 10Krpm Ultra160 68P 8MB	680.99	800.16
PWHQ0173	Atlas 10K II 73.4GB 4.5ms 10Krpm Ultra160 80P 8MB	669.99	787.24

Atlas Hard Drives are covered by a 5 year warranty

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SCSI HARD DRIVES

SEAGATE BARRACUDA

PWHS0508	9.2GB 5.9ms 7200rpm U2W 68P 2MB	143.99	169.19
PWHS0509	9.2GB 5.9ms 7200rpm U2W 80P 2MB	143.99	169.19
PWHS0514	18.2GB 5.9ms 7200rpm U2W 68P 2MB	173.99	204.44
PWHS0515	18.2GB 5.9ms 7200rpm U2W 80P 2MB	222.99	262.01

SEAGATE CHEETAH

PWHS0578	ST392051W 9.2GB 5.4ms 10Krpm U160 68P 4MB	150.99	177.41
PWHS0579	ST392051C 9.2GB 5.4ms 10Krpm U160 80P 4MB	150.99	177.41
PWHS0580	ST318451LW 18.45GB 3.9ms 15Krpm U160 68P 4MB	260.99	306.66
PWHS0581	ST318451LC 18.45GB 3.9ms 15Krpm U160 80P 4MB	260.99	306.66
PWHS0582	ST318405LW 18.4GB 5.4ms 10Krpm U160 68P 4MB	210.99	247.91
PWHS0583	ST318405LC 18.4GB 5.4ms 10Krpm U160 80P 4MB	210.99	247.91
PWHS0584	ST336705LW 36.7GB 5.4ms 10Krpm U160 68P 4MB	360.99	424.16
PWHS0585	ST336705LC 36.7GB 5.4ms 10Krpm U160 80P 4MB	363.99	427.69
PWHS0586	ST173404LW 73.4GB 5.6ms 10Krpm U160 68P 4MB	616.99	724.96
PWHS0587	ST173404LC 73.4GB 5.6ms 10Krpm U160 80P 4MB	699.99	822.49

Seagate SCSI Hard Drives are covered by a 5-year limited warranty

2.5" HARD DRIVES

TOSHIBA

PWHT0004	6GB 9.5mm 4500rpm 13ms ATA66 256K	88.99	104.56
PWHT0005	10GB 9.5mm 4500rpm 13ms ATA66 256K	77.99	91.64
PWHT0006	20GB 9.5mm 4500rpm 13ms ATA66 256K	103.99	122.19

KINGSTON STRATA DRIVES

PWHS9999	NGEN/6 + 6GB 9.5mm	233.99	274.94
PWHS9996	NGEN/14 + 14GB 17mm	585.99	688.54

Strata Drives are covered by a 3 year warranty

EXTERNAL HARD DRIVES

AMACOM

PWCD0258	Flipdisk 6/12GB PCMCIA/Parallel/USB	224.99	264.36
PWCD0256	Flipdisk 10/20GB PCMCIA/Parallel/USB	248.99	292.56
PWCD0322	Flipdisk 18/36GB PCMCIA/Parallel/USB	417.99	491.14
PWCD0323	Flipdisk 20/40GB PCMCIA/Parallel/USB	323.99	380.69
PWCD0326	Flipdisk 30/60GB PCMCIA/Parallel/USB Hard Disk	528.99	621.56
PWCD0135	Amacom Flipdisk USB Cable	31.99	37.59
PWCD0204	Amacom Flipdisk Parallel Port Cable	29.99	35.24
PWCD0207	Amacom Flipdisk Firewire Cable	47.99	56.39

CASES

AT FORM FACTOR

PWCA0160	SC801-S Server case AT	498.99	586.31
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ATX FORM FACTOR

PWCA0365	CE Mini Tower Case ATX 250W	46.99	55.21
PWCA0355	CE Full Tower Case ATX	54.99	64.61
PWCA0018	ATC200 3x5.25" 8x3.5" 300W ATX T5 Alloy	226.99	266.71
PWCA0019	ATC200 3x5.25" 8x3.5" ATX T5 Alloy	199.99	234.99
PWCA0013	InWin Desktop 2x5.25" 2x3.5" ATX 235W	46.99	55.21
PWCA0222	InWin Desktop 2x5.25" 2x3.5" ATX 235W	48.99	57.56
PWCA0014	InWin Desktop 2x5.25" 2x3.5" ATX 235W	54.99	64.61
PWCA0020	InWin Mini Tower 3x5.25" 2x3.5" ATX 235W	54.99	64.61
PWCA0016	InWin Full Tower 5x5.25" 7x3.5" ATX 250W	89.99	105.74
PWCA0021	InWin Full Tower 5x5.25" 7x3.5" ATX 250W	86.99	102.21
PWCA1032	SC350-M Micro ATX 150W	49.99	58.74
PWCA0165	SC730-A Tower Case ATX 235W	94.99	111.61
PWCA0163	SC760-A Full Tower Case ATX 300W	187.99	220.89
PWCA0164	SC760-A Full Tower Case ATX 400W	190.99	224.41
PWCA0167	SC830-W 2x3.5" 9x5.25" SWTX/ATX 300W	526.99	619.21
PWCA0170	SC840 4U 1x3.5" 4xHot Swap 300W + 300W	899.99	1057.49
PWCA0166	SC850-W600W + 300W Triple HS PSU	1129.99	1327.74
PWCA0168	SC860 4U 600W + 300W Triple HS PSU	1059.99	1245.49

TAPE STREAMERS

ECRIX

PWTS0001	VXA-1 66GB Int SCSI	549.99	646.24
PWTS0002	VXA-1 66GB Ext SCSI	699.99	775.49
PWTS0004	Ecix V6 12/24GB 62m Cartridge	23.99	28.19
PWTS0005	Ecix V17 33/66GB 170m Cartridge	56.99	66.96
PWTS0003	Ecix Cleaning Cartridge	34.99	41.11

HP SURESTORE DAT

PWTS0746	DAT 8i Inc Software & Media	399.99	469.99
PWTS0747	DAT 8e Inc Software, Media	469.99	552.24
PWTS0766	DAT 8eU Inc Software, Media	469.99	552.24
PWTS0767	DAT 24i Inc Software & Media	589.99	693.24
PWTS0768	DAT 24e Inc Software, Media	629.99	740.24
PWTS0842	DAT 24eU Inc Software, Media	689.99	810.74
PWTS0791	DAT 24x6i 144GB Int Autoloader	1232.99	1448.76
PWTS0794	DAT 24x6e 144GB Ext Autoloader	1399.99	1644.99
PWTS0783	DAT40i SCSI Inc Software and Media	749.99	881.24
PWTS0784	DAT40e SCSI Inc Software, Media	821.99	965.84
PWTS0799	DAT 40x6 240GB Int Autoloader	1809.99	2126.74
PWTS0801	DAT 40x6 240GB Ext Autoloader	1939.99	2279.49

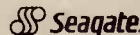
HP SURESTORE DLT

PWTS0848	SureStore DLT1i Inc Software & Media	999.99	1174.99
PWTS0849	SureStore DLT1e Inc Software & Media	1149.99	1351.24
PWTS0774	SureStore DLT40i Inc Software & Media	1209.99	1421.74
PWTS0841	SureStore DLT 40i Hot swap	1400.99	1646.16
PWTS0808	SureStore DLT 80i 80GB Internal	2389.99	2808.24
PWTS0797	SureStore DLT 80e 80GB External	2519.99	2960.99
PWTS0809	SureStore DLT 80i Hot swap	2999.99	3524.99
PWTS0778	SureStore DLT Autoloader 418	3766.99	4426.21
PWTS0804	SureStore DLT Autoloader 718	5799.99	6814.99
PWTS0803	SureStore DLT Autoloader 818	6999.99	8224.99
PWTS0806	SureStore AutoBackup PC25	2499.99	2937.49
PWTS0807	SureStore AutoBackup PC100	5399.99	6344.99
PWTS0871	HP SureStore Ultrium 230i	3399.99	3994.99
PWTS0872	HP SureStore Ultrium 230e	3569.99	4194.74
PWTS0873	HP SureStore Ultrium 230r	3569.99	4194.74

Travan Technology

- TR-4 8GB, TR-5 20GB
- Available in IDE or SCSI interface
- Transfer rates up to 120MB/min
- TapeStar® products include VERITAS Backup Exec® software and Media
- 2 year warranty

See Line Listings for full Seagate® Range



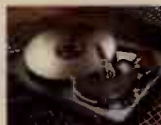
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CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWTS0613	Seagate Hornet® 8 EIDE	119.99	140.99
PWTS0614	Seagate Hornet® 8 SCSI	141.99	166.84
PWTS0620	Seagate TapeStar® Travan 8 EIDE TR8 Inc Media	136.99	160.96
PWTS0630	Seagate TapeStar® Travan 8 SCSI TR8 Inc Media	156.99	184.46
PWTS0636	Seagate Hornet® 20 EIDE	159.99	187.99
PWTS0639	Seagate Hornet® 20GB SCSI	189.99	223.24
PWTS0638	Seagate TapeStar® Travan NS20 SCSI TR20 with RWV	316.99	372.46

Seagate SCSI Disc Drives

Seagate's SCSI drives – The ultimate in performance, technology and reliability.

- Medalist Pro-Entry Level 7,200 RPM
- Barracuda®-Mainstream 7,200 RPM
- Cheetah®-High End 10,000RPM
- All available in Ultra-2 SCSI with capacities from 9.2GB up to 73.4GB



Seagate
CHEETAH
BARRACUDA

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWHS0570	ST39216N 9.2GB 5.9ms 7200rpm Ultra 50Pin 2MB	134.99	158.61
PWHS0568	ST39236N 9.2GB 5.9ms 7200rpm U160 68P 2MB	134.99	158.61
PWHS0572	ST318437LW 18.2GB 8.5ms 7200rpm U160 68P 2MB	174.99	205.61
PWHS0574	ST336737LW 36.9GB 8.5ms 7200rpm U160 68P 2MB	306.99	360.71
PWHS0576	ST1181677LW 181.6GB 7.4ms 7200rpm U160 68P 4MB	1299.99	1527.49
PWHS0578	ST392051W 9.2GB 5.4ms 10Krpm U160 68P 4MB	150.99	177.41
PWHS0582	ST318405LW 18.4GB 5.4ms 10Krpm U160 68P 4MB	210.99	247.91
PWHS0580	ST318451LW 18.45GB 3.9ms 15Krpm U160 68P 4MB	260.99	306.66
PWHS0584	ST336705LW 36.7GB 5.4ms 10Krpm U160 68P 4MB	360.99	424.16

HP DAT

HP SureStore DAT products span the whole DDS family - from DDS-1 to DDS-4 - providing performance and capacities suitable for a wide range of workstations and servers.

As a co-founder of DDS technology and the industry's leading manufacturer, no one has more experience building DAT drives than Hewlett-Packard.

HP One-Button Disaster Recovery does exactly what its name suggests - enabling you to restore your system configuration, data, and applications more quickly and easily than ever before. If minimizing costly downtime is a priority, HP One-Button Disaster Recovery is for you. It's an industry first - an HP innovation that gives you the edge in a competitive world.

Easy to Install and use

- HP TapeAssure ensures correct drive installation
- HP Tape Tools provides drive information, troubleshooting diagnostic and firmware upgrades
- TapeAlert continuously monitors drive and media and warns the user of any potential problems to guarantee hassle-free ownership experience



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWTS0746	SureStore DAT 8i Inc Software & Media	399.99	469.99
PWTS0747	SureStore DAT 8e Inc Software, Media & SCSI Cable	469.99	552.24
PWTS0766	SureStore DAT 8eU Inc Software, Media & SCSI Cable	469.99	552.24
PWTS0767	SureStore DAT 24i Inc Software & Media	589.99	693.24
PWTS0768	SureStore DAT 24e Inc Software, Media & SCSI Cable	629.99	740.24
PWTS0842	SureStore DAT 24eU Inc Software, Media & SCSI Cable	689.99	810.74
PWTS0791	SureStore DAT 24x6i 144GB Int Autoloader	1232.99	1448.76
PWTS0794	SureStore DAT 24x6e 144GB Ext Autoloader	1399.99	1644.99
PWTS0783	SureStore DAT40i SCSI 68P Inc Software and Media	749.99	881.24
PWTS0784	SureStore DAT40e SCSI 68P Inc Software, Media, Cable	821.99	965.84

DAT Technology

- Internal and External Versions, SCSI Interface
- Transfer rates up to 330MB/min
- TapeStar DAT includes VERITAS Backup Exec S/W for Netware and Windows NT Single Server
- Includes 2x media and cleaning cartridge
- DDS2 - 8GB / DDS3 - 24GB / DDS4 - 40GB
- 3 year Rapid Replacement warranty & with REACT



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CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWTS0670	Seagate Scorpion® DAT 8 Int SCSI DDS-2	359.99	422.99
PWTS0666	Seagate TapeStar® DAT 8 Int SCSI DDS-2	419.99	493.49
PWTS0665	Seagate TapeStar® DAT 8 Ext SCSI DDS-2	502.99	591.01
PWTS0672	Seagate Scorpion® DAT 24 Int SCSI DDS-3	444.99	522.86
PWTS0687	Seagate Scorpion® 40 DAT 20/40 Ext UWS SCSI DDS-4	782.99	920.01
PWTS0688	Seagate TapeStar® DAT 20/40 Int U2W DDS-4	719.99	845.99
PWTS0689	Seagate TapeStar® DAT 20/40 Ext U2W DDS-4	809.99	951.74
PWTS0674	Seagate TapeStar® DAT 24 Int SCSI DDS-3	536.99	630.96

Seagate IDE Disc Drives

Seagate's IDE Family of Disc drives – the leading edge in performance and technology.

- Medalist® 4.3GB - 20.4GB Capacity
- 5,400 RPM Spindle Speed
- Barracuda® ATA 20GB - 30.6GB Capacity
- 7,200 RPM Spindle Speed
- Ultra ATA-66 Interface
- Bundled with FREE DiscWizard™ Installation Software
- 3 Year Warranty



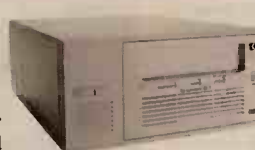
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BARRACUDA

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CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWHS0229	ST310211A U5 10GB 8.9ms 5400rpm UDMA66 512K	54.99	64.61
PWHS0231	ST320131A U5 20GB 8.9ms 5400rpm 512K	58.99	69.31
PWHS0228	ST340823A U5 40GB 8.9ms 5400rpm UDMA66 512K	80.99	95.16

HP DLT 1

HP's new DLT1 drive offers the reassurance of proven DLT technology with up to twice the capacity, and three times the transfer rate as similarly-priced competitors products.



- Capacity: 80GB Compressed
- Transfer Rate: up to 6MB/s
- Interface: LVD 68 Pin
- Compatibility: Windows NT4, 2000, Linux Redhat, Novell Netware 4.2/5.0



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWTS0848	SureStore DLT1i Inc Software & Media	999.99	1174.99
PWTS0849	SureStore DLT1e Inc Software & Media	1149.99	1351.24

HP CDR/DVD Combo 9900ci

The HP CD-Writer DVD Combo 9900ci is a high performance internal CD-Writer offering a powerful solution for writing and rewriting custom CDs fast! Plus it allows you to read DVD-ROMs and play DVD Videos.



The 12x write; 10x rewrite; 32x read and 8x DVD ROM read performance lets you write 650MB of data or 74 minutes of audio to a CD in under 7 minutes and rewrite in under 8 minutes. The 8x DVD read performance lets you read 538MB of data per minute. The CDs you made can then be played on billions of CD-ROMs and stereo CD players world-wide.



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWCD0573	HP CDR/DVD Combo 9900ci 12x/10x32x/8x DVD	184.99	217.36

HP CD-Writer 9510i

- 12x write - 8x rewrite - 32x read
- EIDE (ATAPI)
- Internal
- Length 278mm x Width 150mm x Height 213mm
- One-year Exchange



Minimum System Requirements:

- Pentium II-class 300MHz CPU
- 64MB RAM
- 50MB hard disk space



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWCD3453	HP 9510i EIDE Int Inc Software, 1xCDRW, 1CDRW	119.99	140.99

HP 9710i CDRW

The HP CD-Writer 9710i is the top of the range internal CD-Writer featuring unprecedented performance, innovation and value. As with all HP CD-Writers it stores data, photos, videos, music and more.

The 16x write; 10x rewrite; 40x read performance lets you write 650MB of data or 74 minutes of audio to a CD in under 6 minutes and rewrite in under 8 minutes. These CDs can then be played on billions of CD-ROMs and stereo CD players world-wide.



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWCD3456	HP 9710i Int EIDE Inc Software & Media	159.99	187.99

PlexWriter 16/10/40A CDRW

PlexWriter 16/10/40A (E-IIDE) CD-ReWriter with BURN-Proof Technology

- Write: 16x, Rewrite: 10x, Read: 40x
- Interface: E-IIDE (ATAPI)
- Data Buffer: 2MB with BURN-Proof Technology
- Warranty period: 1 year with On-Site Collect & Return Service
- Package includes: 1 CD-R disk & 1 CD-RW disk
- Recording software: WinOnCD + DirectCD
- Plextor's own utility software "PlexTools"
- 16 language manual



FREE 50 pack of Grade A CDR Media While stocks last



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWCD0632	Plextor PX-W1610TA BURNPROOF Int EIDE Retail	156.99	184.46

Odixion

DIGICOPIER

A full range of standalone CD duplicators.

The DigiCopier is totally self contained, operating independently without a computer. The DigiCopier is easy to use and can copy a full CD in as little as 4 mn. The LCD display allows you to erase, select speed and size up the CD with the master. Hard Disk version allows you to record 2.5 hours of audio, and store up to 4 CDs. The DigiPrinter enables you to personalise your CDs and give them a professional look.



Mitsumi CR-4805TE CDRW

- 8 x Record
- 4 x Re-record
- 32 x Read
- Internal ATAPI/EIDE
- Includes WinOnCD v 3.7



MITSUMI

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWCD0572	Mitsumi CR-4805TE Inc Software, Media	77.99	91.64

Pioneer

Pioneer, the leading manufacturer of DVD technology brings you the most advanced drive to date:

- 16x DVD-ROM/40x CD-ROM
- Fast access time of 80ms for CD-ROM & 95ms for DVD-ROM
- ATAPI Interface
- Slot mechanism
- Games & software in Retail pack

(10X SCSI also available)



Pioneer

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWHD0070	DVD A05S 16xDVD 40xCD Slot Retail	66.99	78.71
PWHD0038	Pioneer DVD 116 16xDVD 40xCD Tray Bare	57.99	68.14
PWHD0037	DVD 106S 16xDVD 40xCD Slot Bare	64.99	76.36
PWHD0039	DVD A05SW 16xDVD 40xCD Slot Retail	74.99	88.11

Ecix VXA - Tape Storage

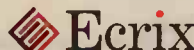
Ecix VXA-1 66GB Tape Drives

VXA revolutionises the tape storage industry by using technology similar to that already proven in the Network, Internet and Re-Writable CD markets by writing and reading data in packets. VXA-1 sets a new standard for data restore and interchange while offering extraordinary tape drive performance

- Up to 66GB at 6MB/sec/
- Designed for 100% reliable restore
- Optimal Backup and restore job times
- Assured media interchange
- Compatible with most OS' Inc. Wintel, Mac, UNIX and LINUX



3 YEAR ADVANCE REPLACEMENT WARRANTY AS STANDARD



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWTS0001	VXA-1 66GB Int SCSI Inc Dantz Retrorespect, Media	549.99	646.24
PWTS0002	VXA-1 66GB Ext SCSI Inc Dantz Retrorespect, Media	659.99	775.49

DIGIMATIC

The first networkable CD production station

The DigiMatic enables you to write and print the top surface of the CDs automatically. It has a 16x writer, a 1440dpi inkjet printer, a Hard Disk and a 50 blank CD loader. It is multi OS compatible by using Ethernet.

The DigiMatic+ has the same features as the DigiMatic, but can also work standalone to reproduce a master CD.



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWCD0482	Odixion DGI-12X Dup 12xDigicopier 1/12x10x32xCDRW	599.99	704.99
PWCD0483	Odixion DGI-16x Dup 16xDigicopier 1/16x10x40xCDRW	799.99	939.99
PWCD0488	Odixion DM100 Repro DigiMatic Network Station Standalone	4199.99	4934.99

Code	Description	£ EX VAT	£ INC VAT
TAPE STREAMERS			
SEAGATE TRAVAN			
PWTS0601	Seagate TapeStor Travan Portable 158 8GB	208.99	245.56
PWTS0613	Hornet 8 EIDE Bare	119.99	140.99
PWTS0614	Hornet 8 SCSI Bare	141.99	166.84
PWTS0620	TapeStor Travan 8 EIDE TR8 inc Media	136.99	160.96
PWTS0630	TapeStor Travan 8 SCSI TR8 inc Media	156.99	184.46
PWTS0636	Hornet 20 EIDE Bare	159.99	187.99
PWTS0690	TapeStor Travan NS20 EIDE TR20	175.99	206.79
PWTS0639	Hornet 20GB SCSI Bare	189.99	223.24
PWTS0638	TapeStor Travan NS20 SCSI TR20	316.99	372.46

SEAGATE DAT			
PWTS0670	Scorpion DAT 8 Int SCSI DDS-2	359.99	422.99
PWTS0671	Scorpion DAT 8 Ext SCSI DDS-2	429.99	505.24
PWTS0666	TapeStor DAT 8 Int SCSI DDS-2	419.99	493.49
PWTS0665	TapeStor DAT 8 Ext SCSI DDS-2	502.99	591.01
PWTS0672	Scorpion DAT 24 Int SCSI DDS-3	444.99	522.86
PWTS0673	Scorpion DAT 24 Ext SCSI DDS-3	584.99	687.36
PWTS0686	Scorpion 40 DAT 20/40 Int UW DDS-4	642.99	755.51
PWTS0687	Scorpion 40 DAT 20/40 Ext UW DDS-4	782.99	920.01
PWTS0688	TapeStor DAT 20/40 Int UZW DDS-4	719.99	845.99
PWTS0689	TapeStor DAT 20/40 Ext UZW DDS-4	809.99	951.74
PWTS0674	TapeStor DAT 24 Int SCSI DDS-3	536.99	630.96
PWTS0675	TapeStor DAT 24 Ext SCSI DDS-3	659.99	775.49
PWTS0676	Scorpion 96 DAT Autoloader Int DDS-3	1329.99	1562.74
PWTS0677	Scorpion 96 DAT Autoloader Ext DDS-3	1409.99	1656.74
PWTS0691	Viper 100/200GB Int UZW SCSI LTO	3499.99	4112.49
PWTS0692	Viper 100/200GB Int UZW SCSI LTO Kit	3599.99	4229.99
PWTS0693	Seagate LTO Media	119.99	140.99

ZIP JAZZ & CLIK! DRIVES

OMEGA CLIK!			
PWHZ0202	PC Card Inc Software, Media	88.99	104.56
PWHZ0206	PC Card Dock/USB PC Card Drive	28.99	34.06
PWHZ0204	Media 4 Pack	33.99	39.94

OMEGA ZIP			
PWHZ0016	Zip 100MB USB	48.99	57.56
PWHZ0033	Zip 100MB USB Starter Kit	68.99	81.06
PWHZ0302	Zip 100 USB New Generation	78.99	92.81
PWHZ0014	Zip 250MB Parallel Ext Inc Media	109.99	129.24
PWHZ0017	Zip 250MB Internal EIDE Inc Media	105.99	124.54
PWHZ0031	Zip 250MB USB Inc Media	128.99	151.56
PWHZ0303	Zip 250 USB Host Powered	148.99	175.06
PWHZ0008	Zip 250MB USB Drive + Belkin 4 Port USB Hub Bundle	129.99	152.74
PWHZ0032	PCMCIA Cable for Zip 250MB USB	24.99	29.36
PWHZ0034	Zip 250 USB FireWire Adapter	54.99	64.61
PWHZ0087	Jaz 2GB Drive Internal No Media	188.99	222.06
PWHZ0093	Jaz 2GB Drive External No Media	228.99	269.06
PWHZ0089	Jaz USB Adapter (SCSI to USB)	44.99	52.86
PWHZ0094	Jaz Firewire Adapter	73.99	86.94
PWHZ0027	Imagex QuickSync 2 Backup Software	14.99	17.61

OMEGA MEDIA AND ACCESSORIES			
PWHZ0050	100MB Zip for PC (Single)	6.99	8.21
PWHZ0067	100MB Zip 6 Pk Coloured for PC	38.99	45.81
PWHZ0059	100MB Zip grey 10 Pk for PC	56.99	66.96
PWHZ0061	250MB Zip for PC	11.99	14.09
PWHZ0062	250MB Zip for PC 4 Pack	38.99	45.81
PWHZ0095	Single 1GB Jaz Disk	58.99	69.31
PWHZ0096	Single 2GB Jaz Disk	58.99	69.31
PWHZ0102	Three Pack 2GB Jaz Disk	162.99	191.51
PWHZ0110	Jaz Jet Interface	64.99	76.36

ORB			
PWHZ9010	EIDE 2.2GB Internal Drive Bare	159.99	187.99
PWHZ9013	USB 2.2GB External Drive	158.99	186.81
PWHZ9016	SCSI 2.2GB Internal Drive	122.99	144.51

CD ROM DRIVES IDE FORTY SPEED			
PWCD0401	Teac 40x EIDE CD Rom Bare	32.99	38.76
FIFTY SPEED			
PWCD0419	Asus CDS500 50x EIDE Tray Bare	30.99	36.41
FIFTY TWO SPEED			
PWCD0423	Simply 52x EIDE CD Rom Bare	25.99	30.54
PWCD0432	AOpen CD952E 52x EIDE CD Rom	27.99	32.89
PWCD0421	Creative 52x Int EIDE CD Rom	28.99	34.06
PWCD0162	CTX 52x Int EIDE CD Rom	27.99	32.89
PWCD0163	CTX 52x Int EIDE CD Rom Bare	26.99	31.71

FIFTY SIX SPEED			
PWCD0164	CTX 56x Int EIDE CD Rom	29.99	35.24

CD ROM DRIVES SCSI THIRTY TWO SPEED			
PWCD0078	Teac CD532S 32x SCSI CD Rom Bare	42.99	50.51

Call our sales team for CD Towers and Jukeboxes

DVD			
DVD RAM DRIVES			
PWTDV1025	Panasonic LF-D201E 6xDVD 24xCD	289.99	340.74
PWTDV1013	Panasonic LFD211V 6xDVD 24xCD IDE Int Bare	279.99	328.99
PWTDV1026	Panasonic 4.7GB DVD Removable Media	20.99	24.66
PWTDV1028	Panasonic 4.7GB DVD RAM Media	18.99	22.31
PWTDV1027	Panasonic 9.4GB DVD RAM Media	29.99	35.24

DVD RAM MEDIA			
PWTDV0050	Single Sided 2.6GB DVD RAM Media	12.99	15.26
PWTDV0051	Double Sided 5.2GB DVD RAM Media	18.99	22.31

DVD ROM DRIVES			
PWTDV0032	AOpen 16x40 Slot Bare	99.99	117.49
PWTDV0027	Creative Encore 12x40 DXR3	119.99	140.99
PWTDV0025	CTX 12x40 EIDE Tray Retail	46.99	55.21
PWTDV0090	Panasonic 8x40 Int EIDE Retail	58.99	69.31
PWTDV0091	Panasonic 16x48 Int EIDE Bare	56.99	66.96
PWTDV0070	Pioneer DVD A05S 16x40 Slot Retail Inc 2 Titles	66.99	78.71
PWTDV0018	Pioneer DVD 105S 16x40 Slot Bare	59.99	70.49
DV0037	Pioneer DVD 106S 16x40 40xCD Slot Bare	64.99	76.36
DV0038	Pioneer DVD 116 16x40 40xCD Tray Bare	57.99	68.14
DV0039	Pioneer DVD A05SW 16x40 40xCD Slot Retail	74.99	88.11

DVD/CDRW COMBI DRIVES			
PWTDV9980	Simply Combi 12x10x32CDRW / 8xDVD	186.99	219.71
PWCD0573	HP 9900ci CDR/DVD 12x10x32CDRW 8xDVD	184.99	217.36

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FLOPPY DRIVES

PWF09996	Simply 1.44MB Floppy Drive	9.99	11.74
PWF00000	Mitsumi 1.44MB Floppy Drive	10.99	12.91
PWF00001	Sony 1.44MB Floppy Drive	11.99	14.09
PWF00035	Teac 1.44MB Floppy Drive	11.99	14.09
PWF00002	Panasonic 1.44MB Floppy Drive	11.99	14.09
PWF00021	Backpack P/Port 1.44MB Floppy Drive	85.99	101.04

MEDIA

CS15442	Imation LS-120 3-pk	24.95	29.32
PW6178	TDK 3.5 DSHD 18M	1.95	2.29

CABLES & ACCESSORIES

PWF00050	5.25" Floppy Drive Brackets	4.99	5.86
PWF01010	Extra Long 5 Head Floppy Cable	3.99	4.69
PWF01000	Standard 5 Head Floppy Cable	3.99	4.69

CD WRITERS

8X WRITE, 24X READ

PWCD8001	Teac 1:1 CopyStation Inc S/w 50x CDR	400.99	471.16
PWCD8002	Teac 1:4 CopyStation Inc S/w 50x CDR	1050.99	1234.91
PWCD8003	Teac 8 Bay CopyStation Inc S/w 100x CDR	2300.90	2703.56

CD REWRITABLE DRIVES

4X WRITE, 4X REWRITE, 6X READ

PWCD3450	HP 8230e USB Inc Software, Media	155.99	183.29
PWCD3332	Imation Predator 8M (Firewire Compatible)	185.99	218.54
PWCD3329	ZipCD USB External	140.99	165.66

4X WRITE, 4X REWRITE, 8X READ

PWCD2073	Mitsumi 4804-TU USB Inc S/w & Media	77.99	91.64
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4X WRITE, 4X REWRITE, 20X READ

PWCD0640	Datawase Dash 4420 Inc S/w & Media	228.99	269.06
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8X WRITE, 4X REWRITE, 32X READ

PWCD3451	HP 9150i EIDE Int Inc Software Media	91.99	108.09
PWCD3368	Imation ZipCD Inc Software Media	97.99	115.14
PWCD3364	LG 8080B Int EIDE Inc Software Media	103.99	122.19
PWCD3367	Philips PCRW804K Int EIDE	81.99	96.34

12X WRITE, 8X REWRITE, 32X READ

PWCD3453	HP 9510i EIDE Int Inc Software Media	119.99	140.99
PWCD3454	HP 9600si SCSI Int Inc Software Media	163.99	192.69
PWCD3455	HP 9600se SCSI Ext Inc Software Media	185.99	218.54
PWCD0229	Philips 1208K Int EIDE Kit	110.99	130.41

12X WRITE, 10X REWRITE, 32X READ

PWCD0154	AOPEN CRW1232 Bonus Int EIDE	99.99	117.49
PWCD0152	Mirai Int EIDE Kit BURN PROOF	98.99	116.31
PWCD0573	HP 9900ci 12x10x32CDRW 8xDVD Int EIDE	184.99	217.36
PWCD3373	Plexor PX-W1210TA EIDE BURN PROOF	135.99	159.79
PWCD3374	Plexor PX-W1210TS SCSI BURN PROOF	180.99	212.66
PWCD0502	Ricoh MP7120A-R EIDE Int Bare	113.99	133.94
PWCD1204	TDK Cyclone Int EIDE BURN PROOF	130.99	153.91
PWCD0138	Teac CD512E Int EIDE Bare	110.99	130.41
PWCD0325	Teac CD512EK Int EIDE BURN PROOF	110.99	130.41

16X WRITE, 10X REWRITE, 40X READ

PWCD3456	HP 9710i Int EIDE Inc Software & Media	159.99	187.99
PWCD0157	Mirai Int SCSI Retail BURN PROOF	151.99	178.59
PWCD0234	Mirai BURN PROOF Int EIDE Retail Kit S/w, Media	137.99	162.14
PWCD0632	Plexor PX-W1610TA BURNPROOF	156.99	184.46
PWCD3398	Yamaha CRW21000E-B10 IDE Int Bare	117.99	138.64
PWCD3399	Yamaha CRW21000E-VK IDE Int Kit	124.99	146.86
PWCD3400	Yamaha CRW21000S-B10 SCSI Int Bare	140.99	165.66
PWCD3401	Yamaha CRW21000S-VK SCSI Int Retail	150.99	177.41
PWCD3402	Yamaha CRW21000S-VK Kit SCSI Int	170.99	200.91
PWCD3403	Yamaha CRW161040SV-VK SCSI Ext Retail Kit	219.99	258.49

20X WRITE, 10X REWRITE, 40X READ

PWCD9167	Ricoh MP7200A-DP EIDE 7200rpm Int Retail Kit	199.99	234.99
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FIREWIRE CDRW

PWCD4050	Evergreen fireLINE Ext CDRW	210.99	247.91
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EXTERNAL CDRW

AMACOM

PWCD0370	Baby CD 24x	67.99	79.89
PWCD0371	EZCD 52x	69.99	82.24
PWCD0033	Baby DVD 5xDVD 24xCD WinDVD	141.99	166.84
PWCD0034	EZ DVD 8xDVD 40xCD WinDVD	119.99	140.99
PWCD0372	Baby CDRW 4x4x32 Nero 1xCDRW 1xCDRW	204.99	240.86
PWCD0373	EZ CDRW 4x4x32 Nero 5xCDRW 1xCDRW	139.99	164.49
PWCD0382	EZ CDRW 8x4x24 Nero 5xCDRW 1xCDRW	220.99	259.66
PWCD0374	EZ CDRW 8x4x32 Nero 5xCDRW 1xCDRW	173.99	204.44
PWCD0375	Baby/EZ PCMCIA Cable	20.99	24.66
PWCD0376	Baby/EZ CardBus Cable	39.99	46.99
PWCD0377	Baby/EZ USB Cable	22.99	27.01
PWCD0378	Baby/EZ Firewire Cable	46.99	55.21
PWCD0379	Baby/EZ Parallel Port Cable	25.99	30.54

CD MEDIA

PWCD9056	Simply CDR 650MB 74Min	0.49	0.58
PWCD0223	Simply CDR 700MB 80Min	0.69	0.81
PWCD9059	Simply CDR 650MB 74Min 100 Flat Packed	29.99	35.24
PWCD9118	Simply CDRW 650MB 74Min	0.95	1.12
PWCD9119	Simply CDRW 650MB 74Min 10 Pack	9.99	11.74
PWCD9120	HP CDR 650MB 74Min Media	0.99	1.16
PWCD9121	HP CDR 650MB 74Min Media 10 Pack	9.99	11.74
PW15306	TDK CD-RW High Speed	2.10	2.47
PW15659	TDK CD-RW 80 min	2.35	2.76
PWCD0901	TDK d-view 12 Speed CDR 650MB 74Min Slim Jewel Case	0.70	0.82
PWCD0902	TDK d-view 12 Speed CDR 700MB 80Min Slim Jewel Case	0.80	0.94
PWCD0903	TDK 50x Reflex 12 Speed CDR 650MB 74Min Cakebox	29.99	35.24
PWCD0905	TDK Reflex ULTRA 16 Speed 650MB 74Min	0.90	1.06
PW15685	TDK CD-R 10 pack Ultra 74m	8.55	10.05
PWCD0906	TDK Reflex ULTRA 16 Speed 700MB 80Min	1.05	1.23
PW15686	TDK CD-R 10 pack ultra 80m	9.25	10.87
PWCD0907	TDK 25x Reflex 12 Speed CDR 650MB 74Min in i-Storage Box	16.99	19.96
PWCD0908	TDK i-Storage Refill Pack (20xCDR in Tyvek Sleeves)	12.99	15.26
PWCD0909	TDK i-Storage Tyvek Sleeves 25 Pack	4.99	5.86
PW15639	TDK iSTORAGE 15 pack	12.50	14.69

Panasonic

REWRITABLE 4.7GB DVD RAM LF-D201E



New! - 4.7GB Rewritable DVD-RAM!

- Bigger! 4.7GB and 9.4GB (double sided) disks
- Faster! More than twice as fast - 2770 KB/s
- Safer! Sector format, defect management and write verification ensure data integrity
- Easier! Supports bare disk and In-cartridge writing
- Writes 4.7GB, 9.4GB, 5.2GB, 2.6GB DVD-RAM media
- Store up to 4 hours of VHS quality video or 2 hours of MPEG2 Video
- Reads 6x DVD, 24x CD

AVAILABLE NOW THE LF-D211KIT A DVD RAM ATAPI/IDE KIT WITH THE SAME PERFORMANCE AS THE EXISTING LF-D201E SCSI MODEL



Panasonic 16x DVD-ROM

Future proof your PC today.

- 16x DVD-ROM, 48xCD-ROM
- 5.25 ATAPI
- Simple installation
- Panasonic quality, 12 month warranty and hotline support



Panasonic

Panasonic 1.44MB Floppy Drive

The JU257AS provides precise access mechanism, with improved reliability.

- Small and lightweight.
(W101.6 x D150 x H25.4 mm, and only 410g)
- 3.5inch FDD Standard 34pin Interface connector
- Low power consumption and TTL Interface.
- Single sided PCB
- Precise screw/follower actuator
- DD spindle motor
- Includes screws and manual

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWTV1025	Panasonic LF-D201E 6xDVD 24xCD DVD Ram SCSI Int	289.99	340.74
PWTV10103	Panasonic LF-D211V 6xDVD 24xCD DVD Ram IDE Int Bare	279.99	328.99
PWTV1026	Panasonic 4.7GB DVD RAM Removable Media	20.99	24.66
PWTV1028	Panasonic 4.7GB DVD RAM Media	18.99	22.31
PWTV1027	Panasonic 9.4GB DVD RAM Media	29.99	35.24
PWF00002	Panasonic 1.44MB Floppy Drive	11.99	14.09
PWTV0090	Panasonic 8xDVD 40xCD Int EIDE Retail	58.99	69.31
PWTV0091	Panasonic SR8586 16xDVD 48xCD Int EIDE Bare	56.99	66.96

TEAC CD-RW 12x10x32 CD-512E

The latest high speed CD rewriter drive

- ATAPI interface
- Burn Proof Retail Kit
- 12x write 10x rewrite 32x read
- Includes CD authoring software
- Compatible
Win 95/98/2000



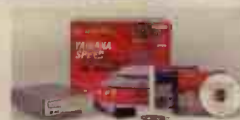
TEAC

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWCD0401	Teac 40x EIDE CD Rom Bare	32.99	38.76
PWCD0325	Teac CD512EA Int EIDE BURN PROOF	110.99	130.41
PWCD1169	Teac CD-W516EK Int EIDE Inc Nero Software, Media	143.99	169.19
PWCD9058	Teac CDR 650MB Data 74min	0.95	1.12

Yamaha CD-RW 16x10x40x

Trust your important data to Yamaha CD-RW drives. Recordable and Re-writable CD's are ideal for any storage purpose. They offer complete security and reliability.

- 16x Write, 10x Re-Write, 40x Read
- 40x Audio-Extraction
- Pure Phase Laser System
- Optimum writer speed control



YAMAHA

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWCD3398	Yamaha CRW21000E-B10 IDE Int Bare Drive	117.99	138.64
PWCD3399	Yamaha CRW21000E-VK IDE Int Retail Kit	124.99	146.86
PWCD3400	Yamaha CRW21000S-B10 SCSI Int Bare Drive	140.99	165.66
PWCD3401	Yamaha CRW21000S-VK SCSI Int Retail Kit	150.99	177.41
PWCD3402	Yamaha CRW21000S-VK Kit SCSI Int SCSI Card	170.99	200.91
PWCD3403	Yamaha CRW21000S-VK SCSI Ext Retail Kit	219.99	258.49
PWCD3404	Yamaha CRW21000S-VK Firewire Kit	250.99	294.91

Amacom CD/DVD/CDRW

Amacom Baby and EZ products support PCMCIA, CardBus, USB, Firewire or Parallel Port connectivity. Amacom Baby and EZ cables are interchangeable and compatible with one another thus ensuring the right portable solution for the mobile user.

- Baby CD: 24x
- Baby DVD: 5x24
- Baby CDRW: 4x4x20
- EZCD: 52x
- EZDVD: 8x40
- EZCDRW: 4x4x32 & 8x8x32
- EZ Combo

Please specify your cable options when ordering your Baby or EZ drive



AMACOM

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWCD0370	Baby CD 24x	67.99	79.89
PWCD0371	EZCD 52x	69.99	82.24
PWTV0033	Baby DVD 5xDVD 24xCD WinDVD	141.99	166.84
PWTV0034	EZ DVD 8xDVD 40xCD WinDVD	119.99	140.99
PWCD0372	Baby CDRW 4x4x20 Nero 1xCDRW 1xCDRW	204.99	240.86
PWCD0373	EZ CDRW 4x4x32 Nero 5xCDRW 1xCDRW	139.99	164.49
PWCD0381	EZRW 4x4x32+ Inc USB Cable	142.99	168.01
PWCD0382	EZ CDRW 8x4x24 Nero 5xCDRW 1xCDRW	220.99	259.66
PWCD0374	EZ CDRW 8x4x32 Nero 5xCDRW 1xCDRW	173.99	204.44
PWCD0380	EZ Combo 6x4x24x4 WinDVD Nero 5xCDRW 1xCDRW	190.99	224.41
PWCD0375	Baby/EZ PCMCIA Cable	20.99	24.66
PWCD0376	Baby/EZ CardBus Cable	39.99	46.99
PWCD0377	Baby/EZ USB Cable	22.99	27.01
PWCD0378	Baby/EZ Firewire Cable	46.99	55.21
PWCD0379	Baby/EZ Parallel Port Cable	25.99	30.54

ABIT TH7-RAID

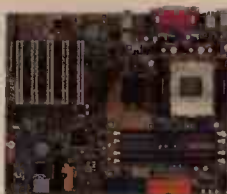
The Ultimate Pentium 4 motherboard

Incorporating the Highpoint IDE RAID controller with RAID 0 for speed and/or RAID 1 for security.

Based on Intel's 850 chipset the TH7-RAID supports 4 DIMMs with 1 AGP, 5 PCI and 1 CNR slot.

Built around the ATX form factor it's supplied with AC 97 audio on board.

Softmenu II technology allows the user to change settings easily on screen.



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWMB9956	ABIT TH7-RAID 850 5P AGP CNR 4RIMM Audio ATX	152.99	179.76

Microstar K7T-Turbo

This is MSI's latest addition to their popular K7T range. Now AMD approved for both 200 and 266 MHz CPUs's

■ Socket A for AMD®

Processors 600MHz ~ 1.5GHz

■ VIA(R) KT133A chipset / VT82C686B

■ 3 x 168-pin unbuffered DIMM sockets, maximum 1.5GB

■ PCI x6, AGP x1, CNR x1

■ 2 x Ultra DMA 66 / 100 sockets

■ Chip Integrated DirectSound AC'97 Audio

■ ATX Form Factor PCB Mainboard



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWMB7771	K7T TURBO KT133A 6P CNR AGP 3DIMM Audio ATX	82.99	97.51

Intel® Pentium®4 Processor

The Intel® Pentium® 4 processor maximizes the performance of cutting-edge technologies such as digital video and online gaming, and has an innovative design capable of taking full advantage of emerging Web technologies. Currently available at 1.3, 1.4, and 1.5GHz, the Pentium 4 processor introduces a new generation of processing power with Intel® NetBurst™ micro-architecture



NOW AVAILABLE
INTEL PENTIUM 4 1.7
GHZ PROCESSOR

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWMB3701	Intel Pentium 4 1.4GHz 256K + 2x64MB PC800 DIMMS	239.99	372.75
PWMB3702	Intel Pentium 4 1.5GHz 256K + 2x64MB PC800 DIMMS	289.99	441.79
PWMB3707	Intel Pentium 4 1.5GHz 256K + 2x128MB PC800 DIMMS	369.99	538.43
PWMB3708	Intel Pentium 4 1.7GHz 256K + 2x64MB PC800 DIMMS	379.99	552.24
PWMB3709	Intel Pentium 4 1.7GHz 256K + 2x128MB PC800 DIMMS	454.99	662.69

AMD PC Processors

The seventh-generation AMD Athlon™ processor is based on the industry's most advanced x86 microarchitecture.

Its features and capabilities combine to give users of AMD Athlon™ processor-based systems an extraordinary computing experience, as well as the confidence that their systems are designed to meet their computing needs for years to come.

The AMD Duron™ processor is specifically designed to provide an optimised solution for value conscious business and home users. Reflecting the market requirements for frequency, cache size, power consumption and cost. Designed to prolong the life of a buyer's investment by accommodating new and more sophisticated applications, the AMD Duron™ processor has the capability and flexibility to meet the computing needs of value conscious buyers for today and tomorrow.

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWMB3251	AMD Athlon 900MHz Socket A 200 FSB	86.99	129.76
PWMB3252	AMD Athlon 950MHz Socket A 200 FSB	99.99	147.71
PWMB3253	AMD Athlon 1GHz Socket A 200 FSB	109.99	158.76
PWMB3255	AMD Athlon 1.1GHz Socket A 200 FSB	119.99	176.71
PWMB3257	AMD Athlon 1.2GHz Socket A 200 FSB	129.99	205.70
PWMB3261	AMD Athlon 1.3GHz Socket A 266 FSB	139.99	234.69

AK73PRO (A)

■ Support 266MHz(EV6) System Bus for AMD Athlon (Thunderbird) & Duron Socket A CPU

■ Support PC133 SDRAM DIMM

■ Support 1X /2X /4X AGP mode

■ AC'97 2.1 Audio support / Audio Codec onboard

■ DUE-RAID BIOS with External Controller (Upgrade optional)

■ Enlarged Aluminum Heatsink for Better Heat Dissipation

■ CPU Vcore Adjustment for Overclockers through BIOS Setting (1.1V ~1.85V)

■ 4 Channel USB Ports Ready

■ AOpen Bonus Pack CD (Norton Anti-Virus 2000 included)



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWMB1758	AK73 Pro (A) 266FSB 5P AMR AGP 3DIMM ATX Audio	89.99	89.99

Blaster CD-RW 12x10x32

The Super fast Blaster CD-RW delivers a whole new world of digital data storage. The pack comes complete with NTI and Packet writing software, which enables you to use your CD-RW just like a hard disk. With the enclosed CD-R and CD-RW media you can create CD's straight out of the box.



NEW

CREATIVE
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CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWCD1013	Creative Blaster CD-RW Inc Software, 1xCDR, 1xCDRW	104.99	123.36

TDK's CD-R Archiving Solution

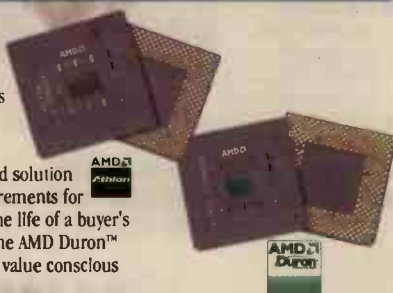
Archive your work safely and effectively with TDK's CD-R REFLEX range

Using TDK's proprietary component and manufacturing technology, Reflex, TDK has created a CD-R of superlative quality in terms of recording and playback performance. All TDK products are available in 12x and 16x speeds in 650MB (74 minutes) and 700MB (80 minutes).



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CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWCD9101	TDK Reflex 12 Speed CDR 650MB 74Min	0.60	0.71
PWCD9090	TDK Reflex 12 Speed CDR 700MB 80Min	0.70	0.82
PWCD9095	TDK Reflex ULTRA 16 Speed 650MB 74Min	0.90	1.06
PWCD9096	TDK Reflex ULTRA 16 Speed 700MB 80Min	1.05	1.23
PW15418	TDK CD-R Label Pens (Red, Blue, Green, Black)	1.99	2.34



AMD

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWMB3256	AMD Duron 800MHz Socket A	44.99	67.64
PWMB3258	AMD Duron 850MHz Socket A	52.99	82.82
PWMB3263	AMD Duron 900MHz Socket A	62.99	74.01

Code	Description	£ Ex VAT	£ Inc VAT
MP3 PLAYERS / VOICE RECORDERS			
PWMP0101	Creative JukeBox Digital Audio Player	252.99	297.26
PWMP0104	D' Music PALMP-3 MP3 32MB Green	84.99	99.86
PWMP0105	D' Music PALMP-3 MP3 32MB Blue	84.99	99.86
PWMP0106	D' Music PALMP-3 MP3 32MB Purple	84.99	99.86
PWMP0107	D' Music PALMP-3 MP3 32MB White	84.99	99.86
PWMP0005	D' Music Digital MP3 Player 32MB	74.99	88.11
PWMP0006	D' Music 32MB Memory Upgrade	46.99	55.21
PWMP0008	D' Music Portable MP3 CD Player	119.99	140.99
PWMP0055	Diamond Rio PMP 600 MP3 Player 32MB	119.99	140.99
PWMP0051	Emuze 32MB MMC MP3 Player	118.99	139.81
PWMP0091	Iomega HipZip Digital Audio Player	188.99	222.06
PWMP0111	Kodak MC3 Video + Digital Images + MP3	179.99	211.49
PWMP0061	Samsung U Pen Digital Recorder	109.99	129.24

SOCKET A MOTHERBOARDS

ABIT			
PWMB1428	KT7A VIA 6PCI 1ISA 3DIMM AGP ATX	96.99	113.96
PWMB1426	KT7A-RAID VIA 6PCI 1ISA AGP 3DIMM ATX	122.99	144.51
AOPEN			
PWMB1758	AK73 Pro (A) 266FSB 5P AMR AGP 3DIMM ATX Audio	89.99	105.74
ASUS			
PWMB1263	A7V-E KT133 6PCI AGP 2DIMM ATX Audio	79.99	93.99
PWMB1264	A7A266 ALI 266FSB 5P AGP 2DDR 3DIMM ATX	132.99	156.26
PWMB3315	A7M266 266FSB 5P AMR AGP 2DDR ATX Audio	144.99	170.36

BIOSTAR			
PWMB2203	M7MIA KT133 266FSB 5P AMR AGP 2DDR ATX Audio	104.99	123.36
PWMB1265	M7VKB2 KT133 5PCI 1ISA AMR AGP 3DIMM ATX Audio	69.99	82.24
PWMB1266	M7VKB NM133 5PCI 1ISA AMR AGP 3DIMM ATX Audio + VGA	72.99	85.76
CHAITECH			
PWMB1808	7AJA KT133 5PCI ISA AGP 3DIMM Audio ATX	73.99	86.94
GIGABYTE			
PWMB0049	GA-7DX 266FSB 5PCI AGP AMR 2DDR ATX	139.99	164.49
PWMB7730	GA-7ZM VIA KT133 3PCI AGP AMR 3DIMM mATX	73.99	86.94
PWMB7731	GA-7ZX-1 VIA KT133 5PCI AMR AGP 3DIMM ATX	82.99	97.51
MICROSTAR			
PWMB7770	MS-6330 KT133 SocketA 6PCI AGP CNR 3DIMM ATX	83.99	98.69
PWMB7771	K7T TURBO KT133A 6P CNR AGP 3DIMM Audio ATX	82.99	97.51
TYAN			
PWMB0160	Trinity S2390 KT133 6PCI 1ISA AGP 3DIMM ATX	96.99	113.96

SOCKET 370 PPGA/FCPGA MOTHERBOARDS

ABIT			
PWMB1424	V16 VIA 5P 11 AGP AMR 3D Audio	56.99	66.96
AOPEN			
PWMB1754	AX3S 815e 5P AGP CNR 3D	79.99	93.99
PWMB1755	MX3S 815e 5P AGP CNR 2D VGA Audio	92.99	109.26
ASUS			
PWMB1228	CUSL2 6P AGP 2CNR 3D VGA	114.99	135.11
BIOSTAR			
PWMB2202	Biostar M6VSB 5P 11 AGP 3D AMR CNR	59.99	70.49
GIGABYTE			
PWMB7729	GA-6VX7-4X 5P 11 AGP AMR 3D	67.99	79.89
PWMB7732	GA-6VXD7 Dual 5P 11 AGP Audio	112.99	132.76
QDI			
PWMB2931	Synactix 1 2P AGP AMR 3D Audio + VGA	74.99	88.11
SUPERMICRO			
PWMB1640	370SWT 810 3P 1AMR 2D TV Out	77.99	91.64
PWMB1648	370SSM 815 2P AGP AMR 3D	84.99	99.86
PWMB1650	370SEA 810E 6P 11 AMR 2D VGA	98.99	116.31
PWMB1652	370SSA 815E 6P AGP CNR 3D Audio	103.99	122.19
PWMB1656	370DLR Dual 6P 11 AGP SCSI	619.99	728.49
PWMB1649	370DLE Dual 6P 11 LAN	249.99	293.74
PWMB1647	370DL3 Dual 6P 11 U160 LAN	389.99	458.24
PWMB1655	370DER Dual 1P 4D VGA SCSI LAN	679.99	798.99
TYAN			
PWMB0161	Tiger 200 Dual 5P AGP 4D IDE RAID	239.99	281.99
PWMB0162	Tiger 230 Dual PCPGA 5P AGP 4D	126.99	149.21

PENTIUM 4 (SOCKET 423) MOTHERBOARDS

PWMB9956	ABIT TH7-RAID 850 5P AGP CNR 4RIMM Audio ATX	152.99	179.76
PWMB1236	Asus P4T 850 5PCI AGP 4RIMM ATX	179.99	211.49
PWMB0001	Intel D850GB 5P AGP CNR 2R Audio LAN	159.99	187.99
PWMB0002	Intel D850GB 5P AGP CNR 2RIMM	149.99	176.24
PWMB1658	Supermicro P4STA 5P AGP CNR 4D	202.99	238.51

SLOT MOTHERBOARDS

ASUSTEK			
PWMB1230	P3V4X 6P 11 AGP 4D ATX	81.99	96.34
PWMB1209	P2B-S PII BX 4P 21 3D U2W SCSI	218.99	257.31
PWMB1212	P2B-D Dual PII BX 4P 21 4D UDMA	198.99	233.81
PWMB1211	P2B-DS Dual PII BX 4P 21 3D U2W	328.99	386.56
GIGABYTE			
PWMB1711	GA-6BXU PII 440BX 4P 31 AGP 4D	210.99	247.91

SUPERMICRO			
PWMB1607	P6SBA Pentium III/III 440BX 233-700MHz	71.99	84.59
PWMB1613	P6SBU Pentium III/III 440BX 233-700MHz	231.99	272.59
PWMB1610	P6DBE Dual Pentium III/III 440BX	129.99	152.74
PWMB1608	P6DBS Dual Pentium III/III 440BX	289.99	340.74
PWMB1621	P6 SWA PII/P III 4P 31 1AMR 2D UDMA66	76.99	90.46
PWMB1623	P6 SWD PII/P III 6P 1AMR 2D UDMA66	78.99	92.81
PWMB1629	P6DGH I2O Dual 9P 21 4D U2W	799.99	939.99
PWMB1624	P6DGU Dual PII/III GX 233-700MHz U2W	349.99	411.24
PWMB1626	S2DGU Dual Xeon U2W/RAIDPort 4P 21	443.99	521.69
PWMB1637	S2DGD Dual Xeon U2W/RAIDPort 4P 21	449.99	528.74
PWMB1638	P6DGE Dual PII/III 440BX 5P 21 AGP 4D	168.99	198.56
PWMB1657	PIII DR3 Dual PII/III 840 6P AGP 4R SCSI	444.99	522.86
TYAN			
PWMB0155	S1854 Slot 1 & PGA370 VIA 6P 11 AGP 3D	74.99	88.11

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CPUS

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PWMB3258	AMD Duron 850MHz Socket A	52.99	82.82
PWMB3263	AMD Duron 900MHz Socket A	62.99	74.01
PWMB3251	AMD Athlon 900MHz Socket A 200FSB	86.99	129.76
PWMB3252	AMD Athlon 950MHz Socket A 200FSB	99.99	147.71
PWMB3253	AMD Athlon 1GHz Socket A 200FSB	109.99	158.76
PWMB3255	AMD Athlon 1.1GHz Socket A 200FSB	119.99	176.71
PWMB3257	AMD Athlon 1.2GHz Socket A 200FSB	129.99	205.70
PWMB3261	AMD Athlon 1.3GHz Socket A 266FSB	139.99	234.69

INTEL SOCKET 370

PWMB3648	Intel Celeron 700MHz (128K cache)	53.99	63.44
PWMB3649	Intel Celeron 733MHz (128K cache)	59.99	70.49
PWMB3650	Intel Celeron 766MHz (128K cache)	64.99	76.36
PWMB3651	Intel Celeron 800MHz (128K cache)	72.99	85.76
PWMB3653	Intel Celeron 850MHz (128K cache)	89.99	105.74

INTEL PENTIUM III

PWMB3689	Intel Pentium III 933MHz (256K cache) FCPGA 133FSB	151.99	178.59
PWMB3692	Intel Pentium III 1GHz (256K cache) FCPGA 133FSB	176.99	207.96
PWMB3692	Intel Pentium III 1GHz (256K cache) FCPGA 133FSB	176.99	207.96

Intel CPUs include heatsink & fan and three year warranty

INTEL PENTIUM 4

PWMB3701	Intel Pentium 4 1.4GHz 256K + 2x64MB PC800 RIMMS	239.99	372.75
PWMB3702	Intel Pentium 4 1.5GHz 256K + 2x64MB PC800 RIMMS	289.99	441.79
PWMB3707	Intel Pentium 4 1.5GHz 256K + 2x128MB PC800 RIMMS	369.99	538.43
PWMB3708	Intel Pentium 4 1.7GHz 256K + 2x64MB PC800 RIMMS	379.99	552.24
PWMB3709	Intel Pentium 4 1.7GHz 256K + 2x128MB PC800 RIMMS	454.99	662.69

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PWMB5041	Spectra 400MHz Upgrade	98.99	116.31
PWMB5700	Spectra III 550MHz Upgrade	67.99	79.89
PWMB5701	Spectra III 600MHz Upgrade	75.99	89.29
PWMB5042	Performa 500MHz PII Upgrade	84.99	99.86
PWMB5702	Performa 600MHz PII Upgrade	97.99	115.14
PWMB5703	Performa 700MHz PII Upgrade	139.99	164.49
PWMB5704	Performa PRO 600MHz Upgrade	168.99	198.56
PWMB5705	Performa PRO 700MHz Upgrade	198.99	233.81
PWMB5706	Performa III 600MHz Upgrade	219.99	258.49
PWMB5707	Performa III 700MHz Upgrade	236.99	278.46
PWMB5708	Performa III 800MHz Upgrade	267.99	314.89
PWMB5043	Accelerator PCI PII 466MHz + 64MB Upgrade	296.99	348.96
PWMB5044	Accelerator PCI PII 533MHz + 64MB Upgrade	305.99	359.54
PWMB5711	Accelerator PCI PII 500MHz + 64MB Upgrade	278.99	327.81
PWMB5712	Accelerator PCI PII 600MHz + 64MB Upgrade	296.99	348.96

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PC800 RIMM'S

PWME8350	128MB PC800 RIMMS	165.00	193.88
PWME8351	256MB PC800 RIMMS	370.00	434.75

133 MHZ DIMM'S

PWME8310	64MB (8x64) 3.3v 168P DIMM	17.99	21.14
PWME8311	128MB (16x64) 3.3v 168P DIMM	31.99	37.59
PWME8312	256MB (32x64) 3.3v 168P DIMM	59.99	70.49
PWME8313	512MB (64x64) 3.3v 168P DIMM ECC Registered	449.99	528.74

100 MHZ SDRAM DIMM'S

PWME8300	32MB (4x64) 3.3v 168P DIMM	13.99	16.44
PWME8301	64MB (8x64) 3.3v 168P DIMM	18.99	22.31
PWME8302	128MB (16x64) 3.3v 168P DIMM	32.99	38.76
PWME8303	256MB (32x64) 3.3v 168P DIMM	62.99	74.01

66 MHZ UNBUFFERED SYNCHRONOUS DIMM'S

PWME8080	64MB (8x64) 3.3v 168P DIMM	21.99	25.84
PWME8204	128MB (16x64) 3.3v 168P DIMM	39.99	46.99

EDO 72 PIN SIMMS

PWME7010	8MB EDO Simms	8.99	10.56
PWME7015	16MB EDO Simms	22.99	27.01
PWME7040	32MB EDO Simms	49.99	58.74
PWME7050	64MB EDO Simms	69.99	82.24

NON-PARITY 72 PIN SIMMS

PWME5070	4MB x 32 Simms 60ns (16MB)	24.99	29.36
PWME5075	8MB x 32 Simms 60ns (32MB)	49.99	58.74

PARITY 72 PIN SIMMS

PWME4070	4MB x 36 Simms 60ns (16MB)	29.99	35.24
PWME4080	8MB x 36 Simms 60ns (32MB)	61.99	72.84

30 PIN MEMORY SIMMS

PWME4010	4MB x 9 Simms 60ns 3 Chip	8.99	10.56
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CONTROLLERS

ADAPTEC

PWIS2001	SCSI Connect 2904 Kit	25.99	30.54
PWIS2067	AHA 2930U PCI Ultra SCSI Kit	60.99	71.66
PWIS2053	APA-1350 Kit Parallel to SCSI Adaptor	44.99	52.86
PWIS2041	APA 1460B SCSI PCMCIA	79.99	93.99
PWIS2039	APA 1480A Kit SCSI PCMCIA Cardbus	113.99	133.94
PWIS2071	ASC19160 32Bit PCI 160MB/s Desktop SCSI Kit	151.99	178.59
PWIS2072	ASC29160N 32Bit PCI 160MB/s Entry Server SCSI Kit	192.99	226.76
PWIS2074	ASC29160 64Bit PCI 160MB/s Mid Range Server SCSI Kit	209.99	246.74
PWIS2075	ASC29160 64Bit PCI 160MB/s High End Server SCSI Kit	238.99	280.81
PWIS2076	AAALDMA Kit Four Channel PCI UDMA RAID Card	259.99	305.49
PWIS2087	ATA RAID 1200A UDMA RAID Controller	74.99	88.11
PWIS2088	ATA RAID 2400A UDMA RAID Controller	298.99	351.31
PWIS2065	AAAL1102 Kit Single Channel Ultra2 SCSI RAID Card	286.99	337.21
PWIS2066	AAAL3302 Kit Three Channel Ultra2 SCSI RAID Card	466.99	548.71
PWIS2077	Adaptec SCSI RAID 2100S Single Channel U160 Card	299.99	352.49
PWIS2078	Adaptec SCSI RAID 3200S Dual Channel U160 Card	542.99	638.01
PWIS2079	Adaptec SCSI RAID 3400S Four Channel U160 Card	709.99	834.24

FIREWIRE

ADAPTEC

PWIS2086	Adaptec FireConnect 4300 Kit	49.99	58.74
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EVERGREEN FIRELINE

PWIS4500	FireLINE PCI 3 Ext, 1 Int Port Inc VideoStudio SE	67.99	79.89
PWIS4501	FireLINE PCMCIA CardBus 2 Ext Ports Inc VideoStudio SE	91.99	108.09
PWIS4502	FireLINE Combo PCI 3Ext, 1Int Firewire, 2USB Ports	97.99	115.14
PWHE0001	FireLINE 20GB HotDrive External IEEE 1394 HD	209.99	246.74
PWHE0002	FireLINE 30GB HotDrive External IEEE 1394 HD	247.99	291.39
PWHE0003	FireLINE 40GB HotDrive External IEEE 1394 HD	288.99	339.56
PWHE0004	FireLINE 60GB HotDrive External IEEE 1394 HD	378.99	445.31
PWHE0005	FireLINE 80GB HotDrive External IEEE 1394 HD	448.99	527.56

ADAPTEC®

SCSI Connect 2904 Kit

The SCSI Connect 2904 provides an easy to use and affordable connection to your SCSI CD-RW drive.

- Reliable CD/DVD creation with SCSI BusMastering
- Connect up to 7 peripherals
- Plug-and-Play installation.



AHA 2930U

Boost your CD-Recordable or Jaz drive to its best performance with the Adaptec Ultra SCSI Card 2930.

- Ultra SCSI transfer rate up to 20MB/sec
- Connect up to 7 SCSI peripherals on one card
- Manage peripherals with Adaptec EZ-SCSI Software
- Kit includes 50-pin internal cable



USB2CONNECT 3100

The USB2Connect 3100 is a USB2.0 controller For both PCs and Macs

- Provides connectivity to both USB1.1 and USB2.0 devices.
- 3 external ports, 1 internal port for connecting up to 127 devices
- Data transfer of up to 480Mbit/sec (60MB/sec)
- Low-profile (MD1) form factor makes it suitable for slim and rack-mount PCs
- Kit includes a high-speed USB 2.0 10-foot cable



AFW-4300 FireConnect Kit

The Adaptec FireConnect 4300 card makes adding FireWire devices to your computer easy.

- Plug-and-play convenience with hot-pluggable FireWire/1394/i.LINK devices for PC & Mac
- Includes MGI VideoWave 4 digital video editing software for PCs (Demo version)
- 400Mbit/sec (50MB/sec) data transfer rate
- Isynchronous data transmission guarantees bandwidth for uninterrupted data transfer



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWIS2001	SCSI Connect 2904 Kit	25.99	30.54
PWIS2067	AHA 2930U PCI Ultra SCSI Kit	60.99	71.66
PWIC0050	Adaptec USB2 Connect 3100 PCI Card (AUA3100LP KIT)	54.99	64.61
PWIS2086	Adaptec FireConnect 4300 Kit	49.99	58.74

Evergreen Processor Upgrades

Processor upgrades for Pentium & Pentium II systems

Upgrade your aging PC to faster speeds and use the latest software.

- Spectra 400 - upgrades 75MHz & higher speed Pentiums.
- Performa 500 - Upgrades 233MHz and higher speed Pentium II and Celeron "Stick" systems.



Higher speeds available, please call for details

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWMB5041	Spectra 400MHz Upgrade	98.99	116.31
PWMB5700	Spectra III 550MHz Upgrade	67.99	79.89
PWMB5701	Spectra III 600MHz Upgrade	75.99	89.29
PWMB5042	Performa 500MHz PII Upgrade	84.99	99.86
PWMB5702	Performa 600MHz PII Upgrade	97.99	115.14
PWMB5703	Performa 700MHz PII Upgrade	139.99	164.49

Evergreen fireLINE fireWire

Take advantage of FireWire with two new bundles from Evergreen.



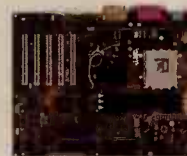
Choose either fireLINE Cardbus + fireLINE HotDrive 20GB + power supply for laptops or fireLINE PCI + fireLINE HotDrive 20GB for desktops.

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWIBD999	fireLINE Cardbus / HotDrive 20GB bundle	279.99	328.99
PWIBD998	fireLINE PCI / HotDrive 20GB bundle	279.99	328.99

ASUS A7V133

The A7V133 is based on VIA® KT133A chipset in ATX form factor for the latest support in AMD® Thunderbird™ / Duron™ 550MHz ~ 1.4GHz + processors.

- Supports AMD® Thunderbird™ / Duron™ 550MHz ~ 1.4GHz + CPU
- 266/200MHz Front Side Bus
- New PCI v2.2 and USB v1.1 standards
- 4 x PCI and 1 x PCI/AMR
- 3 x PCI33 DIMM, UltraDMA/100 and DMA/66 support
- Stepless Frequency Selection



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWMB1234	A7V133 VIA SP AMR 3DIMM AGP ATX	108.99	128.06
PWMB1235	A7V133 VIA SP AMR 3DIMM AGP ATX Audio	112.99	132.76

AdvanSys FireWire/1394 Cards

- Including Ulead VideoStudio SE v4.0 video editing suite for Windows98SE
- AdvanSys offer both PCI and CardBus solutions for FireWire-1394 also known as iLink. Featuring true Hot
- Plug connectivity, transfer rates up to 400 Mbit/sec and the ability to connect up to 63 devices.
- Both include Ulead VideoStudio SE v4.0 video editing suite for windows98SE users, enabling even the novice to become a Steven Spielberg

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWIS2102	AdvanSys 1394 Firewire PCI Adapter Card Retail	52.99	62.26
PWIS2103	AdvanSys 1394 Firewire Cardbus Adapter Card Retail	82.99	97.51

56K Message Modem

For High Speed Online Access to Increase your Productivity!

- World's #1 Selling Modem Brand
- Feature rich Communications package for your home or office!
- Fast internet download speed
- Easy to install and use
- Plug & Play
- Stores incoming voice and faxes while your PC is switched off
- Integrated Flash Memory for easy upgrades
- Includes Internet-Ready and personal voice messaging software



**WORLD NO 1
MODEM BRAND**

**V.92
READY**

U.S. Robotics

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWMD0112	56K Message Plus Modem V90 External	68.99	81.06

Dynamode PCMCIA

Dynamode Modems rated No.1 by PC Advisor (Independent Tests) for performance, reliability and ease of use.

These V90 56K are Plug and Play and Win95/98/2000/NT/ME Compatible. PCMCIA Network cards available in 10BaseT and 10/100 Auto sensing with Cardbus supported on LFE2000 Model. Plug and Play Win95/98/2000/NT/ME Compatible.



Dynamode

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWNE3229	10Mbps RJ45 PCMCIA Card	35.99	42.29
PWNE3231	10Mbps RJ45/BNC Combo PCMCIA Card	37.99	44.64
PWNE3227	10/100 RJ45 PCMCIA Card	41.99	49.34
PWNE3228	10/100 Cardbus RJ45 PC Card	42.99	50.51
PWNE3232	10B-T + 56K Modem PCMCIA Card	109.99	129.24
PWNE3233	10/100 RJ45 + 56K Modem PCMCIA Card	125.99	148.04
PWMD0209	56K V90 PCMCIA Fax/Data (Lucent) Modem	40.99	48.16
PWMD0222	56K V90 PCMCIA Fax/Data Modem for GSM Mobiles	177.99	209.14
PWMD0223	PCMCIA ISDN TA + RVS Com Software	91.99	108.09
PWMD0224	PCMCIA ISDN TA + 56K V90 Modem	225.99	265.54

Nokia 8210e for only £9.99!

Connect to Orange Everyday 50 and receive the stylish Nokia 8210e for £9.99, and 50 FREE off peak minutes of calls every day for just 50p per day! This special deal normally retails for £79.99! Other Orange handsets and tariffs are available upon request, just call for details.

Please note that this offer is subject to Orange terms & conditions, a minimum 12 month contract and credit check.

- Up to 3 hours talk time/5 days standby (under optimum conditions)
- Size: 101.5 x 44.5 x 17.4mm
- Weight: 79g with Li-Ion battery
- Dual band
- Key features: slim & light, voice dialing, picture messaging, predictive text input
- Display: illuminated high-contrast, full-graphics display, 5 lines for text and graphics
- Colours: six Xpress-on covers available



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWMD0420	Orange Everyday 50 Nokia 8210e	9.99	11.74

Dynamode 56K Modems

Rated No.1 by PC Advisor for performance, reliability and ease of use.

- Supports data rates up to 56Kbps using the latest V92 Standards
- Plug & Play - Win95/98/2000/NT/ME Compatible
- Technical support line



Dynamode

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWMD0214	56K V92 Internal PCI Hardware V/F/D Modem	15.99	18.79
PWMD0215	56K V92 External USB Voice/Fax/Data Modem	29.99	35.24
PWMD0216	56K V92 Smart Express Internal AMR Modem (Secondary mode)	13.99	16.44
PWMD0217	56K V92 Smart Express Internal CNR Modem (Auto Mode)	15.99	18.79
PWMD0206	56K V90 Internal PCI Hardware V/F/D Modem (Connexant)	19.99	23.49
PWMD0219	56K V90 Internal PCI Hardware V/F/D Modem (Ambient)	19.99	23.49
PWMD0207	56K V90 External Voice/Fax/Data Modem (Connexant)	38.99	45.81
PWMD0221	56K V90 External Voice/Fax/Data Modem	35.99	42.29
PWMD0209	56K V90 PCMCIA Fax/Data (Lucent) Modem	40.99	48.16

Internal PCI ISDN Terminal Adapter

- Standard ISDN interface (RJ45) for connection to EURO ISDN
- 128Kbps (ML-PPP) for internet access
- BT Highway compatible
- Plug and play with easy installation
- Flash memory for easy firmware upgrades



Lucent Technologies **Hayes**

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWMD0314	Accura PCI ISDN 128K Data/Fax Card	36.99	43.46
PWMD0313	Accura ISDN External D/F/N TA + 2 Analogue Ports	134.99	158.61
PWMD0316	Accura USB ISDN 128K Terminal Adapter	64.99	76.36

The Sony CLIE

CLIE (pronounced klee-ay) stands for **Communication, Link, Information and Entertainment.**

It is a powerful platform for the future of handheld devices.

In addition to the familiar, user friendly Palm operating system, Sony has added unique features to improve the ease of use. The CLIE features a slot for Memory Stick media allowing for virtually unlimited memory expansion. Also, a Jog Dial navigator allows for single-handed scroll and select memory navigation.



- 8MB Internal Memory
- 8MB Blue Memory Stick Removable Memory
- 2MB Flash Memory
- Jog Dial Navigator
- Palm OS Version 3.5.2
- Backlit Monochrome Display
- USB HotSync cradle and battery charger
- Lithium-ion rechargeable battery (internal)
- Protective Case

SONY

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWMD4700	Sony CLIE Monochrome 8MB + 8MB Memory Stick	202.99	238.51

Code Description £ Ex VAT £ Inc VAT

INTERNAL MODEMS

SIMPLY

PWMD0001	Simply Internal ISA 56K V90 Modem	29.99	35.24
PWMD4150	Simply 56K PCI V90 (Connexant)	19.99	23.49

DYNANET

PWMD0205	56K V90 Internal ISA Voice/Fax/Data Modem (Connexant)	29.99	35.24
PWMD0206	56K V90 Internal PCI Hardware V/F/D Mod (Connexant)	19.99	23.49

HAYES

PWMD0358	Accura 56K Voice/Data/Fax PCI Modem	39.99	46.99
PWMD0351	Accura 56K V90 Data/Fax Internal ISA Modem	56.99	66.96

PREMIER

PWMD6344	Premier 56K V90 PCI Modem	22.99	27.01
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U.S. ROBOTICS

PWMD0125	56K Internal PCI Voice Fax V90 Modem	39.99	46.99
PWMD0074	56K Voice Fax V90 ISA Internal	56.99	66.96

EXTERNAL MODEMS

SIMPLY

PWMD0004	56K V90 External Modem (Connexant)	38.99	45.81
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CREATIVE

PWMD11003	Modem Blaster Flash 56K External Modem	40.99	48.16
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DYNANET

PWMD0207	56K V90 External Voice/Fax/Data Modem (Rockwell)	38.99	45.81
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ELSA

PWMD6047	ELSA MicroLink 56K Fun V90 + Communicate!	31.99	37.59
PWMD6048	ELSA MicroLink 56K Internet V90 + Communicate!	39.99	46.99

HAYES

PWMD0356	Accura 56K V90 Data/Fax External	58.99	69.31
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MULTITECH

CMMDH999	MTS600ZDV-E 56.6 with Voice External	75.99	89.29
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OLITEC

PWMD0391	Olitec Smart Memory Pro 56K External	74.99	88.11
PWMD0392	Olitec Self Memory 2000 56K V90 External	58.99	69.31

U.S. ROBOTICS

PWMD0008	56K Data Fax V90 External (No Voice)	53.99	63.44
PWMD0112	56K Message Plus Modem V90 External	68.99	81.06
PWMD0094	56K Pro Message Modem V90 External	84.99	99.86

USB MODEMS

SIMPLY

PWMD4160	Simply USB 56K V90 Fax/Data Modem	43.99	51.69
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DYNANET

PWMD0208	56K External USB Voice/Data/Fax Modem	48.99	57.56
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SITECOM

PWMD0565	Portable USB 56K V90 Fax/Data Pocket Modem	49.99	58.74
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ZOOM

PWMD0382	Zoom 56K USB External Fax Modem	65.99	77.54
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PC CARD MODEMS

SIMPLY

PWMD0022	56K V90 PC Card Fax (Lucent)	39.99	46.99
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DYNANET

PWMD0209	56K V90 PCMCIA Fax/Data (Lucent) Modem	40.99	48.16
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HAYES

PWMD0317	Accura PCMCIA 56K V90 Data/Fax Mod Controllerless	68.99	81.06
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PORTABLE ADD ONS

PWMD0241	Freeprint Global V90 PC Card Mod GSM & ISDN Ready	125.99	148.04
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PSION DACOM

PWMD0196	PC Card DF5660 V90 Global Freedom Fax Modem	138.99	163.31
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U.S. ROBOTICS

PWMD0107	Megahertz 56K Global GSM XJACK PCMCIA	93.99	110.44
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TDK GLOBAL PULSE - SERIAL CABLES

PWMD4211	Global Pulse for Palm Pilot Nokia 6110	63.99	75.19
PWMD4212	Global Pulse GSM for Win CE Nokia 6110	64.99	76.36
PWMD4209	Global Pulse for Windows Nokia 6110	66.99	78.71
PWMD4210	Global Pulse for Windows Nokia 8110 & 3110	61.99	72.84

INTERNAL ISDN TERMINAL ADAPTERS

SIMPLY

PWMD5700	Simply 128K PCI ISDN TA with RVS Com S/W	24.99	29.36
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BT

PWMD6152	BT Speedway 128K ISDN PCI	39.99	46.99
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DYNANET

PWMD0210	Internal ISDN 128K PCI + RVS Com S/W	26.99	31.71
PWMD0211	Internal ISDN 128K PCI + RVS Com S/W (1 Analogue)	48.99	57.56

EICON

PWMD6211	Eicon Diva PCI ISDN Internal Card	55.99	65.79
PWMD6213	Eicon Diva Pro 2.0 PCI ISDN Internal Card	138.99	163.31

HAYES

PWMD0314	Accura PCI ISDN 128K Data/Fax Card	36.99	43.46
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EXTERNAL ISDN TERMINAL ADAPTERS

SIMPLY

PWMD5702	Simply ISDN External TA + 2 Analogue + RVS Com S/W	90.99	106.91
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HAYES

PWMD0313	Accura ISDN External D/F/N TA + 2 Analogue Ports	134.99	158.61
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TDK

PWMD5033	Mail Box Allround 128K ISDN TA + RVS Com Software	95.99	112.79
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ZYXEL

PWMD6131	Zyxel Omni.net D ISDN TA	89.99	105.74
PWMD6135	Zyxel Omni.net Plus ISDN TA (2 Analogue Port)	119.99	140.99

USB ISDN TERMINAL ADAPTERS

SIMPLY

PWMD5701	Simply ISDN TA 128K USB with Voice + RVS Com S/W	46.99	55.21
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BILLION

PWMD5006	Billion 128K ISDN TA USB + RVS Com	47.99	56.39
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DRAYTEK

PWMD6130	Draytek Vigor 128 External TA USB	48.99	57.56
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HAYES

PWMD0316	Accura USB ISDN 128K Terminal Adapter	64.99	76.36
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U.S. ROBOTICS

PWMD0113	ISDN Pro 128K Ext TA Serial + USB	114.99	135.11
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ZYXEL

PWMD6137	Zyxel Omni.net LCD plus 128K TA USB & Serial	148.99	175.06
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PC CARD ISDN TERMINAL ADAPTERS

EICON

PWMD6208	Eicon Diva Pro 128K ISDN PC Card	188.99	222.06
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XIRCOM

PWMD4130	RealPort 2 PCMCIA 128K ISDN Card	124.99	146.86
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www.simply.co.uk
for FREE DELIVERY on orders over £50 ex. VAT

SiMPLY
www.simply.co.uk

Code	Description	£ Ex VAT	£ Inc VAT
JOYSTICKS			
LOGITECH			
PWJ00216	Wingman GamePad Extreme	24.99	29.36
PWJ00215	Wingman GamePad	15.99	18.79
PWJ00214	Logitech Wingman Extreme Digital 3D	21.59	25.37
MICROSOFT			
PWJ00069	MS Dual Strike Game Pad	24.99	29.36
PWJ00198	MS Precision Racing Wheel	32.99	38.76
PWJ00699	MS Sidewinder Force Feedback Wheel USB	78.99	92.81
PWJ00670	MS Sidewinder Force Feedback 2 v1 USB	59.99	70.49
PWJ00211	MS Sidewinder Freestyle Pro	24.99	29.36
PWJ00195	MS Sidewinder Game Pad	18.99	22.31
PWJ00218	MS Sidewinder Game Pad PnP USB	11.99	14.09
PWJ00197	MS Sidewinder Game Pad Pro	22.99	27.01
PWJ00690	MS Sidewinder Precision Pro 2	25.99	30.54
PWJ00699	MS Sidewinder Game Voice USB	30.99	36.41
PWM00356	MS Trackball Explorer	49.99	58.74
DRAGONFLY			
PWJ05258	F1 Micro Steering Wheel	20.99	24.66
PWJ05259	Le Mans Steering Wheel (Leather)	40.99	48.16
MAXI			
PWJ00219	Ferrari Force Feedback Wheel & Peddals	81.99	96.34
KEYBOARDS			
SIMPLY			
PWKE0002	Simply 105 Key Windows 95	7.99	9.39
PWKE0001	Simply 105 Key Windows 95 PS/2	8.99	10.56
CHERRY			
PWKE0029	Cherry G81-3000 Soft with Win 95 Keys (PS/2)	22.99	27.01
PWKE0033	Cherry G81-3504 USB 4 port HUB (USB)	60.99	71.66
PWKE0027	Cherry G83-6105 Soft with Win 95 Keys (AT)	14.99	17.61
PWKE0028	Cherry G83-6105 Soft with Win 95 Keys (PS/2)	14.99	17.61
PWKE0053	Cherry G84-4100 Notebook Keyboard	44.99	52.86
PWKE0032	Cherry G81-3000 (PS/2)	24.99	29.36
LOGITECH			
PWKE0099	Internet Keyboard	12.99	15.26
PWKE0157	Cordless Desktop Touch Keyboard Solution	48.99	57.56
PWKE0156	Cordless Desktop Pro Solution	62.99	74.01
MICROSOFT			
PWKE0079	Microsoft Natural Keyboard	21.99	25.84
PWKE1085	Microsoft Natural Keyboard Pro	29.99	35.24
PWKE0088	Microsoft Internet Keyboard	13.99	16.44
PWKE0093	Microsoft Internet Keyboard Pro	26.99	31.71
RODENTS			
SIMPLY			
PWM00002	Simply PS/2 Mouse 2 Button	3.99	4.69
PWM00001	Mitsumi 2 button Ergonomic Mouse Serial	4.99	5.86
A4 TECH			
PWM06000	A4 Tech Fast 2 Button Mouse serial	4.99	5.86
PWM06001	A4 Tech Fast 2 Button Mouse PS2	3.99	4.69
PWM06003	A4 Tech Scrolltrack (Thumb ball) 3 Button Mouse	9.99	11.74
PWM06005	A4 Tech Wineasy USB 3 Button Mouse	11.99	14.09
PWM06006	A4 Tech Winfast USB 3 Button Mouse	8.99	10.56
DRAGONFLY			
PWM05587	Qware Wheel Mouse	7.99	9.39
PWM05588	Qware Optical Mouse	19.99	23.49
LOGITECH			
PWM01255	Logitech Pilot Mouse 3 button	6.99	8.21
PWM00051	Logitech Wheel Mouse (Optical) USB	28.99	34.06
PWM00182	Logitech Mouseman Wheel (Optical)	32.99	38.76
PWM00059	Logitech Cordless WheelMouse	21.99	25.84
PWM00252	Logitech Cordless Mouseman Wheel	32.99	38.76
PWM00259	Logitech Mini WheelMouse	14.99	17.61
PWM00098	Logitech Pilot Mouse Wheel Combo	9.99	11.74
PWM01063	Logitech Trackman Marble Wheel	28.99	34.06
PWM08897	Logitech Force Feedback Mouse	54.99	64.61
MICROSOFT			
PWM00078	Microsoft Basic Mouse	8.99	10.56
PWM00094	Microsoft Wheel Mouse	12.99	15.26
PWM05188	Microsoft Wheel Mouse Optical	14.99	17.61
PWM05200	Microsoft Cordless Wheel Mouse	19.99	23.49
PWM00088	Microsoft IntelliMouse	14.99	17.61
PWM00089	Microsoft IntelliMouse TrackBall	12.99	15.26
PWM01099	Microsoft IntelliMouse Explorer	31.99	37.59
PWM01097	Microsoft IntelliMouse Optical	24.99	29.36
PWM05189	Microsoft Trackball Optical	20.99	24.66
DIAMOND			
PWM05186	Gyromouse Presenter	173.99	204.44
KENSINGTON INPUT DEVICES			
PWM09000	Mouse-in-a-box Serial & PS/2	11.99	14.09
PWM09006	Mouse-in-a-box Scroll USB & PS/2	14.99	17.61
PWM09003	Expert Mouse	64.99	76.36
SMALL TALK			
PWM09500	Small Talk Mouse Phone	34.99	41.11
GRAPHIC TABLETS			
INTUOS			
PWM00174	Graphire A6 USB with Painter Classic	70.99	83.41
PWM00176	Graphire A6 Serial with Painter Classic	70.99	83.41
PWM01181	Graphire A6 (Blueberry) USB	68.99	81.06
PWM01182	Graphire A6 (Grape) USB	69.99	82.24
PWM01185	Graphire A6 (Tangerine) USB	69.99	82.24
PWM00161	Intuos A6 Tablet	121.99	143.34
PWM00151	Intuos A6 Tablet USB	121.99	143.34
PWM00162	Intuos A5 Tablet	203.99	239.69
PWM00152	Intuos A5 Tablet USB	203.99	239.69
PWM00159	Intuos A5 Tablet USB Graphite	281.99	331.34
PWM00163	Intuos A4 Tablet	294.99	346.61
PWM00153	Intuos A4 Tablet USB	300.99	353.66
PWM00158	Intuos A4 Tablet USB Graphite	395.99	465.29
PWM00166	Intuos A3 Tablet	509.99	599.24
PWM00156	Intuos A3 Tablet USB	498.99	586.31
PWM00168	Intuos A2 Tablet	1223.99	1438.19
PWM00177	Intuos Pen	45.99	54.04
PWM00178	Intuos Stroke Pen	53.99	63.44
PWM00179	Intuos Inking Pen	56.99	66.96
PWM00181	Intuos Airbrush Pen	75.99	89.29

Wacom

INTUOS – the expandable graphics tablet system for professionals

Only Intuos technology takes advantage of Adobe Photoshop's 15 Pressure Sensitive Tools

- 1024 Levels of Pressure Sensitivity for more control and expressiveness
- Absolute Positioning allows masking and retouching at a stroke
- Six innovative input tools, including Digital airbrush, 4D Mouse and Lens cursor
- Programmable Menu Strips
- Quickpoint area for Editing and navigation simultaneously



NEW GRAPHITE SPECIAL EDITION A4 REGULAR & A5 USB AVAILABLE

WACOM

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWM00162	Intuos A5 Graphics Tablet Serial	203.99	239.69
PWM00163	Intuos A4 Graphics Tablet Serial	294.99	346.61

Belkin OmniView SE

The OmniView SE is the ideal PC sharing solution for the office user or the small server installation.

Features:

- Cascadeable to control up to 16 computers.
- Maximum resolution of 1200 x 1600
- Microsoft intellimouse and intellimouse PRO support.
- Compatible with the Belkin SUN and MAC adapters
- Certified for use with windows 95/98/NT, Linux and Novell.



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWCB3088	2 Port OmniView SE KVM Switch	98.99	116.31
PWCB3089	4 Port OmniView SE KVM Switch	148.99	175.06
PWCB3109	Belkin KVM 3x Cables PS/2 1.8m	24.99	29.36
PWCB3108	Belkin KVM 3x Cable 1.8m AT with PS/2 Adapter	22.99	27.01

Kensington

Optical Pro Mouse

- 4 button optical mouse
- USB and PS2 connection



Orbit Trackball

- The UK's No.1 selling trackball
- 2 button trackball
- USB and PS2 connection

ValuMouse Scroll

- 3 button scroll mouse
- Serial and PS2 connection



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWM00203	Optical Pro Mouse	21.99	25.84
PWM00204	Orbit Trackball	18.99	22.31
PWM00205	ValuMouse Scroll	4.99	5.86

Microsoft® Natural® Keyboard Pro

Proven Comfort, Superior Control

The Natural Keyboard Pro gives you one-touch access to the Internet, your e-mail, and your favourite multimedia controls. With its powerful IntelliType™ Pro software and built-in USB ports, the Natural Keyboard Pro combines comfort and control to let you work more efficiently. The Natural Keyboard Pro works the way you want it to!



Microsoft®

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWKE1085	Natural Keyboard Pro	29.99	35.24

Wacom

GRAPHIRE – The Cordless and Batteryless Mouse and Pen Set

Use the input device best suited for the task at hand, and work more intuitively, precisely, quickly and creatively in any application. Use the pen for painting, drawing, image editing and even games, and then immediately use the mouse in office applications and browsing the web

- 1000dpi resolution with 512 levels of pressure sensitivity
- 6 colours now available, including 4 candy colours, Special Graphite (USB only) and Original Blue
- USB for Macintosh and Win 98/2000 and Serial for Win 95/98/NT



WACOM

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWM00174	Wacom Graphire A6 USB with Painter Classic	70.99	83.41
PWM01181	Graphire A6 (Blueberry) USB	68.99	81.06
PWM01182	Graphire A6 (Grape) USB	69.99	82.24

TEAC Subwoofer System

Ideal Multimedia Subwoofer System

- Removable Control Panel offers ease of access
- Swivel satellite speakers
- Subwoofer PMPO 500 Watts, Satellite speakers
- Built in Amplifier
- Volume, Treble and Bass Control
- Also available in Black



TEAC

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWS01606	PowerMax 500 Multimedia Sub-Woofer System Black	49.99	58.74
PWS01605	PowerMax 1500 Multimedia Entertainment System	144.99	170.36
PWS01603	PowerMax 2000 Multimedia Digital System (5 Speaker)	195.99	230.29
PWS01604	PM Traveller Portable Slim Line USB Speakers	35.99	42.29

Microsoft® Internet Keyboard Pro

Get complete, customised control with your keyboard.

The Internet Keyboard Pro gives you high-quality design with one-touch access to the Internet, your e-mail, and your favourite multimedia controls.

- Use the Internet Hot Key to get online with the push of a button, then browse easily - right from your keyboard
- Open your e-mail program to check messages with the E-mail Hot Key - a single keystroke is all it takes to access your electronic mailbox



Microsoft®

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWKE0093	Internet Keyboard Pro	26.99	31.71

Microsoft® Trackball Explorer

The Microsoft Trackball Explorer sets a new standard in trackballs.

The IntelliEye optical sensor tracks the movement of the ball 2,000 times per second to give you unbelievable smooth, precise control.

Two Additional Buttons for Easy Navigation give you faster, more accurate Internet navigation without using toolbars or the keyboard. The shape supports your hand in a natural posture while the ball is positioned for fingertip control and easy navigation.



NEW

Microsoft®

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWM00356	Trackball Explorer	49.99	58.74

3D Prophet III

The most powerful, most fully featured graphics processor. Your opponents will wish they were already dead! The most advanced GPU architecture with the fastest chipset and 64MB onboard DDR RAM

- NVIDIA GeForce3
- 800 Billion Operations per Second
- DVI-Out
- TV-Out
- AGP 4X/2X
- PowerDVD™



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWVG8570	3D PROPHET III GeForce3 64MB AGP	449.99	528.74

Hercules 3D Prophet 4500 64MB AGP

Let the Prophet of 3D Show you the way!

- Kyro II chipset featuring 64MB SDR RAM and 128-bit memory interface
- Tile rendering for fast performance and superb image quality
- 8-layer multi-texturing, 1940 x 1440 true colour at 75Hz refresh rate
- Environmental Bump Mapping
- DVD support for motion compensation, overlay blending and video scaling



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWVG8593	3D PROPHET 4500 STMicro Kyro 2 64MB SDR AGP4X	129.99	152.74
PWVG8594	3D PROPHET 4500 STMicro Kyro 2 64MB SDR TV Out	139.99	164.49

3D Prophet 4000XT

- 3D Prophet 4000XT
- 32MB SDR RAM
- 128-bit
- AGP and PCI versions
- 115mhz
- Tile Architecture
- Hidden Surface Removal
- 8-layers Multi-texturing
- Internal True Color™
- FSAA
- Environmental Bump Mapping
- DirectX® & OpenGL support



NONE	NONE	NONE	NONE
PWVG8674	3D PROPHET 4000 XT 32MB AGP	64.99	76.36
PWVG8672	3D PROPHET 4000 XT 32MB AGP TV Out	69.99	82.24
PWVG8673	3D PROPHET 4000 XT 32MB PCI	Call	

Vivid!XS KyroII Hardcore 3D accelerator

- Superb image quality
- Environment bump mapping
- Full scene anti-aliasing
- Full direct X & OpenGL support
- TV output
- WinDVD 2000 software (inc in retail version)
- 32MB RAM AGP 4x/2x



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWVG2249	Videologic VividXS 32MB AGP Kyro II Chipset	79.99	93.99

SoundWorks Slim500

These new stylish speakers featuring a wired volume control, come complete with detachable stands so that they can be wall mounted.

Although ultra slim, the 500's deliver resoundingly deep bass through the electronically contoured 17w RMS subwoofer unit.

This 2.1 system is perfect for all lifestyle devices as well as your PC, such as your DAP Jukebox or Walkman.



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWV01557	Creative Sound Works Slim500 Speakers	Call	

Video Blaster Webcam Go Plus

Capable of capturing AVI and audio clips as well as digital stills all out on the move, this detachable Webcam takes functionality to a whole new level.

Using a USB connection to the PC, this Webcam's improved CMOS sensor gives superb image quality, even when videoconferencing.

With CCTV and surround picture software, this is a lot of fun straight out of the box!



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWTV5167	Creative Labs Webcam Go Plus USB	87.99	103.39

Modem Blaster 56k External

The stylish Modem Blaster is the ideal solution for both home and business users looking for a solid performer with high speed downloads and reliable connections.

With support for both K56flex and V.90, you can connect anytime, plus, you can ensure upgradeability with our Flash ROM.

You will also find included the fantastic MediaRing Talk Internet Telephony software.



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWMD1003	Modem Blaster Flash 56k External Modem	40.99	48.16

SoundBlaster Live! Player 5.1

Opening up a variety of digital entertainment on your PC, this powerful card will give you Dolby 5.1 decoding as well as EAX surround sound in your games.

Utilising the EMU10K1 processor, which is the industry's most advanced DSP chip, you can enjoy the fabulous suite of software included. Can be upgraded to Platinum spec.



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWV01171	Sound Blaster Live Player 5.1 PCI	48.99	57.56

Code Description £ Ex VAT £ Inc VAT

SOUND CARDS

AOPEN

PWSO9992	AW200 16 PCI	14.99	17.61
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CREATIVE LABS

PWSO9081	Sound Blaster 16 PCI	20.99	24.66
PWSO1669	Sound Blaster PCI 512	35.99	42.29
PWSO1171	Sound Blaster Live Player 5.1 PCI	48.99	57.56
PWSO1174	Sound Blaster Live Platinum 5.1 PCI	124.99	146.86
PWSO1176	Sound Blaster Surround 5.1 Kit + DTT2200	125.99	148.04

D-LINK

PWSO0850	USB FM Radio	29.99	35.24
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MERCULES

PWSO0525	Guillemot GameSurround Fortissimo II	20.99	24.66
PWSO0526	Cougar Video Edition 32MB PCI	70.00	82.25

TERRATEC

PWSO0018	EWS 64 XL Sound Card	358.99	421.81
PWSO0014	XL Professional Audio Card	307.99	361.89
PWSO0008	EWS88MT PCI Sound Card	349.99	411.24

TURTLE BEACH

PWSO1134	Montego A3DXstream PCI Sound Card	46.99	55.21
PWSO1143	Montego II	56.99	66.96
PWSO1144	Montego II Plus	107.99	126.89

VIDEOLOGIC

PWSO0115	SonicFury	66.99	78.71
PWSO0116	SonicFury OEM	56.99	66.96

YAMAHA

PWSO1136	Waveforce SW1000XG PCI Sound Card	348.99	410.06
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SPEAKERS

CREATIVE LABS

PWSO1552	CSW35 Speakers	9.50	11.16
PWSO1553	CSW Sound Works Digital	44.99	52.86
PWSO1554	CSW Sound Works 310	25.99	30.54
PWSO1555	Playworks PS2000 - (Playstation2)	118.99	139.81
PWSO1549	FPS1500 Speakers	45.99	54.04
PWSO1551	DTT2200 Speakers	65.99	77.54
PWSO1550	DTT3500 Digital Theatre Speakers	164.99	193.86

LABTEC

PWSO1107	APX-4620 Edutainment Speakers, inc Sub	71.99	84.59
PWSO1142	ATX-5820 Edutainment Speakers, inc Sub	102.99	121.01
PWSO1145	LCS-1050 Edutainment Speakers (Spin 50°)	11.99	14.09
PWSO1146	LCS-1060 Edutainment Speakers (Spin 60°)	17.99	21.14
PWSO1147	LCS-1070 Edutainment Speakers (Spin 70°)	23.99	28.19
PWSO1248	Edge 418 Flat Panel Speakers (Slab)	61.99	72.84
PWSO1148	C110 Stereo Headset	7.99	9.39
PWSO1999	Desk Boom Flexneck Mic with Base (AM-252)	6.99	8.21
PWSO9010	ClearVoice Mono Headset & Mic	25.99	30.54
PWSO9011	ClearVoice Stereo Headset & Mic	29.99	35.24
PWSO9016	ClearVoice Digital Array Microphone	87.99	103.39
PWSO9013	ClearVoice Head Mic (NCAT2)	17.99	21.14

PHILIPS

PWSO0729	A2-3 (3 speaker)	38.99	45.81
PWSO0728	A2-5 (5 speaker)	47.99	56.39

TEAC

PWSO1601	Powermax 500 Multimedia Sub-Woofers System	36.99	43.46
PWSO1603	PowerMax 2000 Multimedia Digital System	195.99	230.29
PWSO1604	Portable Slim Line USB Speaker	35.99	42.29

VIDEOLOGIC

PWSO9003	Sirocco Spirit Speaker System (OEM)	112.99	132.76
PWSO9006	Sirocco Pro Speaker System	437.99	514.64
PWSO9001	Digi Theatre Home Cinema Speaker System	179.99	211.49
PWSO9002	Sirocco CrossFire Speaker System	194.99	229.11
PWSO9000	Sirocco Speaker System	194.99	229.11
PWSO9007	Digi Theatre DTS	328.99	386.56
PWSO5587	Digi Theatre LC	107.99	126.89
PWSO5588	Digi Theatre PC (With Fury)	164.99	193.86

YAMAHA

PWSO1189	Multimedia YST-M50	92.99	109.26
PWSO1988	Multimedia YST-MS30	41.99	49.34
PWSO1989	Multimedia YST-MS35D (USB)	54.99	64.61

OTHER

PWSO1110	Simply Headphones	3.99	4.69
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MULTI-MEDIA CARDS

SIMPLY

PWVG5898	TV Tuner VE PCI OEM	30.99	36.41
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AVERMIDEA

PWTV0031	JoyTV External TV Tuner Box	71.99	84.59
PWTV0999	AverKey300 PC to TV Scan Converter	139.99	164.49
PWTV0995	AverVision PC to TV Scan (Overlay Camera)	514.99	605.11
PWTV0996	InterCam-Elite (USB VideoConf Camera)	42.99	50.51

DSP

PWTV0990	DSP Spark with VideoAction DV in/out	410.99	482.91
PWTV0991	DSP Spark Plus (UW SCSI)	513.99	603.94

FAST ELECTRONIC

PWTV0125	Screen Machine II	657.99	773.14
PWTV0149	Fast AV Master with Video Studio & PowerPlay	305.99	359.54
PWTV0149	Fast AV Master 2000 Video Studio & PowerPlay	305.99	359.54
PWTV1151	Fast DV Master	307.99	361.89
PWTV1152	Fast DV Master (Win98/95)	1749.99	2056.24
PWTV1153	Fast DV Master Pro (SpeedRaiser) (Win NT)	1955.99	2298.29

FOCUS ENHANCEMENTS

PWTV0857	InVideo Conference	160.99	189.16
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HAUPPAUGE

PWTV1229	Hauppauge WinTV-Go	37.99	44.64
PWTV1226	Hauppauge WinTV-Primio-FM	54.99	64.61
PWTV1225	Hauppauge WinTV-PCI-FM	71.99	84.59
PWTV0092	Hauppauge WinTV-Theater	88.99	104.56
PWTV2135	Hauppauge WinTV-USB	63.49	74.60
PWTV2136	Hauppauge WinTV-USB-FM	79.99	93.99
PWTV2137	Hauppauge USB-Live (Cable)	41.99	49.34

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for FREE DELIVERY on orders over £50 ex. VAT

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www.simply.co.uk

MULTIMEDIA CARDS (CONT.)**HAUPPAUGE (CONT.)**

PWT0131	Hauppauge Cinema Pro	194.99	229.11
PWT1227	Hauppauge USB-Live (Video Capture)	42.99	50.51
PWT1232	Hauppauge WinTV-DVB-s	198.99	233.81
PWT1233	Hauppauge WinTV-Nova	109.99	129.24
PWT1239	Hauppauge DV-Wizard PRO	109.99	129.24
PWT1234	Hauppauge WinTV-PVR	198.99	233.81

PINNACLE

PWT1246	Studio DV (PCI)	78.99	92.81
PWT2289	Studio DV Plus (PCI)	178.99	210.31
PWT1247	miroVIDEO DV500 Real Time (PCI)	575.99	676.79
PWT1251	Studio PCTV Rave (PCI)	32.99	38.76
PWT0262	Studio PCTV (PCI)	39.99	46.99
PWT1252	Studio PCTV inc. FM Radio (USB)	69.99	82.24
PWT0241	Studio DC10 Plus (PCI)	128.99	151.56
PWT0947	miroVIDEO DC30 Plus (PCI)	385.99	453.54
PWT0840	miroVIDEO DV200 FireWire (PCI)	358.99	421.81
PWT1998	miroVIDEO DC1000	1337.99	1572.14
PWT1999	miroVIDEO DC1000	1956.99	2299.46
PWT1996	miroVIDEO DC2000	1699.99	1997.49
PWT1248	miroVIDEO DV1000	6178.99	7260.31

VIDEOLOGIC

PWT0101	Videologic Captivator PCI	47.99	56.39
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**VIDEO CONFERENCING
3COM**

PWT5587	Home Connect Conferencing Camera USB	89.99	105.74
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CREATIVE LABS

PWT5168	Creative VideoBlaster Webcam PLUS	34.99	41.11
PWT5167	Creative Labs WebCam Go Plus USB	87.99	103.39

OYNANET

PWT5241	Dynanet VCOX USB Digital Camera (Win98)	29.99	35.24
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INTEL

PWT5003	Intel Create and Share Camera Pack (USB)	46.99	55.21
PWT5004	Intel PC Camera Pro Pack	66.99	78.71

LOGITECH

PWT5031	QuickCam Express	27.99	32.89
PWT5032	QuickCam Web	43.99	51.69
PWT5029	QuickCam VC (Parr)	44.99	52.86
PWT5027	QuickCam VC (USB)	44.99	52.86
PWT1336	Quickcam Pro 3000	67.99	79.89
PWT1337	Quickcam Traveller	109.99	129.24

NISIS

PWT6969	QuickPix QPI Digital Web Cam/Colour Camera	49.99	58.74
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PHILIPS

PWW0052	Philips ToUcam Fun Web Cam, Mic & Games	37.99	44.64
PWW0050	Philips ToUcam XS Web Cam No Mic	23.99	28.19
PWW0051	Philips ToUcam Pro Web Cam with Mic (60 fps)	48.99	57.56

VIDEOLOGIC

PWT0095	Videologic Captivator PCI / VC	145.99	171.54
PWT1085	Videologic HomeC@m (Win95/98)	54.99	64.61
PWT1086	Videologic HomeC@m (Win95/98) OEM	52.99	62.26

WINNOV

PWT0799	Winnox Conference Pro ISA Kit	234.99	276.11
PWT0798	Winnox Conference Pro ISA Kit (+ CU-SeeMe)	289.99	340.74
PWT0797	Winnox Conference Pro PCI Kit	252.99	297.26
PWT0796	Winnox Conference Pro PCI Kit (+ CU-SeeMe)	276.99	325.46
PWT0795	Winnox Videum Cam Travalser PCMCIA	293.99	345.44

VGA CARDS**ATI**

PWVG0855	Xpert 98 Pro RMB PCI OEM	31.99	37.59
PWVG0949	Xpert 98 Pro RMB AGP OEM	25.99	30.54
PWVG0925	Rage Fury Pro 32MB AGP VIVO	83.99	98.69
PWVG0932	Rage Fury Pro 32MB AGP VIVO OEM	65.49	76.95
PWVG0939	All In Wonder 128 Pro 32MB AGP	117.99	138.64
PWVG0940	All In Wonder 128 Pro 32MB AGP OEM	114.49	134.53
PWVG0941	Radeon 64MB DDR AGP VIVO	169.99	199.74
PWVG0947	Radeon 64MB DDR AGP VIVO OEM	135.99	159.79
PWVG0853	Radeon 32MB DDR AGP	144.49	169.78
PWVG0942	Radeon 32MB SDR AGP OEM	74.49	87.53
PWVG0943	Radeon 32MB SDR AGP TV-Out OEM	77.99	91.64
PWVG0944	Radeon 32MB DDR AGP OEM	110.99	130.41
PWVG0084	Xpert 2000 Pro 16MB AGP OEM	31.99	37.59
PWVG0085	Xpert 2000 Pro 16MB AGP PC2TV OEM	35.49	41.70
PWVG0086	Xpert 2000 Pro 32MB AGP OEM	40.49	47.58
PWVG0087	Xpert 2000 Pro 32MB AGP PC2TV OEM	43.99	51.69
PWVG0948	Radeon All In Wonder 32MB DDR AGP	237.99	279.64
PWVG0930	DVD/MPEG2 Player Software	8.99	10.56

ASUS

PWVG0707	V7100MX GeForce 2MX 32MB TV-out AGP (DDR)	138.99	163.31
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CREATIVE

PWVG2917	3D Blaster GeForce2 GTS 32MB AGP	176.99	207.96
PWVG2918	Creative DXR3 DVD Decoder Card PCI	52.99	62.26

ELSA

PWVG9603	GLADIAC GeForce2MX GTS 32MB AGP	76.99	90.46
PWVG1311	GLADIAC 920 GeForce3 TV-Out 64MB NVIDIA	254.99	299.61

GUILLEMOT (HERCULES)

PWVG8558	3D PROPHET II GTS Ultra 64MB OEM	379.99	446.49
PWVG8595	3D PROPHET II MX 32MB	99.99	117.49
PWVG8596	3D PROPHET II MX 32MB OEM	68.99	81.06
PWVG8597	3D PROPHET II MX 32MB TV-Out OEM	96.99	113.96

ATI All-In-Wonder Radeon

- Take control of your TV with TV-ON-DEMAND™: pause live TV, instant replay, possibility to record TV broadcasts for later viewing
- Create your own videos by capturing and editing MPEG-2 video from a VCR or camcorder
- Watch flicker-free DVD movies
- Get outstanding digital sound with the Digital audio S/PDIF output
- Bring 3D game characters to life with the RADEON™ graphics technology
- Connect to your choice of VGA monitor, Digital Flat Panel or TV set display

"If games, video capture and TV all matter to you, this is the only card you need"
Computer Active



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWVG0948	ATI Radeon All In Wonder 32MB Retail	237.99	279.64

ATI Radeon DDR 64MB VIVO

Radeon - the most powerful and feature packed graphics board ever designed

- The fastest high resolution true colour gaming board in the industry.
- 64MB of ultra fast DDR (Double Data Rate) memory
- Features second generation Transform and Lighting Engine
- Video capture and video out support for the power gaming enthusiast ■ Supports all three bump mapping techniques

"...It's more than a match for it's rivals... and has a wider range of features"
PC Magazine



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWVG0941	ATI Radeon 64MB DDR AGP VIVO	169.99	199.74
PWVG0853	ATI Radeon 32MB DDR AGP	144.49	169.78

ATI Radeon VE

- Up to 32MB of powerful DDR (Double Data Rate) memory
- DVD playback with integrated motion compensation and hardware DVD support
- Analogue video output support for both composite and S-Video
- Flexible multi-display support enabling any combination of VGA, DVI and TV
- Enjoy economical video output to TV's, VCR's and camcorders



World Leader in Graphics Technology

ELSA GLADIAC 511 TwinView PCI

The all-round Business and Gaming Graphics Board

- Powered by NVIDIA GeForce2 MX400 chip, with 32MB memory, TV Out & Twin VGA outputs
- Ultimate image quality with high definition & photo realism
- Enhanced visual display with nVIDIA Shading Rasteriser (NSR) and 'per-pixel shading' for bump mapping, fogging, base texture & transparency 3 year warranty



GLADIAC 511



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWVG9606	GLADIAC 511 TwinView AGP 32Mb GeForce2 MX TV Out	69.99	82.24
PWVG1319	GLADIAC 511 TwinView PCI 32Mb GeForce2 MX TV Out	77.99	91.64
PWVG9607	GLADIAC 511 AGP 64Mb GeForce2 MX TV Out	77.99	91.64

ATI Radeon SDR 32MB PCI

- Powered by Radeon graphics processing unit (GPU)
- 32MB of single data rate (SDR) memory
- Accelerates all of today's top 3D games
- Industry leading video playback
- TV/VCR output support
- AGP universal bus or PCI bus



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWVG0942	ATI Radeon 32MB SDR AGP OEM	74.49	87.53
PWVG0943	ATI Radeon 32MB SDR AGP TV Out OEM	77.99	91.64
PWVG0959	ATI Radeon 32MB SDR PCI OEM	85.99	101.04



NEW



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWVG0955	ATI Radeon VE 32MB DDR (VO, VGA, DVI)	84.99	99.86

Matrox Millennium G450

See More, Do More. Move into the future with the Millennium G450, bringing the latest technology direct to your desktop

- Double your desktop with DualHead™ Display Technology allowing Multi-Display, Zoom, DVDMAX, Clone and TV Output
- Environment-Mapped Bump Mapping and Vibrant Colour Quality™ for photo realistic displays
- Resolutions up to 2048 x 1536 in 32-bit colour @85Hz
- 360MHz UltraSharp DAC
- Advanced AGP 2x/4x support



matrox

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWVG2455	Matrox Millennium G450 AGP Retail	94.99	111.61

ASUS V7100 Deluxe Combo

Doubling its growth rates in production and winning awards in quality and speed, ASUS are arguably designing the best and widest range of nVIDIA® based graphics cards today.

- nVIDIA® GeForce2 MX chipset
- AGP 4x, 32MB SDRAM, 350MHz RAMDAC, VR 3D Glasses
- S-VHS/Composite TV-Out/Video-In
- ASUS DVD2000 software player
- ASUS LIVE video capturing
- Digital VCR recording
- VideoSTUDIO editing
- VideoSECURITY software system
- ASUS SmartDoctor



ASUS

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWVG7010	V7100 Deluxe Combo GeForce2 32MB MX	149.99	176.24

DC215 Zoom Digital Camera

This digital camera is ideal for beginners. So easy to use, it delivers incredible megapixel results time and time again.

- True 1-megapixel resolution (delivers 1152 x 864 pixels per image for great colour pictures)
- 2x wide angle, optical zoom lens
- 45mm colour LCD display for reviewing and previewing pictures
- PC and Mac compatible
- 4MB CompactFlash memory card (stores up to 59 images)
- Includes software bundle



Call us for more information on the complete range of Kodak digital cameras and accessories

Kodak

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWTV285	Kodak DC215 Digital Zoom Camera	180.99	212.66

FUJIFILM FinePix 6800 Zoom

- 6m output pixels from a 3.3m pixel Super CCD sensor
- Ultra-high image output of 2,832 x 2,128
- 3x optical zoom lens (equivalent to 36-108mm on a 35mm camera)
- Movie function with sound of up to 160 seconds 910 frames/second
- Super high-speed operation
- Cradle for image download and battery recharge
- Audio recording (up to 60 minutes)
- Voice captioning over images (up to 30 seconds)
- Attractive case included



FUJIFILM
DIGITAL IMAGING

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWDC1003	Fujifilm FP-6800 + 16MB card, Case & Cradle	541.99	636.84

Minolta Dimage 2300

Quality images plus straightforward operation: The Minolta Dimage 2300 is an ideal tool for hobby and business applications.

- High quality 2.3 Megapixel resolution
- Digital zoom and Macro mode
- Colour LCD monitor and optical viewfinder
- Convenient USB interface
- Built-in Flash



MINOLTA

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWTV6527	Minolta Dimage D2300 Digital Camera	248.99	292.56

Microstar 8818

Utilising the latest nVIDIA GeForce 2 MX-400 Chipset, this is a low end card with high end performance

- nVIDIA® GeForce2 MX-400
- 32MB SDRAM
- 256-bit Graphics Architecture
- TV-Out
- 20 Million Triangles/Sec through T&L and Setup, 32-bit color, Z and Stencil Buffer
- Maximum 3D/2D resolution of 2048 x 1536 @ 75Hz
- Supports Windows® 9X, ME, 2000, NT, Linux and OpenGL™
- AGP 4X with Fast Writes



CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWVG0960	Microstar 8818 GeForce2 MX-400 32MB SDR AGP	Call	

Digimax 35L MP3

The Digimax 35L is an MP3 player and also a Digital Storage Camera and a PC Camera all in one!

Including...

- MP3 Player
 - Index Number
 - WinAmp MP3 music management
 - Compact Flash required
- Digital Storage Camera
 - 648 x 488 Pixels (CMOS)
 - Fixed Focus
 - LCD information display management
- PC Camera
 - USB interface Software and tripod Included
 - Up to 30 FPS



SAMSUNG

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWDC1250	Samsung Digimax 35L/MP3 Player	149.99	176.24

EPSON PhotoPC 3100Z

High performance digital camera built to deliver the ultimate photo prints

- 4.8 Megapixels
- 6x seamless Optical-Digital Zoom
- Compact, fully featured
- Automatic, program and comprehensive manual control
- 1.8" TFT LCD Monitor
- 49mm Lens Adapter for additional lenses and filters
- 16MB CompactFlash memory card
- Windows & Mac compatible
- Hot shoe for external Flash gun
- USB as standard
- Image management and manipulation software included



*Available 1st June 2001

NEW

EPSON

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWDC0514	EPSON PhotoPC 3100Z	Call	

Chase Cardport™

Buying a digital camera?

Read digital film in seconds!

CARDport Swifts are digital camera card readers: Swift SM for Smart Media, Swift CF for type I & II CompactFlash including IBM® microdrive. Our new Swift Syncro USB takes both Smart Media & CompactFlash

- 30x faster than serial cable
- No camera battery drain
- Windows 95*, 98, 2000, Me, NT4* and Mac OS 8.5+ compatible
- USB or Parallel version
- Also available - internal PCMCIA card readers

* Parallel port only

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWIC1024	Cardport Swift CF Compact Flash Reader (USB)	34.99	41.11
PWIC1026	Cardport Swift SM Smart Media Reader (USB)	34.99	41.11
PWIC1027	Swift Syncro (PCMCIA, Smart Media, Compact flash)	54.99	64.61



5/5
MAC USER
9/10
PC PLUS

Code Description E Ex VAT E Inc VAT

VGA CARD (CONT.)

MATROX

PWVG1459	RT 2000 (Real Time Video Editing)	708.99	833.06
PWVG2455	Millennium G450 32MB Dual AGP	94.99	111.61
PWVG2456	Millennium G450 32MB Dual AGP OEM	77.99	91.64
PWVG2457	Millennium G450 16MB Dual AGP OEM	54.99	64.61
PWVG2458	Millennium G450 16MB Dual AGP OEM	60.99	71.66
PWVG2459	Millennium G450 PCI 16MB OEM	Call	
PWVG1479	Millennium G200 Dual Monitor	338.99	398.31
PWVG1478	Millennium G200 Quad Monitor	461.99	542.84
PWVG1477	Millennium G200 Quad Monitor TV In/Out	544.99	640.36

VIDEOLOGIC

PWVG2248	Vivid 32MB AGP Kyro Chipset	88.99	104.56
PWVG2249	Videologic Vivid3S 32MB AGP Kyro II Chipset	79.99	93.99
PWVG2148	GrafiStar 670 16MB AGP (Savage 4 Pro)	39.99	46.99
PWVG2163	Videologic DVD Player PCI	70.99	83.41
PWVG2148	GrafiStar 670 16MB AGP (Savage 4 Pro)	39.99	46.99
PWVG2149	GrafiStar 670 16MB PCI (Savage 4 Pro)	39.99	46.99
PWVG2163	Videologic DVD Player PCI	70.99	83.41

DIGITAL CAMERAS

AGFA

PWTV5239	Agfa E-Photo CL18 Digital Camera Silver	78.99	92.81
PWTV1342	Agfa E-Photo CL34 Digital Camera	189.99	223.24

CANON

PWTV0328	PowerShot G1 3.3 Mpix PAL USB	627.99	737.89
PWTV1339	PowerShot Pro90 IS	899.99	1057.49
PWTV0326	PowerShot S20	481.99	566.34
PWTV0327	Digital Ixus	371.99	437.09
PWTV1338	Canon Digital Ixus 300	414.99	487.61
PWTV1340	PowerShot A10	Call	
PWTV1341	PowerShot A20	Call	

DIGITAL DREAM

PWDC0001	L'Esprit Digital Camera USB	43.99	51.69
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D-LINK

PWTV5299	Neteasy DSC-350 Digital Camera	74.99	88.11
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EPSON

PWDC0509	EPSON PhotoPC 3000Z 3.3 MegaPix	589.99	693.24
PWDC0514	EPSON PhotoPC 3100Z	Call	

FUJIFILM

PWTV1262	Fujifilm FP-1300 Digital Camera	159.99	187.99
PWTV1260	Fujifilm FP-1400 Digital Camera	216.99	254.96
PWTV1263	Fujifilm FP-2400Z Digital Camera	259.99	305.49
PWTV1259	Fujifilm MX-4700 Digital Camera (AVI Capture)	399.99	469.99
PWTV1264	Fujifilm FP-40i (AVI & MP3 Capture)	345.99	406.54
PWTV1265	Fujifilm FP-4900 Digital Camera	538.99	633.31
PWTV1266	Fujifilm FP-S1 Pro Digital Camera	1979.99	2326.49
PWTV0303	Fujifilm SmartMedia card RMB	26.99	31.71
PWTV0288	Fujifilm SmartMedia card 16MB	43.99	51.69
PWTV1298	Fujifilm SmartMedia card 32MB	77.99	91.64
PWTV0304	Flash path Floppy Disk Adapter	56.99	66.96
PWTV1180	Fujifilm NX-70 Digital Printer	223.99	263.19

HP

PWTV2297	HP Photo Smart C200/DJ840C Bundle	213.99	251.44
PWDC2004	HP Photo Smart 215 & Deskjet 950	236.99	278.46
PWDC2010	HP Photo Smart C215	149.99	176.24
PWDC2001	HP Photo Smart 315	195.99	230.29
PWDC2005	HP Photo Smart 315 & P1000	307.99	361.89
PWDC2002	HP Photo Smart 618	304.99	358.36
PWDC2006	HP Photo Smart 618 & P1000	457.99	538.14
PWDC2003	HP Photo Smart 912	509.99	599.24

KODAK

PWTV9299	Kodak EZ200 Digital Camera	78.99	92.81
PWTV9291	Kodak Digital Zoom Camera DVC325	60.99	71.66
PWTV9285	Kodak Digital Zoom Camera DC215	180.99	212.66
PWTV9257	Kodak DC3400 2.1 megapixel digital camera	268.99	316.06
PWTV9255	Kodak PPM120 Colour Direct Printer	Call	
PWTV9258	Kodak DC4800 3x Optical Zoom	555.99	653.29
PWTV9259	Kodak DC5000 3x Optical Zoom Weatherproof	399.99	469.99

MINOLTA

PWTV6527	Minolta D2300 Digital Camera	248.99	292.56
PWTV6528	Minolta RD3000 Professional Digital Camera	2376.99	2792.96

NIKON

PWTV0956	Nikon Coolpix 900/950 Wide Angle Lense	76.99	90.46
PWTV0958	Nikon Coolpix 900/950 Fisheye Lense	203.99	239.69
PWTV0957	Nikon Compact Flash-PCMCIA adapter	15.99	18.79

OLYMPUS

PWTV1667	Olympus C-860 L Digital Camera 1280x960 Spot metering, uncompressed shot mode	148.99	175.06
PWTV1670	Olympus C-960 Digital Camera 1280x960	230.99	271.41
PWTV1671	Olympus C-990Z Digital Camera 1600x1200	320.99	377.16
PWDC1001	Olympus C-2040 Zoom Digital Camera	458.99	539.31
PWDC1002	Olympus C-3040 Zoom Digital Camera	619.99	728.49
PWTV0684	Olympus Flash Path Floppy Adapter Up to 64MB	60.99	71.66
PWTV1665	Olympus USB Smart Media Reader	73.99	86.94
PWTV0685	Olympus PCMCIA Smart Media Adapter	42.99	50.51
PWTV0671	Olympus P330NE Colour Photo Printer Prints direct from your Olympus Digital Camera	346.99	407.71
PWDC0000	Olympus Microscope Adapter for 3030Z	345.99	406.54
PWTV0626	Olympus CLA-1 Lens Adapter (C-2020/C3030)	17.99	21.14
PWTV0621	Olympus C-2020/C3030 0.8X Wide angle lens	101.00	118.68
PWTV0622	Olympus C-2020/C3030 1.4X Teleconverter lens	71.99	84.59
PWTV0627	Olympus 64MB SmartMedia Memory Card	156.99	184.46
PWTV1675	Olympus 32MB SmartMedia Memory Card	86.99	102.21
PWTV0682	Olympus 16MB SmartMedia Memory Card	39.99	46.99
PWTV0678	Olympus 8MB SmartMedia Memory Card	25.99	30.54

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Code	Description	£ Ex VAT	£ Inc VAT
DIGITAL CAMERAS (CONT.)			
SONY			
PWT9379	Sony DSC-F505V USB	611.00	717.93
PWT9373	Sony DSC-S70 3.3 mega pixel	532.99	626.26
PWT0462	Sony Mavica MVC-FD85	389.99	458.24
PWT0469	Sony Mavica MVC-FD90	539.99	634.49
PWT0468	Sony Mavica MVC-FD95	641.99	754.34
PWT1458	Sony HandiCam DCR-PC5	957.99	1125.64
PWT0373	Sony DPP-M55 Printer (for DSC F1 Camera)	303.99	357.19
PWT1343	Sony Mavica MVC-FD87	392.99	461.76

FLASH STORAGE MEDIA			
PWMEF002	Compact Flash Card 8MB	22.99	27.01
PWMEF006	Compact Flash Card 16MB	34.99	41.11
PWMEF008	Compact Flash Card 24MB	48.99	57.56
PWMEF010	Compact Flash Card 32 MB	48.99	57.56
PWMEF011	Compact Flash Card 48 MB	91.99	108.09
PWMEF013	Compact Flash Card 64 MB	73.99	86.94
PWMEF015	Compact Flash Card 128 MB	239.99	281.99
PWMEF012	Compact Flash Card Adapter (PCMCIA)	11.99	14.09
PWMEF102	PCMCIA ATA Flash 8MB	31.99	37.59
PWMEF106	PCMCIA ATA Flash 16MB	54.99	64.61
PWMEF114	PCMCIA ATA Flash 48MB	99.00	116.33
PWMEF116	PCMCIA ATA Flash 64MB	399.99	469.99
PWMEF120	PCMCIA ATA Flash 128MB	749.99	881.24
PWMEF122	PCMCIA ATA Flash 160MB	969.99	1139.74
PWNEF200	SmartMedia Adapter (PCMCIA)	23.99	28.19
PWMEF204	SmartMedia 3 Volt 4MB	12.99	15.26
PWMEF206	SmartMedia 3 Volt 8MB	17.99	21.14
PWMEF207	SmartMedia 3 Volt 16MB	34.99	41.11
PWMEF209	SmartMedia 3 Volt 32MB	54.00	63.45
PWMEF300	FlashPath (SmartMedia - Floppy Disk Adapter)	44.99	52.86
PWMEF350	Sony Memory stick 8MB	26.99	31.71
PWMEF351	Sony Memory stick 16MB	41.99	49.34
PWMEF352	Sony Memory stick 32MB	54.99	64.61
PWMEF353	Sony Memory stick 64MB	98.99	116.31
PWMEF354	Sony Memory stick to PCMCIA adapter	39.99	46.99
PWMEF355	Sony Memory stick to Floppy adapter	59.99	70.49
PWMEF356	Sony Memory stick USB Reader	59.99	70.49

FLASH STORAGE READERS			
PWIC1022	Cardport Swift SM Parallel Smart Media Reader	35.99	42.29
PWIC1023	Cardport Swift CF P/ile Compact Flash Reader	34.99	41.11
PWIC1024	Cardport Swift CF Compact Flash Reader USB	34.99	41.11
PWIC1026	Cardport Swift SM Smart Media Reader (USB)	34.99	41.11
PWIC1027	Swift Syncro (PCMCIA, Smart Media, C flash)	54.99	64.61
PWIC1029	CARDport F2 PCIE (Dual Front Slot)	84.99	99.86
PWIC1030	CARDport R2 PCI (Dual Rear Slot)	87.99	103.39
PWIC1031	CARDport R1 PCIE (Single Rear Slot)	76.99	90.46

MONITORS			
SIMPLY			
PWMN0005	15" Simply SVGA Monitor 1024x768 NI	86.99	102.21
PWMN0007	17" Simply SVGA Monitor 1024x768 NI	113.99	133.94
PWMN1900	19" Simply SVGA Monitor 1280x1024 NI	184.99	217.36

BELINEA			
PWMN0077	15" 102010 28 800x600 @ 85Hz	90.99	106.91
PWMN0158	15" 102020 28 800x600 @ 85Hz	97.99	115.14
PWMN0102	17" 103035 27 1024x768 @ 85Hz	131.99	155.09
PWMN0103	17" 103065 27 1280x1024 @ 85Hz	143.99	169.19
PWMN0085	17" 103020 27 1024x768 @ 85Hz	123.99	145.69
PWMN0096	17" 103050 26 1280x1024 @ 85Hz	183.99	216.19
PWMN0159	19" 106060 26 1280x1024 @ 85Hz (BNC)	267.99	314.89
PWMN0097	19" 106080 26 1920x1440 @ 85Hz (BNC)	308.99	363.06
PWMN0095	21" 108025 25 1600x1200 @ 90Hz	459.99	540.49
PWMN0099	22" 108080 26 1600x1200 @ 90Hz	519.99	610.99
PWMN0098	18" LCD 101515 1024x770	362.99	426.51
PWMN0084	18" LCD 101810 1024x769	1034.99	1216.11

CTX			
PWMN0011	15" VL510 SVGA MPRII	90.99	106.91
PWMN0012	15" VL500 SVGA MPRII	96.99	113.96
PWMN0139	17" PR705F TC099 1280x1024 @ 78Hz	176.99	207.96
PWMN0021	17" VL700 MPRII 28 1280 x 1024	115.99	136.29
PWMN0142	17" EX710F 0.25 1280x1024	170.99	200.91
PWMN0133	17" MS700U MPRII M/Media 28 1280 x 1024	210.99	247.91
PWMN0134	17" PR711F 0.25dpi 1280x1024 @ 88Hz	200.99	236.16
PWMN0041	19" VL950T TC095 0.26 1280x1024	185.99	218.54
PWMN0140	19" PR960F TC095 0.24 1920x1440	314.99	370.11
PWMN0048	21" EX1300 26 1800x1440 (USB)	447.99	526.39
PWMN0082	21" PR1400P 0.24 2400 x 1536 (USB)	596.99	701.46
PWMN0094	15.1" CTX LCD Screen PV505	339.99	399.49
PWMN0093	15.1" CTX LCD Screen PV510	375.99	441.79
PWMN0104	15.1" CTX LCD Screen PV520	385.99	453.54

HANSOL			
PWMN3002	15" 501P 1024x768 @ 85Hz 0.28	96.99	113.96
PWMN3010	17" 710A 1024x768 @ 85Hz 0.28	123.99	145.69
PWMN3011	17" 710P 1600x1200 @ 75Hz 0.26	134.99	158.61
PWMN3012	17" 710D 1600x1200 @ 75Hz 0.25 (Dynafat)	164.99	193.86
PWMN3005	19" 900P 1600x1200 @ 75Hz 0.26	212.99	250.26
PWMN3014	15" TFT LCD 510P 1024x768 @ 75Hz	472.99	555.76

NEW CTX 17" EX700F

A new range of competitively priced Flat CRT monitors

- 17" Flat CRT (16" viewable)
- Flat shadow mask tube with no image distortion or reflection.
- 0.25mm dot pitch
- Rec. Resolution: 1024 x 768 @ 89Hz
- Digital OSD, Plug & Play
- TC099 safety
- 3 year on-site warranty



CTX



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWMN0143	17" EX700F 0.25 1024x768 @ 85Hz	156.99	184.46

FLATRON FL577LM 15" TFT LCD Monitor

This award winning, multimedia LCD monitor has an innovative rotate feature enabling the screen to be viewed in portrait.

- 15.1" FLATRON LCD colour monitor
- Resolution of 1024 x 768 for crisp, sharp image
- 90° rotatable screen, software included
- 120° horizontal viewing angle
- Detachable speakers
- Height adjustment feature
- TC099



LG

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWMN2127	15" TFT Flatron FL577LM LCD	505.99	594.54
PWMN2115	15" TFT Flatron FL575MS LCD	420.99	494.66

Taxan Valuevision 1710 TCO 99

The Taxan 17" Valuevision 1710 TCO 99 monitor delivers performance, quality and reliability at an affordable price point. Highly recommended!!

- 17" (16" viewable) FST
- 0.27 mm diagonal dot pitch
- EPA Energy Star (VESA DPMS)
- 1024 x 768 resolution to 87Hz
- 1280 x 1024 resolution to 65Hz
- On Screen Display (OSD)
- 3 years on-site warranty
- TCO 99 compliant



VALUEVISION

TAXAN

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWMN0461	17" Valuevision 1710 TCO 99 0.27	135.99	159.79

Hansol 710D Monitor

The latest Dynafat flatscreen technology without the expense.

- 17" Dynafat tube (16" viewable)
- 0.25mm dot pitch
- Up to 1600 x 1200 @75Hz
- 3 years on-site swap warranty
- PC and Mac compatible



"The first thing that strikes you when you switch it on is the overall sharpness and liveliness of the screen" Personal Computer World

Hansol

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWMN3012	17" 710D 1600x1200 @ 75Hz 0.25 (Dynafat)	164.99	193.86

CTX PR705F 17" Monitor

Perfect visual flatness with FD Trinitron CRT technology

- 17" FD Trinitron CRT (16" viewable)
- Perfectly flat screen
- Ultra high contrast tube
- 0.24mm Aperture grille
- 1280 x 1024 @80Hz
- TC099 safety
- 3 year on-site warranty



CTX



"A most impressive CTX monitor. Clarity, focus and picture stability are all excellent." PC Direct December 2000

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWMN0139	17" PR705F TC099 1280x1024 @ 78Hz	176.99	207.96

FLATRON 774FT Flat Screen Monitor

The striking blue design of the 774FT really turns heads. It is practical as well with an innovative and space saving keyboard storage feature.

- 17" FLATRON 774FT Flat Screen Monitor
- Innovative blue design
- Space saving keyboard storage feature
- 1024 x 768 @85Hz
- FLATRON 100% flat screen
- No visible tension wires
- 0.24mm stripe pitch
- TCO 95



LG

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWMN2125	17" Studioworks SW774FT 1024x768 @ 85Hz 0.24	171.99	202.09
PWMN2123	17" Flatron 795FT Plus 1600x1200 @ 75Hz 0.24 USB	187.99	220.89
PWMN2122	17" Flatron 775FT 1024x768 @ 85Hz 0.24	154.99	182.11

15" TFT LCD Belinea Digital 101515

A 15" TFT LCD monitor with a cool design and a sharp price. 1024 x 768 native resolution, wide viewing angle, 250:1 contrast ratio plus 3 year swap out warranty.

- 15" TFT LCD monitor
- 1024 x 768 resolution
- 250:1 contrast ratio
- 3 year swap out warranty (including backlights)
- TCO'99 compliant
- Automatic set-up
- VESA wall mount compliant



ISO9001 COMPANY

Belinea
MONITORS BY MAXIMATA

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWMN0098	15" LCD 101515 1024x770	362.99	426.51

The Flat 19" Hansol 920D

The Flat 19" Hansol 920D uses the latest Dynafat tube technology to produce a beautifully flat, sharp, reflection free image.

- 19" Dynafat tube (18" viewable)
- 0.25mm dot pitch (0.20mm horizontal)
- Up to 1792 x 1344 @75Hz
- 3 years on-site 'swap' warranty
- Automatic power saving
- PC and Mac compatible



Hansol

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWMN3013	19" 920D 1792x1344 @ 75Hz 0.25	243.99	286.69

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Tel: 08000 352120 Fax: 0870 727 4002

17" Sony CPD-G220P Monitor

- 17" (16" viewable) Super Fine FD Trinitron CRT Monitor
- Visually Flat Screen
- Aperture Grille Pitch 0.24mm-0.25mm
- Recommended Resolution 1600 x 1200 @ 78Hz
- PC and Mac Compatible
- USB
- Hi-Con and AR Screen Coatings
- 3 year on site Sony Exchange Warranty



NEW



SONY

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWMN1639	17" G220P 1600x1200 @ 78Hz 0.25	245.99	289.04

21" Sony GDM-F520 Monitor

- 21" (19.8" viewable) Super Fine Pitch Trinitron Monitor
- Maximum resolution 2048 x 1536 @ 86Hz
- Aperture grille pitch 0.22mm
- Dual input -1x15 pin D-sub 1x5 BNC
- USB connection (1 up/4 down)
- 3 year warranty (Sony on-site)
- PC and Mac compatible
- TCO'99, NUTEK, International Energy Star, E2000



NEW



SONY

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWMN1635	21" F520 2048x1536 @ 86Hz 0.22	773.99	909.44

18.1" Sony SDM-M81 LCD Flat Panel

- 18.1" TFT LCD Flat Panel
- Maximum resolution 1280 x 1024
- Viewing angle horizontal 160°/Vertical 160°
- DVI-I Input-digital/analog interface
- Integrated speakers and headphone jacket
- 3 Year warranty (Sony On-Site)
- PC and Mac compatible



NEW



SONY

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWMN1632	SDM-M81 18.1" LCD Flat Panel	1389.99	

Diamond Plus92

- 19" (18" viewable) DiamondTron NF™ CRT
- Horizontal scan frequency 31-96Hz
- Aperture grille pitch 0.25mm
- Recommended resolution 1280 x 1024 @ 85Hz refresh rate
- TCO'99
- 3 year on-site warranty



NEC/MITSUBISHI Quality is visible
NEC-MITSUBISHI ELECTRONICS DISPLAY

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWMN0729	19" CRT Diamond Plus 92	286.99	337.21

iiyama Vision Master Pro 411

- 17" (15.9" viewable) DiamondTron NF
- 0.25ag pitch, 130MHz bandwidth
- Max flickerfree res of 1280 x 1024 @ 80Hz
- Easy to use On-Screen Display menus
- 3 year on-site replacement warranty
- TCO-99, USB available



iiyama

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWMN1673	17" Vision Master Pro 411 0.26	184.99	217.36

iiyama Vision Master Pro 452

- 19" (18" viewable) DiamondTron Natural Flat CRT, 0.25 ag pitch
- Maximum flicker free resolution: 1600 x 1200 @ 75Hz refresh, 1280 x 1024 @ 85Hz refresh
- Horizontal sync: 30 - 96kHz
- Vertical sync: 50 - 180Hz
- Easy to use on screen display menus
- TCO-99 compliant



iiyama

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWMN1697	19" Vision Master Pro 452 0.25 M4901U	258.99	304.31

iiyama Vision Master 1401

- New high contrast, low cost 17" FST screen, offering superb value for money.
- 17" (16" viewable) FST monitor
- 0.27 mm dp
- Maximum resolution of 1280 x 1024 @ 65Hz or 1024 x 768 @ 85Hz
- Simple to use 4 push button operated OSD menu
- Plug-and-Play compatible
- MPRII



IIYAMA OFFERS 3 YRS ON-SITE WARRANTY AS STANDARD WITH ALL VISION MASTER PRODUCTS

iiyama

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWMN1702	17" Vision Master 1402 1024x768 @ 85Hz 0.27ag		Call

Diamond Plus220

- 22" (20" viewable) DiamondTron NF™ CRT
- Horizontal scan frequency 31-110KHz
- Aperture grille pitch 0.24mm
- Recommended resolution 1600 x 1200 @ 85Hz refresh rate
- TCO'99
- 3 year on-site warranty



NEC/MITSUBISHI Quality is visible
NEC-MITSUBISHI ELECTRONICS DISPLAY

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWMN0787	22" CRT Diamond Plus 220	543.99	639.19

Code Description E Ex VAT E Inc VAT

MONITORS (CONT.)

IIYAMA

PWMN1682	15" S500N1 1024x768 @ 85Hz 0.28	98.99	116.31
PWMN1703	17" Vision Master 1401 1024x768 @ 85Hz 0.27ag	132.99	156.26
PWMN1672	17" Low Cost 17 404 S704HT 0.26ag	213.99	251.44
PWMN1673	17" Vision Master Pro 411 0.26	184.99	217.36
PWMN0683	17" Vision Master Pro 410 A702HT (NF)	227.99	267.89
PWMN1685	19" Vision Master Pro 451 FST 0.25 A902MT	329.99	387.74
PWMN1697	19" Vision Master Pro 452 0.25 M4901U	258.99	304.31
PWMN1683	19" S900MT1 1600x1200 @ 75Hz 0.26	188.99	222.06
PWMN1706	22" Vision Master Pro 511 FST 0.25ag	528.99	621.56
PWMN1696	15" TFT LCD TXA3813MT	419.99	493.49
PWMN1698	17" TFT Analogue, OSD, SXGA	689.99	810.74
PWMN1681	18" TFT 4633/34 LCD MM TSA4633/34JT	1864.99	2191.36

iiyama CRT monitors come with a 3yr On-Site warranty.

LG

PWMN2126	15" Studioworks SW560N 800x600 @ 85Hz 0.28	88.99	104.56
PWMN2117	15" Studioworks SW575N 1024x768 @ 85Hz 0.28	92.99	109.26
PWMN2124	15" Studioworks SW57M 1024x768 @ 85Hz 0.28 MM	96.99	113.96
PWMN2118	17" Studioworks SW775N 1024x768 @ 85Hz 0.24	118.99	139.81
PWMN2125	17" Studioworks SW774FT 1024x768 @ 85Hz 0.24	171.99	202.09
PWMN2119	19" Studioworks SW995E 1280x1024 @ 85Hz 0.26	186.99	219.71
PWMN2120	19" Studioworks MM SW912U 1600x1024 @ 85Hz 0.28 USB	232.99	273.76
PWMN2121	21" Studioworks MM SW221U 1600x1024 @ 85Hz 0.28 USB	449.99	528.74
PWMN2122	17" Flatron 775FT 1024x768 @ 85Hz 0.24	154.99	182.11
PWMN2123	17" Flatron 795FT Plus 1600x1200 @ 75Hz 0.24 USB	187.99	220.89
PWMN2115	15" TFT FL575MS LCD	420.99	494.66
PWMN2116	18.1" TFT FL885LE LCD	1149.99	1351.24

MITSUBISHI

PWMN0726	17" CRT Diamond Pro 730	182.99	215.01
PWMN0719	17" CRT Diamond Plus 73	160.99	189.16
PWMN0729	19" CRT Diamond Plus 92	286.99	337.21
PWMN0787	22" CRT Diamond Plus 220	543.99	639.19
PWMN0786	22" CRT Diamond Pro 2045U	673.99	791.94

3 year On-Site Warranty with all Mitsubishi CRT Monitors

NEC

PWMN0400	Multisync 15" 1530V LCD	395.99	465.29
PWMN0402	Multisync 18" 1800 LCD	912.99	1072.76
PWMN0419	Multisync 18" 1810x LCD (Digital)	1799.99	2114.99
PWMN0399	Multisync 21.3" 2110P LCD	3193.99	3752.94

PHILIPS

PWMN0591	15" Colour Monitor 105521	93.99	110.44
PWMN0592	17" Colour Monitor 107521	147.99	173.89
PWMN0593	17" Colour Monitor 107721	169.99	199.74
PWMN0596	19" Colour Monitor 109520	226.99	266.71
PWMN0579	15" Brilliance 150B LCD Panel	433.99	509.94
PWMN1569	15.1" Brilliance 150P LCD Panel (M/M)	533.99	627.44
PWMN0568	18.1" Brilliance 181AS LCD	1329.99	1562.74

Philips monitors come with a 3 year warranty.

1st year on-site, 2/3rd year Return to Base

SAMSUNG

PWMN1323	15" Syncmaster SM570B TFT LCD	514.99	605.11
PWMN1375	17" Syncmaster SM770 TFT LCD	850.99	999.91

SONY

PWMN1627	15" E100P 1280x1084 @ 65Hz 0.25	139.99	164.49
PWMN1639	17" G220P 1600x1200 @ 78Hz 0.25	245.99	289.04
PWMN1626	17" E220E 1280x1024 @ 81Hz 0.25	209.99	246.74
PWMN5278	19" E400P 1600x1200 @ 78Hz 0.24	305.99	359.54
PWMN1638	19" G420 1600x1200 @ 89Hz 0.25	384.99	452.36
PWMN1634	21" G520 1800x1440 @ 87Hz 0.24	692.99	814.26
PWMN1630	24" FW900 2018x1536 @ 75Hz 0.23	1187.99	1395.89
PWMN1628	SDM-M51 15.1" LCD Flat Panel	478.99	562.81
PWMN1632	SDM-M81 18.1" LCD Flat Panel	1389.99	1633.24
PWMN1622	15" SDM-N50ST LCD Superslim	735.99	864.79
PWMN1623	15" SDM-N50PS LCD Superslim	735.99	864.79

TAXAN

PWMN0461	17" Valuevision 1710 TCO 99 0.27	135.99	159.79
PWMN0483	17" Ergovision 755 TCO 99 0.25 Trinitron (USB)	234.99	276.11
PWMN1499	19" Valuevision 1910 TCO 99 0.26	240.99	283.16
PWMN0412	19" Ergovision 985 TCO 99 0.25	323.99	380.69
PWMN1459	21" Valuevision 2175 TCO 99 0.26mm	452.99	532.26
PWMN0599	Crystalvision 625 TCO 99-S 12.1" TFT 800 x 600	482.99	567.51
PWMN0489	Crystalvision 680 TCO 99-S 15.1" TFT 1024 x 768 MM	523.99	615.69
PWMN0490	Crystalvision 780 TCO 99-S 17.4" TFT 1280x1024 (USB)	965.99	1135.04
PWMN0491	Crystalvision 880 TCO 99-S 18.1" TFT 1280x1025	1469.99	1727.24

SCANNERS

ACER

PWSC9140	AcerScan 640 P Parallel scanner	49.99	58.74
PWSC9141	AcerScan 640 S SCSI scanner	66.99	78.71
PWSC9144	AcerScan Scan2Web 3300U USB	58.99	69.31
PWSC9145	AcerScan Scan2Web 4300U USB	78.99	92.81
PWSC9269	AcerScan 640 UT USB scanner (Tranny)	98.99	116.31
PWSC9148	AcerScan 640 BU USB scanner	62.99	74.01
PWSC9147	AcerScan 1240 UT Scanner	164.99	193.86

AGFA

PWSC1297	Agfa SnapScan e20	58.99	69.31
PWSC1299	Agfa SnapScan e40	126.99	149.21
PWSC1298	Agfa SnapScan e50	143.99	169.19
PWSC1196	Agfa ScanTouch Scanner (Win98 ONLY!)	82.99	97.51
PWSC0201	Agfa 1212U USB Scanner	62.99	74.01
PWSC0202	Agfa SnapScan 1212P Parallel	49.99	58.74
PWSC1199	Agfa 1236U Scanner	101.99	119.80
PWSC0205	Agfa T1200 Scanner (SCSI, no card!)	449.99	528.74

CANON

PWSC9587	Canoscan N640P Scanner	53.99	63.44
PWSC9588	Canoscan N650U Scanner	53.99	63.44
PWSC9589	Canoscan D660U Scanner (inc. Film Adapter unit)	93.99	110.44
PWSC1516	Canoscan FB 1210U (Win98 Only) Scanner	161.99	190.34
PWSC0511	Canoscan 2710 Slide Scanner (APS)	401.99	472.34
PWSC1517	Canoscan FB 1210FAU Scanner	200.99	236.16
PWSC0535	Canoscan 300/600 Document Feeder	227.99	267.89
PWSC0540	Canoscan 600 Film Adaptor Unit	347.99	408.89

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for FREE DELIVERY on orders over £50 ex. VAT

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www.simply.co.uk

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SCANNERS (CONT.)

EPSON

PWSC2137	EPSON Perfection 640 USB Scanner	87.99	103.39
PWSC1156	EPSON GT-10000 + A3 Network Scanner	674.99	793.11
PWSC1157	EPSON GT-10000 + Pro A3 Network Scanner	1287.99	1513.39
PWSC1249	EPSON Expression 1600 Scanner	485.99	571.04
PWSC1250	EPSON Expression 1600 Pro Scanner	637.99	749.64
PWSC2132	EPSON Perfection 1240U	122.99	144.51
PWSC2133	EPSON Perfection 1240U Photo	166.99	196.21
PWSC0131	EPSON GT12000 A3 Scanner (Bare)	1291.99	1518.09
PWSC0133	EPSON GT12000 A3 Scanner Graphics Bundle	1715.99	2016.29
PWSC1158	EPSON Expression 1640XL Scanner	1273.99	1496.94
PWSC2134	EPSON Perfection 1640SU	181.99	213.84
PWSC2135	EPSON Perfection 1640SU Photo	217.99	256.14
PWSC2136	EPSON Perfection 1640SU Office	262.99	309.01

HEWLETT PACKARD

PWSC0589	HP Scanjet 3300C USB	46.99	55.21
PWSC0588	HP Scanjet 3400C USB	53.99	63.44
PWSC0582	HP Scanjet 4300C USB (Win98 only)	80.99	95.16
PWSC1174	HP Scanjet 5300C Parallel & USB	99.99	117.49
PWSC0581	HP Scanjet 5370C Parallel & USB	137.99	162.14
PWSC1080	HP Scanjet 7400C Scanner (USB & SCSI)	274.99	323.11
PWSC1081	HP Scanjet 7450C Scanner (USB & SCSI)	361.99	425.34
PWSC1082	HP Scanjet 7490C (USB & SCSI)	499.99	587.49
PWSC6178	HP Scanjet 4300C/DJ840C Bundle	121.99	143.34
PWSC0581	HP Scanjet 5370C Parallel & USB	137.99	162.14
PWSC6179	HP Scanjet 5370C/DJ950C Bundle	220.99	259.66

MICROTEK

PWSC0136	Microtek Scanmaker 3600 USB 600x1200 42bit	51.99	61.09
PWSC0238	Microtek Scanmaker 3700 USB 600x1200 42bit	62.99	74.01
PWSC0239	Microtek Scanmaker 4700 USB 600x1200 42bit	33.99	39.94
PWSC1144	Microtek X12 USL 1200x2400dpi 42bit SCSI/USB	195.99	230.29
PWSC1142	Microtek X12 USL Pro SCSI/USB	269.99	317.24
PWSC1143	Microtek X12 USL Photo SCSI/USB	178.99	210.31
PWSC0154	Microtek Scanmaker 9600d SCSI A3 600x1200	979.99	1151.49
PWSC1150	Microtek Artisan 1100 A4 1000x2000dpi	1175.99	1381.79

MINOLTA

PWSC5529	Minolta ScanDual II 35mm + APS Scanner	328.99	386.56
PWSC0000	Minolta Dimage Scan Multi II	1617.99	1901.14
PWSC0001	Minolta Dimage Scan Elite	637.99	749.64
PWSC0002	Minolta Dimage Scan Speed	534.99	628.61

MUSTEK

PWSC9090	ScanExpress A3	99.99	117.49
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NIKON

PWSC0312	Nikon CoolScan III Ext + 2902AE & Nikon Scan 2.1	480.99	565.16
PWSC0317	Nikon Super Coolscan LS2000 inc Silverfast	1109.99	1304.24

UMAX

PWSC9485	UMAX Astra 4000U 42bit Scanner (USB)	120.99	142.16
PWSC9450	ASTRA 3400 USB	49.99	58.74
PWSC9451	ASTRA 3450 USB INC Tranny	74.99	88.11
PWSC9452	ASTRA 5400 USB	83.99	98.69
PWSC9453	ASTRA 5450 USB INC Tranny	125.99	148.04
PWSC9454	ASTRA 6400 Firewire	166.99	196.21
PWSC9455	ASTRA 6450 Firewire	207.99	244.39
PWSC9460	PowerLook 1100 Graphic	783.99	921.19
PWSC9461	PowerLook 1100 Pro	930.99	1093.91
PWSC9462	PowerLook 1100 Pre Press	1077.99	1266.64
PWSC9466	PowerLook 2100XL Pro	2155.99	2533.29
PWSC9467	PowerLook 2100XL Pre Press	2253.99	2648.44

PROJECTORS

3M

PWTY9012	3M MP8610 Projector XGA	1648.99	1937.56
PWTY9011	3M MP8745 Projector XGA	3848.99	4522.56
PWTY9005	3M MP8750 Projector XGA	4448.99	5227.56
PWTY9001	3M MP8725 Projector XGA	2948.99	3465.06
PWTY9010	3M MP8670 Projector SVGA	2999.99	3524.99
PWTY9100	3M OHP Economy Twin Lamp (250 Watt)	159.99	187.99
PWTY9101	3M OHP Portable Brief Case (400 watt)	258.99	304.31
PWTY9102	3M OHP Portable Overhead Twin Lamp (250 Watt)	358.99	421.81
PWTY9103	3M OHP Budget (275 Watt)	218.99	257.31

ACER

PWTY1399	Acer 7763P SVGA Projector	2198.99	2583.81
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OPTOMA

PWTY1455	Optoma EzPro 550 Projector	1138.99	1338.31
PWTY1452	Optoma EzPro 585 Projector	1329.99	1562.74
PWTY1454	Optoma EzPro 610 Projector	2058.99	2419.31

EPSON

PWTY1431	EPSON EMP-710 Portable Projector	3698.99	4346.31
PWTY1424	EPSON EMP-5350 Multimedia Projector	3099.99	3642.49
PWTY1425	EPSON EMP-7250 Multimedia Projector	4099.99	4817.49
PWTY1426	EPSON EMP-7350 Multimedia Projector	5056.99	5941.96
PWTY1427	EPSON EMP-8000 Multimedia Projector	6098.99	7166.31

INFOCUS

PWTY0756	Infocus LP400 Portable Projector SVGA	1698.99	1996.31
PWTY0758	Infocus LP435z Portable Projector XGA	3498.99	4111.31
PWTY2768	Infocus LP755 Desktop Projector XGA	3298.99	3876.31
PWTY2767	Infocus LP770 Desktop Projector XGA	4498.99	5286.31
PWTY2769	Infocus LP940 Portable Projector XGA	1799.99	2114.99
PWTY2770	Infocus LP950 Portable Projector XGA	2799.99	3289.99
PWTY2771	Infocus LP260 Portable Projector XGA	1699.99	1997.49
PWTY2772	Infocus LP130 Portable Projector XGA	3399.99	3994.99
PWTY2773	Infocus LP920 Portable Projector XGA	5295.99	6222.79

MIMIO

PWTY8899	Mimio Portable Memo board	399.99	469.99
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MITSUBISHI

PWTY1604	LVP-S50u 1000 Lumens SVGA (Ultra Portable)	2198.99	2583.81
PWTY1605	LVP-X70u 1100 Lumens XGA (Ultra Portable)	3098.99	3641.31
PWTY1606	LVP-S250 1500 Lumens SVGA (Portable/Desktop)	2498.99	2936.31
PWTY1608	LVP-X250 1300 Lumens XGA (Portable/Desktop)	3548.99	4170.06
PWTY1610	LVP-SD1 1200 Lumens SVGA (Ultra Portable)	Call	
PWTY1611	LVP-XD1 1200 Lumens XGA (Ultra Portable)	Call	

ScanMaker 4600 USB

Microtek Scanmaker 4600 USB

2400 x 1200dpi, 42 bit A4 award winning flatbed scanner

- 2400 x 1200dpi optical resolution
- 42 bit colour depth
- 3 Push buttons for easy scanning, e-mailing and copying
- USB interface (Mac & PC)
- Comprehensive software package included
- OPTIONS: MTMA for scanning transparencies.



TWO YEAR WARRANTY WITH ALL MICROTEK SCANNERS

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSC0237	Microtek Scanmaker 4600 1200 x 2400 42bit USB	97.99	115.14
PWSC0238	Microtek Scanmaker 3700 600x1200 42bit USB	62.99	74.01
PWSC0239	Microtek Light Lid 35	33.99	39.94

Minolta Film Scanner

High Resolution Film Scanner - 2820dpi

- 10.8 million pixels
- World's only dedicated 35mm/APS film scanner with USB*
- Hot swappable Plug 'n Play
- 36 bit 3.2 dynamic range
- Autofocus with manual focus option
- Auto slide feeding function
- Unique EasyScan Utility
- Unique Auto Image Correction Function
- Advanced Driver Software



*Optional APS adaptor required



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSC5529	Minolta Dimage Scan Dual II	328.99	386.56

CanoScan N640P

Simple, high-quality scanning for home and small office PC users

- High quality 600 x 1200 dpi colour flatbed scanner
- 42 bit colour depth provides superb colour accuracy
- Parallel connection provides simple installation and set-up
- Canon ScanGear toolbox utility enables easy scanning
- FREE ArcSoft PhotoStudio 2000 image editing software
- FREE OmniPage Pro 9.0 OCR software
- Supports Windows® 95, 98, NT 4.0 & 2000 Professional
- Dimensions: 256 x 372.5 x 39mm
- Weight: 1.5kg approx.



INCLUDES 1 YEAR ON-SITE WARRANTY

Canon

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSC9587	CanoScan N640P Scanner	53.99	63.44

Acer ScanPrisa 1240UT / 3300U

Performance all rounder with PC and Mac compatibility

- A4 colour flatbed scanner
- PC and Mac compatible
- Slim design that fits almost anywhere
- Sharp images at 19,200dpi maximum resolution
- 48-bit colour with ACE Technology
- USB for easy connectivity
- Built-in film and transparency adaptor/Free copier software



acer

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSC9147	Acer ScanPrisa 1240UT inc. transparency adaptor (PC/Mac)	164.99	193.86
PWSC9144	AcerScan Scan2Web 3300U USB	58.99	69.31

ABBYY FineReader 5 OCR

ABBYY FineReader is the ultimate OCR solution for the office or home.

FineReader will import text, spreadsheets, tables, graphics and photos into your computer.

- Excellent recognition of spreadsheets & tables
- Saves in HTML and PDF format with full-page layout retention.
- Full text colour retention
- Vertical text recognition
- Recognition of pictures "embedded" in table cells
- Dual page splitting

"ABBYY FineReader 5.0 Pro is by far the best OCR-programme" PC World Magazine (March 2001)

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSC9159	ABBYY FineReader 5.0 Pro	72.99	85.76
PWSC9157	ABBYY FineReader 5.0 Pro Cyrillic Plus	83.99	98.69
PWSC9160	ABBYY FineReader 5.0 Office (Network version)	244.90	287.76
PWSC9158	ABBYY FineReader 5.0 Office Cyrillic Plus (Network version)	279.99	328.99



NEW

HP ScanJet 5300C

The scanner for quality results in the office

- Easy set up via parallel or USB port
- 4 button, scan, copy e-mail and fax
- 1200dpi, 36 bit colour
- Optional document feeder and optional transparency adapter
- Adobe PhotoDeluxe, HP PrecisionScan 3.0, HP ScanJet Copy Utility, Integrated OCR.



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSC1174	HP ScanJet 5300C Parallel & USB	99.99	117.49

CanoScan N1220U

The combination of leading 1200dpi performance and superior design

- Superb 1200 x 2400 dpi colour flatbed scanner
- Innovative "Z-lid" expands to accommodate books and magazines
- Scan button provides simple one-touch operation
- Power supplied by USB cable - no AC adapter required
- Canon ScanGear toolbox utility enables easy scanning
- FREE Adobe Photoshop 5.0 LE Image editing software
- FREE OmniPage Pro OCR software
- Compatible with Windows® 98, 2000 Professional & Mac OS 8.5 or higher



INCLUDES 1 YEAR ON-SITE WARRANTY

Canon

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSC9586	CanoScan N1220U Scanner 1200x2400 42 Bit USB	116.99	137.46

ScanJet 7400 Series

The complete professional 48-bit scanning solution for PC or Macintosh users.

- Up to 2400dpi with true 48-bit colour
- Up to 15 pages per minute with a 50 page capacity document feeder (included with the ScanJet 7450c and 7490c; optional with ScanJet 7400c)
- Scan beyond scanner bed boundaries - stitching software scans larger than A4 size originals (available with 7490c only)
- All models include active transparency adapter
- USB and SCSI connections



NEW



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSC1080	HP ScanJet 7400C Scanner (USB & SCSI)	274.99	323.11
PWSC1081	HP ScanJet 7450C Scanner (USB & SCSI)	361.99	425.34
PWSC1082	HP ScanJet 7490C (USB & SCSI)	361.99	425.34

One Touch scanning from AGFA

AGFA SnapScan e50

The design of SnapScan e50 is so sleek that you'd never guess it has a built-in scanning module for 35 mm slides and films (negative / positive), on top of the A4 scanned for reflectives. It leads the field in quality and scanning speed: 1200 x 2400dpi true optical resolution, 42-bit colour sampling and USB connection and one touch scanning directly to email, print or file

SOFTWARE BUNDLE INCLUDES:
SCANWISE, COREL PRINT
OFFICE 2000, READ IRIS OCR
SOFTWARE, & AGFANET CLIENT
SOFTWARE



AGFA SnapScan e20

- 600x1200ppi
- 36 bit depth - Up to 68 billion colours
- USB
- 3 Interchangeable handles
- Win 98/2000/ME/Mac OS 8.x compatible



AGFA *Agfa*

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWSC1298	Agfa SnapScan e50	143.99	169.19
PWSC1297	Agfa SnapScan e20	58.99	69.31

UMAX Scanners

ASTRA 3400 USB

- A4 flatbed
- 600 x 1200dpi
- Interface USB
- 4 Scan buttons
- Transparency option available with the Astra 3450
- Comprehensive Software Bundle

**NEW 42 BIT
SCANNING
FROM UMAX**



UMAX ASTRA 6400 Firewire

- 600 x 1200dpi
- 42 bit
- Max Res: 9600 x 9600dpi
- Interface: Firewire/IEEE-1394
- Transparency option available with the Astra 6450
- Comprehensive software bundle incl. Adobe Photoshop LE

**NEW 42 BIT
SCANNING
FROM UMAX**



AstraNET iA 101 Internet Scanner

- A4 Color flatbed, Single pass
- 600dpi x 1200dpi
- 42 bit
- USB
- Scan direct to web, fax or email and a spreadsheet into Excel



**50MB FREE
WEB SPACE**

All Umax Astra scanners include 2 year warranty

UMAX
www.umax.co.uk

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWSC9450	Umax ASTRA 3400 USB	49.99	58.74
PWSC9451	Umax ASTRA 3450 USB Inc TRANNY	74.99	88.11
PWSC9452	Umax ASTRA 5400 USB	83.99	98.69
PWSC9454	Umax ASTRA 6400 Firewire	166.99	196.21
PWSC9463	AstraNET iA 101 Internet Scanner	74.99	88.11

ScanJet 4300C with DeskJet 840C

Versatile printer and scanner combination for use in the home or small office

- DeskJet 840c printer with excellent photo quality printing
- Print speeds of up to 8ppm black and 5ppm colour printing
- ScanJet 4300 with scan to email, copying and scanning at the touch of a button
- Brilliant photo quality results with 600 dpi optical resolution and 36-bit colour



**3 YEAR
WARRANTY
AVAILABLE**



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWSC6178	HP ScanJet 4300C/DJ840C Bundle	121.99	143.34

HP ScanJet 5370C

The versatile home and office scanner that provides top quality scanning results from any source

- Quick! Scan, color copy, e-mail, and fax buttons optimize images at the touch of a button
- Brilliant photo quality results with 1200 dpi optical resolution and 42-bit colour
- Quality results for transparent media, incl. 35mm slides, negatives, and more



**3 YEAR
WARRANTY
AVAILABLE**



CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWSC0581	HP ScanJet 5370C Parallel & USB	137.99	162.14
PWSC6179	HP ScanJet 5370C/DJ950C Bundle	220.99	259.66

EPSON Perfection 640U Scanner

- High Quality 600x2400 dpi optical resolution with Micro Step Drive
- Easy to Use EPSON Smart Panel enables scanning to e-mail, OCR and Photo editing applications with just a few clicks.
- Integrated 3 button panel with Copy, Scan and programmable Start button for added flexibility
- Easy and Intelligent EPSON TWAIN Software: Full Auto Mode removes complex set up procedures and enables automatic scanning suitable for your documents
- Maximum interpolated resolution 9600dpi
- 36bit internal scanning capability for excellent colour reproduction
- Easy Plug & Play USB Interface
- Space-saving with Upright Support Base for storage
- PC and Mac compatible



EPSON

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWSC137	EPSON Perfection 640 USB Scanner	87.99	103.39

EPSON Expression 1680 Scanner

High speed, professional scanning made easy.

- 1600 x 3200dpi optical resolution, with Epson Micro Step Drive
- 48-bit colour scanning (in & out)
- Epson Dual-Focus System
- USB, SCSI and optional IEEE 1394 connectivity
- Optional Epson Network Image Express hardware scanner server for simple network integration
- Optional Transparency Unit (standard with Pro model)
- Optional Automatic Document feeder
- Epson TWAIN Pro 2 and TWAIN Pro 2 Network
- Includes SilverFast Ai5 with IT8 calibration - the first choice for professionals



EPSON

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWSC138	EPSON Expression 1680	475.99	559.29

Code	Description	£ Ex VAT	£ Inc VAT
PHILIPS			
PWTV1777	UGO S-Lite DLP Projector	2338.99	2748.31
PWTV1778	UGO X-Lite DLP Projector	3288.99	3864.56
PWTV0773	XG201 Projector 1250 ANSI Lumens SVGA	2648.99	3112.56
SANYO			
PWTV0886	Sanyo PLC-SU7 SVGA 700 ANSI lumen projector	1998.99	2348.81
PWTV1818	Sanyo PLC-SU20 SVGA 1200 ANSI lumen projector	2399.99	2819.99
PWTV1820	Sanyo PLC-SU22 SVGA 1200 ANSI lumen projector	2798.99	3288.81
PWTV1825	Sanyo PLC-SW10 SVGA 600 ANSI lumen projector	1748.99	2055.06
PWTV1819	Sanyo PLC-XU20 XGA 1000 ANSI lumen projector	2998.99	3523.81
PWTV1816	Sanyo PLC-XU22 XGA 1200 ANSI lumen projector	3548.99	4170.06
PWTV1587	Sanyo PLC-XP17 XGA 1600 ANSI lumen projector	4198.99	4933.81
PWTV1588	Sanyo PLC-XP20 XGA 2200 ANSI lumen projector	5088.99	5979.56
PWTV0818	Sanyo PLC-XF10 XGA 3000 ANSI lumen projector	6599.99	7754.99
PWTV0816	Sanyo PLC-EF10B SXGA 3300 ANSI lumen projector	11498.99	13511.31
PWTV0813	Sanyo PLC-XX70 70" Rear projector	8398.99	9868.81
PWTV1817	Sanyo PLC-XX70i 70" Touch screen Rear projector	13998.99	16448.81

PRINTERS

BROTHER LASER PRINTERS

PWPB0107	HL 1030 2MB 600x600dpi 8ppm Laser	158.99	186.81
PWPB0150	HL 1240 2MB 600x600dpi 10ppm Laser	178.99	210.31
PWPB0151	HL 1250 4MB 1200x600dpi 12ppm Laser	208.99	245.56
PWPB0152	HL 1250 8MB 1200x600dpi 12ppm Laser	227.99	267.89
PWPB0158	HL 1250LT 8MB 1200x600dpi 12ppm Laser	318.99	374.81
PWPB0153	HL 1270N 4MB 1200x600dpi 12ppm (P/Script 2)	308.99	363.06
PWPB0154	HL 1270N 8MB 1200x600dpi 12ppm (P/Script 2)	329.99	387.74
PWPB0180	HL 1270NLT 4MB 1200x600dpi 12ppm (P/Script 2)	388.99	457.06
PWPB0155	HL 1270NLT 8MB 1200x600dpi 12ppm (P/Script 2)	378.99	445.31
PWPB0185	HL 2060N 16MB 1200x600dpi 20ppm Laser	848.99	997.56
PWPB0186	HL 2060N 40MB 1200x600dpi 20ppm Laser	898.99	1056.31
PWPB0187	HL 2060N 40MB 1200x600dpi 20ppm Laser DPLT	1278.99	1502.81
PWPB0210	HL 2460 16MB 24ppm 10/100 Laser	734.99	863.61
PWPB0211	HL 2460N + 48MB 24ppm 10/100 Laser	Call	
PWPB0212	HL 2460N + 80MB 24ppm 10/100 10GB HD Laser	819.99	963.49
PWPB0213	HL 2460N MAX 80MB 24ppm 10/100 10GB HD Ltray	Call	
PWPB0194	HL 2400CN 280MB H/D Colour Laser	2199.99	2584.99
PWPB0195	HL 3400CN 64MB Colour Laser	2249.99	2643.74
PWPB0196	HL 3400CN 192MB Colour Laser	2598.99	3053.81
PWPB0197	HL 3400CN 192MB 6GB HD Colour Laser	3098.99	3641.31
PWPB0198	HL 3400CN 320MB 6GB HD Colour Laser	3248.99	3817.56
PWPB0199	HL 3400CN 320MB 6GB HD Duplex 2xLtray Col Laser	4248.99	4992.56

Above Brother printers include 12 month ON SITE warranty

CANON INKJET PRINTERS

PWPC0012	BJC55 Colour Portable Printer (USB)	202.99	238.51
PWPC5547	Canon BJC-85 Colour Portable Printer	169.99	199.74
PWPC5546	BJC-85 Colour Portable Printer & Scan Cart	209.99	246.74
PWPC5026	Canon BJC-2100 Bubblejet	45.99	54.04
PWPC5548	Canon BJC-8200Photo Bubblejet Printer	230.99	271.41

CANON LASER PRINTERS

PWPC0109	Canon LBP 800 8ppm Laser Printer	175.99	206.79
PWPC0113	Canon LBP 2460 24ppm Laser Printer	1548.99	1820.06
PWPC0125	Canon CLBP 400 16/4ppm 600x2400 Col Laser	1558.99	1831.81

CANON COVER PACK WARRANTIES

PWPC8901	Canon Cover Pack 1 (CCPBUS1)	35.69	41.94
PWPC8902	Canon Cover Pack 2 (CCPBUS2)	48.29	56.74
PWPC8903	Canon Cover Pack 3 (CCPBUS3)	62.99	74.01
PWPC8904	Canon Cover Pack 4 (CCPBUS4)	82.99	97.51
PWPC8905	Canon Cover Pack 5 (CCPBUS5)	100.79	118.43
PWPC8906	Canon Cover Pack 6 (CCPBUS6)	136.49	160.38
PWPC8907	Canon Cover Pack 7 (CCPBUS7)	170.09	199.86
PWPC8908	Canon Cover Pack 8 (CCPBUS8)	237.29	278.82
PWPC8909	Canon Cover Pack 9 (CCPBUS9)	340.19	399.72
PWPC8910	Canon Cover Pack 10 (CCPBUS10)	573.29	673.62

EPSON DOT MATRIX PRINTERS

PWPE2015	EPSON LX300+ 9Pin Dot Matrix	97.99	115.14
PWPE5579	EPSON FX880 9Pin Dot Matrix	245.99	289.04
PWPE2046	EPSON FX980 9Pin Dot Matrix	303.99	357.19
PWPE2055	EPSON FX1180 9Pin Dot Matrix	298.99	351.31
PWPE2049	EPSON FX2180 9Pin Dot Matrix	372.99	438.26
PWPE1007	EPSON LQ300 24 Pin Dot Matrix	112.99	132.76
PWPE1016	EPSON LQ-680 24Pin Dot Matrix (Wide)	215.99	253.79
PWPE3055	EPSON DLQ3000+ Wide 9Pin Dot Matrix	772.99	908.26
PWPE1051	EPSON LQ2180 24 Pin Dot Matrix	446.99	525.21
PWPE4030	EPSON DFX5000+ 9Pin Dot Matrix	1196.99	1406.46

EPSON INKJET PRINTERS

PWPE3256	EPSON Stylus Color 480SXU USB Only	43.99	51.69
PWPE3260	EPSON Stylus Color 580	52.99	62.26
PWPE3258	EPSON Stylus Color 680	65.99	77.54
PWPE3165	EPSON Stylus Color 680 Printer (Transparent)	75.99	89.29
PWPE3259	EPSON Stylus Color 880	102.99	121.01
PWPE3126	EPSON Stylus Color 980	192.99	226.76
PWPE3127	EPSON Stylus Color 980N	340.99	400.66
PWPE4159	EPSON Stylus Color 1160	190.99	224.41
PWPE3160	EPSON Stylus Photo 790 (6 Colours)	102.99	121.01
PWPE3148	EPSON Stylus Photo 875DC	148.99	175.06
PWPE3161	EPSON Stylus Photo 890 (6 Colours)	147.99	173.89
PWPE3162	EPSON Stylus Photo 1290 (6 Colours)	295.99	347.79
PWPE3158	EPSON Stylus Photo 2000P	591.99	695.59
PWPE3019	EPSON Stylus 1520 wide-carriage inkjet	315.99	371.29
PWPE3017	EPSON Stylus color 3000 (A2)	791.99	930.59
PWPE3044	EPSON Stylus Pro 5000 (A3+)	1375.99	1616.79

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PRINTERS (CONT.)

EPSON LASER PRINTERS

PWPE3172	EPSON EPL-8800L Laser Printer	168.99	198.56
PWPE3169	EPSON EPL-8800 10ppm Laser Printer, USB	235.99	277.29
PWPE3170	EPSON EPL-8800N 10ppm Laser USB 10/100BaseTX	368.99	433.56
PWPE3171	EPSON EPL-8800PS 10ppm Laser Printer USB	442.99	520.51
PWPE3060	EPSON EPL-N1600 16ppm Laser Printer	455.99	535.79
PWPE3061	EPSON EPL-N1600T 16ppm Laser Printer	579.99	681.49
PWPE3062	EPSON EPL-N1600ENT 16ppm Laser Printer	705.99	827.19
PWPE3032	EPSON EPL-N2000 A4/A3 20ppm Laser Printer	938.99	1103.31
PWPE3033	EPSON EPL-N2000PS A4/A3 20ppm Laser Printer	1181.99	1388.84
PWPE3130	EPSON EPL-N2050 Laser Printer (10/100Base)	656.99	771.96
PWPE3133	EPSON EPL-N2050T Laser Printer (10/100Base)	950.99	1117.41
PWPE3132	EPSON EPL-N2050PS Laser Printer (10/100Base)	911.99	1071.59
PWPE3059	EPSON EPL-N2700 A4/A3 27ppm Laser Printer	1186.99	1394.71
PWPE3068	EPSON EPL-N2700T A4/A3 27ppm Laser Printer	2309.99	2714.24
PWPE3082	EPSON EPL-N2750 A4/A3 27ppm Laser Printer	1155.99	1358.29
PWPE3083	EPSON EPL-N2750PS A4/A3 27ppm Laser Printer	1310.99	1540.41
PWPE3084	EPSON EPL-N2750DT A4/A3 27ppm Laser Printer	2237.99	2629.64
PWPE3085	AcuLaser C2000 10/100Base 32MB 5/20ppm Col Laser	1279.99	1503.99
PWPE3086	AcuLaser C2000PS 10/100Base 96MB PS3 Colour Laser	1479.99	1738.99
PWPE3087	AcuLaser C2000DT 10/100Base 96MB LCF Duplex	1959.99	2302.99
PWPE3088	AcuLaser C2000PSDT 10/100Base 160MB PS3 LCF Dup	2159.99	2537.99
PWPE3178	AcuLaser C8500 64MB, 6/26ppm 10/100 Colour Laser	2752.99	3234.76
PWPE3180	AcuLaser C8500PS 256MB 6/26ppm P/Script Col	3316.99	3897.46
PWPE3179	AcuLaser C8500DT 192MB 6/26ppm 10/100 Dup Col	4213.99	4951.44
PWPE3181	AcuLaser C8500PSDT 384MB 6/26ppm P/S Dup Col	4831.99	5677.59

EPSON WARRANTIES

PWPE8210	EPSON Cover Plus Group 10	26.24	30.83
PWPE8220	EPSON Cover Plus Group 20	36.74	43.17
PWPE8230	EPSON Cover Plus Group 30	60.89	71.55
PWPE8235	EPSON Cover Plus Group 35	79.79	93.75
PWPE8240	EPSON Cover Plus Group 40	103.94	122.13
PWPE8250	EPSON Cover Plus Group 50	166.94	196.15
PWPE8260	EPSON Cover Plus Group 60	261.44	307.19
PWPE8270	EPSON Cover Plus Group 70	376.94	442.90
PWPE8280	EPSON Cover Plus Group 80	461.99	542.84
PWPE8290	EPSON Cover Plus Group 90	629.99	740.24
PWPE8300	EPSON Cover Plus Group 100	776.99	912.96

HP DESKJET PRINTERS

PWPH0127	HP Deskjet 350c	137.99	162.14
PWPH0126	HP Deskjet 350chi	156.99	184.46
PWPH1924	HP Deskjet 640C	53.99	63.44
PWPH1255	HP Deskjet 840C	68.99	81.06
PWPH1256	HP Deskjet 930C	100.99	118.66
PWPH2258	HP Deskjet 930C	116.99	137.46
PWPH0078	HP Deskjet 970Ccd	152.99	179.76
PWPH0279	HP Deskjet 990Ccd	191.99	225.59
PWPH0179	HP Deskjet 1125C	209.99	246.74
PWPH1258	HP Deskjet 1220C	259.99	305.49
PWPH0297	HP 2200 Business Inkjet	268.99	316.06
PWPH0299	HP 2250 Business Inkjet	398.99	468.81
PWPH0298	HP 2250TN Business Inkjet	607.99	714.39
PWPH2296	HP PhotoSmart P1000 Printer	157.99	185.64
PWPH2256	HP PhotoSmart P1215 Printer	221.99	260.84
PWPH2257	HP PhotoSmart P1218 Printer	229.99	270.24

HP LASERJET 1200 LASER PRINTERS

PWPH0805	HP Laserjet 1200 14ppm 1200dpi Laser Printer	267.99	314.89
PWPH0806	HP Laserjet 1200n 14ppm 1200dpi Laser Printer	396.99	466.46
PWPH0807	HP Laserjet 1220 Scan/Copy/Print	334.99	393.61
PWPH0808	HP Laserjet 1200 Scanner/Copier Attachment	99.99	117.49

HP LASERJET 2200 LASER PRINTERS

PWPH9220	HP Laserjet 2200D 8MB 18ppm 1200x1200dpi	529.99	622.74
PWPH9221	HP Laserjet 2200DT 8MB 18ppm 1200x1200dpi	627.99	737.89
PWPH9222	HP Laserjet 2200DN 8MB 18ppm 1200x1200dpi	666.99	783.71
PWPH9223	HP Laserjet 2200DTN 16MB 18ppm 1200x1200dpi	847.99	996.39

HP LASERJET 4100 LASER PRINTERS

PWPH9120	HP Laserjet 4100 16MB 24ppm 1200x1200dpi	774.99	910.61
PWPH9121	HP Laserjet 4100N 32MB 24ppm 1200x1200dpi	979.99	1151.49
PWPH9122	HP Laserjet 4100TN 32MB 24ppm 1200x1200dpi	1048.99	1232.56
PWPH9123	HP Laserjet 4100DTN 32MB 24ppm 1200x1200dpi	1244.99	1462.86
PWPH9124	HP Laserjet 4100 16MB 24ppm + 3Yr On-Site Warranty	907.99	1066.89
PWPH9125	HP Laserjet 4100N 32MB + 3Yr On-Site Warranty	1117.99	1313.64
PWPH9126	HP Laserjet 4100TN 32MB + 3Yr On-Site Warranty	1185.99	1393.54
PWPH9127	HP Laserjet 4100DTN 32MB + 3Yr On-Site Warranty	1371.99	1612.09

HP LASERJET 5000 LASER PRINTERS

PWPH0031	HP Laserjet 5000	940.99	1105.66
PWPH0032	HP Laserjet 5000N	1342.99	1578.01
PWPH0034	HP Laserjet 5000GN	1656.99	1946.96

HP LASERJET 8150 LASER PRINTERS

PWPH0117	HP Laserjet 8150 32MB 32ppm A3/A4 Laser Printer	1460.99	1716.66
PWPH0118	HP Laserjet 8150N 32MB 32ppm A3/A4 Laser Printer	1705.99	2004.54
PWPH0119	HP Laserjet 8150DN 32MB 32ppm A3/A4 Laser Printer	2067.99	2429.89
PWPH0121	HP Laserjet 8150MFP 64MB 32ppm A3/A4 Laser	5321.99	6253.34

HP COLOUR LASERJET 4550 LASER PRINTERS

PWPH4002	HP Colour Laserjet 4550	1265.99	1487.54
PWPH4003	HP Colour Laserjet 4550N	1518.99	1784.81
PWPH4004	HP Colour Laserjet 4550DN	2136.99	2510.96
PWPH4005	HP Colour Laserjet 4550HDN	2440.99	2868.16

HP COLOUR LASERJET 8550 LASER PRINTERS

PWPH0785	HP Colour Laserjet 8550	2939.99	3454.49
PWPH0786	HP Colour Laserjet 8550N	3547.99	4168.89
PWPH0787	HP Colour Laserjet 8550DN	4625.99	5435.54
PWPH0788	HP Colour Laserjet 8550CN	5468.99	6426.06
PWPH0789	HP Colour Laserjet 8550MFP	7095.99	8337.79

HP DIGITAL SENDERS

PWPH5875	HP Digital Sender 8100C	1029.99	1210.24
PWPH5569	HP 9100C Digital Sender 10/100BT Combo	2338.99	2748.31

HP DESIGNJET PLOTTER SERIES

PWPH0208	HP Designjet 800 A4 - A0 42"	4341.99	5101.84
PWPH0209	HP Designjet 800 A4 - A1 24"	3537.99	4157.14
PWPH9305	HP Designjet 1050C A0/91cm 16MB	4842.99	5690.51
PWPH9306	HP Designjet 1055CM A0/91cm 32MB	6993.99	8217.94
PWPH9307	HP Designjet 2500C printer A0/91cm	6660.99	7826.66
PWPH9308	HP Designjet 2000C printer A0/91cm	5714.99	6715.11
PWPH9309	HP Designjet 3500C printer 1.37m	9454.99	11109.61
PWPH9310	HP Designjet 3000C printer 1.37m	7775.99	9136.79

Brother Printers

Brother HL-1650/1670N

The HL-1600 printer range deliver the perfect balance of quality and durability and is the ideal printing solution for stand alone professionals and small workgroups alike.

- BUILT-IN DOUBLE-SIDED PRINTING
- Fast 16ppm print speed
- 3-colour LCD status Indicator
- 10/100BaseTX network connectivity (Optional on HL-1650)
- Crisp text and graphics with Brother HQ1200 print quality
- Large paper input capacity with up to 350 sheets
- Optional additional lower tray to give up to 600 sheet total



BUILT IN DUPLEXING

Brother HL-1030

The HL-1030 is a Windows dedicated laser printer ideal for the budget conscious user who works almost exclusively within the Windows environment and needs fast, high quality mono printing at around 1p per page using standard plain paper.

- Windows® Dedicated Printer
- 10ppm print speed
- Small Footprint
- Crisp Print Quality at 600dpi Class
- 2MB Memory
- 250 Sheet Paper Input
- Handles a Range of Paper Sizes
- Useful 'On-Screen Interactive Help' and 'Quick Print Set-Up' for Windows Facilities
- Auto E-mail Printing
- Long Life Consumable with Low Running Costs



Brother HL-1250

- Professional Print Quality at 1200dpi Class
- 12ppm
- 66MHz RISC Processor
- 4MB Standard Expandable to 36MB
- Windows, PCL6, IBM and Epson Emulations
- Printer Driver for iMac G3 & G4 Supplied
- Parallel and USB Ports as Standard
- 250 Sheet Paper Input
- Optional Second Tray Increases Capacity to 500 Sheets
- Easily Adaptable for use on a Network



Brother HL-2460

The Brother HL-2460 offers the complete solution to today's complex business printing requirements. Designed for reliability and speed, this high performance printer delivers outstanding print quality at an impressive 24 pages per minute. With a comprehensive range of options available to expand the capabilities of the HL-2460, this printer can grow along side your business.

- Fast 24ppm laser print speed
- Optional 10/100BaseTx network connectivity
- Crisp text and graphics with Brother HQ1200 print quality
- 3 colour LCD for easy status recognition
- Large paper input capacity with up to 600 sheets
- Optional additional lower trays to give up to 2100 sheet total
- Large Memory - 16MB as standard, expandable to 272MB
- Easy replacement long life consumables
- 200MHz RISC Processor
- PostScript Level 3 Language Emulation
- 1 year on-site warranty



At your side.
brother

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWPH0151	Brother HL-1250 4MB 1200x600dpi 12ppm Laser	208.99	245.56
PWPH0107	Brother HL-1030 2MB 600x600dpi 10ppm Laser	158.99	186.81
PWPH0107	Brother HL 1650 8MB 16ppm 10/100 Duplex	389.99	458.24
PWPH1009	Brother HL 1670N 16MB 16ppm 10/100 Duplex	519.99	610.99
PWPH0210	Brother HL 2460 16MB 24ppm 10/100 Laser	734.99	863.61

Canon BJ S400

Versatile and Creative Colour Printer

- Replaces the award winning BJC3000
- Separate ink tanks for all colours
- 1440dpi
- Up to 9ppm mono and 4ppm colour
- High Precision Ink low/ink out detection
- Networkable
- Compatible with: Win 95/98/Me/2000/NT 4.0, Mac OS (iMac/G3/G4)



INCLUDES 1 YEAR ON-SITE WARRANTY

Canon

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWPC5025	BJ-S400 Colour Bubblejet 4/6ppm 1440dpi Printer	68.99	81.06
PWPC8902	Canon Cover Pack 2 (CCPBUS2)	48.29	56.74

Canon BJ S450

The Personal High Speed Colour Printer

- Replaces the highly acclaimed BJC 6200
- Separate ink tanks for all colours
- 1440dpi
- 10ppm mono and 7ppm colour
- Six colour photo printing (for enthusiasts)
- High precision ink low/ink out detection
- Automatic print head alignment
- Networkable
- Compatible with Win 95/98/Me/2000/NT 4.0, Mac OS (iMac/G3/G4)



INCLUDES 1 YEAR ON-SITE WARRANTY

Canon

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWPC5028	BJ-S450 Colour Bubblejet 7/10ppm 1440dpi Printer	91.99	108.09
PWPC8903	Canon Cover Pack 3 (CCPBUS3)	62.99	74.01

Canon BJ S600

The Professional Colour Printer for Advanced Users

- Outstanding print quality 1200 x 2400dpi
- 15ppm Mono and 10ppm Colour
- High precision ink level detection
- Single ink technology for amazing cost performance
- New high speed auto sheet feeder system
- Compatible with Win 95/98/Me etc. Mac OS 8.1 upwards iMac G3/G4

NEW



INCLUDES 1 YEAR ON-SITE WARRANTY

Canon

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWPC5550	BJ-S600 Bubblejet 15/10ppm 2400x1200	151.99	178.59
PWPC4016	Black Ink Tank (BIC6BK)	7.99	9.39
PWPC8903	Canon Cover Pack 3 (CCPBUS3)	62.99	74.01

Canon BJ S800

Ultimate Photo Printer for imaging professionals

- 2400 x 1200dpi
- A4 full page photo in approx. 2 minutes
- 6 ink colour photo system
- Individual ink tanks
- Parallel and USB connection
- Can take up to 500gsm paper
- Compatible with Win 95/98/Me/2000/NT 4.0, Mac OS (iMac/G3/G4)



INCLUDES 1 YEAR ON-SITE WARRANTY

Canon

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWPC5549	BJ-S800 2400x1200 Photo Printer	254.99	299.61
PWPC4016	Black Ink Tank (BIC6BK)	7.99	9.39
PWPC8904	Canon Cover Pack 4 (CCPBUS4)	82.99	97.51

EPSON Stylus Color 480SXU

Introducing the new Stylus Color 480SXU. This new version of the Stylus Color 480 has a USB interface as standard.

- USB interface as standard
- Easy to use panel - free design with paper tray
- 720dpi 4-colour printing
- Variable Sized Droplet Technology
- Print Speeds of 4ppm black and 2.6ppm colour
- Photo Enhance 4 for image optimisation
- Drivers designed for Windows 98/ME/2000



EPSON

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWPE3256	EPSON Stylus Color 480SXU USB Only	43.99	51.69

EPSON Stylus Color 680/680T

Up to 2880dpi for business and home office

- Transparent Indigo version
- Breakthrough resolution up to 2880dpi
- Innovative flexible paper tray - new aesthetic design
- EPSON Ultra Micro Dot 4pl with variable sized droplet technology
- Intellidrive™ ink cartridges for enhanced user feedback
- USB and parallel interfaces as standard
- Print speeds of 8.0ppm black and 7.7ppm colour
- Windows 95/98/NT4.0/2000/iMac and G3/G4 compatibility



EPSON

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWPE3258	EPSON Stylus Color 680 Printer	65.99	77.54
PWPE3165	EPSON Stylus Color 680 Printer (Transparent)	75.99	89.29

EPSON Stylus Photo 790

Outstanding value photo printing for the home.

- Up to 2880 x 720dpi Perfect Picture Printing
- 6 colour printing for extra detail and smoother images
- Print speeds of up to 7.7ppm black text and 7.5ppm colour
- Borderless prints on 4"x6" and A4 media without the need for special media
- EPSON Ultra Micro Dot 4pl with Variable Sized Droplet Technology
- USB and Parallel connectivity for Windows® and Macintosh®
- Feature-rich EPSON PhotoQuicker 2 software included



EPSON

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWPE3160	EPSON Stylus Photo 790 (6 Colours)	102.99	121.01

EPSON EPL 5800L

High quality 1200dpi laser printer for PC and Mac.

- High speed 10ppm A4 mono laser printer
- High Print Quality - 1200dpi class printing with RITech and MicroGrey 1200
- 150 sheet capacity expandable up to 650 sheets
- Standard 2MB memory upgradeable to 13MB (EDO RAM)
- Ideal for Windows® and Macintosh® printing
- Standard USB and IEEE1284 parallel interface



EPSON

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWPE3172	EPSON EPL-5800L Laser printer	168.99	198.56

EPSON Stylus Color 580

1440dpi high performance home printer

- New aesthetic panel-less design with paper tray
- Ultra-high 1440dpi printing resolution
- Single interface - USB as standard
- Print speeds of 6ppm black and 3.2ppm colour
- Windows 98/2000/iMac and G3/G4 compatibility
- PhotoEnhance 4 for image optimisation



EPSON

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWPE3260	EPSON Stylus Color 580	52.99	62.26

EPSON Stylus Color 880

Up to 2880dpi ideal printer for all business requirements

- Up to 2880dpi printing resolution
- Print speeds of 12ppm black and 11.6ppm colour
- Improved driver functions with Duplexing and book printing options
- Network option
- USB and parallel interfaces
- Windows 3.1/95/98/NT4.0/2000/ iMac, G3/G4 compatible
- PhotoEnhance 4 for image optimisation

Also available in transparent version to compliment iMac, G3 & G4 Design



EPSON

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWPE3259	EPSON Stylus Color 880	102.99	121.01
PWPE3261	EPSON Stylus Color 880 (Transparent)	110.99	130.41

EPSON Stylus Photo 890

Advanced photo printing for the home and office.

- Borderless prints on 4"x6" and A4 media without the need for special media
- Advanced 6 colour printing for true photographic reproduction
- Up to 2880 x 720dpi Perfect Picture Printing
- Print speeds of up to 9.6ppm black text and 9.2ppm colour
- EPSON Ultra Micro Dot 4pl with Variable Sized Droplet Technology
- USB and Parallel connectivity for Windows® and Macintosh®
- Feature-rich EPSON PhotoQuicker 2 software included



EPSON

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWPE3161	EPSON Stylus Photo 890 (6 Colours)	147.99	173.89

EPSON Stylus Photo 1290

Wide Carriage printer for photographers and printing professionals.

- Borderless prints on 100mm, A4, A3 & A3+ media without the need for over sizing or the use of a guillotine
- Up to 2880 x 720dpi Perfect Picture Printing
- Advanced 6 colour printing for true photo reproduction
- Print speeds of up to 9.4ppm black text and 9.0ppm colour
- EPSON Ultra Micro Dot 4pl with Variable Sized Droplet Technology
- USB and Parallel connectivity for Windows® and Macintosh®
- Feature-rich EPSON PhotoQuicker 2 software included



EPSON

CODE	DESCRIPTION	E EX.VAT	E INC.VAT
PWPE3162	EPSON Stylus Photo 1290 (6 Colours)	295.99	347.79

Code Description £ Ex VAT £ Inc VAT

PRINTERS (CONT.)

HP WARRANTIES

PWPH0305	HP Support Pack Deskjet 340,400,670,690C,1100C H5461A	41.99	49.34
PWPH0320	HP Support Pack Deskjet 1600C/CM H5473A	87.14	102.39
PWPH0340	HP Support Pack LaserJet 5, 5M, 5N, 4000/TN/TN H5479A	186.99	219.71
PWPH0457	HP Support Pack HP Network ScanJet 5, H5485A	281.99	331.34
PWPH0445	HP Support Pack LaserJet 55L, 55U/MX, 55U/XX,8000 H5492A	751.99	883.59
PWPH0345	HP Support Pack Office Jet 635, H5467A	72.99	85.76

KYOCERA LASER PRINTERS

PWPK0002	Ecosys FS-800N 8ppm	476.99	560.46
PWPK9999	Kyocera Ecosys FS-1000 10ppm Laser Printer	228.99	269.06
PWPK1921	FS-1000N 10ppm	414.99	487.61
PWPK1922	FS-1000T 10ppm	309.99	364.24
PWPK1923	FS-1000TN 10ppm	465.99	547.54
PWPK2304	Kyocera Ecosys FS-1800 Laser Printer	579.99	681.49
PWPK2305	Kyocera Ecosys FS-1800N Laser Printer	734.99	863.61
PWPK2306	Kyocera Ecosys FS-1800T Laser Printer	750.99	882.41
PWPK2307	Kyocera Ecosys FS-1800TN Laser Printer	905.99	1064.54
PWPK0008	Ecosys FS-6700 A4/A3 Laser	998.99	1173.81
PWPK2308	Kyocera Ecosys FS-3800 Laser Printer	744.99	875.36
PWPK2320	Kyocera Ecosys FS-3800N Laser Printer	905.99	1064.54
PWPK2321	Kyocera Ecosys FS-3800T Laser Printer	925.99	1088.04
PWPK2322	Kyocera Ecosys FS-3800TN Laser Printer	1098.99	1291.31
PWPK0013	Ecosys FS-7000 + 28ppm A4 / 15ppm A3 Printer	1337.99	1572.14
PWPK0014	Ecosys FS-7000N + 28ppm A4 / 15ppm A3 Printer	1881.99	2211.34
PWPK0046	Ecosys FS-9000 36ppm A4 / 20ppm A3 Printer	1986.99	2334.71
PWPK1223	Ecosys FS-5900C	1848.99	2172.56
PWPK1022	Ecosys FS-5900CN	1998.99	2348.81
PWPK1023	Ecosys FS-5900C-EN	2498.99	2936.31

LEXMARK INKJET PRINTERS

PWPL0022	Lexmark Optra Colour 45	453.99	533.44
PWPL0023	Lexmark Optra Colour 45n	779.99	916.49

LEXMARK LASER PRINTERS

PWPL1020	Lexmark Optra M412n Laser	799.99	939.99
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OKI DOT MATRIX PRINTERS

PWPO0055	OKI ML320 Dot Matrix 9 Pin (80 Column)	325.99	383.04
PWPO0060	OKI ML520 Dot Matrix 9 Pin (80 Column)	348.99	410.06
PWPO0070	OKI ML590 Dot Matrix 24 Pin (80 Column)	449.99	528.74
PWPO0080	OKI ML3410 Dot Matrix 9 Pin (136 Column)	868.99	1021.06
PWPO0077	OKI ML 395B Dot Matrix 24 Pin Mono (136 Column)	698.99	821.31
PWPO0079	OKI ML 4410 Dot Matrix 9 Pin	1798.99	2113.81
PWPO0086	OKI ML 3320 Dot Matrix 9 Pin (80 Column)	298.99	351.31

OKI LASER PRINTERS

PWPO9105	OKiPage 8w 8ppm GDI	156.99	184.46
PWPO9106	OKiPage 8P Plus 8ppm 600x1200dpi 2MB	198.99	233.81
PWPO9004	OKiPage 14EX 14ppm A4 600x1200dpi 4MB (Parallel/USB)	266.99	313.71
PWPO9011	OKiPage 14IN 14ppm A4 600x1200dpi 8MB (Parallel/USB)	416.99	489.96
PWPO9101	OKiPage 20plus 20ppm 600x1200dpi 16MB	638.99	750.81
PWPO9007	OKiPage 20plusX 20ppm 600x1200dpi 16MB	845.99	994.04
PWPO9008	OKiPage 20plusDX 20ppm 600x1200dpi 16MB	745.99	876.54
PWPO9009	OKiPage 20plus NDX 20ppm 600x1200dpi 16MB	946.99	1112.71
PWPO9005	OKiPage 24dx 600x1200dpi 16MB (Duplex)	849.99	998.74
PWPO9006	OKiPage 24dxn 600x1200dpi 16MB Ethernet (Dup)	1048.99	1232.56

PANASONIC DOT MATRIX PRINTERS

PWPP1108	Panasonic KX-P1131 24-Pin Fast Narrow Carriage	127.99	150.39
PWPP1000	Panasonic KX-P1150 9-Pin Dot Matrix Printer	100.99	118.66
PWPP1048	Panasonic KX-P3200 9-Pin Dot Matrix Forms Printer	168.99	198.56
PWPP1046	Panasonic KX-P3626 24-Pin Quiet Dot Matrix Printer	289.99	340.74
PWPP1047	Panasonic KX-P3696 9-Pin Dual Head Multi-Mode	275.99	324.29
PWPP1052	Panasonic KX-P3196 Dual 9pin Dot Matrix Printer	219.99	258.49
PWPP1053	Panasonic KX-P2023 24-Pin Quiet Dot Matrix Printer	123.99	145.69

PANASONIC LASER PRINTER

PWPP1105	Panasonic KX-P6300 6ppm GDI Laser Printer	158.99	186.81
PWPP1110	Panasonic KX-P6500 6ppm GDI Laser Printer	194.99	229.11
PWPP1128	Panasonic KX-P7500 17ppm Laser Printer	548.99	645.06
PWPP1129	Panasonic KX-P7510 17ppm Laser Printer (Ethernet)	721.99	848.34
PWPP1119	Panasonic KX-P8415 Colour Laser Printer	881.99	1036.34
PWPP1115	Panasonic KX-P8420 Colour Laser Printer	1898.99	2231.31
PWPP1116	Panasonic KX-P8420X 3.7ppm Colour Laser Printer	2993.99	3517.94
PWPP1117	Panasonic KX-P8420X 3.7ppm Colour Laser Printer	3493.99	4105.44

QMS LASER PRINTERS

PWPPQ8820	2560 BX Laser Printer	1299.99	1527.49
PWPPQ8821	2560 GX Laser Printer	1549.99	1821.24
PWPPQ8822	2560 EX Laser Printer	2399.99	2819.99
PWPPQ8823	2560 EXS Laser Printer	3798.99	4463.81
PWPPQ925	4032 CX A3 40/20ppm 16MB 600x600dpi	2098.99	2466.31
PWPPQ926	4032 EX A3 40/20ppm 32MB 1GB 600x600dpi	3347.99	3933.89
PWPPQ927	4032 EXS A3 40/20ppm 32MB 1GB 600x600dpi (Stapler)	4597.99	5402.64
PWPPQ930	3260 EX A332ppm 32MB 1200x600dpi	3247.99	3816.39
PWPPQ941	Magicolor 330GX A3 Colour Laser Printer	3295.99	3872.79
PWPPQ158	Magicolor 2 DeskLaser Plus 24MB	743.99	874.19
PWPPQ175	QMS DeskLaser 6100 24ppm 32MB Laser Printer	2098.99	2466.31
PWPPQ168	Magicolor 6100N 600x600dpi 12ppm 10/100 A3+	2584.99	3037.36
PWPPQ169	Magicolor 6100GN 600x600dpi 12ppm 10/100 A3+	2784.99	3272.36
PWPPQ170	Magicolor 6100EN 600x600dpi 12ppm 10/100 A3+	3175.99	3731.79
PWPPQ171	Magicolor 6100DP 600x600dpi 12ppm 10/100 A3+	4299.99	5052.49
PWPPQ185	Magicolor 2200N 600dpi 5/20ppm 64MB 10/100	1394.99	1639.11
PWPPQ186	Magicolor 2200GN 1200dpi 5/20ppm 128MB, 10/100	1507.99	1771.89
PWPPQ187	Magicolor 2200EN 1200dpi 5/20ppm 128MB, 10/100	1864.99	2191.36
PWPPQ188	Magicolor 2200DP 1200dpi 5/20ppm 256MB, 10/100	2394.99	2814.11
PWPPQ5529	PagePro 1100L	144.99	170.36

SAMSUNG LASER PRINTERS

PWPS7018	Samsung ML4500 8ppm Mono Laser Printer	139.99	164.49
PWPS7019	Samsung ML4600 8ppm Mono Laser Printer	155.99	183.29
PWPS7020	Samsung ML6040 12ppm Mono Laser Printer	179.99	211.49
PWPS7021	Samsung ML6060 12ppm Mono Laser Printer	209.99	246.74
PWPS7022	Samsung ML6060N 12ppm Mono Laser Printer	299.99	352.49
PWPS7005	Samsung ML7050 16ppm Mono Laser Printer	580.99	682.66
PWPS7008	Samsung ML7300N 20ppm Mono Laser Printer	802.99	943.51

All Samsung Printers come with 12 months On-Site Warranty

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for FREE DELIVERY on orders over £50 ex. VAT

SiMPLY™
www.simply.co.uk

PRINTERS (CONT.)**TEKTRONIX LASER PRINTERS**

PWPT2013	Phaser 750N A4 Col Laser 64MB 5/16ppm 600dpi	1626.99	1911.71
PWPT2014	Phaser 750P A4 Col Laser 96MB 5/16ppm 1200dpi	1999.99	2349.99
PWPT2018	Phaser 750DP A4 Col Laser 128MB 5/16ppm 1200dpi	2449.99	2878.74
PWPT2019	Phaser 750DX A4 Col Laser 128MB 6GB disk	2948.99	3465.06
PWPT2015	Phaser 780N A3 Col 64MB 4/16ppm 600dpi	3593.99	4222.94
PWPT2016	Phaser 780GN A3 Col 96MB 4/16ppm 1200dpi	4693.99	5515.44
PWPT2017	Phaser 780P A3 Col 192MB 4/16ppm 1200dpi	5492.99	6454.26
PWPT2055	Phaser 850N 14ppm 32MB 1000dpi USB	1974.99	2320.61
PWPT2056	Phaser 850DP 14ppm 64MB 1200dpi USB Dup	2698.99	3171.31
PWPT2057	Phaser 850DX 14ppm 128MB 1200dpi USB Dup	3397.99	3992.64

XEROX INKJET PRINTERS

PWPX1112	DocuPrint C20 A3 8MB 12/5ppm Inkjet 1200x600dpi	137.99	162.14
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FAX/MULTIFUNCTION MACHINES**BROTHER**

PWFA3529	Brother 515 Thermal Fax Machine	87.99	103.39
PWFA3530	Brother 525 Thermal Fax Machine with answerphone	124.99	146.86
PWFA3506	Brother 920 Plain Paper Fax	130.99	153.91
PWFA3507	Brother 930 Plain Paper Fax	163.99	192.69
PWFA3511	Brother 1020 Plus Plain Paper Fax	183.99	216.19
PWFA3520	Brother 1030 Plain Paper Fax	242.99	285.51
PWFA3502	Brother 8600P Plain Paper Laser Fax	284.99	334.86
PWFA3546	Brother 8750 Plain Paper Laser Fax	570.99	670.91
PWPB0119	Brother MFC-925 Multi-function laser print/scan	198.99	233.81
PWPB0024	Brother MFC-9650 Multi-function laser print/fax/scan	475.99	559.29
PWPB0025	Brother MFC-9750 Multi-function laser print/fax/scan	598.99	703.81
PWPB0026	Brother MFC-9870 Multi-function laser print/fax/scan	798.99	938.81
PWPB0029	Brother MFCPro730 Multi-function Colour inkjet	340.99	400.66
PWPB0121	Brother MFC740 Multi-function Colour inkjet	425.99	500.54
PWPB1123	Brother MFC760 Multi-function Colour inkjet	333.99	392.44

CANON

PWFA4002	Canon B155 Plain Paper Fax	179.99	211.49
PWFA4013	Canon B210C Colour Plain Paper Fax	202.99	238.51
PWFA4014	Canon B230C Colour Plain Paper Fax	270.99	318.41
PWFA5874	Canon L350 Plain Paper Fax	519.99	610.99
PWPC1129	Canon Multipass C70 (Colour)	219.99	258.49
PWPC1121	Canon Multipass C80 (Colour)	298.99	351.31
PWPC1119	Canon Multipass L60 Laser (Mono)	580.99	682.66
PWPC1117	Canon Multipass L90 Laser (Mono)	699.99	822.49
PWPC9982	Canon FC224 Portable Copier 4cpm	398.99	468.81
PWPC9988	Canon FC336 Portable Copier 6cpm	359.99	422.99

HP

PWFA5105	HP Fax 925	113.99	133.94
PWPB0609	HP Officejet G55	231.99	272.59
PWPB10610	HP Officejet G85	346.99	407.71
PWPB0611	HP Officejet G95	428.99	504.06
PWPB10608	HP Officejet T45 Colour Print/Copy/Scan/Fax	203.99	239.69
PWPB0509	HP Officejet K60	201.99	237.34
PWPB10508	HP Officejet K80	231.99	272.59
PWPH2146	HP Office/LaserJet 3150 Laser Scanner/Fax/Copier	414.99	487.61
PWPH15285	HP Colour Copier 290	294.99	346.61

OKI

PWFA2580	OKIFAX 4100 Plain Paper Fax	335.99	394.79
PWFA2582	OKIFAX 4500 Plain Paper Fax	445.99	524.04
PWFA2583	OKIFAX 5400 Plain Paper Fax	702.99	826.01
PWFA2589	OKIFAX 5700 Plain Paper Fax	978.99	1150.31
PWFA2585	OKIFAX 2700 Plain Paper Fax	978.99	1150.31
PWFA2586	OKIFAX 2800 Plain Paper Fax	1212.99	1425.26
PWFA2587	OKIFAX 2900 Plain Paper Fax	1212.99	1425.26
PWFA2581	OKI Office 84 Plain Paper Fax	446.99	525.21

SAMSUNG

PWFA1532	Samsung SF4500 Fax	224.99	264.36
PWFA1534	Samsung SF5800 Fax	338.99	398.31
PWFA2013	Samsung SF6800 Large Workgroup Laser Fax	539.99	634.49

USB PERIPHERALS**SIMPLY**

PWNE7800	Simply Standard 4 Port USB Hub	62.99	74.01
PWUC0204	USB Printer A-B 1.8m Cable	8.99	10.56

BELKIN

PWUC0056	4 Port Mini USB Hub	40.99	48.16
PWUC0047	7 Port USB Hub	50.99	59.91
PWUC0040	USB Bus Port 2 Port PCI Card	34.99	41.11
PWUC0055	DockStation 4xUSB 2xPS/2 1xSerial 1xParallel USB Hub	104.99	123.36
PWUC0048	BusStation Modular Rack inc 7 USB Ports	64.99	76.36
PWUC0052	Modular USB Serial Adapter	50.99	59.91
PWUC0053	Modular USB Ethernet Adapter	44.99	52.86
PWUC0054	Modular USB PS/2 Adapter (2 PS/2 Ports)	30.99	36.41
PWUC0051	Modular 4 Port USB Hub	42.99	50.51
PWUC0038	Direct Connect - 2 PC Networking Box	69.99	82.24
PWUC0059	USB VideoBus II PAL Version	86.99	102.21
PWCB3047	USB to Printer Adapter (Centronics 36M)	42.99	50.51
PWUC0035	USB Motherboard Cable 10' (2 ports)	8.99	10.56
PWCB3043	USB A Male to USB A Female Extension Cable 1.8m	8.99	10.56
PWCB3044	USB A Male to USB A Female Extension Cable 3m	11.99	14.09
PWCB3046	USB A to USB B Cable 3m	11.99	14.09
PWCB3170	USB A to USB B Cable 4.8m	14.99	17.61

D-LINK

PWUC0301	2 USB Port PCI Controller Card	23.99	28.19
PWUC0302	USB to Parallel Converter	31.99	37.59
PWUC0303	USB to Serial Converter	40.99	48.16
PWUC0304	USB Video Grabber	59.99	70.49
PWUC0305	4 Port USB Hub - 3xUSB 1x10/100 RJ45	49.99	58.74
PWUC0306	4 Port USB Hub - 3xUSB 1x10/100 RJ45	52.99	62.26
PWUC0307	3 Port USB Hub - 3xUSB 1xSerial 1xParallel + Cable	77.99	91.64
PWUC0308	4 Port USB Hub + USB A - USB B Cable	31.99	37.59
PWUC0309	7 Port USB Hub	40.99	48.16
PWUC0310	7 Port USB Hub - 4xUSB 1xSerial 2xPS/2	45.99	54.04

SITECOM

PWUC0201	USB to Gameport	13.99	16.44
PWUC0202	USB Network Bridge Cable	30.99	36.41
PWUC0203	USB Dock 4xUSB 1xSerial 1xParallel 2xPS/2	87.99	103.39
PWUC0204	USB Printer A-B 1.8m Cable	8.99	10.56
PWUC0210	USB 2 Port PCI Card	19.99	23.49
PWUC0220	USB to Serial (DB25M) Converter	39.99	46.99
PWUC0215	USB to Fast IRDA (Infra Red) Adapter	41.99	49.34

HP DeskJet 640C

The ideal printer for quality everyday printing

- Great quality colour printing – optimal photo quality printing
- 600dpi black printing
- Up to 6ppm black printing and 3 ppm colour printing
- Prints on plain paper, envelopes, greeting cards and more
- Easy to use and reliable



3 YEAR WARRANTY AVAILABLE



CODE	DESCRIPTION	E EX VAT	E INC VAT
PWPH1924	HP Deskjet 640C	53.99	63.44
PWPH0305	HP Support Pack H5461A	41.99	49.34

HP DeskJet 930C

The ideal printer for PC and Mac users who require ultimate photo quality printing with space saving design

- Highest possible photo quality printing at the lowest possible price
- HP PhotoRet III Precision Technology and alternate 2400 dpi mode
- Up to 9ppm black and 7.5 ppm colour
- Space saving fold up paper tray
- Supports parallel and USB for user-friendly operation



3 YEAR WARRANTY AVAILABLE



CODE	DESCRIPTION	E EX VAT	E INC VAT
PWPH1256	HP Deskjet 930C	100.99	118.66
PWPH2258	HP Deskjet 930CM	116.99	137.46
PWPH0305	HP Support Pack H5461A	41.99	49.34

HP DeskJet 970Cxi

The ideal printer for PC or Mac users who require unparalleled printing performance with ultimate photo-quality

- Ultimate photo-quality with HP PhotoRet III Precision Technology and alternate 2400dpi mode
- Up to 12ppm black printing and 10ppm colour
- Very quiet operation
- Unmatched versatility – automatic two-sided printing
- Supports parallel and USB ports, also Optional Network capability via JetDirect EX
- Low ink indicator
- 4MB memory
- 1 year warranty



3 YEAR WARRANTY AVAILABLE



CODE	DESCRIPTION	E EX VAT	E INC VAT
PWPH0078	HP Deskjet 970Cxi	152.99	179.76
PWPH0305	HP Support Pack H5461A	41.99	49.34

HP DeskJet 1220C

The ideal printer for PC users who require Versatility printing with ultimate photo-quality.

- A5 to A3 printer - Printing Ultimate photo-quality with HP PhotoRet III Precision Technology and alternate 2400dpi mode. ■ Up to 11ppm (A4) 7ppm (A3) black printing and 9.5ppm (A4) 6.4ppm (A3) Colour. ■ Unmatched versatility. ■ Media with sensor
- Convenient time saving features like; low ink warning, cancel print button, smart software features and long cartridge life
- Supports parallel, also network capable via JetDirect.
- 1 year warranty



3 YEAR WARRANTY AVAILABLE



CODE	DESCRIPTION	E EX VAT	E INC VAT
PWPH1258	HP Deskjet 1220C	259.99	305.49
PWPH2356	HP Support Pack 3 Year Warranty Upgrade	47.24	55.51

HP DeskJet 840C

The ideal printer for PC or Mac users with excellent photo quality and whisper quiet operation

- Excellent photo quality printing
- 600dpi black printing and enhanced PhotoRet II Precision Technology to give sharp black text and vibrant colour graphics on all papers.
- Optional 1200dpi mode.
- Up to 8ppm black printing and 5ppm colour printing
- Very quiet operation



3 YEAR WARRANTY AVAILABLE



CODE	DESCRIPTION	E EX VAT	E INC VAT
PWPH1255	HP Deskjet 840C	68.99	81.06
PWPH0305	HP Support Pack H5461A	41.99	49.34

HP DeskJet 959C

The perfect printer for photo intensive applications

- Ultimate Photo Quality output - PhotoRet III precision technology with alternate 2400x 1200dpi printing available on photo paper, excellent lightfastness with HP photo papers.
- Compact design – fits easily on a shelf or under a desk
- Built in additional 10 x 15cm photo paper tray
- Up to 11ppm black and 8.5 ppm colour with an improved printer driver - gives 40% enhanced performance over the DeskJet 950c
- Plus, additional smart features
- Low ink indicator
- Job cancel
- Optional two sided printing module



NEW

3 YEAR WARRANTY AVAILABLE



CODE	DESCRIPTION	E EX VAT	E INC VAT
PWPH2259	HP Deskjet 959C	139.99	164.49
PWPH0305	HP Support Pack H5461A	41.99	49.34

HP DeskJet 990Cxi

Leading edge personal inkjet printing

- Premium performance - 17ppm black /13ppm colour
- Photo quality with HP PhotoRet III or 2400dpi mode
- IR printing – print wireless directly from laptops, pocket pc's, 3Com palm, mobile phones, digital cameras etc.
- Automatic paper type sensor – optimises printing
- Special "low memory mode" for less powerful PCs
- Auto duplex
- Ink indicator
- Job cancel
- Optional network connectivity with jet direct print servers



3 YEAR WARRANTY AVAILABLE

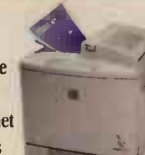


CODE	DESCRIPTION	E EX VAT	E INC VAT
PWPH0079	HP Deskjet 990Cxi	191.99	225.59
PWPH0305	HP Support Pack H5461A	41.99	49.34

Magicolor 2200 Range

The award winning A4 colour laser for graphics and business alike.

- 5ppm colour and 20ppm monochrome
- Up to 1200dpi resolution
- Standard 10BaseT/100 BaseTX Ethernet
- PostScript, PCL 6, and PDF emulations (Except 2200 DeskLaser)
- Automatic duplexing (std. on DP model), mailbox, and copying capabilities
- Up to 1,150 sheets paper input
- Up to 384MB RAMO
- Automatic Image Calibration



MINOLTA
QMS

CODE	DESCRIPTION	E EX VAT	E INC VAT
PWPH0184	QMS Magicolor 2200 DeskLaser 1200dpi 5/20ppm 64MB	877.99	1031.64
PWPH0185	QMS Magicolor 2200N 600dpi, 5/20ppm, 64MB	1394.99	1639.11
PWPH0186	QMS Magicolor 2200GN 1200dpi 5/20ppm 128MB	1507.99	1771.89
PWPH0187	QMS Magicolor 2200EN 1200dpi 5/20ppm 128MB	1864.99	2191.36
PWPH0188	QMS Magicolor 2200DP 1200dpi 5/20ppm 256MB	2394.99	2814.11

Sharp AJ1800

New Colour InkJet Printer with 4 Separate Cartridge Print System

- 4 Cartridge Print System
- Low Running Costs
- No Ink Wastage
- Fast Print Speeds in Draft & Normal Mode
- Up to 10ppm Mono, up to 6ppm Colour
- 1200 x 1200dpi Resolution
- 1 Year Exchange Warranty
- Free PhotoSuite III SE Software
- Windows 95, 98, NT4, 2000 & Mac
- Windows ME availability TBA



NEW

SHARP

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWPSH200	AJ1800 1200x1200dpi 10ppm Parallel/USB Multifunction	72.99	85.76

Sharp AJ2100

New Colour InkJet Photo Printer with 6 Separate Cartridge Print System

- 6 Cartridge Print System
- Low Running Costs
- No Ink Wastage
- Fast Print Speeds in Draft & Normal Mode
- Up to 8ppm Mono, up to 8ppm Colour
- 1200 x 1200dpi Resolution
- 1 Year Exchange Warranty
- Free Photo Suite III SE & SharpDesk Software
- Windows 98, 98, NT4, 2000 & Mac



NEW

SHARP

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWPSH210	AJ2100 1200x1200dpi 8ppm Parallel/USB Multifunction	160.99	189.16

Samsung ML6000 Series

This superb value range of 12ppm mono laser printers are ideally suited for use in small workgroup.

Features include a high 630 sheet (6060/N) paper capacity as standard, a 10/100Base T Ethernet (6060N) connection and a one piece toner drum for ease of use and added economy.

- 12 ppm printing speed
- 1200dpi class resolution
- Speedy 66MHz RISC processor
- 4MB-16MB memory as standard
- 40% Toner Save mode
- USB connectivity



ML6060 WINNER OF THE PC PRO "RECOMMENDED" AWARD

SAMSUNG

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWPS7021	Samsung ML6060 12ppm 1200dpi Mono Laser Printer	209.99	246.74
PWPS7022	Samsung ML6060N 12ppm Mono Laser Printer	299.99	352.49
PWPS7020	Samsung ML6040 12ppm 600x600 Mono Laser Printer	179.99	211.49

Samsung ML7300N

This network ready printer delivers a super fast 20ppm print speed and 1200dpi high quality prints. Flexible paper handling and duplex as standard make it the perfect choice for large workgroups.

- 20ppm single sided, 10ppm double sided printing
- 1200dpi print quality
- 16MB memory (expandable to 144MB)
- 600 sheet paper input (max. 1100 sheets)
- 10/100Base T Ethernet Interface
- Duplex as standard ■ Postscript level 3
- 1 year on-site warranty



SAMSUNG

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWPS7008	Samsung ML7300N 20ppm Mono Laser Printer	802.99	943.51
PWPS7005	Samsung ML7050 16ppm Mono Laser Printer	580.99	682.66

Panasonic KX-P6500

The 6ppm laser printer for workgroups

- Emulation: PCL4.5, Windows and LaserJet IIP
- Photo Enhancement and EET (GDI mode)
- Bi-directional parallel interface
- Resolution: 600x600 in GDI using EET. 300x300 in PCL mode
- Paper size: A4, A5, B5, letter, legal, executive, envelope and label
- Paper capacity: 100 sheets, 10 envelopes, 30 OHP transparencies & 30 labels
- 1 Year Exchange warranty



Panasonic

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWPL1110	Panasonic KX-P6500 PCL + GDI 600dpi Laser Printer	194.99	229.11

Lexmark Z43

Ultimate Photo Printing

The Lexmark Z43 is the printer of choice for home office and experienced users.

- Highest resolution printing on ALL media in both mono and colour - 2400 x 1200 dpi
- High speed printing - up to 12ppm black, 6ppm colour
- Mac and PC compatible
- Lexmark's unique system gives you a new printhead every time you change the cartridge, which is like getting a new printer each time
- RMN Print Gallery 4 CD included - works of art to print as cards, calendars and much more



NEW

LEXMARK Z43
Color Inkjet™

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWPL2052	Lexmark Colour Z43 Inkjet	Call	Emty!

Lexmark Z53

Professional Performance Printing - Business Class Results

The Lexmark Z53 is the perfect choice for business, home office or performance focused users and delivers fast professional results in both text and photo printing. With speeds up to 16ppm mono and 8ppm colour, the Z53 has the fastest mono speed in its class.

- Technology Leading superior resolution printing on ALL media in both mono and colour - 2400 x 1200 dpi
- Ease of use - one click installation and 'drop and load' cartridge change
- Four print modes - saves you time and money!
- Business Class speeds - up to 16ppm black, 8 ppm colour
- Pigmented black ink for sharp, deep, black text
- Document enhancing feature for professional results - duplex, posters, booklets and multi up



NEW

LEXMARK Z53
Color Inkjet™

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWPL2053	Lexmark Colour Z53 Inkjet	Call	Emty!
PWPL062	Lexmark Black Cartridge 12A1970	22.99	27.01
PWPL0149	Lexmark Hi-Resolution Colour Cartridge 15M0120	28.99	34.06

Code	Description	£ Ex VAT	£ Inc VAT
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CABLES

BELKIN

BI-DIRECTIONAL PARALLEL PRINTER CABLES

PWCB3001	Shielded Moulded DB25M/ Centronics 36M 1.8m	6.99	8.21
PWCB3003	Shielded Moulded DB25M/ Centronics 36M 3m	13.99	16.44
PWCB3004	Shielded Moulded DB25M/ Centronics 36M 4.5m	17.99	21.14

IEEE 1284 (A-B) DB25M/ CENTRONICS 36M

PWCB3009	IEEE 1284 Gold Printer Cable Moulded A-B 1.5m	19.99	23.49
PWCB3010	IEEE 1284 Gold Printer Cable Moulded A-B 3m	23.99	28.19
PWCB3011	IEEE 1284 Gold Printer Cable Moulded A-B 4.5m	28.99	34.06
PWCB3012	IEEE 1284 Gold Printer Cable Moulded A-B 7.5m	37.99	44.64
PWCB3013	IEEE 1284 Gold Printer Cable Moulded A-B 10m	39.99	46.99
PWCB3066	IEEE 1284 Printer Cable Moulded 18P Wire 1.8m A-B	14.99	17.61
PWCB3067	IEEE 1284 Printer Cable Moulded 18P Wire 3m A-B	16.99	19.96
PWCB3068	IEEE 1284 Printer Cable Moulded 18P Wire 5m A-B	19.99	23.49
PWCB3069	IEEE 1284 Printer Cable Moulded 18P Wire 10m A-B	28.99	34.06

IEEE 1284 (A-A) DB25M/ DB25M

PWCB3070	IEEE 1284 Bidirectional Cable Moulded 1.8m 18P Wire A-A	14.99	17.61
PWCB3071	IEEE 1284 Bidirectional Cable Moulded 5m 18P Wire A-A	19.99	23.49
PWCB3072	IEEE 1284 Bidirectional Cable Moulded 10m 18P Wire A-A	28.99	34.06

IEEE 1284 (A-C) DB25M/ MICRO CENTRONICS 36M

PWCB3005	IEEE 1284 Printer Cable Moulded A-C 1.5m	29.99	35.24
PWCB3006	IEEE 1284 Printer Cable Moulded A-C 1.8m	33.99	39.94
PWCB3007	IEEE 1284 Printer Cable Moulded A-C 4.5m	37.99	44.64

KEYBOARD ADAPTERS AND CABLES

PWCB3019	15cm Flexi Keyboard Adapter 6 Pin F/ 5 Pin M (PS/2 - AT)	5.99	7.04
PWCB3020	15cm Flexi Keyboard Adapter 5 Pin F/ 6 Pin M (AT - PS/2)	5.99	7.04
PWCB3021	Keyboard Adapter 5 Pin F/ 6 Pin M (AT - PS/2)	5.99	7.04

MOUSE ADAPTERS AND CABLES

PWCB3022	Mouse Adapter DB9M/ Mini Din 6 M (Serial - PS/2)	6.99	8.21
PWCB3023	Mouse Adapter Mini Din 6 F/ DB9F (PS/2 - Serial)	6.99	8.21

MONITOR CABLES

PWCB3031	Shielded Monitor Cable (VGA-SVGA) HDDB15 M/M 2m	27.99	32.89
PWCB3032	Shielded Monitor Cable (VGA-SVGA) HDDB15 M/M 3m	33.99	39.94
PWCB3033	Shielded Monitor Cable (VGA-SVGA) HDDB15 M/M 7.5m	44.99	52.86
PWCB3034	Shielded Monitor Cable (VGA-SVGA) HDDB15 M/M 15m	70.99	83.41

MONITOR EXTENSION CABLES

PWCB3093	VGA Mono Extension Cable HDDB15F/ HDDB15M 1.8m	9.99	11.74
PWCB3094	SVGA Monitor Extension Cable HDDB15F/ HDDB15M 2m	27.99	32.89
PWCB3095	SVGA Monitor Extension Cable HDDB15F/ HDDB15M 3m	32.99	38.76
PWCB3096	SVGA Monitor Extension Cable HDDB15F/ HDDB15M 7.5m	44.99	52.86
PWCB3097	SVGA Monitor Extension Cable HDDB15F/ HDDB15M 15m	70.99	83.41

SCSI INTERNAL CABLES

PWTHC1001	SCSI Peripheral Cable Centronics 50 M/M 0.5m	13.99	16.44
PWTHC1002	SCSI Peripheral Cable Centronics 50 M/M 1.8m	16.99	19.96
PWTHC1003	SCSI Extension Cable Centronics 50 M/F 1.8m	18.99	22.31

SCSI EXTERNAL CABLES

PWTHC1004	SCSI System Cable DB25M/Centronics 50M 1m	10.99	12.91
PWTHC1005	SCSI System Cable DB25M/Centronics 50M 1.8m	13.99	16.44
PWTHC1006	SCSI Cable Micro DB50 M/M 0.5m	14.99	17.61
PWTHC1007	SCSI Cable Micro DB50 M/M 1m	23.99	28.19
PWTHC1008	SCSI Cable Micro DB50 M/M 3m	36.99	43.46
PWTHC1009	SCSI Cable Micro DB50M/ Centronics 50M 0.5m	13.99	16.44
PWTHC1010	SCSI Cable Micro DB50M/ Centronics 50M 1m	20.99	24.66
PWTHC1011	SCSI Cable Micro DB50M/ Centronics 50M 1.8m	26.99	31.71
PWTHC1012	SCSI Cable Micro DB50M/ DB50M 1m	26.99	31.71
PWTHC2010	SCSI Cable DB50M/ DB50M 1.8m	36.99	43.46
PWTHC1014	SCSI II Cable Micro DB50M/ DB25M 1m	13.99	16.44
PWTHC1015	SCSI II Cable Micro DB50M/ DB25M 3m	19.99	23.49
PWTHC1016	SCSI DB50M/ Centronics 50M 1.2m	17.99	21.14
PWTHC1018	SCSI Cable Micro DB68M/ DB25M 1m	16.99	19.96
PWTHC1019	SCSI Cable Micro DB68M/ DB25M 3m	18.99	22.31
PWTHC1089	SCSI Cable Micro DB68M/ Micro DB50M 1m	29.99	35.24
PWTHC1090	SCSI Cable Micro DB68M/ Micro DB50M 2m	34.99	41.11
PWTHC1020	SCSI Cable Micro DB68M/ Centronics 50M 1m	16.99	19.96
PWTHC1021	SCSI Cable Micro DB68M/ Centronics 50M 3m	22.99	27.01
PWTHC1022	SCSI Cable Micro DB68M/ Micro DB68M 1m	30.99	36.41
PWTHC1023	SCSI Cable Micro DB68M/ Micro DB68M 1.8m	36.99	43.46

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PWNE7178	Cat 5 UTP Patch Cable Moulded/ Snagless 0.5m Grey	3.99	4.69
PWNE7166	Cat 5 UTP Patch Cable Moulded/ Snagless 1m Grey	4.99	5.86
PWNE7180	Cat 5 UTP Patch Cable Moulded/ Snagless 1m Black	4.99	5.86
PWNE7167	Cat 5 UTP Patch Cable Moulded/ Snagless 2m Grey	5.99	7.04
PWNE7811	Cat 5 UTP Patch Cable Moulded/ Snagless 2m Green	5.99	7.04
PWNE7168	Cat 5 UTP Patch Cable Moulded/ Snagless 3m Grey	6.99	8.21
PWNE7802	Cat 5 UTP Patch Cable Moulded/ Snagless 3m Red	6.99	8.21
PWNE7803	Cat 5 UTP Patch Cable Moulded/ Snagless 3m Yellow	6.99	8.21
PWNE7804	Cat 5 UTP Patch Cable Moulded/ Snagless 3m Green	6.99	8.21
PWNE7805	Cat 5 UTP Patch Cable Moulded/ Snagless 3m Blue	6.99	8.21
PWNE7169	Cat 5 UTP Patch Cable Moulded/ Snagless 5m Grey	7.99	9.39
PWNE7806	Cat 5 UTP Patch Cable Moulded/ Snagless 5m Red	7.99	9.39
PWNE7807	Cat 5 UTP Patch Cable Moulded/ Snagless 5m Yellow	7.99	9.39
PWNE7808	Cat 5 UTP Patch Cable Moulded/ Snagless 5m Green	7.99	9.39
PWNE7809	Cat 5 UTP Patch Cable Moulded/ Snagless 5m Blue	7.99	9.39
PWNE7171	Cat 5 UTP Patch Cable Moulded/ Snagless 10m Grey	10.99	12.91
PWNE7810	Cat 5 UTP Patch Cable Moulded/ Snagless 15m Blue	20.99	24.66
PWNE7172	Cat 5 UTP Patch Cable Moulded/ Snagless 15m Grey	20.99	24.66
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PWNE2008 Systemax NE2000 Compatible 32 Bit Combo Card PCI 10.99 12.91

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PWNE2661 OfficeConnect 10/100 PCI 3C50HO100-TX 19.99 23.49

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PWNE6575 Fast EtherLink Server Card 10/100 PCI 3C980C-TXM 64.99 76.36

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PWNE4446 AT2500TX-ACPI Card PCI RJ45 10/100-TX 9.99 11.74

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PWNE0956 DE528CT PCI Ethernet Card BNC/TP 11.99 14.09

PWNE3911 DFE530TX 10/100 PCI RJ45 15.99 18.79

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PWNE4340 FA311 10/100 UTP PC 2000 PCI 12.99 15.26

PWNE4828 EA101c USB to 10BaseT Adapter RJ45 (Win 98 Only) 26.99 31.71

SITECOM

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SMC

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D-LINK

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PWNE0407 Network Flyer 10/100Base-TX Cardbus 82.99 97.51

XIRCOM

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PWNE2217 Network CardBus Ethernet 10/100BaseTX RJ45 91.99 108.09

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BUFFALO TECHNOLOGIES

PWNE9301 AirStation ISA Adapter (PCMCIA Card needed) 42.99 50.51

PWNE9302 AirStation PCI Adapter (PCMCIA Card needed) 42.99 50.51

PWNE9303 AirStation PCMCIA Card 99.99 117.49

PWNE9304 AirStation Wireless Bridge (10/100 LAN interface) 249.99 293.74

PWNE9305 AirStation 56K Home Wireless Gateway 234.99 276.11

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PWNE2513 ZoomAir 11Mbps PCMCIA Wireless NIC 122.99 144.51

PWNE2514 ZoomAir 11Mbps PCI Card Wireless NIC 166.99 196.21

PWNE2516 ZoomAir Access Point Software 65.99 77.54

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PWNE2086 Simply 8 Port TP (8xRJ45 1xBNC) Mini Type 19.99 23.49

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PWNE9930 Hub TP4 4x10BaseT Ports 3C16704A 25.99 30.54

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D-LINK

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PWNE9916 Fast Hub TP400 4x100BaseTX 3C16723A 74.99 88.11

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PWNE2241 Express 330T 16 Port Auto 10/100 Hub 334.99 393.61

PWNE2243 Express 330T 24 Port Auto 10/100 Hub 489.99 575.74

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PWNE4807 DS104 4x10/100 Compact Hub 45.99 54.04

PWNE4806 DS108 8x10/100 Compact Hub 63.99 75.19

Belkin SurgeMaster™

Belkin Surge Protectors are guaranteed to protect your connected equipment from all over voltages, even lightning strikes. All Belkin Surge Protectors come with a Connected Equipment Warranty. We will repair or replace any devices that are damaged by a surge or spike whilst properly connected to a Belkin Surge Protector.

Features:

- EMI/RFI Filtration
- Blocks space to allow AC adapters to be plugged into the surge without losing the neighbouring socket
- Thermal Fuses for added safety
- Surge protected and earthed Indicators



Buffalo



Buffalo 11Mbps 2.4GHz Wireless LAN

- Up to 253 Users
- Internet Sharing Function
- Bridge Modem & ADSL versions
- Up to 200m indoors, 4000m outdoors
- Internal NAT Router
- DHCP Function

Buffalo Switch LSW10/100-16H

- 10/100 Auto-Negotiation
- 4.2GB Backplane
- Supports Full/Half Duplex up to 200Mbps
- 32,768 MAC address table (self learning)
- Manufacturers 25 year warranty

IBM UPS and TRIPP LITE UPS

Office Professional UPS Systems

- Modem/Fax Surge Protection
- OP7001 - Serial port with free software

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- Automatic Voltage Regulation
- 500 & 700 VA Serial Port with free software

Network Professional UPS Systems

- Serial Ports with free software
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APC

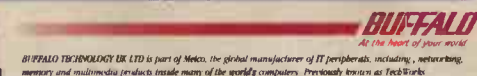
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- Cellguard - intelligent battery management
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8 Way-SurgeMaster™

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
	Maximum Grade		
PWSP9031	Surge Master 8 Way 2m Cord + Tel CEW 30000	33.99	39.94
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PWSP9033	Surge Master 8 Way 2m Cord + Tel/Coax CEW 30000	41.99	49.34
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PWSP9023	Surge Master 4 Way + Tel Protection 2m Cord CEW 3000	21.99	25.84
PWSP9024	Surge Master 4 Way + Tel Protection 4m Cord CEW 3000	24.99	29.36
PWSP9025	Surge Master 5 Way 2m Cord CEW 10000	17.99	21.14
PWSP9026	Surge Master 5 Way 2m Cord + Tel Protection CEW 10000	25.99	30.54
PWSP9027	Surge Master 5 Way 4m Cord + Tel Protection CEW 10000	29.99	35.24



BUFFALO TECHNOLOGY UK LTD is part of Mexico, the global manufacturer of IT peripherals, including, networking, memory and multimedia products inside many of the world's computers. Previously known as TechWorks.

CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWNE9301	AirStation ISA Adapter (PCMCIA Card needed)	42.99	50.51
PWNE9302	AirStation PCI Adapter (PCMCIA Card needed)	42.99	50.51
PWNE9303	AirStation PCMCIA Card	99.99	117.49
PWNE9304	AirStation Wireless Bridge (10/100 LAN interface)	249.99	293.74
PWNE9305	AirStation 56K Home Wireless Gateway	234.99	276.11
PWNE9306	AirStation Bridge with Router Function	279.99	328.99
PWNE9309	AirStation External High Gain Antenna	66.99	78.71
PWNE9310	AirStation Wall Mount Kit	29.99	35.24
PWNE9333	Buffalo PCI RJ45 10/100 Network Card LGE-PCI-TXC-3	12.99	15.26
PWNE9321	Buffalo PCMCIA RJ45 10/100 Card	41.99	49.34
PWNE9322	Buffalo Cardbus RJ45 10/100 Card	44.99	52.86
PWNE9327	Buffalo 8 Port UTP 8xRJ45 Desktop Hub	36.99	43.46
PWNE9338	Buffalo 8 Port 10/100 Port Unmanaged Switch	74.99	88.11
PWNE9336	Buffalo 8 Port 10/100 Desktop Unmanaged Switch	95.99	112.79
PWNE9325	Buffalo 8 Port 10/100 Desktop Switch	128.99	151.56
PWNE9334	Buffalo 16 Port 10/100 Compact Switch	149.99	176.24
PWNE9326	Buffalo 16 Port 10/100 Desktop Switch	191.99	225.59

Tripp Lite UPS

Smartpro Rackmount

- Automatic Voltage Regulator
- Free Power Alert Software
- Up to 18 different LED Displays
- Battery Replacement Door



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PWNE1205	Office Professional OP3000 3000VA UPS	47.99	56.39
PWNE1210	Office Professional OP5000 5000VA UPS	59.99	70.49
PWNE1215	Office Professional OP7000 7000VA UPS	99.99	117.49
PWNE1220	Office Professional AVR OP3000AVR 3000VA UPS	75.99	89.29
PWNE1225	Office Professional AVR OP5000AVR 5000VA UPS	99.99	117.49
PWNE1230	Office Professional AVR OP7000AVR 7000VA UPS	139.99	164.49
PWNE1235	Network Professional NP4500RT 4500VA UPS	119.99	140.99
PWNE1240	Network Professional NP7000 7000VA UPS	169.99	199.74
PWNE1261	Tripp Lite SmartPro 700 Rackmount UPS 700VA	224.99	264.36
PWNE0001	Tripp Lite SmartPro 1000 Rackmount UPS 1000VA	209.99	246.74
PWNE1263	Tripp Lite SmartPro 1400 Rackmount UPS 1400VA	269.99	317.24



Legendary Reliability™

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PWNE6051	Back UPS Pro 2800i	77.99	91.64
PWNE6052	Back UPS Pro 4200i	96.99	113.96
PWNE6053	Back UPS Pro 6500i	132.99	156.26

NEW Etherlink 10/100 PCI NIC with 56-bit Encryption

A new generation of fast ethernet NICs uniquely optimised for Windows 2000 to reduce CPU utilisation and enhance performance by off-loading TCP/IP networking tasks from the host system to the NIC's onboard 3XP processor.

- Easy installation & configuration with EtherCD™ CD-ROM
- Auto senses 100BaseTX or 10BaseT networks
- Parallel Tasking Technology for max throughput
- Remote start up and SNMP manageability
- Lifetime Warranty

MULTI-PACKS AVAILABLE, PLEASE CALL FOR DETAILS

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWNE2659	Fast Etherlink 10/100 PCI RJ45 3C905C-TX-M	42.99	50.51
PWNE9973	Etherlink Security Card 10/100 PCI RJ45 3C9900-TX-95	58.99	69.31
PWNE9906	Fast Etherlink 10/100 Combo PCI 3C905B	81.99	96.34
PWNE2661	OfficeConnect 10/100 PCI 3C90H0-100-TX	19.99	23.49
PWNE0004	EtherLink 10BaseT PCI 3C900B-TPO	33.99	39.94
PWNE0011	EtherLink 10BaseT PCI Combo 3C900B	78.99	92.81

3Com 10/100 LAN Type III PC Card

The 3Com 10/100 LAN CardBus Type III PC Card enables complete control from your desktop and an integrated LAN Connector for guaranteed compatibility

- 100Mbps Fast Ethernet performance in 32-bit CardBus notebooks
- Integrated LAN connector
- Lower power consumption
- Dynamic Access Technology



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWNE4055	Megahertz 10/100 LAN Type III PCMCIA 3C3FB574BT	89.99	105.74
PWNE4065	Megahertz 10/100 LAN Type III Cardbus 3C3FE575CT	92.99	109.26
PWNE4060	Megahertz 10/100+56K Modem Type III Cardbus	159.99	187.99
PWNE2694	Megahertz XJACK 10/100 LAN PCMCIA 3CXFE574BT	84.99	99.86
PWNE4105	Megahertz XJACK 10/100 LAN Cardbus 3CXFE575CT	89.99	105.74
PWNE9993	OfficeConnect XJACK 10/100 LAN PC Card 3CXSH572BT	56.99	66.96
PWNE2676	Megahertz XJACK 10B-T PCMCIA 3CXSE589ET	85.99	101.04
PWNE2675	Megahertz XJACK 10B-T Combo PCMCIA 3CXSE589EC	109.99	129.24

Hubs, Switches and Firewall Security

3Com's OfficeConnect products are designed to be compact and quiet, ideal for use in small offices.

- Fanless power supply for silent running
- Easy to use and install with the Network Assistant CD-ROM shipped with all products
- Supports Novell Netware, Microsoft Windows NT and other leading network operating systems
- Limited Lifetime Warranty



3COM

The OfficeConnect Internet Firewalls offer affordable Internet security for the LAN by denying unauthorised access and preventing DoS hacker attacks.

- Free one month trial of OfficeConnect website filter

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWNE9931	Hub TP4 Combo 4x10BaseT & 1xBNC/AUI 3C16703A	48.99	57.56
PWNE9932	Hub 8TP0 8x10BaseT 3C16700A	34.99	41.11
PWNE9933	Hub 8TPC 8x10BaseT & 1xBNC 3C16701A	64.99	76.36
PWNE9934	Hub TP16C 16x10BaseT & 1xBNC 3C16702A	79.99	93.99
PWNE9935	Dual Speed Hub 8x10/100BaseTX 3C16750B	74.99	88.11
PWNE4133	Dual Speed Hub 16x10/100BaseTX 3C16751B	128.99	151.56
PWNE9947	Switch 800 8x10/100BaseTX 3C16734B	86.99	102.21
PWNE9945	Switch 1600 16x10/100BaseTX 3C16735B	184.99	217.36
Firewalls			
PWNE9942	OfficeConnect Internet Firewall 25 - Up To 25 Users	299.00	351.33
PWNE9943	OfficeConnect Internet Firewall DMZ - Up To 100 Users	649.00	762.58
PWNE9941	OfficeConnect Website Filter for Internet Firewalls	99.99	117.49

D-Link

D-Link is a worldwide leader in network hardware that offers a complete solution for small to the large networks

We offer a large range of Ethernet and fast Ethernet hubs both managed and unmanaged devices. Our palm sized 10/100Mbps hubs with 4 or 5 ports offer a low cost network solution for SOHO users. For the larger workgroups we have a complete range of managed and unmanaged devices from 8 to 24 ports.



D-Link
Building Networks for People

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWNE3911	D-Link DFE530TX 10/100 PCI RJ45	13.99	16.44
PWNE2454	D-Link DFE680TCD 10/100 Cardbus RJ45 Direct Port	62.99	74.01
PWNE2429	D-Link DFE908DX 8 Port 10/100 Hub	93.99	110.44
PWNE2396	D-Link DES100SD 5x10/100 N-Way Switch	69.99	82.24
PWNE2408	D-Link DES1008 8x10/100 N-Way Rackmount Switch	149.99	176.24
PWNE2445	D-Link DES1016D 16x10/100 N-Way Desktop Switch	219.99	258.49
PWNE2450	D-Link DES1024R 24x10/100 N-Way Desktop Switch	349.99	411.24

USB to Fast IrDA

Wireless infra-red communication

The USB to infrared adapter is generally recognised in Windows.

- Works with all infra-red equipment
- Fully compatible with the USB v1.1 and IrDA v1.1 standard
- Supports standard Infrared and fast Infra-red connections of 115 Kbps to 4 Mbps data transfer.
- DMA data transfer between IrDA Tx/Rx buffer and USB Rx/Tx buffer for optimum data transfer.
- Windows 98/2000/ME compatible
- Including user manual



SITECOM

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWUC0215	USB to Fast IrDA (Infra Red) Adapter	41.99	49.34

Intel® Management Adapter

Intel® PRO/100+ Management Adapter

- Fast, manageable 10/100 network connections
- Improve network response time and reduce support costs
- Pre-installed PRO/100 Boot Agent for deploying and upgrading PCs remotely and Wired for Management (WfM) 2.0
- Intel® PROSet utility for easy installation and configuration
- 10/100 autosensing and full duplex operation
- Adaptive technology for optimising network performance



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWNE2366	Intel PRO 100S Desktop Security PCI Card + Encrypt	47.99	56.39

Firewire Desktop Kit

Edit your own home video on your PC

With this kit you can connect your digital video camera directly to your PC, and import video fragments in the video-editing software provided with this kit. The software has all the features necessary to enable you to quickly and easily edit unprocessed recordings with excellent results.



SITECOM

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWIS2405	Firewire Desktop Kit	49.99	58.74

Code Description £ Ex VAT £ Inc VAT

FAST ETHERNET HUBS (CONT.)

SMC

PWNE1050	5605DS 5 Port 10/100B-TX Dual Speed Hub	59.99	70.49
PWNE1048	5608DS 8 Port 10/100B-TX Dual Speed Hub	69.99	82.24

UNMANAGED SWITCHES

SIMPLY UNMANAGED SWITCHES

PWNE8010	Simply 8 10/100 UTP Port Unmanaged Switch	62.99	74.01
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3COM OFFICECONNECT SWITCHES

PWNE9938	Switch 400 4x10/100BaseTX 3C16733A	64.99	76.36
PWNE9939	Switch 800 8x10/100BaseTX 3C16734A	89.99	105.74
PWNE9945	Switch 1600 16x10/100BaseTX 3C16735B	184.99	217.36

BUFFALO TECHWORKS

PWNE9325	Buffalo 8 Port 10/100 Desktop Switch	128.99	151.56
PWNE9326	Buffalo 16 Port 10/100 Desktop Switch	191.99	225.59

DYNAMET

PWNE3225	Dynamet 16 Port 10/100 Switch SW160010-RD	152.99	179.76
PWNE3226	Dynamet 24 Port 10/100 Switch 4 Module Ports	229.99	270.24

INTEL UNMANAGED SWITCHES

PWNE4793	InBusiness 4 Port 10/100 Switch	65.99	77.54
PWNE2750	InBusiness 8 Port 10/100 Switch	89.99	105.74

NETGEAR

PWNE4338	FS105 5x10/100 Compact Switch	51.99	61.09
PWNE4331	FS108 8x10/100 Compact Switch	69.99	82.24

SITECOM

PWNE5405	NesSwitch 8x10/100 Port Unmanaged Switch	79.99	93.99
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SMC SWITCHES

PWNE1038	EZ-108DT 8x10/100 Fast Ethernet Switch	69.99	82.24
PWNE1039	EZ-1016DT 16x10/100 Fast Ethernet Switch	124.99	146.86
PWNE1040	EZ-1024 24x10/100 Fast Ethernet Switch	219.99	258.49

3COM SUPERSTACK 3

PWNE4035	Switch 3300XM SS3 24x10/100B-TX 3C16985B	579.99	681.49
PWNE4026	Switch 3300TM SS3 24x10/100 1x1000B-T 3C16986A	929.99	1092.74
PWNE4027	Switch 3300SM SS3 24x10/100 1x1000B-SX 3C16987A	1049.99	1233.74
PWNE4028	Switch 3300MM SS3 24x10/100+3x Matrix 3C16988A	1049.99	1233.74

CISCO

PWNE6668	Catalyst 2924XL-EN 24x10/100Mbps Port Switch	859.99	1010.49
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INTEL MANAGED SWITCHES

PWNE9419	Express 460T Standalone Switch 16 Port 10/100	578.99	680.31
PWNE9420	Express 460T Standalone Switch 24 Port 10/100	720.99	847.16
PWNE2164	Express 520T Switch 12 port 10/100 Mbps	759.99	892.99
PWNE2163	Express 510T Switch 24 port 10/100 Mbps	1098.99	1291.31

LAN MODEMS

3COM LAN MODEM/ROUTER

PWNE4998	OfficeConnect LAN Modem ISDN 4x10Mbs 3C891A	198.99	233.81
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NETGEAR

PWNE4342	RT338 ISDN IP Router 1x10/100 2xAnalogue Ports	205.99	242.04
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ZYXEL

PWNE0855	Prestige 100H ISDN Router+4x10Mbs Hub+2xPOTS	215.99	253.79
PWNE0850	Prestige 201 10B-T IP ISDN Router+4 Port Hub	170.99	200.91
PWNE0860	Prestige 202 10/100 IP ISDN Router+2 Analogue Port	225.99	265.54

EMAIL SERVERS

TIXI ANALOGUE

PWMD5035	Mail Box Network Edition 56k V90+5 Client Licences	179.99	211.49
PWMD5032	Mail Box Pro + 56k V90 + 5 Client Licences	203.99	239.69

TIXI ISDN

PWMD5039	Mail Box Network Edition 128K ISDN+5 Client Licences	179.99	211.49
PWMD5034	Mail Box Pro 128K ISDN+5 Client Licences	203.99	239.69

PRINT SERVERS

AXIS

PWNE3706	5400 1xParallel Port 10/100Mbps	124.99	146.86
PWNE3707	5600 2xParallel 1xSerial 10/100Mbps	159.99	187.99

INTEL PRINT SERVERS

PWNE6613	Netport Express 10/100 1 Parallel Port External	128.99	151.56
PWNE6612	Netport Express 10/100 3 Parallel Ports External	194.99	229.11

KVM SWITCHES

ADDER

ADDERVIEW

PWKV0050	AdderView 2 Personal 2 Port KVM Switch	128.99	151.56
PWKV0060	AdderView 4 Personal 4 Port KVM Switch	154.99	182.11

ADDERVIEW OSD

PWKV0055	AdderView 4 OSD 4 Port KVM Switch	298.99	351.31
PWKV0065	AdderView 8 OSD 8 Port KVM Switch	340.99	400.66

SMARTVIEW

PWKV0070	SmartView 2 Desktop 2 Port KVM Switch	255.99	300.79
PWKV0075	SmartView 4 Desktop 4 Port KVM Switch	342.99	403.01

ADDER KVM ACCESSORIES

PWKV0064	KVM Cable Kit 2m	22.99	27.01
PWKV0066	KVM Cable Kit 5m	41.99	49.34

UPS SYSTEMS

APC BACK UPS

PWNE6009	Back UPS 3000M (300VA)	48.99	57.56
PWNE6012	Back UPS 5000M (500VA)	58.99	69.31

No Software Included

APC BACK UPS PRO

PWNE6052	Back UPS Pro 420SI	96.99	113.96
PWNE6053	Back UPS Pro 650SI	132.99	156.26
Inc. PowerChute Plus Software for Windows Applications APC Smart UPS			
PWNE6078	Smart UPS 420INET	104.99	123.36
PWNE6077	Smart UPS 700INET	174.99	205.61

BELKIN

PWNE7090	Regulator Pro Gold Series 325VA UPS CEW £30,000	58.99	69.31
PWNE7091	Regulator Pro Gold Series 425VA UPS CEW £40,000	74.99	88.11
PWNE7092	Regulator Pro Gold Series 525VA UPS CEW £50,000	84.99	99.86
PWNE7093	Regulator Pro Gold Series 625VA UPS CEW £60,000	98.99	116.31

LIEBERT POWERSURE PERSONAL

PWNE6877	Powersure Personal 300VA	48.99	57.56
PWNE6878	Powersure Personal 500VA	68.99	81.06

LIEBERT POWERSURE PROACTIVE

PWNE6881	Powersure Proactive 350 VA Minitower	89.99	105.74
PWNE6883	Powersure Proactive 700 VA Minitower	148.99	175.06

software:

Code	Description	£ Ex VAT	£ Inc VAT
PWMS0000	MS Access 2002 Win32 CD	240.99	283.16
PWMS0003	MS Access 2002 Win32 VUP CD	99.99	117.49
PWSR0002	MS AutoRoute Express 2001 GB & Europe CD	39.99	46.99
PWSN0147	MS BackOffice SBS 2000 20 users Add on 3.5"	668.99	786.06
PWSN0148	MS BackOffice SBS 2000 5 users Add on 3.5"	199.99	234.99
PWSN0149	MS BackOffice SBS 2000 5 users Add on 3.5" Upg	108.99	128.06
PWSOP317	MS BackOffice SBS 2000 CD DVD 5 users	1139.99	1339.49
PWSOP326	MS BackOffice SBS 2000 CUP CD DVD 5 users	614.99	722.61
PWSOP319	MS BackOffice SBS 2000 P Upg 4.5 CD DVD 5 users	514.99	605.11
PWSOP318	MS BackOffice Server 2000 CD/DVD 5 User	2599.99	3054.99
PWSOP323	MS BackOffice Server 2000 PUP CD/DVD 5 User	2149.99	2526.24
PWSOP325	MS BackOffice Server 2000 VUP CD/DVD 5 User	1349.99	1586.24
PWMS0004	MS Excel 2002 Win32 CD	241.99	284.34
PWMS0007	MS Excel 2002 Win32 VUP CD	79.99	93.99
PWMS0060	MS Exchange Conferencing Server 2000 CD	3499.99	4112.49
PWSN0818	MS Exchange Server 2000 5 Cti C Upg CD	688.99	809.56
PWSN0815	MS Exchange Server 2000 5 Cti C Upg CD	909.99	1069.24
PWSN0819	MS Exchange Server 2000 V Upg CD	449.99	528.74
PWSN0064	MS Exchange Server Ent 2000 P Upg CD	3899.99	4582.49
PWSN0826	MS Exchange Server Ent 2000 V Upg	2449.99	2878.74
PWMS0008	MS FrontPage 2002 Win32 CD	113.99	133.94
PWMS0011	MS FrontPage 2002 Win32 VUP CD	59.99	70.49
PWSGD350	MS Greetings 2001	14.99	17.61
PWSM0077	MS MapPoint 2002 Win32 CD	149.99	176.24
PWSA0036	MS Money 2001	20.49	24.08
PWSA0038	MS Money Business 2001 Financial Suite	47.99	56.39
PWSA0037	MS Money Deluxe 2001	33.99	39.94
PWSL0302	MS MSDN Library 6.0 CD	121.99	143.34
PWSL0301	MS MSDN Pro 6.0 CD	429.99	505.24
PWMS0085	MS MSDN Pro 6.0 Win32 CD Renewal	322.99	379.51
PWSL0300	MS MSDN Universal 6.0 CD	1549.99	1821.24
PWSL0303	MS MSDN Universal 6.0 Renewal	1254.99	1474.61
PWSI0177	MS Office Personal Portfolio 2001	16.99	19.96
PWSI0175	MS Office XP Dev	614.99	722.61
PWSI0176	MS Office XP Dev Upg	379.99	446.49
PWSI0172	MS Office XP Pro	449.99	528.74
PWSI0002	MS Office XP Pro or Office 2000 Pro for Students	96.99	113.96
PWSI0173	MS Office XP Pro Upg	234.99	276.11
PWSI0174	MS Office XP Pro Upg Special Edition	299.99	352.49
PWSI0168	MS Office XP Standard	372.99	438.26
PWSI0171	MS Office XP Standard Upg	169.99	199.74
PWMS0098	MS Outlook 2002 Win32 CD	79.99	93.99
PWMS0100	MS Personal Collection 2001 Win32 UK/Ireland CD	32.99	38.76
PWMS0102	MS PowerPoint 2002 Win32 CD	239.99	281.99
PWMS0103	MS PowerPoint 2002 Win32 VUP CD	79.99	93.99
PWSPO021	MS Project 2000	314.99	370.11
PWSPO022	MS Project 2000 Upg	129.99	152.74
PWMS0111	MS Project 4.0 for Windows English Int'l 3.5	307.99	361.89
PWSI5215	MS Proofing Tools 2000 CD W NT	51.99	61.09
PWSN5023	MS Publisher 2000	70.99	83.41
PWMS0133	MS Publisher 2000 Win32 VUP CD	42.99	50.51
PWSN5509	MS SQL Server 2000 Dev Edition CD	349.99	411.24
PWSN5500	MS SQL Server 2000 Standard Edition CD	3309.99	3889.24
PWSN5502	MS SQL Server 2000 Standard Edition CD 10 Cti	1639.99	1926.99
PWSN5503	MS SQL Server 2000 Standard Edition CD 5 Cti	1099.99	1292.49
PWSN5504	MS SQL Server 2000 Standard Edition CVUP CD	1699.99	1997.49
PWSN5505	MS SQL Server 2000 Std Edition CVUP CD 5 Cti	543.99	639.19
PWMS0183	MS Visio Pro 2002 Win32 CD	294.99	346.61
PWMS0185	MS Visio Pro 2002 Win32 VUP CD	149.99	176.24
PWMS0195	MS Visio Std 2002 Win32 CD	130.99	153.91
PWMS0197	MS Visio Std 2002 Win32 VUP CD	64.99	76.36
PWSL0060	MS Visual Basic Pro 6	349.99	411.24
PWSL0066	MS Visual Basic Pro 6 Upg	169.99	199.74
PWSL0056	MS Visual Basic Standard V6	63.99	75.19
PWSL0057	MS Visual Basic Standard V6 Upg	38.99	45.81
PWSL0097	MS Visual C++ - Pro V6	348.99	410.06
PWSL0098	MS Visual C++ - Pro V6 Upg	173.99	204.44
PWSL0080	MS Visual C++ - Standard V6	64.99	76.36
PWSL0081	MS Visual C++ - Standard V6 Upg	36.99	43.46
PWSL0067	MS Visual FoxPro Pro V6	348.99	410.06
PWSL0036	MS Visual FoxPro Pro V6 Upg	174.99	205.61
PWSL0314	MS Visual Inter Dev Pro V6	348.99	410.06
PWSL0315	MS Visual Inter Dev Pro V6 C V Upg	177.99	209.14
PWSL0092	MS Visual J++ - Pro V6	344.99	405.36
PWSL0093	MS Visual J++ - Pro V6 Upg	139.99	164.49
PWSL0090	MS Visual J++ - Standard V6	66.99	78.71
PWSL0091	MS Visual J++ - Standard V6 Comp / Version Upg	36.99	43.46
PWMS0205	MS Visual Source Safe 6.0 C V Upg	173.99	204.44
PWSL0096	MS Visual Source Safe V6	348.99	410.06
PWSL0021	MS Visual Studio 6.0	64.99	76.36
PWSL0310	MS Visual Studio Pro V6	688.99	809.56
PWSL0311	MS Visual Studio Pro V6 C V Upg	328.99	386.56
PWSOP300	MS Windows 2000 Pro	228.99	269.06
PWSOP302	MS Windows 2000 Pro P Upg 95/98	152.99	179.76
PWSOP301	MS Windows 2000 Pro V Upg 3.51/4.0	93.99	110.44
PWSOP310	MS Windows 2000 Server C UP CD 10 Clients	384.99	452.36
PWSOP309	MS Windows 2000 Server C UP CD 5 Clients	344.99	405.36
PWSOP304	MS Windows 2000 Server CD 10 Clients	828.99	974.06
PWSOP303	MS Windows 2000 Server CD 5 Clients	703.99	827.19
PWSOP307	MS Windows 2000 Server V UP CD 10 Clients	391.99	460.59
PWSOP306	MS Windows 2000 Server V UP CD 5 Clients	344.99	405.36
PWSOP151	MS Windows 98 Full Product 2nd Ed CD	114.99	135.11
PWSOP161	MS Windows 98 Upg 2nd Ed CD	61.99	72.84
PWSOP321	MS Windows ME Millennium Edition	112.99	132.76
PWSOP324	MS Windows ME Upg From 95/98	58.99	69.31
PWSL0014	MS Windows Millennium Edition for Students	46.99	55.21
PWMS0230	MS Word 2002 Win32 CD	236.99	278.46
PWMS0231	MS Word 2002 Win32 VUP CD	59.99	70.49
PWSI5212	MS Works 6.0	45.99	54.04
PWSI5213	MS Works Suite 2001 Upg	72.99	85.76

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PWSC1292	Flash 5 FreeHand 10 Studio	Call	Call
PWSC1293	Flash 5 FreeHand 10 Studio Upg from Flash 4/5	Call	Call
PWSC1294	Flash 5 FreeHand 10 Studio Upg from Freehand 7/8/9	Call	Call

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- Locate any file by title, keywords, annotations, URL and content



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CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWSCR048	PaperPort Deluxe V7 CD	24.99	29.36

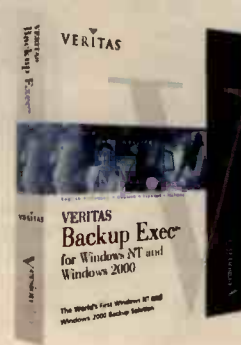
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PWSGD005	Corel DRAW 10.0 Upgrade	158.99	186.81

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PWSPL301	Orland Delphi 6 Professional	Call	

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Sage Actively Supporting Business

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSA0167	Sage Instant Accounting v6.02	126.99	126.99
PWSA0367	Sage Line 50 Accountant V7 (Windows) CD	394.99	464.11
PWSA0368	Line 50 Accountant Plus V7 (Windows) CD	577.99	679.14

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Sage Actively Supporting Business

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSA022	Sage Instant Payroll V6.01	126.81	149.00
PWSA0170	Sage Financial Suite V6.01	211.99	249.09
PWSA0369	Sage Line 50 Financial Controller V7 (Windows) CD	839.99	986.99
PWSA0370	Line 50 Financial Controller V7 Network CD	1726.99	2029.21

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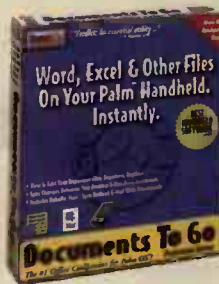
CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSGV102	Video Studio 5.0	59.99	70.49

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PWSHH010	Documents To Go Pro for Palm v3.0	64.99	76.36

software:

Code	Description	£ Ex VAT	£ Inc VAT
ADAPTEC			
PWSCR400	Adaptec Go Back 2.2 95/98 ME CD	41.99	49.34
ADOBE			
PWSG0133	Acrobat Capture V2 for Win 95 CD	488.18	573.61
PWSG5324	Acrobat v5 for Win 3.1 & 95 & nt cd	199.00	233.83
PWSG5325	Acrobat v5 Upg Win 3.1 & 95 & nt cd	84.99	99.86
PWSGD300	After Effects Pro v4.1 CD NT98	1184.99	1392.36
PWSG0169	Dynamic Media Collection	1089.99	1280.74
PWSDP010	FrameMaker V6	598.99	703.81
PWSDP011	FrameMaker V6 Upg	164.99	193.86
PWSD0201	Go Live V5	234.99	276.11
PWSD0057	Illustrator V9 for Win 98/NT/2000 CD	314.99	370.11
PWSD0058	Illustrator V9 for Win 98/NT/2000 Upg CD	119.99	140.99
PWSD0063	PageMaker V6.5 Plus Win95/NT4 CD	391.42	459.92
PWSD0061	PageMaker Ver U/G V6.5 Plus Win 95 CD	68.99	81.06
PWSD0124	Photo Deluxe Business Edition for Win95 CD	51.99	61.09
PWSD0150	Photo Deluxe Home V4.0	33.99	39.94
PWSD3000	Photo Shop V6 for Win 95 & NT CD	478.99	562.81
PWSG1300	Premier 6	444.99	522.86
PWSD0039	Publishing Collection 9	749.99	881.24
PWSD0332	Type Manager Deluxe V4.1 for Win NT CD	47.99	56.39
AHEAD			
PWSU2099	Nero 5 CD Recording Software 95/98/NT 4	28.99	34.06
AUROLOG			
PWSTL003	Tell Me More French - Beginner	31.99	37.59
PWSTL004	Tell Me More French - Intermediate	29.99	35.24
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PWSD3000	Autrix Technical 2000 (No Manual)	204.99	240.86
PWSD3001	Autrix Technical 2000 Upg (No Manual)	60.43	71.01
PWSCAD000	AutoCAD 2000	Call	
PWSCAD001	AutoCAD 2000i	Call	
PWSCA038	AutoCAD LT 2000i Upg LT97/LT98/LT2000 CD	139.99	164.49
PWSCA034	AutoCAD LT 2000i Win98/NT CD	441.99	519.34
PWSCA036	Autosketch R7 for Win 95/98/NT CD	78.99	92.81
PWSCA037	Autosketch R7 Version Upg W95/98/NT CD	42.99	50.51
PWSCA039	QuickCad 7 Millennium Edition W95/98/NT 4 CD	33.99	39.94
PWSD3002	Symbols 2000 Architectural Series CD NT9x	124.99	146.86
PWSD3003	Symbols 2000 Mechanical Series CD NT9x	131.99	155.09
PWSCA048	Autodesk Volo View	128.99	151.56
PWSCA049	Autodesk Volo View Upg	38.99	45.81
BORLAND			
PWSL5035	C++ Builder 5 Professional Scholar	94.99	111.61
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PWSL5017	Delphi 5 Professional Scholar for Win 95 CD	84.99	99.86
PWSL0027	Delphi 5 Student for Win 95 CD	48.99	57.56
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PWSTR308	Easy Tutor - Learn Lotus SmartSuite Millennium	14.99	17.61
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PWSTR305	Easy Tutor - Learn Windows 98	14.99	17.61
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PWSCD000	WinOnCD 3.7 Power Edition W95/98/NT/2000	24.99	29.36
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PWSFC102	Art Explosion 600,000 Images CD	24.99	29.36
PWSFC101	Art Explosion 600,000 Images DVD	44.99	52.86
PWSG5181	Bryce 4 for Win 95/NT and MAC CD	149.99	176.24
PWSG5233	Custom Photo	29.99	35.24
PWSGD004	DRAW 10.0	298.99	351.31
PWSGD005	DRAW 10.0 Upgrade	158.99	186.81
PWSD0171	Draw Classic	53.99	63.44
PWSG0316	Gallery 1,300,000	53.99	63.44
PWSG0315	Gallery 380,000	28.99	34.06
PWSD0000	Painter 6 Win CD	267.99	314.89
PWSDA521	Paradox 9 for Win 95 & NT CD	92.99	109.26
PWSG5240	Print Office 2000 for Win95/NT4 CD	28.99	34.06
PWSG1114	Printhouse Magic 4 Classic for Win95/98 CD	15.99	18.79
PWSG1113	Printhouse Magic 4 Premium for Win95/98 CD	26.99	31.71
PWSD0037	Ventura V8 for Win 95 CD	319.99	375.99
PWSD0038	Ventura V8 Version & Comp Upg for Win 95 CD	187.99	220.89
PWSI0166	Wordperfect Professional 2002	287.99	338.39
PWSI0167	Wordperfect Professional 2002 Upg	164.99	193.86
PWSI0164	Wordperfect Standard 2002	219.99	258.49
PWSI0165	Wordperfect Standard 2002 Upg	99.99	117.49
CYBERLINK			
PWTDVD101	CyberLink Power DVD 3.0 Retail Box	29.99	35.24
PWSVE001	CyberLink Power VCR 2 Deluxe	39.99	46.99
PWSVE000	CyberLink Power VCR 2 Retail Box	31.99	37.59
DANTZ			
PWSBU170	Retrospect 5.1 Desktop Backup Win (not 3.x)	119.99	140.99
PWSBU173	Retrospect Clients 5-User Mac / Win (not 3.x)	84.99	99.86
DATA BECKER			
PWSU5169	Data Becker D Copier W95 CD	19.99	23.49
DATA WATCH			
PWSDA311	Data Watch Monarch v5 Professional Edition	324.99	381.86
PWSDA310	Data Watch Monarch v5 Standard Edition	286.99	337.21
DATAVIZ			
PWSHH007	Dataviz Desktop To Go for Palm 2.5 10-User Win	284.99	334.86
PWSHH006	Dataviz Desktop To Go for Palm 2.5 5-User Win	164.99	193.86
PWSHH005	Dataviz Desktop To Go for Palm 2.5 Win	39.99	46.99
PWSHH010	Dataviz Documents To Go Pro for Palm v3.0	64.99	76.36
DIGITAL WORKSHOP			
PWSD3010	Image Robot 1.2 Win 95/98/NT CD	67.99	79.89
PWSG2101	Paintshop Pro v7 for Win 95/98/NT CD	67.99	79.89
EQUISYS			
PWSCF029	ZetaFax Starter System v7 5 users	394.99	464.11

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Code	Description	£ Ex VAT	£ Inc VAT
EXECUTIVE SOFTWARE			
PWSU8106	Undelete Server v2 Single Pack	181.25	212.97
PWSU5356	Diskeeper Workstation V6.0 1 Pack 95/98/NT	33.99	39.94
PWSV5357	Diskeeper Workstation V6.0 1 Pack Upg 95/98/NT	19.99	23.49
PWSV5358	Diskeeper Workstation V6.0 5 Pack 95/98/NT	158.99	186.81
PWSBU177	Retrospect Express Mac/Win	32.99	38.76
PWSU8104	Undelete Workstation v2 Single Pack	34.38	40.40
FILEMAKER			
PWSDA201	FileMaker Pro Server v5 Win	744.99	875.36
PWSDA205	FileMaker Pro v5 on CD Win Upgrade	124.99	146.86
PWSDA130	FileMaker Pro V5 W95/98 CD	214.99	252.61
GUILDHALL			
PWSED313	(Key Stage 2) English, Math's, Science	8.50	9.99
PWSED310	(Key Stage 2) SATs English	8.50	9.99
PWSED311	(Key Stage 2) SATs Math's	8.50	9.99
PWSED312	(Key Stage 2) SATs Science	8.50	9.99
PWSED317	(Key Stage 3 & 4) French, German, English	8.50	9.99
PWSED315	(Key Stage 3) English, Math's, Science	12.76	14.99
PWSED316	(Key Stage 3) Geometry, Algebra, Statistics	8.50	9.99
PWSED303	Adding & Subtracting, Dinosaurs, Trains, Planes	12.76	14.99
PWSED305	Decimals, Fractions, Counting Songs, Mouse Skills	8.50	9.99
PWSED307	English Skills, Junior Topics, Math's Skills	12.76	14.99
PWSED309	Essential Eng, Jnr Essentials, Essential Science	8.50	9.99
PWSED308	Essential Math's, Math's Numbers, Times Tables	8.50	9.99
PWSED300	Phonic Spelling, Number Skills, Early Science	12.76	14.99
PWSED302	Reading & Phonetics, Sea Creatures, Space	12.76	14.99
PWSED306	Spelling, Science, Mental Math's	12.76	14.99
HEMERA			
PWSFC021	Photo Objects Premium 50,000 Image Collection	46.80	54.99
HUTCHINSON			
PWCDT324	Hutchinson Educational Encyclopedia 2000	21.99	25.84
PWCDT292	Hutchinson Ultra Revision Pack 7 GCSE Titles	17.01	19.99
IC-D PUBLISHING			
PWSM3005	UK Info Professional Directory	149.00	175.08
PWSM3008	UK Info Home Directory	35.99	42.29
IBM			
PWSVR205	IBM ViaVoice Pro v8.0	67.99	79.89
PWSVR206	IBM ViaVoice Pro v8.0 Upgrade	39.99	46.99
PWSVR204	IBM ViaVoice Standard v8.0	28.99	34.06
IMSI			
PWSU0341	WinDelete 5	14.99	17.61
PWSCA562	TurboCAD v7	64.99	76.36
PWSCA563	TurboCAD v7 Pro	244.99	287.86
INTERACT COMMERCE			
PWSCM002	ACT! 2000 5 User Win 95 / NT CD	549.99	646.24
PWSCM000	ACT! 2000 for Win 95 / NT CD	124.99	146.86
PWSCM001	ACT! 2000 Upg for Win 95 / NT CD	70.00	82.25
INTUIT			
PWSA0046	Quickbooks 2001	74.99	88.11
PWSA0048	Intuit Quickbooks 2001 Pro	184.99	217.36
PWR2035	Quicken 2001 Standard	Call	
PWR2036	Quicken 2001 Deluxe	Call	
KOMMUNICATE			
PWSCR310	Kommunicate PhoneTools Suite 2.11	63.99	75.19
LAPLINK			
PWSU4901	LapLink Gold (USB, Serial and parallel)	94.99	111.61
PWSRC200	LapLink PC Sync - File transfer Solution	51.99	61.09
LOTUS			
PWSDA514	Lotus Approach Millennium	64.99	76.36
PWLS0000	Lotus Organizer V6 CD Window NT	29.99	35.24
PWLS0001	Lotus Organizer V6 CD Window NT Upgrade	24.99	29.36
NAMO			
PWSID010	Namo WebEditor 4	Call	
MACMILLAN			
PWSIS300	Black Ice Defender	29.99	35.24
MACROMEDIA			
PWSID000	Macromedia Director 8 Shockwave Studio	798.99	938.81
PWSC1283	Macromedia Dreamweaver 4 Fireworks 4 Studio	348.99	410.06
PWSC1281	Macromedia Dreamweaver 4.0	228.99	269.06
PWSC1269	Macromedia Fireworks 4 Web Graphics	228.99	269.06
PWSID019	Macromedia Flash 5/Freehand 9 Studio Win	398.99	468.81
PWSID021	Macromedia Flash V5 CD	254.99	299.61
PWSID001	Macromedia Freehand V9 for Win 95 & NT CD	299.99	352.49
MCAFFEE			
PWSIS002	Firewall CD	19.99	23.49
PWSU5602	Office 3.0	51.99	61.09
PWSU5701	PGP Personal Privacy 6.5 CD	19.99	23.49
PWSIS001	Internet Guard Dog 3.0 W95/98	19.99	23.49
PWSVP101	Virus Scan 5	18.49	21.73
PWSVP103	Virus Scan Wireless for Palm OS, Win CE, EPOC	19.99	23.49
METACREATIONS			
PWSGU001	Canoma 1.0 3D Models from Photo's	348.99	410.06
PWSG5101	Ray Dream 3D for Win 95 & NT CD	96.99	113.96
PWSG5102	Ray Dream Studio 5 for Win 95 & NT CD	264.99	311.36
MGI			
PWSG6001	MGI Photo Suite 3 Platinum Edition CD	19.99	23.49
PWSPE000	MGI Photo Suite 4 Platinum	34.99	41.11
PWSGE000	MGI Photo Vista 2.0 CD	34.99	41.11
PWDVD150	MGI Soft DVD Max 4.0	15.99	18.79
PWSG6012	MGI Video Wave 4	51.99	61.09
MINDSCAPE			
PWSGA011	Mavis Beacon Teaches Typing V9 for Win CD	16.99	19.96
MIRAMAR			
PWSU8210	Miramar PC MACLAN 7.2 WIN 95/98	179.99	211.49
NEWTAK			
PWSG7010	NewTek Inspire 3D Win95/98/NT 4 CD	292.99	344.26
ONTRACK			
PWSU7500	Ontrack Easy Uninstall 2000	17.01	19.99
PWSU7504	Ontrack Fix It Utilities v3	24.99	29.36
PWSU7505	Ontrack System Suite v2	39.99	46.99
PWSU7503	Ontrack Zip Magic v4	26.99	31.71

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CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWSBU312	Partition Magic 6 for W98/95/3.1/2000 Pro/Me/NT CD	42.99	50.51
PWSBU313	Partition Magic 6 V Upg W98/95/3.1/2000 Pro/Me/NT	23.99	28.19

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CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWSBU309	PowerQuest Drive Image 4.0	39.99	46.99
PWSBU310	Drive Image 4.0 Upgrade	24.99	29.36

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PWSM0195	MS Visio Std 2002 Win32 CD	130.99	153.91
PWSM0197	MS Visio Std 2002 Win32 VUP CD	64.99	76.36

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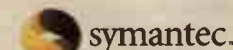
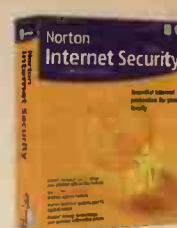
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CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWSU0518	EZCD Creator 5 Platinum	49.99	58.74

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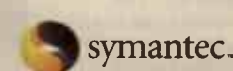
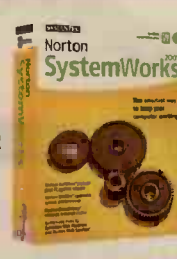


CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWSIS007	Norton Internet Security Family Edition 2001 v3	59.99	70.49
PWSIS008	Norton Internet Security Family Ed 2001 v3 Upg	41.99	49.34

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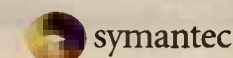
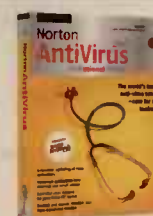


CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWSU5239	Norton System Works 2001 4.0 W95/98/NT/2000	48.99	57.56
PWSU5209	Norton System Works 2001 4.0 Upgrade W 95/98/NT/2000	31.99	37.59

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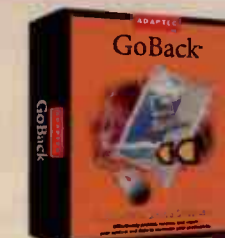


CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWSVP216	Norton Antivirus 2001 Pro	34.99	41.11
PWSVP217	Norton Antivirus 2001 Pro 5 user	172.99	203.26

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CODE	DESCRIPTION	£ EX.VAT	£ INC.VAT
PWSCR400	Adaptec GoBack 2.2 95/98/Me CD	41.99	49.34

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CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSC034	AutoCAD LT 2000i Win95/NT CD	441.99	519.34
PWSC035	AutoCAD LT 2000i 1 Upg	139.99	164.49

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSC036	AutoSketch 7 for Win 95/98/NT CD	78.99	92.81
PWSC037	AutoSketch 7 Version Upg W95/98/NT CD	42.99	50.51

CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSC039	QuickCAD 7 Millennium Edition	33.99	39.94

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PWSC010	McAfee Virus Scan 5	18.49	21.73

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Total protection for your entire network

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- Perpetual and two year subscription licenses
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- Protects all points of entry on your network



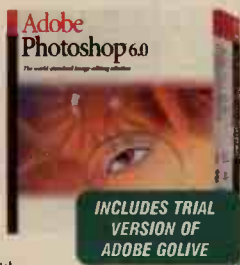
CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSU511	Dr Solomon's Total Virus Defence 5 User 2 Yr Sub	214.99	252.61
PWSU513	Dr Solomon's Total Virus Defence 10 User 2 Yr Sub	398.99	468.81
PWSU515	Active Virus Defense 25 User 2 Year Sub	969.99	1139.74
PWSU517	Active Virus Defense 50 User 2 Year Sub	1499.99	1762.49
PWSU519	Active Virus Defense 75 User 2 Year Sub	1999.99	2349.99
PWSU523	Active Virus Defense 100 User 2 Year Subscription	3149.99	3701.24

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- Master the power of Photoshop quickly. Photoshop 6.0 is designed to make it faster and easier for everyone to get to work quickly and use its comprehensive toolset more fully.



CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSG3000	Photo Shop V6 for Win 95 & NT CD	478.99	562.81
PWSG3001	Photoshop V5.5 to V6 Upg Win 95/NT CD	149.99	176.24

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- Share Files
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CODE	DESCRIPTION	£ EX VAT	£ INC VAT
PWSC200	LapLink PC Sync - File transfer Solution	51.99	61.09

software:

Code	Description	£ Ex VAT	£ Inc VAT
OXFORD			
PWCDT158	Oxford English Dictionary 2nd Edition V2 CD	186.99	219.71
PWSED203	Oxford Pop-up English Language Reference Shelf	25.52	29.99
PARAGON			
PWSCR200	Paragon FoneSync Simply Communicating	34.99	41.11
POWERQUEST			
PWSBU300	Drive Copy 3 Win95/98/NT/2000 CD	18.99	22.31
PWSBU309	Drive Image 4.0	39.99	46.99
PWSBU312	Partition Magic 6 for Win 98/96/3.1/2000 CD	42.99	50.51
PWSBU315	Partition Magic 6 Pro Win 98/96/3.1/2000 CD	Call	
PWSBU311	Server Magic 4 NetWare	289.99	340.74
PWSBU318	Server Magic 4 NT 2000	287.99	338.39
PWSBU319	Power Expert ST	559.99	657.99
PWSBU326	Power Manager/SE	819.99	963.49
PWSBU327	Power Volume Manager	439.99	516.99
QUARK			
PWSD0052	Quark Xpress V4.1 for Win 95 / NT CD	859.99	1010.49
PWSD0053	Quark Xpress V4.1 Passport W95/NT CD	1199.99	1409.99
RED HAT			
PWSOP711	Red Hat 7.0 Deluxe	38.99	45.81
PWSOP712	Red Hat 7.0 Professional	101.99	119.84
PWSOP710	Red Hat 7.0 Standard	24.99	29.36
ROXIO			
PWSU0518	EZCD Creator 5 Platinum	49.99	58.74
PWSU0518	EZCD Creator Deluxe 5 Win 95/98/Me/NT/2000 CD	49.99	58.74
S.U.S.E LINUX			
PWSOP752	S.U.S.E 7.1 Personal Edition	24.99	29.36
PWSOP753	S.U.S.E 7.1 Professional Edition	41.99	49.34
SAGE			
PWSA0170	Financial Suite V6.01	211.99	249.09
PWSA0167	Instant Accounting v6.02	126.99	149.21
PWSA0168	Instant Accounting v6.02 Upg	67.99	79.89
PWSA0169	Instant Payroll v6.01	126.81	149.00
PWSA0059	Job Costing Single User V5 W95/98 CD	599.99	704.99
PWSA0567	Line 50 Accountant V7 (Windows) CD	394.99	464.11
PWSA0369	Line 50 Financial Controller V7 (Windows) CD	839.99	986.99
PWSPO400	Personnel (50 employees)	98.99	116.31
SCANSOFT			
PWSC527	OmniForm V4 Win 95 & NT CD	70.99	83.41
PWSCR300	OmniPage Pro 10 W95/98 CD	299.99	352.49
PWSCR071	OmniPage ScanSuite Plus Upg (From any OCR)	74.99	88.11
PWSCR046	Pagis Pro Millennium	47.99	56.39
PWSCR048	Paperport Deluxe V7 CD	24.99	29.36
PWSCR047	Textbridge Home Edition	24.61	28.92
PWSCR045	Textbridge Pro Millennium	41.99	49.34
SERIF			
PWSD5011	Serif Page Plus V6 Publishing Studio	48.99	57.56
SOFTQUAD			
PWSU0327	SoftQuad Hot Metal Pro V6 for Win 95 CD	54.99	64.61
SOPHOS			
PWSVP400	SOPHOS File Server Lic 0-10 Users 1 Yr.	349.99	411.24
PWSVP401	SOPHOS File Server Lic 0-10 Users 2 Yr.	559.99	657.99
PWSVP402	SOPHOS File Server Lic 0-10 Users 3 Yr.	745.99	876.54
SYMANTEC			
PWSU5513	Dr Solomon's Total Virus Defence 10 User 2 Yr Sub	398.99	468.81
PWSU5511	Dr Solomon's Total Virus Defence 5 User 2 Yr Sub	214.99	252.61
PWSVP511	Norton Antivirus 2001 / NORTON Utilities 2001	31.99	37.59
PWSVP510	Norton Antivirus 2001 7.0 Upg W95/98/NT/2000	15.99	18.79
PWSVP509	Norton Antivirus 2001 7.0 W95/98/NT/2000	24.99	29.36
PWSVP502	Norton Antivirus Small Business Solution 10 User	378.99	445.31
PWSVP501	Norton Antivirus Small Business Solution 5 User	198.99	233.81
PWSU9300	Norton Cleanseweep 2001	24.99	29.36
PWSU5219	Norton Ghost 2001 6.5 W95/98/NT/2000	32.99	38.76
PWSIS004	Norton Internet Security 2001 v3	31.99	37.59
PWSIS006	Norton Internet Security 2001 v3 5 user	184.99	217.36
PWSIS005	Norton Internet Security 2001 v3 Upg	28.99	34.06
PWSIS009	Norton Internet Security Family Ed 2001 5 pack	229.99	270.24
PWSIS008	Norton Internet Security Family Ed 2001 v3 Upg	41.99	49.34
PWSIS007	Norton Internet Security Family Edition 2001 v3	59.99	70.49
PWSBU400	Norton Speed Disk v5 CD NT	28.99	34.06
PWSU5239	Norton System Works 2001 4.0 W95/98/NT/2000	48.99	57.56
PWSU5201	Norton Utilities 2001 5.0 W95/98/NT/2000	26.99	31.71
PWSCR157	PCAnywhere v10 Host & Remote	143.99	169.19
PWSCR000	PCAnywhere v10 Host & Remote Upg	86.99	102.21
PWSCR162	PCAnywhere v10 Host & Remote 5 user	621.99	730.84
PWSCR158	PCAnywhere v10 Host Only	84.99	99.86
PWSCR001	PCAnywhere v10 Host Only Upg	49.99	58.74
PWSCR163	PCAnywhere v10 Host Only 5 user	379.99	446.49
PWSCR002	PCAnywhere v10 5 User Add on	149.99	176.24
PWSCR003	PCAnywhere v10 5 User Add on Upg	279.99	328.99
PWSCR153	ProComm Plus 4.80	84.99	99.86
PWSCF200	WinFax Pro 10	43.99	51.69
SYSTRAN			
PWSTL201	Systran Personal	29.99	35.24
PWSTL203	Systran Professional Premium	509.99	599.24
PWSTL202	Systran Professional Standard	98.99	116.31
ULEAD			
PWSGD400	Ulead Cool 3D 3.0	39.99	46.99
PWSGD401	Ulead Cool 3D 3.0 Upgrade	19.99	23.49
PWSGV101	Ulead Media Studio Pro 6.0	319.99	375.99
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PWSPE100	Ulead Photo Impact 6	79.99	93.99
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PWSGV102	Ulead Video Studio 5.0	59.99	70.49
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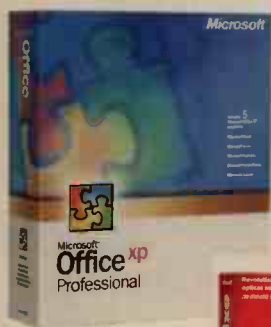
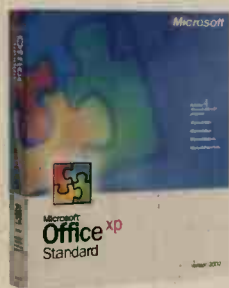
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Excel 2002 (spreadsheet)	●	●	●	●
Outlook® 2002 (personal e-mail and information manager)	●	●	●	●
PowerPoint 2002 (presentation graphics)	●	●	●	●
Access 2002 (database management system)		●	●	●
FrontPage 2002 (website creation and management)			●	●
SharePoint Team Services (Team Web site Solution)			●	●
Publisher 2002 (desktop publishing)				●

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PWS10172	MS Office XP Professional	449.99	528.74
PWS10173	MS Office XP Professional Upg	234.99	276.11
PWS10174	MS Office XP Professional Upg Special Edition	299.99	352.49

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SIE121	6570	PIII 750 MHz	256MB	20GB	DVD	14.1" TFT XGA	10/100 LAN	Win NT/2000	£1539.99	£1809.49

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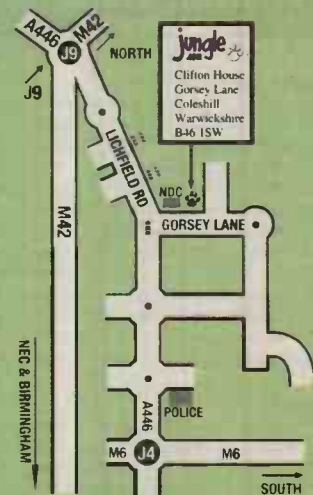
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F2303WT	PIII® 700MHz	64MB	10GB	24XCD/FDD	56 Kbps/LAN	13.3" TFT	W98	£995	£1169.13
F2337W	PIII® 850MHz	128MB	20GB	8XDVD/FDD	56 Kbps/LAN	14.1" TFT	W98	£1475	£1733.13
F2338W	PIII® 850MHz	128MB	20GB	8XDVD/FDD	56 Kbps/LAN	15" TFT	W98	£1599	£1878.83

HP OmniBook XE2

F2068W	K6/2 AMD 550MHz	32MB	5GB	24XCD/FDD	56 Kbps	12.1" HPA	W98	£679	£797.83
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F2197KT	PIII® 700MHz	64MB	7.5GB	24XCD/FDD	Mini PCI / LAN	14.1" TFT	W2000	£1259	£1479.33

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5

NOTEBOOKS & ACCESSORIES

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TAR004	NOTEBOOK NAVY BLUE	£19.24 £22.61
TAR005	NOTEBOOK HUNTER GREEN	£18.23 £21.42
TAR007	UNIVERSAL NOTEBOOK BLACK	£41.35 £48.59
TAR009	ENCORE NYLON BLACK	£59.99 £70.49
TAR011	TARGUS NOTEBOOK PLUS	£26.99 £31.71
TAR012	PREMIER LEATHER DELUXE	£94.61 £111.17
TAR013	AIR UNIVERSAL NOTEBOOK BLACK	£50.99 £59.91
TAR014	CONVERTIBLE BACKPACK BLACK	£37.99 £44.64
TAR018	CONVERTIBLE BACKPACK GREEN	£38.33 £45.04
TAR019	CONVERTIBLE BACKPACK BLUE	£37.99 £44.64
TAR021	PREMIER NOTEBOOK LEATHER	£80.54 £94.63
TAR023	BUSINESS TRAVEL LEATHER	£99.99 £117.49
TAR024	BUSINESS TRAVELLER NYLON	£64.31 £75.56
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TAR027	PLATINUM NYLON BLACK CASE	£68.48 £80.46
TAR029	POA/HPC LEATHER WALLET	£16.22 £19.06
TAR030	POA/HPC DOUBLE LTRH WALLET	£24.26 £28.51
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TAR045	CARRY CASE MATE BLACK	£16.22 £19.06
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TAR078	POA ULTRA PORTABLE BLACK	£32.30 £37.95
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TAR081	BLACK NYLON UNIVERSAL DEL	£68.48 £80.46
TAR082	BROWN SOFTBUCK NOTEBOOK P	£33.31 £39.14
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 - 10GB HDD
 - 13.3" TFT, SVGA Display
 - DVM 11MB Max
 - Internal Modem 56K

- CD-ROM 24x
- Touchpad Mouse
- VAI World Software
- Microsoft® Windows® Millennium

SON660 Sony FX101

EX VAT £799.99 INC VAT £939.99



Sony FX103

- Key Features:**
- PIII 650MHz
 - 64MB RAM (512 MB Max)
 - 10GB HDD
 - 13.3" TFT, SVGA Display
 - DVM 11MB Max
 - Ethernet Connection (RJ-45)

- Internal Modem 56K
- DVD-ROM x 8
- Touchpad Mouse
- VAI World Software
- Microsoft® Windows® Millennium

SON664 Sony FX103

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Sony Z600HEK

- Key Features:**
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 - Internal Modem 56K
 - BMB VRAM

- Jog-Dial
- Touchpad Mouse
- High Power Battery
- Microsoft® Windows® 2000
- External floppy disk drive included

SON661 Sony Z600HEK

EX VAT £1879.00 INC VAT £2208.90

CODE	PRODUCT	EX VAT	INC VAT
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SON501	SONY PCG-CIVE CRU500 600 128MB 12GB 8.9" WM	£1,199.99	£1,409.99
SON506	SONY PCG-SR11K PIII 600 54MB 10GB 10.4" W2K	£1,239.00	£1,455.83
SON665	SONY PCG-SR21K PIII 700 64MB 15GB 12.1" TFT W2K	£1,329.99	£1,562.74
SON501	SONY VAIO CIVE CRU500 TMS600 600MHz 128MB 12GB	£1,199.99	£1,409.99
SON662	SONY Z600LEK PIII 700 64MB 15GB 12.1" TFT W2K	£1,534.00	£1,802.45
SON091	SONY VAIO FX108K A4 P3-700 14.1" TFT W2K 20GB 128MB DVD	£1,439.99	£1,691.99
SON090	SONY VAIO FX108K A4 P3-750 15" TFT W2K 20GB 128MB DVD	£1,869.99	£1,962.24
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Top Loading Notepac with Air

KEY FEATURES

- Notebook Computer or Portable Printer Compatibility
- Dimensions: 27.9 x 35.5 x 6.3 cm
- Overall Dimensions fully expanded: 33 x 42 x 15.2 cm



TAR114 Top Loading Notepac with Air EX VAT £34.99 INC VAT £41.11

Top Loading Notepac Plus with Air

KEY FEATURES

- Notebook Computer or Portable Printer Compatibility
- Dimensions: 27.9 x 35.5 x 7.6 cm
- Overall Dimensions fully expanded: 33 x 40.6 x 15.2 cm
- Expanding file section dimensions: 29.2 x 38.1 x 3.8 cm



TAR106 Top Loading Notepac plus with Air EX VAT £49.00 INC VAT £57.58

Top Loading Universal Notepac with Air

KEY FEATURES

- Notebook Computer Compatibility
- Dimensions: 27.9 x 35.5 x 7.1 cm
- Printer Compatibility Dimensions: 29.2 x 35.5 x 3.8 cm
- Overall Dimensions fully expanded: 33 x 40.6 x 20.3 cm
- Expanding file dimensions: 29.2 x 35.5 x 3.8 cm



TAR087 Top Loading Universal Notepac with Air EX VAT £49.99 INC VAT £58.74

Premier Leather Deluxe

The Targus Premier Leather combines a luxurious, feature-rich leather briefcase (also available in nylon) with a functional notebook computer carrying case. The design has three fully lined document sections in

KEY FEATURES

- Addition to a padded computer compartment and zip down workstation section
- Dimensions 43.2 x 33 x 10.2cm
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- Full Grain Leather
- Printer Compatibility 43.2 x 33 x 6.4cm
- Lifetime Warranty

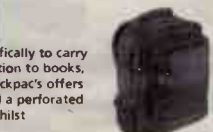
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£94.46
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KEY FEATURES

- The notebook compartment is fully cushioned and has a Velcro security fastener to ensure the notebook stays firmly in place.
- Ergonomic padded shoulder straps



- Expanding File Divider
- Transferable mobile phone holder to suit left or right handed person.
- Business card and pen/pencil holders
- Lifetime Warranty

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KEY FEATURES

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FRE090	Traveller CD-ROM 24x Grey + PCMCIA Cable	£85.10	£99.99
FRE062	Traveller CDRW Premium 4x4x20x	£229.99	£270.24
FRE069	Traveller CDRW Grey 4x4x20x + USB Cable	£226.99	£266.71
FRE134	Traveller CDRW Grey 4x4x20x + PCMCIA Cable	£229.78	£269.99
FRE135	Traveller CDRW Grey 4x4x20x + Firewire Cable	£238.29	£279.99
FRE136	Traveller DVD Premium 8x24x	£170.20	£199.99
FRE137	Traveller DVD Grey 8x24x + PCMCIA cable	£170.20	£199.99
FRE143	Generation II USB cable	£32.33	£37.99
FRE144	Generation II Firewire-link cable	£48.93	£57.49
FRE145	Generation II PCMCIA cable	£25.52	£29.99
FRE146	Generation II Parallel cable	£25.52	£29.99
FRE147	Traveller Power Module	£38.29	£44.99

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- CD-RW Available in Grey or Blue



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FRE149	Portable CD-ROM 48x + USB Cable	£87.65	£102.99
FRE138	Portable CD/RW 4x4x24x	£144.67	£169.99
FRE139	Portable CD/RW 4x4x24x + Parallel Cable	£161.69	£189.99
FRE140	Portable CD/RW 4x4x24x + USB Cable	£161.69	£189.99
FRE150	Portable CD/RW 8x4x32x	£153.18	£179.99
FRE141	Portable CD/RW 8x4x32x + Firewire PC/MAC	£204.25	£239.99
FRE151	Portable CD/RW 12x8x32x	£187.23	£219.99
FRE142	Portable CD/RW 12x8x32x + Firewire PC/MAC	£238.29	£279.99
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AMA091	BABY/EZ 32 BIT CARDBUS CABLE	£40.15	£47.18
AMA090	BABY/EZ USB CABLE KIT	£23.06	£26.10
AMA092	BABY/EZ PARALLEL CABLE KIT	£26.08	£30.64
AMA093	BABY/EZ FIREWIRE CABLE KIT	£48.19	£56.62
Portable PCMCIA 2.5" HDD			
AMA079	FLUPDISK 6.0-12.0 GB* SUBSYS	£225.52	£264.99
AMA054	FLUPDISK 10.0-20.0 GB* SUBSYS	£249.01	£292.59
AMA083	FLUPDISK 20.0-40.0 GB* SUBSYS	£324.25	£380.99
AMA106	FLUPDISK 30.0-60.0 GB* SUBSYS	£529.35	£621.99
*(Greater capacity can be achieved by using supplied compressor/backup SW)			
AMA051	FLUPDISK PARALLEL CABLE KIT	£30.10	£35.36
AMA068	FLUPDISK USB CABLE KIT (USB OPTION)	£32.11	£37.73
AMA104	FLUPDISK FIREWIRE KIT	£48.19	£56.62
ZIP 100 BABY DRIVE & Portable PCMCIA Ultra Slim Zip Drive			
AMA052	100MB ZIP DRIVE	£116.08	£136.39
AMA060	PARALLEL CABLE & MAINS ADAP	£29.09	£34.18
AMA066	USB CABLE KIT (USB OPTION)	£29.09	£34.18

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AMA100	EZCD 52X CD-ROM	£70.35	£82.66
AMA099	EZCD 8X40 DVD-ROM	£120.60	£141.71
AMA098	EZCD 4X4x32 CDRW-ROM	£140.70	£164.61
AMA097	EZCD 8X8x32 CDRW-ROM	£174.87	£205.47
AMA096	EZ COMBO 6X4x24x4	£191.96	£225.55
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F1816A HP JORNADA 720 32MB COLOUR	£555.00	£652.13

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PAL033 PALM M105 8MB POA	£129.99	£152.74
3CM250 PALM VX 8MB	£211.91	£248.99
3CM403 PALM M105 8MB	£139.99	£164.49
3CM256 PALM M105 8MB	£219.00	£257.33

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Sony		
SOM093 CLIE PALM 8MB INFR JOG OI	£214.00	£251.45

Xircom		
XIR075 XIRCOM REX 6000 PDA USB	£85.99	£101.04
XIR076 XIRCOM REX 6000 MICROPOA	£80.99	£95.16

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COM663 IPAQ EXPANDABLE CASE	£12.99	£15.26

Handspring		
HAN028 VISOR PLATINUM 8MB HANDHELD	£211.91	£248.99

Hewlett Packard		
F1816A STYLUS PEN - JORNADA 540	£8.75	£10.28
F1827A SCREEN PROTECTORS HP 540	£8.49	£9.98
F1279B AC ADAPTER FOR JORNAD 720	£25.50	£29.96
F1829A HP EXECUTIVE LEATHER CASE	£25.00	£29.38

Palm		
3CM404 PALM M105 MOBILE INTERNET	£18.99	£22.31
3CM261 PALM VX/V SLIM LEATHER CASE	£16.99	£19.96
3CM396 PALM VX/V PORTABLE KEYBOARD	£59.99	£70.49
3CM148 PALM VX/V HOTSYNC CRADLE	£32.99	£38.76
3CM216 PALM VX/V STYLUS 3 PACK	£6.99	£8.21
PAL029 PALM M100 SLIM LEATHER CASE	£17.07	£20.06
3CM235 PALM VX/V HARD CASE SILVER	£29.99	£35.19
3CM397 PALM VX/V TRAVEL KIT	£33.99	£39.94
3CM246 PALM VX/V USB KIT	£24.99	£29.36
PAL025 PALM M100 LEATHER FLIP CASE	£17.07	£20.06
PAL030 PALM M100 HOTSYNC CRADLE	£20.09	£23.61
PAL019 PALM M100 HOTSYNC CABLE	£14.06	£16.52
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What is the Secure Digital/Multimedia Card?

SD and MMC are two industry-standard (postage stamp size) expansion card technologies with a variety of uses. With over 200 big name players such as Panasonic, Nokia, Philips, Pioneer, JVC, Kodak supporting the open platform of Secure Digital you don't have to worry about being locked into a proprietary standard. At launch seven fantastic cards are available and the future holds additions such as Bluetooth, Ethernet, Modems, Digital Cameras, MP3 players or even GPS receivers that will utilise the SD/MMC expansion slot.

Palm™ m105

Palm™ m105 Fun, Functional and Internet Capable

With a compatible mobile phone the Palm™ m105 connected organiser is capable of getting you access to e-mail, the internet via web clipping or a WAP browser. You can even utilise your address book in your Palm™ m105 to send and receive your text messages! With 8mb and all the organiser features you'd expect from your Palm handheld. Helping you to keep track of your e-mails, appointments, memo's, to do items and address book.

With interchangeable faceplates you can really change the look and personalise your handheld. Follow the easy PC on screen installation guide to configure your handheld to communicate with one of the following mobile phones:

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Motorola Timeport L7082 / L7089 / P1088 / P7389 / P7389E
Nokia 6210 / 6250 / 8210 / 8810 / 8850 / 8890
Samsung SGH-A100

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Palm™ Vx

Palm™ Vx Ultra thin, Ultra Stylish, Ultra sleek

With its ultra-slim anodised aluminium casing and embossed leather screen cover, the Palm™ Vx connected organiser appeals to your sense of style. With calendar, address book, to do list, expense and e-mail applications that synchronise with your desktop computer with a single touch and the long life Lithium-ion rechargeable batteries that provide up to a months operation on a single charge you have the perfect PC companion!

Be assured that the 8mb of memory will provide you will all of the storage you require. Stock code 3CM250 10,000 addresses, up to 5 years appointments, 3,000 To Do items, 3,000 Memos, 400 emails plus with an average application size of only 50k you can add plenty of the 7,000 additional applications available to download from the internet.

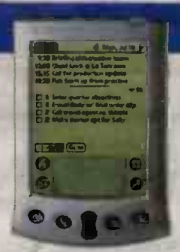
Palm™ m505

Palm™ m505 Expandable, Internet Capable, in brilliant colour

With support for rich, 16-bit colour, the stylish, customisable Palm™ m505 handheld also has a standard Secure Digital/MultiMediaCard slot and Palm™ universal connector for adding extra applications and peripherals

- Features**
- Stunning colour display
 - Only 139g – 26% lighter than the Palm™ M105
 - Fantastic Battery Life – up to four weeks on a single charge (based on normal usage!)
 - Mac & PC compatible via the USB cradle!
 - Read and edit MS Word & Excel

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HP Jornada 525



A PC that fits your pocket and your life.

The HP Jornada 525 colour Pocket PC, lets you work where and when you need to. Not only will it help you stay organised, you'll be able to work away from your desk.

With pocket PC versions of Microsoft® Word, Excel and Outlook, you can edit a spreadsheet on the plane, work on a Word document while listening to your favorite MP3 or record a voice memo instantly when that great idea hits.

Plus, it's wireless-Internet ready* so you can connect to the Web to check stocks, pick a restaurant, or read your email when you're on the road.* Even freetime is fun, the vivid colour display enriches reading electronic books, playing games and surfing the Web.*

Key Features

- 133MHz 32-bit processor
- 16MB SDRAM
- 256 colours LCD Display
- Pen-and-touch Interface
- 8 hours of battery life (estimated)
- RS232 serial port
- Microsoft® Windows™ for Pocket PC, Pocket versions of Microsoft® Word, Excel, Outlook, Internet Explorer and Windows™ Media Player

1 year limited warranty

£289.00 Inc. VAT
£245.96 Ex. VAT
Stock code F1868A



Colour

CODE	PRODUCT	Ex VAT	Inc VAT
F1825A	HP Jornada 548 with 32MB RAM	£325.00	£381.88

HP Jornada 710

Fast, secure and ready to go

As a busy professional, getting more done in less time is a challenge you face every day. You need a convenient and reliable way to store your information and keep it up-to-date while away from your desk.

The HP Jornada 710 handheld PC lets you move at a fast pace. It keeps you current by synchronising with your desktop or notebook PC and gives you the flexibility and power you need anywhere, anytime.

Packed with memory, it lets you run all the applications you need, as you send and receive e-mail and use the Internet (internal 56Kbps modem with HP Jornada 720 only). It also features a rich colour display, a comfortable keyboard and extended battery life.

Key Features

- Lightweight (1.1lb) and compact - fits in your coat pocket or handbag
- Work up to 9 hours without recharging (estimated)
- Touch screen
- Type comfortably with touch-typeable keyboard (3/4 full-size)
- 32-bit processor, 32MB SDRAM
- 6.5-in COLOUR LCD display (supports up to 65,536 colours)
- Microsoft® Windows® for Handheld PC 2000 - version 3.0
- Pocket Versions of Microsoft® Word, Excel, PowerPoint, Access, Inbox, Internet Explorer, Outlook and Media Player for Handheld PC
- Modem optional with HP Jornada 710

1 year world-wide parts and labour limited warranty

CODE	PRODUCT	Ex VAT	Inc VAT
F1816A	HP Jornada 720, 56Kbps int modem	£555.00	£652.13



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Stock code F1889A

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HANDHELD/ACCESSORIES

MGI PhotoSuite Mobile Edition

If you've ever wished that you'd taken along some family photos when you last visited your auntie, or kicked yourself that you forgot to bring those dodgy pictures of your mates' flat-warming party when you met them in the pub, then a newly-launched software program from MGI could have been designed just for you!



£17.99 Inc. VAT
£15.31 Ex. VAT
Stock code MG1018

Born from the outstanding success of PhotoSuite, MGI has recently launched PhotoSuite Mobile Edition. Priced at £17.99 inc VAT, MGI PhotoSuite Mobile Edition allows users to store, view and share photo and video files on both colour and greyscale Palm OS handhelds, and comes complete with a robust Windows desktop application for editing and fixing photos, as well as optimising media files prior to transfer.

MGI PhotoSuite Mobile Edition comprises two elements: PhotoSuite Mobile Organizer, which is the desktop application, and PhotoSuite Mobile Album, which resides on the Palm OS handheld. The PhotoSuite Mobile Album allows users to store, view (including pan and zoom) and share media on their handheld device, create slide shows with timed or manual playback, and play back video at a full 30 fps (frames per second). The software also supports the 'beaming' of photos and videos to other handhelds, while retaining all the essential colour and image information even when 'beamed' between greyscale and colour screen units.

The desktop software allows users to acquire media files from a variety of sources, edit and enhance photos, as well as optimise pictures and videos prior to transferring them to the handheld device. It also supports and converts popular media file formats including JPG, PNG, TIF, BMP, GIF, AVI, WMV and MOV. The software is certified as a Palm Powered Compatible Solution, passing rigorous testing for usability and quality. MGI PhotoSuite Mobile Edition may be run on any Palm OS handheld, including the Palm family of handhelds, Handspring Visors and Sony Clie range.

MG1015 MGI PhotoSuite V4.0 Platinum
£31.48 Inc. VAT £36.99
MG1019 MGI PhotoSuite V4.0 Limited Edition
£31.48 Inc. VAT £36.99

COMPAQ iPAQ Pocket PC's

COMPAQ iPAQ H3630/H3660 Pocket PC

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- Fit in, Stand out - its cool design!
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- Operating System Windows Powered Pocket PC
- Superfast 206 MHz Intel Strong ARM32 bit Processor
- Display Type Colour reflective thin Film transistor (TFT) LCD

H3630 32MB

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H3660 64MB

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CODE	PRODUCT	Ex VAT	Inc VAT
174003	H3130 Monochrome 16MB	£228.89	£268.95

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DESKTOPS

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P4274T	Celeron™ 700MHz	64MB	10GB	24x	Yes	Intel 3D	SFB	3Com	56K	W98/ Works 2000	£515	£605.13
P4256T	P III 866MHz	128MB	20GB	24x	Yes	Intel 3D	SFB	3Com	56K	W98/ Works 2000	£685	£804.88
P4275T	P III 1GHz	128MB	20GB	24x	Yes	Intel 3D	SFB	3Com	56K	W2000/ Works 2000	£755	£887.13

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HP e-PC and HP Vectra prices are valid from 1st May 2001. Please call in June 2001 for latest models and prices.

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COMPAQ

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MODEL	COMPAQ DESKPRO EXM CELERON	COMPAQ DESKPRO EXM PIII 733
Product Code	531076-031	531077-031
Processor	Intel® Celeron™ 633MHz processor - Intel 810E	Intel® Pentium® III 733MHz processor - Intel 810E
Memory (std/max)	64MB/512MB SDRAM	64MB/512MB SDRAM
Hard Drive	10GB Smart III Ultra ATA/66 (7200rpm)	20GB Smart III Ultra ATA/66 (7200rpm)
Graphics	Integrated Intel® 3D Direct AGP	Integrated Intel® 3D Direct AGP
Communications	10/100 NIC	56k v9 Modem
Audio	Integrated Intel Audio (without speakers)	Integrated Intel Audio (without speakers)
Multimedia	48x CD-ROM	48x CD-ROM
Dimensions (W x H x D)	Minitower:	
Standard Interfaces	3 PCI slots, 5 bays: 1 internal, 4 external	
Standard Software	Compaq Restore CD	
Keyboard & Mouse	Compaq mouse and Compaq Easy Access keyboard with Windows® and Euro keys	
Operating System	Microsoft Windows 98	
Warranty	3 year part replacement warranty with first year free on-site service two business days	

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- 20GB Ultra ATA/66 hard disk drive
- Integrated S3 SMA graphics, 8MB of main system memory allocated to graphics
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HP Brio Celeron™ 733

- Intel® Celeron™ processor 733MHz (66MHz system bus) **P4853T**
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- 20GB Ultra ATA/66 hard disk drive
- Integrated S3 SMA graphics, 8MB of main system memory allocated to graphics
- 56K PCI internal modem
- HP 10/100 PCI network card
- 20-bit stereo digital audio recording and playback; full duplex
- 3.5-inch, 1.44MB floppy disk drive
- HP 48x Max-speed IDE CD-ROM drive
- HP Internet Keyboard and HP Scrolling Mouse (for easy Web browsing)
- Expandable Compact Microtower
- Three PCI slots, 1 AGP 4X slot, 2 serial, 1 parallel and 2 USB ports
- Microsoft® Windows 98 Second Edition
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- 56K PCI internal modem
- HP 10/100 PCI network card
- 20-bit stereo digital audio recording and playback; full duplex
- 3.5-inch, 1.44MB floppy disk drive
- HP 48x Max-speed IDE CD-ROM drive
- HP Internet Keyboard and HP Scrolling Mouse (for easy Web browsing)
- Expandable Compact Microtower
- Three PCI slots, 1 AGP 4X slot, 2 serial, 1 parallel and 2 USB ports
- Microsoft® Windows 98
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DESKTOPS

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AD1107	MICROSCAN M500 15" 1024x7	£92.99	£109.26
AD1024	MICROSCAN 19" 0.26 G66	£280.40	£329.47
AD1037	MICROSCAN G910 19" HIGH R	£347.72	£408.57
AD1038	MICROSCAN G700 17" HIGH R	£199.99	£234.99

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BEL441	15" FST 0.28MM 3YR OSW	£95.99	£112.79
BEL776	15" TFT LCD 1024x768 ANAL	£439.99	£516.99
BEL817	19" CRT 1600x1200 0.26MM	£195.99	£230.29
BEL799	17" CRT 1600x1200 0.26MM	£152.99	£179.76
BEL742	BELINEA 17" FST 0.26PD TCD	£195.99	£230.29

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COM533	SS10 15" CRT 28.85HZ MPR	£107.54	£126.36
CP0058	COMPAQ S710 17" MONITOR T	£170.84	£200.74

Hansol		EX VAT	INC. VAT
HAN017	HANSOL 710P 17" FST 0.26	£138.64	£162.90
HAN021	19" DYNALAT CRT 1600x1200	£251.24	£295.21
HAN016	HANSOL 7100 17" DYNALAT	£167.78	£197.14
HAN010	HANSOL 501P 15" 0.28	£95.62	£112.35
HAN008	HANSOL 900P 19" 0.26	£216.06	£253.87
HAN013	710A 0.28MM1024x768 85HZ	£127.99	£150.39
HAN024	GENERIC 19" MONITOR 1280X	£159.99	£187.99
HAN020	HANSOL 510F 15" TFT 0.297	£439.00	£515.83
HAN018	HANSOL 910A 19" FST 12800	£199.99	£234.99

Hewlett-Packard		EX VAT	INC. VAT
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D8997A	HP 15" FLAT SORE MONITOR	£105.00	£123.38
PAV004	HP 17" M70 MONITOR	£169.00	£198.58
PAV003	HP 15" M50 MONITOR	£109.00	£128.08
P1287B	HP V50 15" MONITOR 1024 X	£109.00	£128.08
P1283A	HP M70 17" MONITOR 1280X	£169.00	£198.58
D8915A	HP 21" P1120 FD TRINITRON	£699.00	£821.33

Iiyama		EX VAT	INC. VAT
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IY053	VISION MST S900MT1 19" FS	£211.04	£247.97
IY052	VISION MASTER PRO 451 19"	£351.74	£413.29

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NMD019	NEC FE700+ 17IN ULTRA FLA	£178.99	£210.31
NMD024	NEC FE950+ 19IN ULTRA FLA	£299.95	£352.44
MIT094	PLUS200/22" DTR 24.72HZC	£561.80	£666.12
NEC023	FE950 19" CRT 0.25 96HZ T	£300.50	£353.09
NMD005	PRO920 19" DTR 24 1600X1	£359.99	£422.99
NMD021	MITSUBISHI PLUS92 19IN DI	£299.99	£352.49

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SON4390	19" G400 MONITOR TRINITRON	£432.15	£507.78
SON633	A420 19" TRINITRON 1600X1	£359.99	£422.99
SON626	SONY E2202 17" FD TRINITR	£231.14	£271.59
SON357	21" G500 TRINITRON MONITO	£703.49	£826.60
SON619	MULTISCAN M51 15" TFT 102	£639.99	£751.99
SON354	G200 17" TRT 24 120HZ TC	£255.26	£299.93
SON359	MULTISCAN L181 18" TFT 12	£1,889.39	£2,220.03
SON621	MULTISCAN 17" G200P 1600X	£239.99	£281.99
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HP Pavilion 6712



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- 64 MB SDRAM (max 512 MB) PC 100
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HP Pavilion 9720



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- 20 GB Hard Disk Drive
- CD-ROM 48x
- Built in 56 Kbps, V.90
- Integrated 3D AGP graphics
- Sound AC97 on board
- 2 Polk Audio premium stereo speakers
- 2 Polk Audio premium stereo speakers
- USB One Touch Multimedia Keyboard and Scroll Mouse
- HP V50 15" monitor
- One Year Parts & Labour Warranty
- Microsoft® Windows® Me
- Microsoft Works & Money 2001
- Microsoft Encarta Standard 2001

HP Pavilion 7885



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- 2 Polk Audio premium stereo speakers
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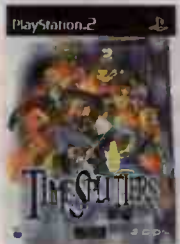
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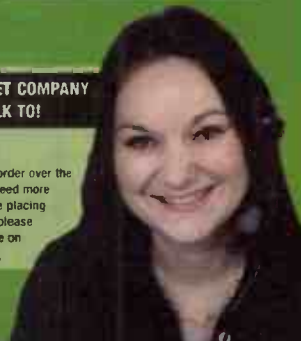
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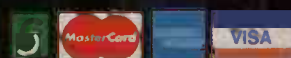


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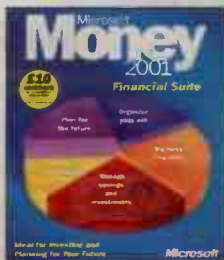
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- Images & Templates: 50,000 images and 12,000+ project templates giving you everything you need to quickly and easily design your own master pieces. Track transactions, balance your account, schedule and pay bills, and manage investments.
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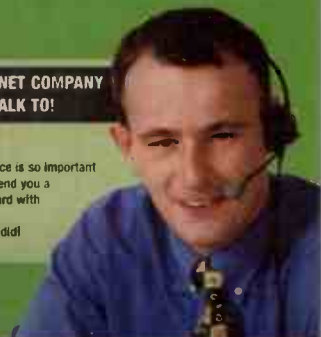
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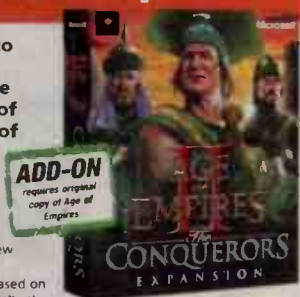
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The official add-on to the award-winning, best-selling real-time strategy game Age of Empires II: The Age of Kings.

Focusing on legendary leaders, The Conquerors Expansion will challenge veterans and novices to wage war on an epic scale with all-new civilisations, unique units and technologies, and campaigns based on infamous conquerors such as Attila the Hun and El Cid. It includes 5 new civilisations, 4 new campaigns, 11 new units and 26 new technologies, smart villagers and new farm queuing.

KEY FEATURES

- Five New Civilisations
- Four New Campaigns
- New Units
- New Technologies
- New Game Type
- Real World Maps
- Smart Villagers
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ADD-ON
requires original copy of Age of Empires II: The Age of Kings

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Microsoft Age of Empires II: The Age of Kings

Rome has fallen and the World is up for grabs The Empire Continues! There are many paths to power, but only one civilisation will reign supreme.

Age of Empires II: The Age of Kings, is the sequel to the award-winning, best selling real-time strategy game of Age of Empires. Age of Empires II spans a thousand years, from the fall of Rome through the Middle Ages in which players control the destiny of one of thirteen civilisations. The game keeps the epic scope of Age of Empires game play while evolving the combat and economic features.

KEY FEATURES

- Choose your path to greatness
- Covers 1,000 years of history through the middle ages
- Command one of thirteen new
- mighty civilisations
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- Battle alongside the heroes of the day
- New bigger lands
- Lead swiftly and with ease



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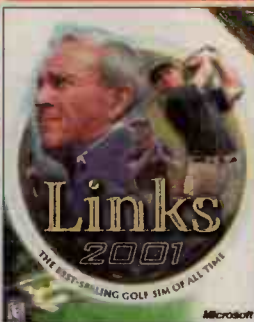
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AVG 6.0 brings a new, revolutionary technology into the world of PC oriented anti-virus products. Our modular high-tech solution significantly increases efficiency and reliability. The new AVG engine was built utilizing Virtual Device Driver Technology. Thanks to this approach, we have developed a break-through technological solution by creating only one testing engine for all parts of the AVG Anti-Virus system. Advanced heuristics analysis implemented in the AVG engine represents 9 years of continuous development and is now not used exclusively by the "on-demand" scanner, but is also available in the AVG Resident Shield, AVG Email-Scanner and AVG Shell Extension.

- **AVG On-demand Scanner** - run complete and user defined tests which can be scheduled
- **AVG Resident Shield** - continuous protection utilising both Heuristic emulator and the whole virus database
- **AVG E-mail Scanner** - tests all email messages and attachments and certifies them with a text message (outlook only)
- **Heuristic Analysis** - can detect both known and unknown viruses
- **Integrity Test** - tests for changes in files
- **Automatic Healing** - once a test has finished all viruses are removed or passed to the Virus Vault
- **AVG Virus Vault** - infected files are stored in an encrypted format and can be restored
- **AVG Control Centre** - powerful console for controlling all AVG components
- **Scheduler** - schedule tests and/or updates
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Standard Single User

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More Countries than
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Street Finder GB

KEY FEATURES

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- includes all co-ordinate systems - national grid, OS grid, latitude & longitude
- set origin for on-screen rulers
- measure - distance, area, radius, bearing
- move around easily using the grabber hand
- search the map - in a radius, in a ring, in an irregular or existing polygon
- new advanced query builder
- corridor search - search the map along a planned route
- search databases for an word or pattern
- search within existing polygons
- tile printing - print a detailed map over several neatly

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- draw any shape and save it
- pushpins
- attach text

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Router GB

ALL AS STREET FINDER PLUS:

ROUTE PLANNER

- detailed routing using every street in Britain
- one way streets and other driving restrictions
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- setup numerous vehicles, each with different configuration
- select a waypoint from the map, Postcode Locator or any other database
- choose stops along the route
- select places to avoid - beat the roadworks & traffic jams
- display the shortest/quickest route on a detailed map and print it in colour
- print a full itinerary

POSTCODE LOCATOR

- 1.6 million postcodes can be located on the map

ROUTE EDITOR

- add your own one way streets & access restrictions
- the only product with editable routing

GPS - SATELLITE NAVIGATION

- monitor your position on the map
- map is adjusted automatically
- record and replay a journey



EDITING

- add your own data - points, icons, lines, text, etc
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- edit and sort attached databases

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Professional GB

All as Router plus:

IMPORT TOOLS

- create your own layers
- import data by postcode or national grid reference
- design data entry forms
- make your own map symbols
- automatic update

STATISTICAL MODULE

- bar graph, pie chart or colour/shade existing areas
- use existing databases or your own
- setup parent/child relations

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- locate over 1.4 million businesses
- search by name, street, locality, town, postcode or phone
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CA1199 InoculateIT v4.53 WG/Adv	£34.51	£40.55
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Switzerland	✓	✓	✓
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Denmark	✓	✓	✓
Sweden	✓	✓	✓
Luxembourg	✓	✓	✓
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Director 8.5 Shockwave Studio is the solution for developing content for magnetic Web destinations, dazzling 3D entertainment, interactive product demonstrations, and online learning applications. Deliver professional, 3D, and interactive applications that increase Web site traffic, entertain visitors, retain customers, and increase product sales. New scalable real-time 3D features integrated with Shockwave Player provide unprecedented reach for highly visual interactive 3D content on the web.

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CODE	PRODUCT	Ex VAT	Inc VAT
MAC404	Director Shockwave Studio 8.5 upgrade from v8	£149.00	£175.08
MAC405	Director Shockwave Studio 8.5 U/G from Director 1.x-7.x	£299.00	£351.33

£1115.08 Inc. VAT
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Dreamweaver 4 & Fireworks 4 Studio

Integrated web graphics design and professional web site development.

A shared Macromedia® User Interface, and integrated product features make the Dreamweaver/Fireworks Studio the most efficient way to create professional web sites. Create, edit and animate bitmap and vector Web graphics, and add advanced interactivity and popup menus in the Macromedia® Fireworks® robust, professional environment. Easily import Fireworks rollovers, pop-up menus and buttons into Dreamweaver® to create engaging Web experiences. Launch and edit both graphics and tables between Dreamweaver and Fireworks for efficient workflow.

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FIREWORKS
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Rapidly build database-driven Web applications with total control over source code, plus integrated Web graphics. Professional hand coding environment includes ASP, JSP and CFML keyword color-coding, auto-indenting, punctuation balancing, and the ability to debug client-side JavaScript directly in your browser. Create, edit and animate Web graphics in Fireworks® 4, add advanced interactivity, optimize images and integrate seamlessly with UltraDev™ for efficient development. View live, server-side data in the workspace and make edits to layout and logic on the fly.

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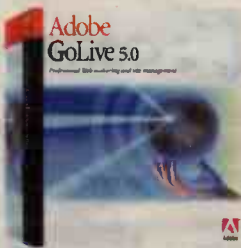
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The cutting-edge tool for creating premier Web sites

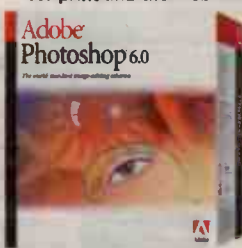


Adobe GoLive 5.0 offers both coders and designers the unique tools they need to ensure the success of their role in the workflow of creating a Web site. Coders can be confident in GoLive's ability to write accurate, intelligent code while at the same time prevent existing code from being overwritten or modified. Plus, advanced functionality such as Dynamic Link simplifies the incorporation of dynamic database and e-commerce capabilities.

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£209.35 Ex. VAT
Stock code ADO314

Photoshop 6.0

The world-standard image-editing solution for print and the Web



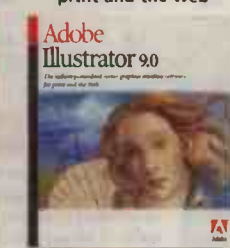
Adobe Photoshop 6.0 software delivers the next generation of image-editing capabilities with powerful new features that offer something for every user. Now you can:

- Expand beyond pixels. Adobe Photoshop 6.0 redefines desktop image editing with integrated vector-drawing support that extends your creative range.
- Produce superb Web graphics. Expanded Web toolkit to provide more timesaving, production oriented features, including Adobe ImageReady™ 3.0 for advanced Web-production tasks.

£172.98 Inc. VAT
£147.22 Ex. VAT
Stock code ADO329
ADO328 Photoshop 6
Ex VAT £468.08 Inc VAT £549.99

Illustrator 9.0

The industry-standard vector graphics creation software for print and the Web



Adobe Illustrator 9.0 software delivers powerful new options for Web designers, graphic design professionals and business graphics users, including:

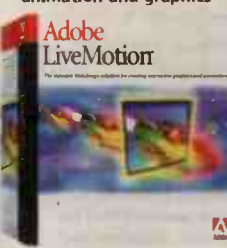
Key Features:

- Robust, built-in Web graphics creation and optimization tools. Now you can create and edit logos, buttons, line art, and other Web graphics with greater flexibility, speed, and quality than image-editing tools provide.
- Unlimited transparency capabilities, so you can apply transparent effects to any object and then print those transparent objects with superb results.

£124.98 Inc. VAT
£106.37 Ex. VAT
Stock code ADO315
ADO312 Illustrator 9
Ex VAT £302.12 Inc VAT £354.99

LiveMotion

The intuitive Web design solution for creating interactive animation and graphics



On the Internet, competition for attention is fierce. Many Web designers are changing their focus from developing sites that simply convey information, to developing sites with higher entertainment value. A Web site with entertaining content will attract more visitors, keep visitors at the site longer, and encourage repeat visits. Therefore it's not surprising that designers want to incorporate animation, interactivity, high-quality streaming sound and video, and other technological advancements to make their sites engaging.

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SOFTWARE

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CA1004 ARCT NW U/G 8.6 >25-ENT	£649.57	£763.24
CA1021 ARCSERVEIT 6.6 SS NETWORK	£559.86	£657.84
CA1024 ARCSERVEIT SS U/G NW 8.6	£388.53	£104.02
CA1025 ARCT NW TAPE LIB OPT 6.6	£630.28	£740.58
CA1030 ARCSERVE NETWORK W/G U/G	£128.18	£150.61
CA1032 ARCT 6.6 NW FOR SBS	£348.59	£409.59
CA1033 ARCSERVEIT 6.6 NW TO USER	£383.80	£450.97
CA1035 ARCT NW PUSH AGENT 6.6	£348.59	£409.59
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CA1043 ARC ENT V6.0> ADV 6.6 NT	£152.06	£178.67
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CA1051 RAID OPTION 2.0 NT	£394.23	£463.22
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NEW PRODUCT



COR711 Corel Draw 10
Ex VAT £314.88 Inc VAT £369.98



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- Life-like natural airbrushes
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COR705	Painter 6 PC	£255.31	£299.99
COR722	Painter 6 PC Upg.	£140.42	£164.99
COR721	Painter 6 Mac	£255.31	£299.99
COR723	Painter 6 Mac Upg.	£140.42	£164.99



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Bryce® 4 is dedicated to designing, rendering & animating breathtaking natural 3D worlds and abstract 3D sculptures.

Bryce® 4 is dedicated to designing and animating breathtaking natural 3D worlds and abstract 3D landscapes while making the creative process every bit as entertaining as the final output. Based on ease of use, price and output Bryce 4 is the application of choice for hobbyists and professionals who want natural 3D animation on the desktop. Create mountain ranges, lakes, oceans and environments that are startlingly realistic with multiple atmospheric and cloud controls. Bryce 4 now includes multiple import and export formats, instantly turns free USGS data into 3D models new sky models, and lots of content and tutorials so quickly get you started.

CODE	PRODUCT	Ex VAT	Inc VAT
COR710	Bryce 4	£127.65	£149.99
COR724	Bryce 4 Upg.	£66.37	£79.98



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- Cleaner is a complete camera-to-web streaming solution, and a critical tool in every web designer's toolbox.
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- Format Flexibility – Cleaner 5 supports all the streaming formats – QuickTime, Real, Windows Media, and MP3, as well as MPEG-1 and MPEG-2 – now you can deliver whatever your client wants or show them all at once!
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Guildsoft

ALL002	ALL CLEAR	£140.20	£164.74
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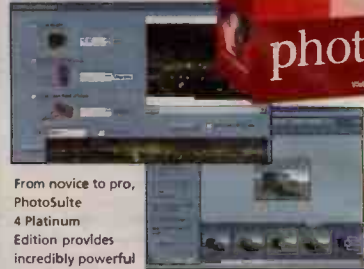
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Stock code MGI015

From novice to pro, PhotoSuite 4 Platinum Edition provides incredibly powerful features to deliver superior results - quickly and easily. The user-friendly menus, toolbars and icons make it easy to edit, e-mail, print and share photographs online.

NEW FEATURES INCLUDE: Create Web sites with links, music and animated .gif files. Stitch up to 48 images into a seamless immersive panorama with zoom and pan features. Add .MP3 audio to slide shows and albums. Create mosaics using your own database of thumbnails images and use alpha channel technology to create transparent regions.



Serif PagePlus 6

The best value in a complete desktop publishing solution!

Creating stunning flyers, newsletters, stationery sets, reports, brochures, posters, invitations, greeting cards, and more has never been easier. PagePlus 6 offers users of any level all the tools they need to be able to create professional looking documents with over 1300 professionally designed Automatic Documents, a 100,000 Deluxe Graphics Pack with 60,000 pieces of clip art, 20,000 photos and 20,000 Internet graphics. You can now view and edit multiple documents simultaneously so you can see and share concepts from documents that need a similar look and feel (and even drag and drop objects between them).

Key Features:

- Versatile printing controls makes folded and small publications even easier to create and output
- Intelligent Colour Schemes
- Amazing on-screen Studio Bar for drag and drop formatting and font previews
- Powerful multimedia Web publishing with HTML 4.0 support for fast-loading web designs - no expertise required!
- Access to on-line resources
- Hundreds of ready-designed objects available on-screen, including 3D text and professional logos
- Built-in word processing, logo creation, calendar, mini-spreadsheet, index and table-of-contents creators and more



£59.98 inc.VAT
£51.05 ex.VAT
Stock code SER065

WebPlus 6

Everything you need to create exciting Web pagesfast!

The easiest way to get your business, organisation or household on the World Wide Web! Produce attention grabbing headlines, unique text effects and powerful logos. The easy to use interface means all you have to do is select a style, choose a colour scheme and customise. Packed with over 20,000 Web art images, 600 animated GIFs, 110 automated Web page Wizards, 150 colour schemes and gallery objects and 400 professional TrueType fonts. Plus all the tools you could ever need for professional effects. You also get clipart, photos, community chat and more from VisualCities.com. Designing eye-catching Web pages has never been easier!



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£18.71 ex.VAT
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PhotoPlus 6

Photo fun as limitless as your imagination!

Dynamic animation tools and automated special effects that will take your photographs into an exciting new dimension. Standard editing capabilities enable you to clone, smudge, fade, blend, erase, brush and more using scanned and digitally captured photos. Including a Multiple Document Interface, powerful Image Export Optimiser - ensuring you get it right first time, text selection and much, much more. Packed with features that enable you to create 7 spectacular effects, PhotoPlus 6 has all the power and punch of other high price industry standard software but at less than a third of the price!



£26.99 inc.VAT
£22.97 ex.VAT
Stock code SER080

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Give your Opus publications your own unique stamp by creating bespoke templates utilizing your company's logo and tagline... or those of your clients. Then publish direct to the net; burn to business-card or standard CD-ROM; or present straight from your PC or laptop.

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SOFTWARE

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ADD420 FRAMEMAKER PLUS SGML V6.0	£1,299.99	£1,527.49
Apex		
APE003 TRUE DB SUITE V6	£453.26	£532.58
APE004 TRUE DB GRID PRO	£296.48	£348.36
Computer Associates		
CA1177 INGRES II WORKGROUP EDIT	£700.70	£823.32
CA1178 INGRES II OPENROAD RUNTI	£175.35	£206.04
CA1179 INGRES II OPENROAD DEVEL	£351.41	£412.91
CA1213 ERWIN 3.52 FOR WINDOWS NT	£549.95	£646.19
CA1281 ERWIN DATABASE DESIGN V4	£2,500.00	£2,937.50
Corel		
COR655 PARADOX V9 FP	£99.65	£117.09
COR656 PARADOX V9.0 UPG	£69.50	£81.66
COR657 PARADOX V9.0 DEVELOPER	£251.25	£295.22
Dataease		
DAT099 DATAEASE VER 5.15 UK	£492.44	£578.62
Filemaker		
FILO02 FILEMAKER PRO V5 10UR	£1,357.76	£1,595.37
FILO04 FILEMAKER PRO 5 WIN/MAC	£221.10	£259.79
FILO05 FILEMAKER PRO 5 U/G	£112.05	£131.66
FILO06 FILEMAKER PRO V5 (5 USER	£799.95	£939.94
FILO07 FILEMAKER SERVER V5	£804.00	£944.70
FILO09 FILEMAKER SERVER V5 U/G	£361.80	£425.12
FILO11 FILEMAKER PRO V5 25 USER	£3,216.00	£3,778.80
FILO13 FILEMAKER PRO V5 UG PK	£499.95	£587.44
FILO14 FILEMAKER BOX SET TIER 3	£60.68	£71.30
FILO15 FILEMAKER PRO 5 UNLIMITED	£804.00	£944.70
FILO16 FILEMAKER PRO SERVER DOCU	£18.24	£21.43
FILO17 FILEMAKER PRO 5 (DESKTOP)	£18.24	£21.43
FILO18 FILEMAKER DEVELOPERS	£402.99	£473.51
Goldsoft		
GAT091 MONARCH FOR WINDOWS V5	£302.49	£355.43
GUI044 ALPHA 5 V4.0	£75.52	£88.74
GUI067 QUALITY MANAGER DATABASE	£170.20	£199.99
Microsoft		
MS1485 ACCESS 2000	£256.28	£301.13
MS1487 ACCESS 2000 V/UPG	£81.41	£95.66
MS4456 ACCESS 2002 WIN32 ENGLISH	£79.15	£93.00
MS4516 SQL SVR 2000 DEVELOPER FP	£349.00	£410.08
QAS		
QAS001 QUICK ADDRESS LITE CD	£102.12	£119.99

Fandango 2

Create unique Screensavers for fun or profit!

Fandango v.2 is a fast, easy-to-use screensaver creator that enables the user to create an infinite range of different screensavers and full-screen animations on your own PC for pleasure, promotion or profit.

With no royalties to pay, Fandango 2 is perfect for corporate promotion, and now provides even more fun and greater flexibility.

Features

- Update your screensaver as often as you like
- Ensure greater screen privacy with a message and a password
- No distribution limitations
- No royalties to pay
- No previous experience necessary!
- Completely rewritten Graphics Engine harnessing the latest technology
- Animation script for ultimate control
- Foreground graphic facility
- Multiple sets of activity can be played consecutively or simultaneously
- Timeline
- Sound effects for more actor states
- Sound mixing

DIG135 Fandango Upgrade Ex.VAT £10.20 Inc.VAT £11.99

£19.99 Inc.VAT
£17.01 Ex.VAT
Stock code DIG121



Paint Shop Pro 7

A NEW BOX OF TRICKS FOR PERFECT PICS!

Paint Shop Pro 7 is one of the world's most popular image-editing software programs, allowing the user to create better digital images in less time and with minimal outlay. With a fully comprehensive range of photo-lab tools and image controls, Paint Shop Pro 7 enables you to create & manipulate your own unique images using photos, graphics and text.

Now users can harness all the high-end power and creativity of this versatile package at a fraction of the cost of its much pricier competitors... and with minimal effort!

And because Paint Shop Pro offers the same functionality of other commercial photo-editing packages, it is used by many games developers and graphic design studios at professional-level.

Features:

- Retouch, repair and edit digital photos and other images
- Enhance and restore damaged or old photos
- Ensure image quality with digital darkroom tools
- Remove red-eye instantly in photographs of both humans and animals.
- Easily remove noise, scratches, dust, and blemishes
- Share photos electronically with friends, family and colleagues
- Create unique images for logos and business presentations
- Add interest to graphics and text with frames and borders
- Create Web graphics
- NEW: picture tubes for scatter-effect!

As an added bonus Paint Shop Pro 7 now also includes Animation Shop 3 FREE and also offers over 35 new features and refinements to enable you to edit and produce graphic images of the highest quality.

£82.99 Inc.VAT
£70.63 Ex.VAT
Stock code DIG123



Media Center Plus 3

ALL SORTED IN SECONDS!

Media Center Plus 3 is the one-stop management package for organising and cataloguing digital media.

With Media Center Plus, it's easy to manage images, videos and sound acquired from a variety of sources, including scanners, digital cameras and CD's.

Media Center Plus has direct support for over 120 digital cameras, for TWAIN devices & also supports over 50 different file formats.

Organise your resources into manageable albums by using the thumbnail display for fast file location, then choose to export to HTML, create a slide show -complete with background music!- or simply print out your album in either standard or thumbnail versions.

Features:

- Direct digital camera support
- Print images in standard photo sizes
- MP3 Audio Support
- MPEG Video Support
- Export to HTML
- 24-bit thumbnails
- Link directly to your favourite editing programs

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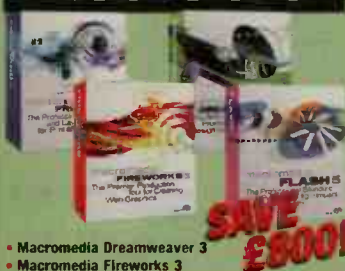


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Whilst Stocks Last

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- Macromedia Fireworks 3
- Macromedia Flash 5
- Macromedia Freehand 9

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ADAPTEC EASY CD CREATOR V.5



£39.99 Inc. VAT
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 Stock code ADA200

FANDANGO 2 PLUS SKIVEMASTER



£21.98 Inc. VAT
£18.71 Ex. VAT
 Stock code DIG139

MEDIAGOLD BLACKICE DEFENDER



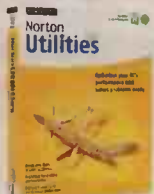
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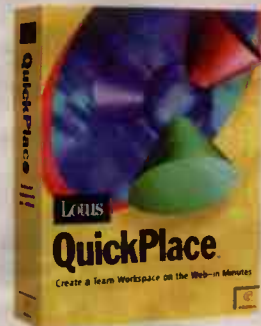


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Lotus
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QuickPlace 2



Lotus QuickPlace is a teamware solution that allows non-technical professionals to instantly create an electronic shared workspace to enable their team to centrally communicate, share and organize information around any task, project or initiative.

All colleagues need to participate is access to the Internet or intranet through a supported browser. Instant electronic workspace. In about 5 minutes, non-technical professionals can create a QuickPlace to tackle any project. Ready for business. QuickPlace can be easily installed on Windows NT or hosted by authorized ISPs. A Web browser and a network connection mean you're ready for work. Easy and inviting. Make training obsolete. Simple and flexible. QuickPlace invites new users to contribute right

away. No knowledge of HTML or scripting is required to publish to the Web Room-by-room security. Easily control access to your QuickPlace content with time-tested Lotus Domino security features. Flexible floorplan. Nothing's hardwired. As your project changes, QuickPlace can change with it. Decorate your QuickPlace with a unique look and feel. Now you can also see and chat with on-line members.

£52.82 inc.VAT

£44.95 ex.VAT

Stock code LOT661

Sametime

Sametime is software that adds real-time multimedia collaboration to e-mail, discussion databases, document libraries and a host of other applications. Sametime allows people in different places to work together in a virtual office, whether they're across the hall or across the globe with Sametime audio, video and data conferencing. The Sametime product family includes the Sametime Server, the Sametime Connect client, and developer tools. The Sametime Server supports LDAP, T.120 & H.323 standards and is designed to work smoothly with third-party clients like Microsoft NetMeeting. The Sametime Server also works seamlessly with any browser or with Lotus Notes.



£4698.83 inc.VAT

£3999.00 ex.VAT

Stock code LOT639

Domino Mail Server

The Domino Server Family is an integrated messaging and Web application software platform for growing companies that need to improve customer responsiveness and streamline business processes. The Domino Mail Server combines full support for the latest Internet mail standards with Domino's industry-leading messaging capabilities - all in one manageable and reliable infrastructure.



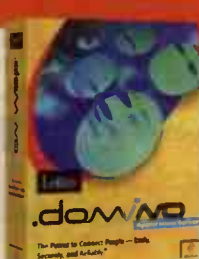
£707.35 inc.VAT

£602.00 ex.VAT

Stock code LOT538

Domino Application Server

The Domino Server Family is an integrated messaging and Web application software platform for growing companies that need to improve customer responsiveness and streamline business processes. The Domino Application Server is optimized to let you integrate your enterprise systems with your collaborative Web applications, and delivers the unmatched messaging functionality found in the Domino Mail Server.



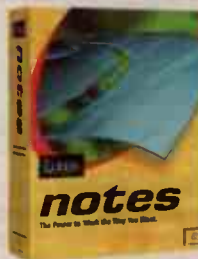
£1807.90 inc.VAT

£1538.64 ex.VAT

Stock code LOT531

Notes

Lotus Notes is the leading integrated e-mail and collaboration software for the Internet. Notes R5 offers an easy-to-use, open, and customizable environment -- so you can work the way you want, with all the power you expect. Notes R5 offers enhancements built on the most popular features of previous Notes releases and other Lotus products, including cc:Mail and Organizer, while offering full Internet standards support.



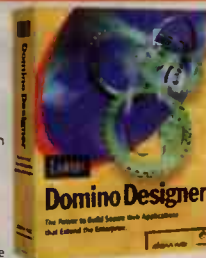
£88.99 inc.VAT

£75.74 ex.VAT

Stock code LOT540

Domino Designer

Lotus Domino Designer R5 is an open, integrated Web application development environment, with everything you need to build and deploy secure e-business applications that connect enterprise data with strategic processes.



£473.51 inc.VAT

£402.99 ex.VAT

Stock code LOT532

Fax for Domino

Fax for Domino is the ultimate fax solution for Lotus Notes and Domino. Fax for Domino has the tightest Integration to Notes and Domino, with advanced features like load balancing, scheduled transmissions, inbound routing, print-to-fax and improved attachment support.



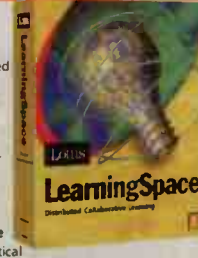
£1555.22 inc.VAT

£1323.59 ex.VAT

Stock code LOT652

LearningSpace

Learning Space Forum allows you to offer distributed learning courses that students and instructors can access whether they are online or offline. That makes it easier to learn from wherever they are and it reduces critical network bandwidth requirements! Since LearningSpace Forum courses are designed to be taken on your own time and from anywhere, learners benefit from the thoughtful interaction of all students.



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ADO214 ADOBE CAPTURE V2 DONGLE	£226.37	£265.98
ADO215 ADOBE CAPTURE V2 PLUS 2	£503.49	£591.60
ADO232 PAGEMAKER PLUS V6.5 CD WM	£413.61	£485.99
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ADO309 FRAMEMAKER V6 UPGRADE	£165.95	£194.99

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COR675 PRINT OFFICE 2000	£35.16	£41.31
COR701 COREL PRINT HOUSE V4 CLSC	£34.87	£41.74

Enfocus		
ENF003 CHECKUP V1.5	£131.14	£154.09

Equilibrium		
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EQU047 DEBABELIZER PRO V4.5 SUR	£1,206.00	£1,417.05

Europress		
EUR161 ART ATTACK PRINT IT!	£16.22	£19.06

Green		
GRE038 PUBLISHER 4	£34.03	£39.99

GSP		
GSP033 INSTANT BUSINESS CARDS	£11.48	£13.49

The Learning Company		
SOF250 KEY BUSINESS CARDS	£6.02	£7.07

Mattel		
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MAT119 PRINTSHOP PLUS 10	£25.27	£29.69
MAT120 PRINTSHOP PRO 10	£55.42	£65.12

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MGF092 IGRAFX DESIGNER UPGRADE	£200.49	£235.58

Microsoft		
MS1475 PUBLISHER 2000 V/UPGRADE	£35.18	£41.34
MS1491 PUBLISHER 2000	£69.50	£81.66
MS3814 PICTURE IT PREMIUM 2001	£22.23	£26.12
MS3815 PICTURE IT! PHOTO/PRINT	£37.44	£43.99
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The best way to protect your family when using the internet, providing you with peace of mind.

Net Nanny filtering software for your PC gives parents complete control over what comes into and goes out of the home via the internet. It has the capability to monitor the Internet, e-mail, IRC chat programs, newsgroups and offline applications in a fully customised, user friendly environment. Thus enabling you to prevent your children from accessing internet sites that you decide are not appropriate for them to see. Net Nanny provides free of charge updated screening lists of internet sites which you can modify to suit your family. With Net Nanny version 4.0 the parent or administrator can customise access permissions to suit different individuals. This flexibility allows you the knowledge that your child has access only to child friendly sites and is protected from cyber strangers and from disclosing personal information.

Popular Features include

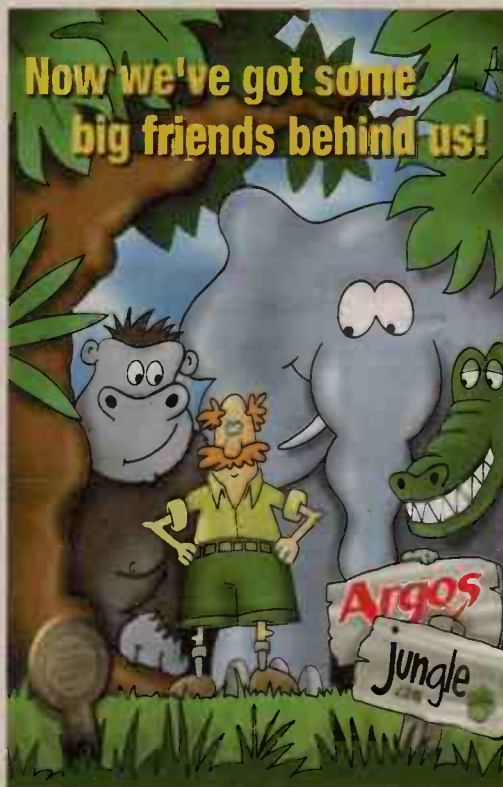
- Fully customisable filter lists and activity logs — you can edit, delete or add to reflect your personal views
- Free list updates, no hidden monthly/subscription fees
- Two-way, real-time monitoring putting you in control
- Choice of actions if a violation occurs — on-screen warning, masking of words and phrases, shutting down applications

Net Nanny can help you to

- Limit access to inappropriate material by screening or blocking anything such as pornography, bomb-making formulas, hate literature, cult information, drugs, or whatever else concerns you. If you can define it, Net Nanny can block it!
- Prevent the threat of Cyber Strangers
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- Provides user with the information to complete self-assessment and VAT returns
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- Includes free future upgrades

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AutoCAD LT 2000i

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To make the design process run smoothly and successfully, you need the active participation and contribution of all key design team members. But how do you provide the necessary tools and collaboration system without breaking your budget? Autodesk has the solution to your problem - AutoCAD LT 2000i, the affordable, easy-to-use 2D drafting software that uses Internet-enabled features to improve collaboration during the design process.

If you're looking for a better way to:

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Your search is over

- new AutoCAD LT 2000i is the only affordable 2D CAD program that combines AutoCAD functionality with Internet collaboration tools.

CODE	PRODUCT	Ex VAT	Inc VAT
AUT490	AutoCAD LT 2000i	£470.00	£552.25
AUT491	AutoCAD LT 2000i UPGRADE	£145.00	£170.38

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FROM **£170.38** Inc. VAT
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AutoSketch 7

Take time drawing, NOT learning software

AUTOSKETCH 7 IS PRECISION DRAWING MADE EASY!

You simply choose the type of drawing you want to create. AutoSketch's Application Wizards automatically set options and choose symbol libraries based on the type of drawing. Enjoy features such as 3D effects, multiple active snaps, hundreds of new symbols, JPEG import and export, Rich Text capabilities, Line Extension, and the Content Librarian, (which provides access to drag and drop symbols along with drag and drop hatch patterns), and more. AutoSketch 7 is ideal for first-time and advanced CAD users, midnight engineers, and technical writers wanting to create precision drawings quickly and easily.

CODE	PRODUCT	Ex VAT	Inc VAT
AUT479	AutoSketch v7	£80.84	£94.99
AUT480	AutoSketch v7 Upgrade	£44.25	£51.99

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QuickCAD Millennium Edition Release 7

...the faster, easier, most affordable CAD!

QuickCAD Millennium Edition is the faster, easier, most affordable CAD. You can start drawing immediately. QuickCAD 7's innovative 3-level interface lets you choose your experience level for a customised work environment. Enjoy new features such as Spell Check, multiple active snaps, hundreds of new symbols, JPEG import and export, Rich Text capabilities, and the Content Librarian, a great user interface which provides access to Drag and drop symbols, drag and drop hatch patterns and much more. QuickCAD 7 is ideal for first-time CAD users, students, midnight engineers, technical writers, architects-anyone wanting to create CAD drawings quickly and easily.

CODE	PRODUCT	Ex VAT	Inc VAT
AUT486	QuickCAD Millennium Edition v7	£35.74	£41.99

NEW VERSION
£41.99 Inc. VAT
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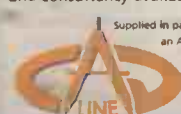
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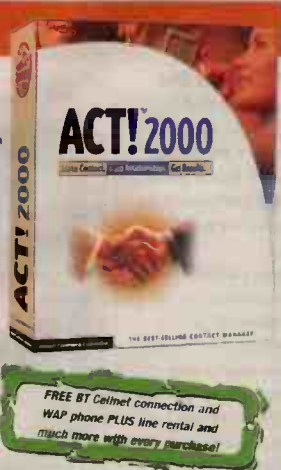
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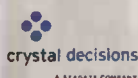
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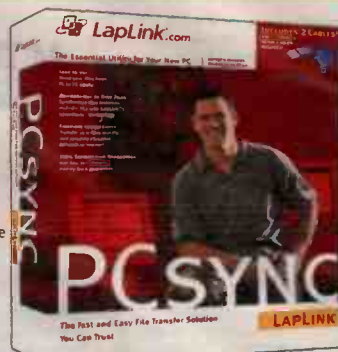
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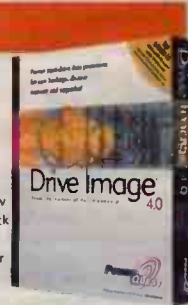
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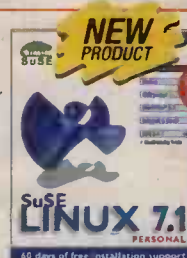
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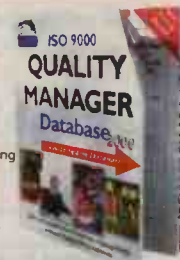
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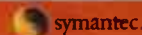
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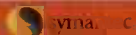
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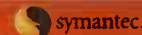


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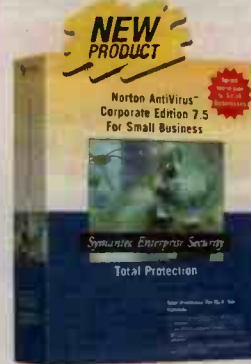
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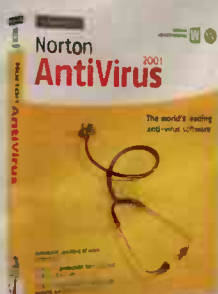
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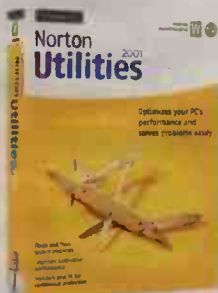
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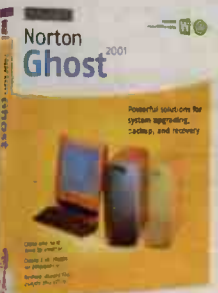
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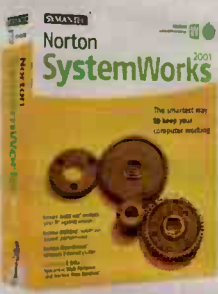
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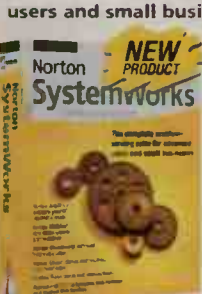
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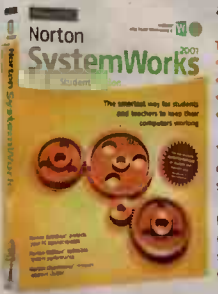
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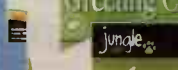












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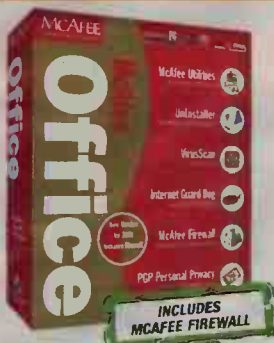


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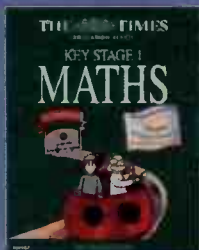
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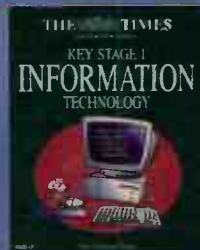
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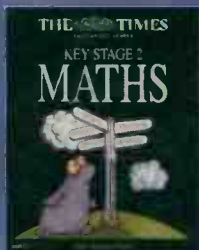


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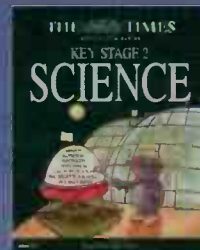
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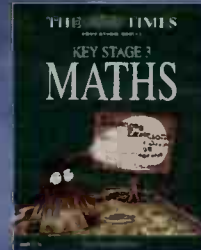
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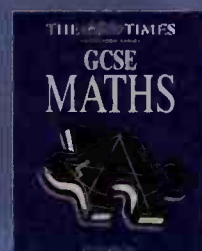


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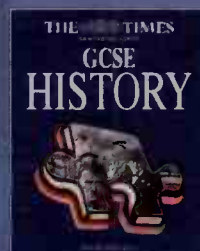
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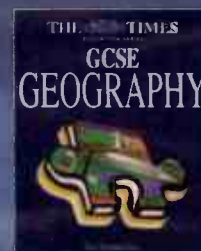
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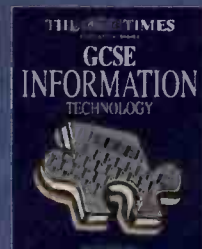
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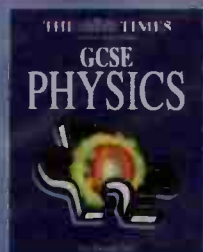
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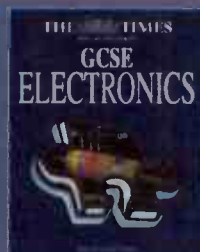
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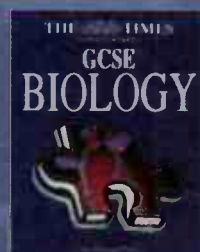
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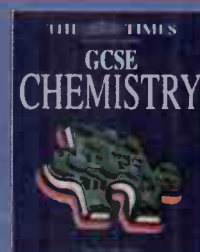
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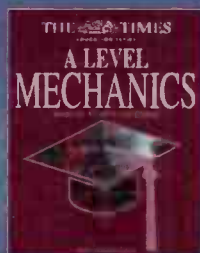


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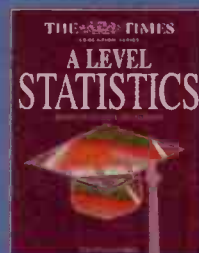
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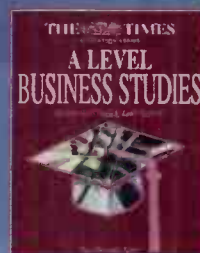
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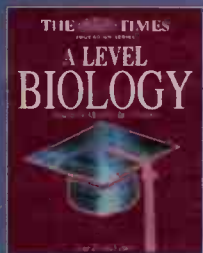
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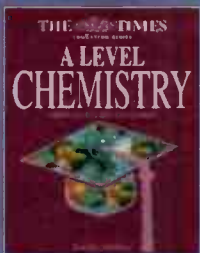
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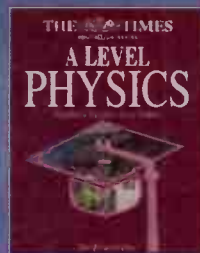
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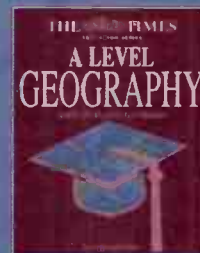
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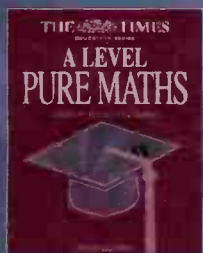
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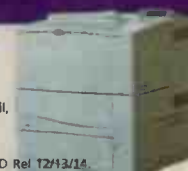
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FROM £272.60
£232.00
Stock code C6736A

HP OfficeJet G85

Home and office users who want to print, scan, copy, fax and colour fax with the additional convenience of an Automatic Document Feeder.

- Space, time and money savings of an All in One
- Based on the multiple award winning 2400dpi Deskjet 970 printer
- Colour faxing
- Convenience of an ADF



FROM £410.08
£349.00
Stock code C6737A

HP OfficeJet G95

Business users who want a network ready printer, scanner, copier, fax and colour fax with advanced functionality

- Based on the multiple award winning 2400dpi Deskjet 970 printer
- Excellent scan resolution
- Easy to set up and use
- Colour faxing
- Convenience of an ADF
- JetDirect included
- Automatic two sided printing



FROM £501.73
£427.00
Stock code C6740A

CLAIM UP TO £1100 CASH BACK WHEN BUYING A HP PRINTER*

* Money is claimed back directly from HP via the website www.hp-color-tradein.com. The old printer must be in perfect working order and older than 6 months. This promotion only applies when buying the printers stated below. Typical cashback values can be seen in the table. For full terms and conditions visit www.hp-color-tradein.com

Product	Rebate Laser	Rebate Ink
Business InkJet 2250	£30	£30
Business InkJet 2250TN	£95	£95
Colour LaserJet 4550	£140	£100
Colour LaserJet 4550N	£215	£135
Colour LaserJet 4550DN	£320	£170
Colour LaserJet 4550HDN	£395	£200
Colour LaserJet 8550	£395	£200
Colour LaserJet 8550N	£395	£200
Colour LaserJet 8550DN	£600	£200
Colour LaserJet 8550GN	£800	£200
Colour LaserJet 8550MFP	£1,100	£200

All In One Office Products

All prices correct at time of press. Online prices may vary than these shown due to daily fluctuations & online discounts. See page 62 for terms and conditions.

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PRINTERS

CANON CONSUMABLES

Inkjet Supplies	EX VAT	INC VAT
CAN017 BJ10/20/150/200/200-50BLK	£13.21	£15.52
CAN024 BJC4000 SERIES BLK CARTRIDGE	£18.00	£21.15
CAN025 BJC150/210/240/250 COLOR	£16.07	£18.88
CAN031 BJC5000 BLACK CARTRIDGE	£17.99	£21.14
CAN032 BJC4000/5000 INK TANK BLK	£5.00	£5.88
CAN033 BJC4000/5000 COLOR CART	£10.50	£12.34
CAN036 BJC 30/50/70/80 BLACK INK	£9.03	£10.61
CAN041 600 RANGE BLACK INK CART	£4.99	£5.86
CAN042 CANON 600 RANGE CYAN CART	£5.01	£5.89
CAN044 BJ 600 RANGE YELLOW CART	£5.01	£5.89
CAN045 BJC 50/70/80 COL TANK 3PK	£10.99	£12.91
CAN050 BJC240/250 PHOTO COL CART	£13.00	£15.28
CAN051 BJC50/70/80 BLK TANK 3PK	£6.02	£7.07
CAN073 BJC 7000/7100 BLK CARTRIDGE	£19.24	£22.61
CAN087 BJC 4000/5500 COLOR CART	£26.12	£30.69
CAN122 BJC 6000 CYAN INK TANK	£5.49	£6.45
CAN123 BJC 6000 YELLOW INK TANK	£5.49	£6.45
CAN124 BJC 6000 MAGENTA INK TANK	£5.49	£6.45
CAN125 BJC 6000 BLACK INK TANK	£6.99	£8.21
RET019 BC32 PHOTO CART BJC6000	£21.25	£24.97

XEROX CONSUMABLES

Inkjet Supplies	EX VAT	INC VAT
XER060 BLACK CART 450C/XJ4C	£7.89	£9.27
XER061 CYAN CART 450C	£8.49	£9.98
XER062 MAGENTA CART 450C/XJ6C/XJ	£8.49	£9.98
XER063 YELLOW CART 450C/XJ6C/XJ4	£8.49	£9.98
XER064 BLACK TURBO CART 450C/XJ6	£24.16	£28.14
XER124 C11/C15 BLACK INK CARTRID	£22.10	£25.97
XER125 C11/C15 COLOR INK CARTRID	£30.14	£35.41
XER126 C20/XJ8C BLACK INK CART	£27.99	£32.89
XER149 C6/C8 BLACK INK TANK	£13.99	£16.44
XER155 STANDARD COL CART 8C/C20	£26.12	£30.69
XER184 X06/XC8 COLOUR PRINTEHEAD	£30.14	£35.41
XER186 XEROX M750/M760 HIGH CAPA	£20.42	£23.99
XER187 XEROX M750/M760 BLACK INK	£14.46	£16.99
XER188 XEROX M750/M760 CYAN INK	£8.93	£10.49
XER189 XEROX M750/M760 MAGENTA I	£8.93	£10.49
XER190 XEROX M750/M760 YELLOW IN	£8.93	£10.49

Laser Supplies	EX VAT	INC VAT
XER090 C55/NC60 BLACK TONER	£13.21	£15.52
XER091 C55/NC60 CYAN TONER	£59.99	£70.49
XER092 C55/NC60 MAGENTA TONER	£59.99	£70.49
XER093 C55/NC60 YELLOW TONER	£59.99	£70.49

Canon S400

The versatile and creative colour printer

- Separate ink tanks for all colours eliminating waste and ultimately, saving money
- New High Colour inks for higher OD black and brighter colour printing
- High Resolution - 1440 dpi plus Drop Modulation Technology™ to produce professional looking documents
- Enables up to 9 ppm mono and up to 4 ppm colour output
- Advanced business features include network capability and high precision ink low and ink out detection
- Colour image Scanner Cartridge (optional), transforms printer into a 720dpi, 24-bit colour, image scanner

NEW PRODUCT

McLaren Special Offer

CAN247 Canon S400 Ex VAT £89.00 Inc VAT £108.00

Canon S450

The high speed personal colour printer

- Staggering print rate - 10ppm mono and 7ppm colour printing
- Individually replaceable ink tank for all colours eliminating waste and money saving
- New High Colour inks for higher OD black and brighter colour printing
- 1440 dpi plus Drop Modulation Technology and pigment black ink giving more professional looking documents
- Six colour photo system delivers stunning photo print quality
- 15-32 scan cartridge transforms printer into high quality scanner

NEW PRODUCT

McLaren Special Offer

CAN248 Canon S450 Ex VAT £92.00 Inc VAT £108.10

McLaren Special Offer

When you buy either the BJ-S400 or the BJ-S450 you will receive the Canon guide to West McLaren Mercedes' CD-ROM and official West McLaren cap, worth £45 FREE

Canon BJC 2100

"The Printer Designed for the Home"

- Outstanding 'out-of-box' print quality using pDrop Modulation Technology™
- Rapid print speeds - up to 5ppm mono and 2ppm colour printing
- Compact design and simple operation - perfect for the home user
- Optional 15-22 Scanner Cartridge and Photo Kit turn printer into a mini photo lab
- Wide range of inks and papers to meet all printing needs
- Easy connection via USB and Parallel ports
- Works with Windows 95/98, NT 4.0, Mac OS (iMac and G3/G4) and Windows 2000
- One year on-site warranty

ONE YEAR ON-SITE WARRANTY

£55.17 Inc VAT
£46.95 Ex VAT
Stock code CAN213

Canon S4500

The high performance A3 colour printer

- Rapid printing: up to 9 ppm mono and 6 ppm colour output ensures superb productivity
- Exceptional media handling allows full colour printing up to A3 in size
- Separate, individually replaceable ink tanks allows cost efficient printing and minimises ink wastage - an important factor when printing out large documents
- New High Colour inks for higher OD black and brighter colour printing
- Professional printing quality: up to 1440 dpi plus Drop Modulation Technology™, pigment black ink and optional 6 colour photo system
- Rich in business features: ink low and ink out hardware detection, automatic print head alignment, networkable using the Axis PP140 BJC network adapter

NEW PRODUCT

£273.78 Inc VAT
£233.00 Ex VAT
Stock code CAN249

Canon Imaging across networks

For more great Canon products go to www.jungle.com/CANON

XEROX WorkCentre™ M760 & FREE Nisis Digital Camera

Workgroup printing faster, easier, and more economical

- Distinguish documents with photo-quality color and crisp laser like black text
- Save on ink with separate cartridges for each color
- Get jobs done faster at 12ppm in black, 8ppm in color
- eXpress Mode that gives business-quality color twice as fast as comparable printers in normal mode with comparable dpi
- Networkable option for multiple users makes workgroup printing more economical
- Digital, Web & Video Colour PC Camera
- Maximum Resolution: 352 x 288 (101,376 pixels)
- USB port interface
- Image performance for Video stream: 20 fps for QCIF (176 x 144) 9 fps for CIF (352 x 288)

FREE Nisis Digital Camera

£145.95 Inc VAT
£124.21 Ex VAT
Stock code XER193

CODE	PRODUCT	EX VAT	INC VAT
XER176	DocuPrint M750	£85.53	£77.00
XER182	DocuPrint M760	£124.62	£146.43

XEROX WorkCentre™ M940

Colour Flatbed Printer • Copier • Scanner • PC Fax

- True to life photo quality colour printing
- Up to 1200 x 1200 dpi
- Engineered to print faster - up to 12 ppm black and 7 ppm colour
- Networkable with optional CentreDirect External Print Server

Flatbed Colour copying

- Flatbed design - if it fits on the glass, you can copy it

High Resolution Flatbed Scanning with XEROX CONTROLCENTRE Software

- Easy image capture at 600 x 600 dpi
- Scan to your favourite applications, including e-mail, as easy as 1-2-3
- 30-bit colour (millions of colours); 10-bit black
- Send and receive faxes via your PC modem

£279.99 Inc VAT
£238.28 Ex VAT
Stock code XER183

XEROX Xerox WorkCentre™ 470cx

Xerox Brings Vibrant Colour to your desktop

- Multifunctional 4 in 1 Versatile machine
- Colour Print Scan Copy & B&W fax
- Prints up to 6 PPM black, 3PPM Colour
- Up to 1200 x 1200 dpi for brilliant colour photo images
- True Multitasking - do two tasks at once
- Print and fax, print and scan
- Scan directly to Email
- Comprehensive Software Package
- Includes Full Versions of Pagemaster PRO 2.0
- TextBridge PRO 98

£187.94 Inc VAT
£159.95 Ex VAT
Stock code XER178

M750 / M760 / M940 / M950

CODE	PRODUCT	EX VAT	INC VAT
XER186	H100 High Capacity Black Ink Cartridge	£20.42	£23.99
XER187	Y100 Black Ink Cartridge	£14.46	£16.99
XER188	Y101 Cyan Ink Cartridge	£8.93	£10.49
XER189	Y102 Magenta Ink Cartridge	£8.93	£10.49
XER190	Y103 Yellow Ink Cartridge	£8.93	£10.49

M Series Media Inkjet Consumables

CODE	PRODUCT	EX VAT	INC VAT
XOS001	Ultra White Paper A4 (500)	£7.65	£8.99
XOS003	Premium Coated 1 Sided A4 (50)	£4.67	£5.49
XOS005	Premium Coated 2 Sided A4 (50)	£5.95	£6.99
XOS007	Premium Photo Paper (Gloss) A4 (20)	£9.78	£11.49

FREE Pack of Xerox Premium Photogloss A4 (5) with every M750/ M760/ M940/ M950 machine

All orders exclude delivery. Next-day delivery available from £7.45 + vat E&OE. Internet (online) deliveries from £2.49 Inc Vat

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EPSON EPSON Stylus COLOR 580

The most affordable 1440 dpi colour inkjet printer for the home

- Ultra-high 1440dpi printing resolution
- EPSON Ultra Micro Dot 6pl with Variable Sized Droplet Technology
- Advanced Driver providing full control of printer operations
- Print speeds of 6ppm black and 3.2ppm colour
- Standard USB Interface
- Windows 98 / 2000 / iMac and G3/G4 compatibility



£61.10
Inc. VAT
£52.00
Ex. VAT
Stock code EPS518

EPSON EPSON Stylus COLOR 680

Ideal Colour Inkjet Printer for Advanced Home and Business Users

- Up to 2880 dpi printing resolution
- New aesthetic design with innovative flexible paper tray
- EPSON Ultra Micro Dot™ 4pl with Variable Sized Droplet Technology
- IntelliEdge™ ink cartridges for enhanced user feedback
- USB and parallel interface
- Print speeds of 8.0ppm black and 7.7ppm colour
- Also comes in coloured Indigo casing



£77.55
Inc. VAT
£66.00
Ex. VAT
Stock code EPS519

EPSON EPSON Stylus COLOR 880

The ideal product for Photo enthusiasts and Soho users

- Up to 2880 dpi resolution
- Print speeds of 12ppm black and 11.6ppm colour
- Improved driver functions w/ Duplexing and book printing options
- EPSON Ultra Micro Dot 4pl with Variable Sized Droplet Technology
- Network option
- Windows and Mac compatible
- PhotoEnhance 4 for image optimisation



£121.03
Inc. VAT
£103.00
Ex. VAT
Stock code EPS511
EPS536 Stylus Color 880 Transparent
Ex. VAT £111.00 Inc. VAT £130.43

EPSON EPSON Stylus Photo 790

All-purpose inkjet ideal for the photo enthusiast

- Advanced 6 colour printer
- Up to 2880dpi Perfect Picture Printing
- Print speeds of 7.8ppm black text and 7.5ppm colour
- Borderless prints on 4"x6" and A4 without the need for special media
- EPSON Ultra Micro Dot 4pl with Variable Sized Droplet Technology
- USB and Parallel connectivity for Windows and Macintosh
- Feature-rich EPSON PhotoQuicker 2 software included
- Adobe Activeshare also included



£121.03
Inc. VAT
£103.00
Ex. VAT
Stock code EPS566

EPSON EPSON Stylus Photo 890

Versatile A4 Photo Printing for Quality and Lightfastness up to 20 years*

- test conditions apply
- Up to 2880dpi Perfect Picture Printing
- Advanced 6 colour printing for true photographic reproduction
- Print speeds of up to 9.6ppm black text & 9.2ppm colour
- Borderless prints on 4" x 6" and A4 media without the need for special media
- EPSON Ultra Micro Dot 4pl with Variable Sized Droplet Technology
- USB and Parallel connectivity for Windows® and Macintosh®
- Feature-rich EPSON PhotoQuicker 2 software included



NEW PRODUCT
£173.90
Inc. VAT
£148.00
Ex. VAT
Stock code EPS567

EPSON EPSON Stylus COLOR 980

High speed business printer, for stand alone, work groups and networked users

- Up to 2880dpi printing resolution
- EPSON Ultra Micro Dot 3pl with Variable Sized Droplet Technology
- USB and parallel interfaces
- Integrated network option (10/100 BaseT Ethernet) available in 980N model
- Print speeds of 13ppm black and 12.5ppm colour
- Windows 95/98/NT4/2000/ iMac & G3/G4 compatible
- PhotoEnhance 4 for image optimisation
- Duplexing/booklet printing option available
- New, sleek aesthetic design



EPS516 Epson Stylus Color 980
Ex. VAT £192.00 Inc. VAT £225.60

EPSON EPSON Stylus PHOTO 1290

lightfast 6-colour Photo Reproduction for serious and Professional photographers.

- Borderless prints on 100mm A4, A3 & A3+ media without the need for over sizing or guillotine
- Up to 2880dpi
- 6 colour printing for true photo reproduction
- Print speeds of up to 9.4ppm black text and 9.0ppm colour
- EPSON Ultra Micro Dot 4pl with Variable Sized Droplet Technology
- USB and Parallel connectivity



EPS568 Epson Stylus Photo 1290
Ex. VAT £296.00 Inc. VAT £347.80

EPSON EPSON EPL- 5800L

High Quality 1200dpi Laser Printer

- Compact 10ppm A4 Laser Printer
- 1200dpi Class resolution
- Standard USB and IEEE 1284 parallel interface
- Windows and Mac drivers included
- Standard 2MB memory upgradeable to 13MB
- Flexible paper handling with standard 150 sheet Universal Paper
- Optional:- Large Capacity Paper Unit (500Sheet)



EPS462 Epson Stylus Photo 5800L
Ex. VAT £236.00 Inc. VAT £277.30

EPSON EPSON AcuLaser C2000

AcuLaser C2000 A4 Colour Laser Printer

- Superior colour printing quality - 600dpi with EPSON AcuLaser 2400C-RIT
- Print speeds approx 20ppm mono, 5ppm colour
- Versatile paper handling - up to 1,150 sheets with 500 sheet output and optional Duplex Unit
- Outstanding value with low operating costs
- Powerful 266MHz RISC Processor
- Mac or PC compatible
- Extensive connectivity - ECP high-speed Parallel or Ethernet 10100BASETX interfaces
- EPSON AcuLaser 'DualRIP' Technology with EPSON Controller and Advanced Load Balancing



£1504.00
Inc. VAT
£1280.00
Ex. VAT
Stock code EPS492

EPSON EPSON EPL-N2050

EPL-N2050 Mono Laser Printer

- 20PPM A4 Laser Printer with True 1200dpi
- 166MHz High Performance RISC Processor
- Standard 16MB memory upgradeable to 256MB
- 100-Sheet Multi Purpose Tray and 550-Sheet Universal Cassette as Standard
- PCL5e / PCL6 Emulation
- Send Once Print Many Technology
- Built in 10/100BaseTx Network Print Server
- Optional:- Duplex Unit, Large Capacity Paper Unit (550Sheet), Multi-bin Unit, Offset Stacker, Envelope Feeder, Hard Disk Drive, Adobe® PostScript® 3(tm)



£771.98
Inc. VAT
£657.00
Ex. VAT
Stock code EPS455

PRINTERS

EPSON PRINTERS

	EX VAT	INC VAT
Colour Laser		
EPS492 ACULASER C2000 5PPM A4 32	£1,280.00	£1,504.00
Dot Matrix		
EPS512 LX-300+ 9 PIN 80 COLUMN 2	£97.00	£113.98
EPS031 LQ300 24 PIN 80 COLUMN	£112.00	£131.60
EPS204 FX-880 9PIN 80 COLUMN	£246.00	£289.05
EPS467 LQ580 24 PIN 80 COLUMN 10	£209.00	£245.58
Inkjet		
EPS519 STYLUS COLOUR 680 USB/PAR	£66.00	£77.55
EPS567 STYLUS PHOTO 890 9.6PPM	£148.00	£173.90
EPS511 STYLUS COLOUR 880 12PPM	£103.00	£121.03
EPS568 STYLUS PHOTO 1290 9.4PPM	£296.00	£347.80
EPS566 STYLUS PHOTO 790 USB/PARA	£103.00	£121.03
EPS518 STYLUS COLOUR 580 INKJET	£52.00	£61.10
EPS562 STYLUS COLOUR 480SKU	£44.00	£51.70
EPS388 STYLUS COLOUR 1160 A3+ PA	£192.00	£225.60
EPS516 STYLUS COLOUR 980 12.7PPM	£192.00	£225.60
EPS139 EPSON STYLUS 1520 A2	£315.00	£370.13
EPS468 STYLUS PHOTO 8750C INKJET	£170.00	£199.75
EPS563 STYLUS 680 TRANSPARENT	£74.00	£86.95
EPS536 STYLUS COLOUR 880 TRANS	£111.00	£130.43
Laser		
EPS462 EPL5800 A4 10PPM USB LASER	£236.00	£277.30

EPSON CONSUMABLES

	EX VAT	INC VAT
Epson		
008401 STYLUS 870 COLOUR INK CAR	£10.09	£11.86
020191 STYLUS 440/640/740 COL IN	£14.99	£17.61
020187 440/640/750/1200 BLK CART	£13.29	£15.62
020189 STYLUS 740/760/86 BLK INK	£14.00	£16.45
007402 1270/870 TWIN BLACK INK	£20.99	£24.66
018401 COLOUR INK STYLUS 680	£14.99	£17.61
007401 PHOTO1270/870 BLACK CART	£12.05	£14.16
009401 EPSON 1270 COLOUR CART	£14.06	£16.52
020193 STYLUS PHOTO 750 COL CART	£10.29	£12.09
017401 BLACK INK EPSON 680	£17.49	£20.55
020401 INK CARTRIDGE 3 COL 880	£14.99	£17.61
020093 STYL 400/500/600/PHOTOBLK	£12.29	£14.44
020089 COLOUR INK 4/6/8/850/1520	£14.00	£16.45
019401 INK CART/BLACK 900SH F S	£17.99	£21.14
017402 BLACK INK STYLUS680 2PK	£30.29	£35.59
020208 STYLUS 440/640 BLK INK 2P	£21.99	£25.84
020110 STYL PHOTO 5 COL INK CART	£10.29	£12.09
EPS281 A4 PHOTO PAPER (20 SHTS)	£5.82	£6.84
EPS183 PHOTO CARDS 4"x6" 20 SHTS	£4.01	£4.71
EPS317 PREMIUM INKJET PAPER 250	£2.50	£2.94
041287 A4 PREMIUM GLOSSY 20PACK	£8.03	£9.44
EPS181 A4 PHOTO G LOSS PAP 20SH	£5.01	£5.89

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Why not ring our corporate team on 0845 2020 330 to discuss your business needs.



For more great EPSON products go to www.jungle.com/EPSON

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PRINTERS

MINOLTA-QMS CONSUMABLES

QMS-Minolta	EX VAT	INC VAT
QMS073 TONER CARTRIDGE	£34.00	£39.95
QMS096 MAGICOLOR 2200 TONER CART	£40.20	£47.24
QMS044 MAGICOLOR 2 TONER KIT	£369.99	£434.74
QMS095 QMS 2200 TONER YELLOW	£77.39	£90.93
QMS018 MAGICOLOR 2 YELLOW TONER	£86.42	£101.54
QMS031 MAGICOLOR 2 SERIES CYAN	£86.42	£101.54
QMS096 MAGICOLOR 2200 TONER MAG	£77.39	£90.93
QMS097 MAGICOLOR 2200 TONER CYAN	£77.39	£90.93
QMS032 FUSER OIL & CLEANING PAD	£56.99	£66.96
QMS012 MAGICOLOR 2 BLACK TONER	£86.42	£101.54
QMS058 BLACK TONER QMS 6100	£97.47	£114.53
QMS019 MAGICOLOR 2 MAGENTA TONER	£86.42	£101.54
QMS055 QMS 6100 YELLOW TONER	£130.64	£153.50
QMS056 QMS 6100 MAGENTA TONER	£130.64	£153.50

BROTHER CONSUMABLES

Brother	EX VAT	INC VAT
BR0137 HL-1200 SERIES 6K TONER	£42.99	£50.51
BR0045 HL1060/50/40/820 TONER	£13.99	£16.44
BR0010 720-760/800P/MFC TONER	£13.99	£16.44
BR0101 BLACK INK CART MFC740	£7.79	£9.15
BR0052 HL820/1020-1070 DRUM UNIT	£78.80	£92.59
BR0136 HL-1200 SERIES 3K TONER	£29.99	£35.24
BR0103 MAGENTA INK CART MFC740	£4.99	£5.86
BR0102 CYAN INK CART MFC740	£4.99	£5.86
BR0104 YELLOW INK CART MFC740	£4.99	£5.86
BR0011 HL720-760/MFC900 DRUM KIT	£83.99	£98.69
BR0007 HL-630/660/631 TONER	£17.07	£20.06
BR0110 BLACK/CYAN CART MP21C	£14.21	£16.70
BR0111 MAGENTA/YELLOW INK MP21C	£13.99	£16.44
BR0009 HL-1260/1660 EP/ED TONER	£49.99	£58.74

KYOCERA CONSUMABLES

Kyocera	EX VAT	INC VAT
KY0122 FS-600/680/800 TONER CART	£27.99	£32.89
KY0169 TK-17 TONER KIT FOR FS-10	£44.99	£52.86
KY0038 FS600/800 250 SHEETFEEDER	£83.40	£98.00
KY0079 FS7000 TONER HIGH YIELD	£75.00	£88.13
KY0035 FS1700/3700 MYIELD TONER	£41.99	£49.34
KY0041 FS-1500 TONER CARTRIDGE	£26.99	£31.71
KY0149 FS-1200 TONER CARTRIDGE	£38.33	£45.04
KY0191 TONER KIT FOR 1800/3800	£60.30	£70.85
KY0008 FS-400 TONER CARTRIDGE	£12.20	£14.34
KY0056 FS5800 BLACK TONER CART	£69.99	£82.24
KY0069 RS232C/RS422A SERIAL CARD	£30.14	£35.41
KY0108 F1000/1010 TONER CARTRIDGE	£18.23	£21.42
KY0206 TOKEN RING INTERFACE	£268.00	£314.90
KY0007 1550/1600/34/3600 TONER	£35.32	£41.50



magicolor 2200

- PostScript ready (except DeskLaser)
- 5 ppm colour
- 20 ppm mono
- up to 1200 dpi
- 10/100BT card as standard
- Optional digital copying and scanning
- Optional automatic duplexing

QMS074 magicolor 2200N	Ex VAT £1395.00	Inc VAT £1639.13
QMS075 magicolor 2200GN	Ex VAT £1595.00	Inc VAT £1874.13
QMS076 magicolor 2200EN	Ex VAT £1865.00	Inc VAT £2191.38
QMS077 magicolor 2200DP	Ex VAT £2395.00	Inc VAT £2814.13
QMS103 magicolor 2200DeskLaser (Win Only)	Ex VAT £895.00	Inc VAT £1051.63

NEW PRODUCT



FROM £1051.63
£895.00
Stock code QMS103



PagePro 4100

- Versatile mono printer
- PostScript 3
- 18ppm
- 250 sheet tray
- 1200 x 600 dpi
- 2Mb (max 18Mb)
- Duty cycle 60,000 pages/month
- Optional extra paper tray, network card and duplexing capabilities (Windows 95/98 & NT)

QMS094 PagePro 4100W	Ex VAT £399.00	Inc VAT £468.83
QMS107 PagePro 4100E	Ex VAT £495.00	Inc VAT £581.63
QMS108 PagePro 4100GN	Ex VAT £695.00	Inc VAT £816.63



magicolor 6100 Range

- Up to 1200 x 1200 dpi
- Up to 24 ppm mono / 6ppm colour
- Prints oversize A3 full bleed
- Up to 1250 paper input
- Ethernet standard 10BaseT/100BaseTX
- Up to 384MB RAM
- Automatic duplexing available
- Digital scanning/copying capability

QMS068 magicolor 6100 DeskLaser (Win Only)	Ex VAT £2099.00	Inc VAT £2466.33
QMS049 magicolor 6100N	Ex VAT £2449.00	Inc VAT £2877.58
QMS050 magicolor 6100 GN	Ex VAT £2699.00	Inc VAT £3171.13
QMS051 magicolor 6100 EN	Ex VAT £2999.00	Inc VAT £3523.83
QMS052 magicolor 6100 DP	Ex VAT £4249.00	Inc VAT £4992.58

Includes 1 year on site warranty



FROM £2466.33
£2099.00
Stock code QMS068



PagePro 1100

- The award winning Page Pro 1100L is the ideal tool for easy production of business documents.
- 10 pages per minute
- Up to 600 x 600 dpi resolution
- Up to 215 x 355mm size documents
- Print on paper, transparencies, labels, thick stock, envelopes
- High-capacity toner cartridge
- Expandable paper capacity
- Easily shared through Windows or Ethernet interface

QMS070 PagePro 1100	Ex VAT £195.00	Inc VAT £229.13
MIN104 PagePro 1100L	Ex VAT £145.00	Inc VAT £170.38



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Printers

For more great Brother products go to www.jungle.com/BROTHER

Brother HL-1030

The HL-1030 is a Windows dedicated laser printer ideal for the budget conscious user who works almost exclusively within the Windows environment and needs fast, high quality mono printing at around 1p per page using standard plain paper.

- Key Features**
- 10ppm print speed
 - Windows Dedicated Printer
 - Small Footprint
 - Crisp Print Quality at 600dpi Class
 - 2Mb Memory
 - 250 Sheet Paper Input
 - Handles a Range of Paper Sizes
 - Useful 'On-Screen Interactive Help' and 'Quick Print Set-Up' for Windows Facilities
 - Auto E-Mail Printing
 - Long Life Consumable with Low Running Costs



BRO139 Brother HL-1030	Ex VAT £169.00	Inc VAT £198.58
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Brother HL-1270N

12ppm network printer, ideal for small work groups

- Key Features**
- Built-in Ethernet 10/100 Base TX support
 - Professional print quality at 1200dpi class
 - Exceptional 12 page per minute printing
 - Windows, PCL6, IBM, EPSON, & Postscript level 2 compatible emulations
 - Flash memory as standard, for greater flexibility
 - Optional 2nd tray increases capacity to 500 sheets
 - Parallel and USB ports for easy connection
 - Useful 'On-Screen Interactive Help' and 'Quick Print Set-Up' for Windows
 - Long life consumable



BRO126 Brother HL-1270N	Ex VAT £339.00	Inc VAT £398.33
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Brother HL-3400CN

For a first class Impression - express yourself with colour. Brother colour laser printers are designed to meet your demands for colour printing from office through to everyday professional use.

- Key Features**
- Fast printing speed at a high resolution
 - Wide range of printer drivers and emulations
 - Large memory & expandability
 - Pantone compliant/ICC Profiles
 - Postscript Level 3 Language Emulation
 - Fax modem support
 - 64Mb Memory - Upgradeable to 320Mb



BRO150 Brother HL-3400CN	Ex VAT £2250.00	Inc VAT £2643.75
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Brother HL-1650/1670N

- BUILT-IN DOUBLE-SIDED PRINTING**, 3-colour LCD status indicator and fast network connectivity are just a few of extensive list of features.
- Key Features**
- Fast 16ppm print speed
 - BUILT-IN AUTOMATIC DUPLEX AS STANDARD FOR ECONOMICAL PRINTING
 - Crisp text & graphics with Brother HQ1200 print quality
 - 10/100BaseTX network connectivity (HL-1650 Optional, HL-1670N Standard)
 - 3 colour LCD for easy status recognition



BRO178 Brother HL-1650 (16MB)	Ex VAT £419.99	Inc VAT £493.49
BRO179 Brother HL-1670N (16MB)	Ex VAT £559.99	Inc VAT £657.99
BRO180 Brother HL-1670N (32MB)	Ex VAT £602.00	Inc VAT £707.35

Brother HL-2400Ce

The Brother HL-2400Ce range of colour laser printers provide high quality, high speed colour A4 output plus a host of unique printing capabilities.

- Key Features**
- Up to 2400dpi Class Colour Printing
 - Up to 8ppm In Colour
 - Up to 16ppm in Mono
 - Low Cost Per Copy
 - PCL5c Emulation (Colour)
 - PCL6 Emulation (Mono)
 - Postscript Level 3 Language Emulation
 - 167MHz RISC Processor
 - 32mb Standard Memory - Upgradeable to 288mb



BRO140 Brother HL-2400Ce	Ex VAT £1169.99	Inc VAT £1374.74
BRO145 Brother HL-2400CeN	Ex VAT £1331.63	Inc VAT £1564.67

Brother HL-1250

The Brother HL-1250 has all the advantages of a large business printer without the bulk, with its high resolution output and optional Networking capabilities you won't be disappointed.

- Key Features**
- 12ppm
 - 1200 x 600dpi for crisp print quality
 - 4mb Memory, Max 36mb
 - 250 sheet input, optional 2nd tray
 - parallel and USB Port for easy connection with other devices
 - Low running cost consumable
 - Optional Networking connectivity with full management capabilities
 - Windows, PCL6, IBM, EPSON.



BRO122 Brother HL-1250	Ex VAT £239.99	Inc VAT £281.99
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All orders exclude delivery. Next-day delivery available from £7.45 + vat E&OE. Internet (online) deliveries from £2.49 Inc Vat



Lexmark Z52

High Performance Photo Quality
Delivering results for demanding users

Features

- Ultimate high resolution printing - 2400 x 1200 dpi on all media
- High Performance speeds - up to 15ppm black, 7ppm colour
- Pigmented black ink for super sharp text
- USB and Parallel
- Job finishing features for professional results - duplex, posters, booklets and multi up.



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Lexmark Z42

High Definition Photo Imaging
First Class results for text and photos

Features

- Ultimate high resolution printing - 2400 x 1200 dpi on all media
- Fast Printing - up to 10ppm black, 5 ppm colour
- Pigmented black ink for super sharp text
- Mac and PC compatible



£85.76 Inc.VAT
£72.99 Ex.VAT
Stock code LEX204

Lexmark Z32

Premium Quality for Photos and Text
The affordable feature packed photo quality printer

Features

- Photo quality printing 1200 x 1200 dpi
- High speed printing - up to 7ppm black, 3ppm colour
- Easy to use and install
- Mac and PC compatible



£76.38 Inc.VAT
£65.00 Ex.VAT
Stock code LEX202

Lexmark Z12

Effortless Photo Quality
The perfect printer for new users

Features

- Photo Quality printing 1200 x 1200 dpi
- Fast speeds up to 6ppm black, 3ppm colour
- USB and parallel connectivity
- Mac and Windows compatible
- Small and compact



£55.26 Inc.VAT
£47.03 Ex.VAT
Stock code LEX218

Lexmark J110

The J110, with LiquidLaser (TM) technology, gives small workgroups big new benefits!

Features

- Brilliant colour for powerful business documents.
- The speed you need for fast job turnaround
- IT-friendly and designed for your network
- Affordable to own and operate
- Up to 16ppm
- 2400 x 1200 dpi
- 4 Separate high yield ink tanks
- Mac and PC compatible



LEX263 Lexmark J110 Ex.VAT £629.99 Inc.VAT £740.24

Lexmark Optra E312L

The Low-Cost, Easy-to-use Laser Printer for Home or Office

Features

- 1200 Image Quality
- 10ppm print speed
- Ships with 1.5k toner cartridge
- 10k monthly duty cycle
- 2mb memory expandable to 62MB
- USB and parallel connectivity
- Excellent print quality



LEX209 Lexmark E312L Ex.VAT £189.00 Inc.VAT £222.08

PRINTERS

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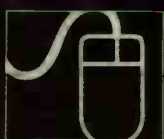
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PRINTERS

DIGITAL CAMERAS

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AGF053 EPHOTO CL18 SILVER	£76.55	£89.95
AGF059 EPHOTO CL20/NON 1024X768P	£119.99	£140.99
AGF056 EPHOTO CL18 NON 640X480PI	£79.99	£93.99
Canon		
CAN222 DIGITAL IXUS 2.11PIX 8MB	£379.99	£446.49
CAN205 POWERSHOT S10 DIGITAL CAM	£329.99	£387.74
Fujifilm		
FUJ208 FINEPIX 1300 8 MB	£159.00	£186.83
FUJ175 FINEPIX 4700 ZOOM 16MB	£419.99	£493.49
FUJ224 FINEPIX 2400 ZOOM 2.1MPX	£269.99	£317.24
FUJ198 FINEPIX 401 2.4MEGA PIXEL	£349.99	£411.24
FUJ218 FP 4900 CAMERA 6X OPTICAL	£549.99	£646.24
FUJ239 FINEPIX 6800Z 6MPXELS 3X	£499.99	£587.49
Hewlett Packard		
C8452A C315 DIGITAL CAMERA	£192.00	£225.60
C8890A HP PHOTOSMART C215 DIGITAL	£131.00	£153.93
C6324A HP PHOTOSMART C618 DIGITAL	£305.00	£358.38
C8574A C315 CAMERA & P1000	£308.00	£361.90
C8575A HP C618 CAMERA & PHOTOSMA	£408.00	£479.40
Kodak		
KOD107 DC3200 MEGA PIXEL 2MB 2X	£123.00	£144.53
KOD096 DC3400 CAMERA 2 MEGAPIXEL	£269.99	£317.24
KOD097 DC3800 CAMERA 2MP DIGITAL	£229.99	£270.24
KOD054 DC215 ZOOM DIGITAL CAMERA	£189.99	£223.24
KOD092 KODAK DC5000 DIGITAL CAMERA	£399.99	£469.99
Nikon		
NIK025 COOLPIX 880 3.34MPXEL	£599.00	£703.83
Olympus		
OLY045 C960ZOOM 1.3MEGAPIXEL	£228.94	£269.00
OLY046 C860L 1.3MEGAPIXEL	£160.00	£188.00
OLY058 CAMERA E10SLR 4MPXEL DIGI	£1,149.00	£1,350.08
OLY067 C2040Z 2.1MEGAPIXEL USB	£399.00	£468.83
OLY054 CAMERA C990 ZOOM DIGITAL	£319.00	£374.83
Pretech		
PRE017 DC-530 4 IN 1 MULTIMEDIA	£103.41	£121.51
Ricoh		
RIC045 RDC-6000 DIGITAL CAMERA	£254.47	£299.00
Sony		
SON097 MAVICA FDB7 1.3MPXEL XGA	£379.99	£446.49
SON087 FD75 10X ZOOM DIGITAL CAM	£299.99	£352.49
SON469 MAVICA FD90 DIGITAL STILL	£542.69	£637.66

SHARP AJ SERIES PRINTER ACCESSORIES

	EX VAT	INC VAT
Sharp Ink Tanks		
SHA100 BLACK AJ1800/6010	£15.99	£18.79
SHA101 CYAN AJ1800/2100/6010	£6.49	£7.63
SHA102 MAGENTA AJ1800/2100/6010	£6.49	£7.63
SHA103 YELLOW AJ1800/2100/6010	£6.49	£7.63
SHA104 PHOTO CYAN AJ2100	£8.99	£10.56
SHA105 PHOTO MAGENTA AJ2100	£8.99	£10.56
SHA106 PHOTO BLACK AJ2100	£8.99	£10.56
Sharp Print Heads		
SHA107 BLACK AJ1800/6010	£42.99	£50.51

FS-1000 A4 Laser Printer



The small office laser printer that means business

- 10 page per minute print speed
- 75MHz PowerPC processor
- 600dpi resolution enhanced to 1200dpi (KIR2)
- 4MB RAM (132MB max)
- 250-sheet cassette and 50-sheet multi-purpose feed standard paper input
- Options include additional 250-sheet cassette, network and memory upgrades
- Variety of pre-configured models available
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* Less than 1p per page

* based on 5% coverage at RRP

KY0167 Kyocera FS-1000 Ex VAT £229.00 Inc VAT £269.00
KY0169 Toner (6,000 pages) FS-1000 Ex VAT £44.99 Inc VAT £52.86

Memory Upgrades

Code	MB	Compact Flash Upgrades	Ex VAT	Inc VAT
MEM029	8MB	COMPACT FLASH MEMORY	£17.99	£21.14
MEM030	16MB	COMPACT FLASH CARD	£25.99	£30.54
MEM032	32MB	COMPACT FLASH CARD	£39.99	£46.99
MEM035		COMPACT FLASH ADAPTER	£6.99	£8.21
MEM042		CARD READER USB PORT	£24.99	£29.36

Code	MB	SmartMedia Upgrades	Ex VAT	Inc VAT
MEM036	8MB	SMARTMEDIA	£12.99	£15.26
MEM037	16MB	SMARTMEDIA	£20.99	£24.66
MEM038	32MB	SMARTMEDIA	£34.99	£41.11
MEM091	64MB	SMARTMEDIA	£52.99	£62.26
MEM039		SMARTMEDIA ADAPTER	£24.99	£29.36
MEM043		CARD READER USB PORT	£24.99	£29.36

HP PhotoSmart C315 Digital Camera

The 2.1 megapixel digital camera with point-and-shoot simplicity and photo-quality results

- Capture those special moments effortlessly in 2.1 megapixel quality - just open lens, point and shoot
- Easy, intuitive camera design and operations real-image viewfinder makes it easy to frame your shots
- Preview and review your pictures instantly on the fast 4.5cm colour LCD display
- Direct printing with HP infrared technology and removable memory cards via HP Photosmart printers - no PC or Mac required
- HP imaging software makes it easy to share pictures via direct e-mail portal



C8452A HP Photosmart C315 camera Ex VAT £191.00 Inc VAT £224.43

HP PhotoSmart P1218 Printer

The ultimate photo printer for maximum performance and versatility.

- Convenient direct photo printing from a digital camera without using a PC
- Fast downloading of digital camera images to PC via CompactFlash™ and SmartMedia™ card reader in the printer
- Up to 17 pages per minute in black, 13 pages per minute in colour.
- 2400 x 1200 dpi printing available on photo paper
- Windows 3.1x, 95, 98, 2000 Professional, NT4, ME, Mac OS 8.5.1 or above compatible.



£251.45 Inc VAT
£214.00 Ex VAT
Stock code C8402A



SHARP AJ-1800

Impressive Colour and Speed for the Home or Office

- 4 cartridge print system
- Low running costs as no ink wastage
- 6ppm colour, 10ppm mono print speeds
- 1200 x 1200 dpi resolution
- Photo Suite III SE Image Editing software included (value £29.99)
- Parallel and USB ports
- 1 year exchange warranty
- Windows 95/98/ME/NT4.0/2000 and Mac operating system



NEW PRODUCT
£88.11 Inc VAT
£74.99 Ex VAT
Stock code SHA110

SHARP AJ-2100

A Speedy Six-Colour Solution For Superb Photo Quality Printing

- 6 cartridge print system for higher quality photographic printing
- Low running costs as no ink wastage
- 1200 x 1200 dpi resolution
- Photo Suite III SE Image Editing Software included (value £29.99)
- Parallel and USB ports
- 1 year exchange warranty
- Windows 95/98/ME/NT4.0/2000 and Mac operating systems
- Ideal for Digital camera users



NEW PRODUCT
£199.73 Inc VAT
£169.99 Ex VAT
Stock code SHA096

Olympus C1

Taking its inspiration from the best-selling MJU range of 35mm compact cameras, the new C1 Digital camera is ideal for those who want a low-cost digital camera but refuse to compromise on quality or performance.

Ultra-compact with a 2x digital zoom, 1.3 mega pixels resolution and a USB connection interface (storage class), this lightweight camera gives high quality pictures and fantastic value for money.



CODE	PRODUCT	Ex VAT	Inc VAT
OLY046	C860L 1.3 mega pixels 5.5mm F2.8 Lens	£180.00	£188.00
OLY073	C1 1.3 mega pixels 2x digital zoom	£199.99	£234.99
OLY067	C2040Z 2.1 mega pixels	£399.00	£468.83
OLY068	C3040Z 3.3 mega pixels USB port	£618.99	£728.49
OLY058	E10 4.0 mega pixels digital SLR	£1149.00	£1350.08

RDC 6000

The RDC-6000 digital camera is packed with powerful imaging capabilities that make it perfectly simple for you to create, process, and share professional looking stills and movies with almost anyone at home or around the world.

- 2.14 megapixel CCD
- 8.3mm Lens
- 2x3x4x Digital Zoom
- 3 mega pixel output resolution
- LCD Screen and Optical Viewfinder
- Moving image (AVI) recording mode
- Web camera functionality
- Complete solution, includes A/C adapter, PC/Mac Serial solution



£299.99 Inc VAT
£254.47 Ex VAT
Stock code RIC045

CODE	PRODUCT	Ex VAT	Inc VAT
RIC046	RDC-7	£467.23	£549.00
RIC023	RDC-700	£807.87	£949.01

All orders exclude delivery. Next-day delivery available from £7.45 + vat E&OE. Internet (online) deliveries from £2.49 Inc VAT



Kodak DC3400 Zoom Digital Camera

This brilliant two megapixel digital camera is perfect for business or pleasure and combines fast, responsive performance with superb image quality.



- Two-megapixel resolution
- Enough detail for 18cm x 24cm prints
- 2x optical, plus 3x digital zoom lens
- User-friendly controls
- USB connectivity for fast downloads
- 8MB CompactFlash memory card

£317.24 inc. VAT
£269.99 ex. VAT
Stock code KOD096

mc3 Portable Multimedia Device

The KODAK mc3 is the coolest pocket player out there. It lets you shoot digital video with sound or still pictures. Download and play your favourite MP3s. And share your memories over the Internet. It's all the multimedia you've ever wanted in one little player.



- Click it into digital video mode to make movies that'll embarrass everyone later.
- Download and store your favourite music, then listen via ear buds, boom box or car stereo.
- Snap digital pictures and share the fun through the color preview screen, e-mail or prints.
- Combine all three features using the software provided to create cool video clips or music videos.
- Connect to the Internet and e-mail, so you can share your favourite memories with friends.

£180.95 inc. VAT
£154.00 ex. VAT
Stock code KOD123

Kodak CD-R & Paper

Kodak CD-R media is the most cost-effective way to store and share large amounts of information digitally. With the capacity to store up to 700MB (80 min. audio), the equivalent of 450 floppy diskettes or 240,000 8.5 x 11 inch sheets of paper

CODE	PRODUCT	Ex VAT	Inc VAT
KOD104	Kodak CDR 74 Min 50PK	£21.26	£24.98
KOD114	NEW Kodak Ultima Silver-Gold 80min 25PK	£9.99	£11.74
KOD082	Kodak Photo Paper A4 50 sheets	£12.99	£15.26
KOD083	Kodak Greeting Cards 20 cards & envelopes	£4.99	£5.86

Kodak DC3200 Digital Camera

It has never been easier to capture and share vibrant eye-catching pictures than with the new DC3200 camera from Kodak.



- One mega pixel resolution
- Preview and review pictures through the built-in LCD screen
- 2MB internal memory plus Compact flash card compatibility
- 2 x digital zoom

KOD107 Kodak DC3200 Digital Camera £123.00 Ex VAT £144.00 Inc VAT

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RIO 600 Digital Audio Player

SONIC blue RIO AUDIO



Rio shatters the personal sound barrier with customizable features and high-end audio you simply cannot get anywhere else! Capture and playback up to 1 hour of digital-quality music from the Internet or your CDs. Seize your audio, master your mix, retool your memory, even select your face plate colour - it's radical freedom of choice.

- Weighs 2.4 ounces
- 32 MB built-in flash memory, expandable to 372 MB with rechargeable memory backpacks
- Over 10 hours of continuous playback on 1 AA alkaline battery
- Plays MP3 (16 - 320Kbps) and Microsoft Windows Media (WMA)
- USB port connector for high-speed downloads (5 times faster than a parallel port connection)
- Repeats one track, all tracks, or random
- Customizable EQ
- Select from on-board custom playlists
- Includes earphones, USB cable, battery and software
- Upgradeable firmware from the Internet 'Future Proof'
- More Information at www.riohome.com

£148.99 inc. VAT
£126.80 ex. VAT
Stock code DIA110

RIO 600 SE 64MB

- All the great features of the Rio 600 plus...
- 64MB built-in flash memory, expandable to 404MB with rechargeable memory backpacks
- Up-to 2 hours of CD quality digital music
- Exclusive black faceplate
- Free preloaded tracks from the Ministry of Sound
- Free Ministry of Sound Annual CD sampler included
- Upgradeable firmware from the Internet 'Future Proof'

£199.99 inc. VAT
£170.20 ex. VAT
Stock code DIA111



DC-530 Digital Camera

A unique product in terms of design and functionality, the DC-530 is a fully equipped 640X480 high resolution Digital Camera and USB PC camera with an integrated, easy-to-use MP3 player and voice recorder.



£121.51 inc. VAT
£103.41 ex. VAT
Stock code PRE017

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NAPA DAV315

With up to 8 hours of MP3 music with the AA rechargeable batteries, the DAV315 is the ultimate in portable CD based MP3 players.



- Up to 700 MB of MP3 Music
- Supports CDR / CDRW Disks
- Up to 120 Seconds ESP - MP3 Only
- CD-DA Playback supported
- Cool adjustable shoulder strap for portability
- Will take Standard Alkaline AA batteries
- AA rechargeable batteries & Charger included

£79.99 inc. VAT
£68.08 ex. VAT
Stock code AMA108

DIGITAL CAMERAS/MP3

MP3 PLAYERS & ACCESSORIES

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ARC081 JUKEBOX 6000 (PC & MAC) 6	£254.46	£298.99
Casio		
CAS056 WRIST MP3 PLAYER	£190.94	£224.35
Creative		
CRE119 DAP JUKEBOX WITH 6GB HD	£254.46	£298.99
Diamond		
DIA110 DIAMOND RIO 600 32MB USB	£126.80	£148.99
DIA111 RIO 600 SE 64MB USB MP3 P	£170.20	£199.99
DIA116 RIO 600 64MB MEMORY BACKP	£115.52	£135.74
DIA089 RIO 500 CAR ADAPTER KIT	£0.99	£1.16
DIA114 RIO 600/800 CAR ADAPTOR K	£15.06	£17.70
DIA108 RIO PMP500/64MB USB PURPLE	£181.39	£213.13
DIA115 RIO 600 FM TUNER/REMOTE	£21.56	£25.33
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DIA075 RIO REMOTE CONTROL UNIT	£18.23	£21.42
DIA084 RIO 500 TRAVEL CASE BLACK	£15.22	£17.88
DIA090 RIO 500 BLACK CASE LEATHER	£23.26	£27.33
DIA112 RIO PMP 600/BACKPACK & AD	£65.31	£76.74
Digital Media		
MEM128 MUSICSTORE - DIGITAL AUDIO	£170.20	£199.99
lomega		
LOM132 HIPZIP DIGITAL MP3 AUDIO	£189.99	£223.24
Memory Plus		
MEM150 DAV 309 / 310 IN CAR ADAP	£9.99	£11.74
MEM127 SPARE BATTERY PACK FOR US	£12.99	£15.26
MEM093 IN CAR ADAPTER FOR MP3 PL	£4.99	£5.86
Samsung		
SAM080 MP3 64MB +MMC SLOT	£119.74	£140.69

50 PACK CD-R MEDIA & E-JAY SOFTWARE

£19.99 inc. VAT
£17.01 ex. VAT
Stock code MEM125



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SCANNERS

SCANNERS

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ACE225 ACER 1240 UT SCANNER	£170.84	£200.74
AGFA		
AGF051 SNAPSCAN E50 PC/MAC+UTA	£153.18	£179.99
AGF035 SNAPSCAN 1212PARALLEL A4	£59.99	£70.49
AGF057 SNAPSCAN E20/EN 600X1200	£56.16	£65.99
AGF033 SNAPSCAN 1212U MAC/PC	£74.99	£88.11
Canon		
CAN229 CANONSCAN N650U 600X1200	£55.28	£64.95
CAN228 CANONSCAN N640P 600X1200	£55.28	£64.95
CAN237 CANONSCAN N1220U 2400DPI U	£129.99	£152.74
CAN240 CANONSCAN D660U 1200DPI US	£99.99	£117.49
Epson		
EPS509 PERFECTION 1640SU PHOTO	£224.00	£263.20
EPS506 PERFECTION 1240U 1200X240	£127.00	£149.23
EPS526 PERFECTION 640U 600X2400	£75.00	£88.13
EPS507 PERFECTION 1240U PHOTO	£172.00	£202.10
EPS508 PERFECTION 1640SU 1600X32	£187.00	£219.73
EPS510 PERFECTION 1640SU OFFICE	£269.00	£316.08
EPS517 GT10000+ PRO 2400DPI SCSI	£688.00	£808.40
Hewlett Packard		
C7697A SCANJET 5300C PARAL/US	£104.00	£122.20
C8477A SCANJET 5370C PARALLEL/US	£144.00	£169.20
C7727A SCANJET 3400C USB	£57.00	£66.98
HWP785 HP SCANJET 3300C A4 USB	£49.00	£57.58
C7737A SCANJET 4300C PARALLEL/US	£81.00	£95.18
HWP787 HP SCANJET 6350C USB/SCSI	£281.00	£330.18
HWP786 SCANJET 6300C USB/SCSI A4	£227.00	£266.73
C7718A HP SCANJET 7450C 2400DPI	£366.00	£430.05
Microtek		
MCR089 MICROTEK 3600 USB PHOTO I	£59.53	£69.95
MCR067 SCANMAKER 4600 USB	£99.50	£116.91
MCR050 SCANMAKER 3600 600X1200P	£49.00	£57.58
MCR088 4600USB PLUS MTMA BUNDLE	£129.99	£152.74
MCR064 MICROTEK X12 USL BUNDLE	£189.00	£222.08
Umax		
UMA082 UMAX ASTRA 2100U 600X1200	£34.03	£39.99
UMA112 ASTRA 5400 USB A4 42BIT 1	£85.09	£99.98
UMA110 ASTRA 3400 USB A4 42BIT	£51.05	£59.98
UMA111 ASTRA 3450 USB+TRANNNY A4	£76.59	£89.99
UMA113 ASTRA 5450 USB INC TRANNNY	£127.65	£149.99
UMA125 "ASTRANET IA 101 42 BIT, 6"	£75.99	£89.29
UMA114 ASTRA 6400 FIREWIRE A4 42	£170.20	£199.99

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- Transparency option available with the Astra 3450

UMA110 Astra 3400 Ex VAT £51.05 Inc VAT £59.98

Umax Astra 5400

High Resolution Scans at 1200dpi for Low Cost

- 1200 x 2400 dpi (optical)
- 9600 x 9600 dpi (interpolated)
- 42-bit colour
- USB Interface
- Windows 98, 98/SE, Millenium /2000 MacOS 8.1 and above
- 4 - Scan, Copy, Custom Fax/OCR/Email, PowerSaving
- Vistascan, Presto! PageManager, Omnipage LE, Adobe PhotoDeluxe Homediton, Acrobat Reader (W/M) and Adobe Photoshop LE
- Transparency option available with the Astra 5450

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Astra 6400/6450 the Worlds First Firewire Consumer scanner from UMAX. Please ask your sales contact for more details

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Umax AstraNet iA 101

The Umax AstraNet iA 101 scanner is the first consumer scanner that features automatic scanning and complete internet solution

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- USB Interface
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The World's 1st Internet Scanner

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Umax Astra 6400

Offers Fast Speed of Firewire along with Versatility and High Quality Image Capture

- 600 x 1200 dpi (optical)
- 9800 x 9800 dpi (interpolated)
- 24/42-bit colour
- Firewire/IEEE-1394 Interface
- Windows 98/2000 and Millenium MacOS 8.6 and above
- 3 - Scan, Copy, Custom Fax/OCR/Email, PowerSaving
- Vistascan, Presto! PageManager, Omnipage LE, Adobe PhotoDeluxe Homediton, Acrobat Reader (W/M) and Adobe Photoshop LE
- Includes Firewire PC card

£199.99 Inc VAT

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Improve Your Image

ScanMaker 3600 USB

- A4 flatbed scanner for reflective media
- 600 X 1200DPI optical resolution
- 9600 X 9600DPI interpolated
- 42 BIT (D.O.T.) colour depth
- USB interface (IMAC & PC)
- Comprehensive software package including Adobe PhotoDeluxe
- Complete 'out of box' solution including all cables
- Options: lightlid 35 (35MM scanning adaptor)
- 2 year swap out warranty

ScanMaker 3700 USB

- A4 flatbed scanner for reflective media
- 42 bit colour via dot*, 600 x 1200 dpi optical resolution
- 3 push-buttons for easy scanning, e-mailing & copying
- Supports Windows 98 & 2000 and iMac/G3/G4
- Easy to set up and operate thanks to USB interface (Mac & PC)
- Powerful software included
- 2 year swap out warranty

MCR065 ScanMaker 3700USB Ex VAT £64.00 Inc VAT £75.20

FilmScan 35

- Dedicated 35mm scanner
- 36 bit Color Depth
- 1800 x 1800 dpi
- USB Interface (Mac & PC)
- Scans 35mm negatives and slides
- Max Scanning area: 24mm x 36mm
- Dimension: 268mm x 66mm x 16mm
- Presto, Page Manager Deluxe (with Image Folio), Mr Photo Gold (with Photo Album), Scanne Controller Software
- PC and Mac compatible Pentium PC or later with USB port, running Microsoft Windows 98/2000
- 2 year swap out warranty

MCR068 FilmScan 35 Ex VAT £129.65 Inc VAT £152.34

ScanMaker 4600 USB

- A4 flatbed scanner for reflective media
- 42 bit colour depth
- 2400 X 1200 DPI optical resolution
- 9600 X 9600 DPI interpolated
- 3 push-buttons for easy scanning, e-mailing & copying
- Supports Windows 98 & 2000 and IMAC /G3/G4
- Easy to set up and operate thanks to USB Interface (Mac & PC)
- Web ready to easily create your own website with software included
- 2 year swap out warranty

MCR067 ScanMaker 4600 USB Ex VAT £99.50 Inc VAT £116.91

MCR088 ScanMaker 4600 USB Photo Inc. MTMA Ex VAT £129.99 Inc VAT £152.74

ScanMaker X12 USL Photo

- Legal size flatbed scanner for reflective media
- 1200 x 2400 dpi optical resolution
- 9600 x 9600 dpi interpolated
- 42 bit true colour depth
- USB & SCSI interface for greater flexibility (Mac & PC)
- Comprehensive software package included
- Complete 'out of the box' solution including cables & SCSI card
- Includes: TMA (Transparent Media Adaptor)
- Options: Lasersoft Silverfast Prescan Software
- 2 year swap out warranty

MCR064 ScanMaker X12 USL Photo Ex VAT £189.00 Inc VAT £222.08

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HP ScanJet 3400C

The Smart Home Scanner combining high quality and ease-of-use to make every project a success

- Easy! Scan, copy and e-mail buttons launch any project and save steps
- Brilliant photo-quality results with 600 dpi optical resolution and 36-bit color
- Ideal companion for any PC-parallel and USB connectivity
- Win 95 (Parallel Only) & 98 ME (USB Only) compatible
- Web Page creation utility
- HP copy utility
- Adobe Activeshare
- USB and Parallel cable included
- 600 x 1200dpi hardware resolution
- 9600dpi enhanced resolution



£65.80 Inc.VAT

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Stock code C7727A



HP ScanJet 4300C

The versatile home scanner that does Emailing, copying and scanning at the touch of a button

- Scan a black & white drawing in under 60 seconds
- Instant colour copies using front panel display
- Completes projects faster than the competition with HP's exclusive scanning software
- Brilliant, photo-quality results 600 dpi optical resolution and 36-bit colour
- Parallel & USB interface
- Win 95, 98 + 2000 Pro compatible
- Corel Print House 2000
- Web Page creation utility
- Adobe Activeshare
- HP copy utility
- USB and Parallel cable included



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HP ScanJet 5300C

The scanner for quality results in the office - Internet ready

- Unique set-up program guides you through installation with demonstration video clips
- USB interface supported under Microsoft® Windows® 98 and Windows® 2000 Professional
- Scans directly to your e-mail, web and fax applications
- HP PrecisionScan scanning software with Integrated Optical Character Recognition (OCR) software converts hard-copy text into electronic files
- Hardware - 1200 x 2400dpi
- Enhanced - 9600dpi
- Optional transparency adaptor or 35mm slide adaptor
- Optional automatic document feeder
- Parallel Interface supported under Win 95, 98, NT4, & 2000 Professional



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HP ScanJet 5370C

The versatile home and office scanner that provides top quality scanning results from any source

- Quick! Scan, color copy, e-mail, and fax buttons optimize images at the touch of a button
- Brilliant photo quality results with 1200 dpi optical resolution and 42-bit colour
- Quality results for transparent media, including 35mm slides, negatives, and more
- Parallel and USB connection
- Transparency adapter included
- Caere Page Keeper Standard
- Corel Print Office 2000
- USB & Parallel cables included
- Active transparency adaptor offers top-quality results, scans multiple 35mm negatives or slides and up to 12.7 x 12.7 cm transparencies



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KEY FEATURES

- High Quality 600x2400 dpi optical resolution with Micro Step Drive
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- Integrated 3 button panel with Copy, Scan and programmable Start button for added flexibility
- Easy and Intelligent EPSON TWAIN Software: Full Auto Mode removes complex set up procedures and enables automatic scanning suitable for your documents
- Maximum interpolated resolution 9600dpi
- 36bit internal scanning capability for excellent colour reproduction
- Easy Plug & Play USB Interface
- For use with: Windows 98/2000, Mac OS 8.1 or later (USB equipped Macintosh)



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Stock code EPS526

EPSON® Perfection 1240U

Exceptional 1200x2400dpi A4 Scanner for advanced family and small home office users

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- Easy to Use EPSON Smart Panel enables scanning to e-mail, OCR and Photo editing applications with just a few clicks
- Integrated 3 button panel with Copy, Scan and programmable Start button for added flexibility
- Easy and Intelligent EPSON TWAIN Software: Full Auto Mode removes complex set up procedures and enables automatic scanning suitable for your documents
- Maximum interpolated resolution 9600dpi
- 42bit internal scanning capability for excellent colour reproduction
- Easy Plug & Play USB Interface
- Optional film adaptor for scanning pos/neg films up to 5" x 4"



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AGFA SnapScan e50

The design of SnapScan e50 is so sleek that you'd never guess it has a built-in scanning module for 35 mm slides and films (negative/positive), on top of the A4 scanned for reflectives. It leads the field in quality and scanning speed

KEY FEATURES

- Built-in transparency scanning: scans 35 mm slides or transparencies, including colour print negatives
- USB connection for rapid transfer speeds and hot-swapping between computers
- 1200 x 2400 ppi true optical resolution
- 42-bit colour sampling captures superb shadow and highlight details
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AGFA SnapScan e20

KEY FEATURES

- 3 Interchangeable handles
- 600 x 1200 dpi
- 36 bit
- USB
- Compatible with Win 98, 2000, ME, Mac OS 8.x
- Software: Agfa Scanwise, Corel Print Office, Read Iris OCR, AgfaNet Client Software



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CODE	PRODUCT	EX VAT	INC VAT
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AGF053	ePhoto CL18 Digital Camera 640x480pix USB	£76.55	£89.95
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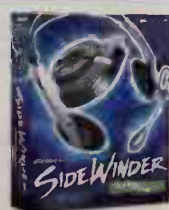


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WAC036	Intuos A4 Regular W95/98/2000/NT Serial	£304.99	£358.36
WAC063	Intuos A6 Tablet W98/2000/USB	£118.99	£139.81
WAC064	Intuos A5 Tablet W98/2000/USB	£209.99	£247.98
WAC065	Intuos A4 Tablet W98/2000/USB	£304.99	£358.36
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- 650 ANSI Lumens
- 2.4Kg
- Carrycase supplied



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SAN	SONY VPL-CS3	Ex VAT £1450.00	Inc VAT £1703.75
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MONITORS

MONITORS

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ADI043 MICROSCAN M700 17"	£122.99	£144.51
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ADI035 17" HIGH RESOLUTION MULTI	£154.99	£182.11

Belinea		
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BEL441 15" FST 0.28MM 3YR OSW	£93.00	£109.28
BEL817 19" CRT 1600X1200 0.26MM	£192.00	£225.60

Compaq		
154499 S710/17" FST .28 85HZ 102	£169.85	£199.57
CP0058 COMPAQ S710 17" MONITOR	£170.84	£200.74
COM533 S510 15" CRT .28 85HZ MPR	£107.54	£126.36

Hansol		
HAN017 HANSOL 710P 17" FST 0.26	£129.99	£152.74
HAN016 HANSOL 710D 17" DYNAFLAT	£167.78	£197.14
HAN021 19" DYNAFLAT CRT 1600X120	£251.24	£295.21
HAN010 HANSOL 501P 15" 0.28	£95.62	£112.35
HAN013 710A 0.28MM1024X768 85HZ	£119.99	£140.99

Hewlett Packard		
D8902A HP 17" FLAT SORE MONITOR	£150.00	£176.25
D8897A HP 15" FLAT SORE MONITOR	£105.00	£123.38
P1287B HP V50 15" MONITOR 1024 X	£109.00	£128.06
P1283A HP MX70 17" MONITOR 1280X	£169.00	£196.58
PAV004 HP 17" M70 MONITOR.	£169.00	£196.58
PAV003 HP 15" M50 MONITOR	£109.00	£128.06

Iiyama		
IY053 VISION MST S900MT1 19" FS	£199.99	£234.99

NEC Mitsubishi		
NMD024 NEC FE950+ 19IN ULTRA FLA	£299.95	£352.44
NMD019 NEC FE700+ 17IN ULTRA FLA	£178.99	£210.31
NEC023 FE950 19" CRT 0.25 96HZ T	£300.50	£353.09

Philips		
PHI32 15" TFT 0.297MM 3YR OSW	£499.00	£586.33

Samsung		
SAM090 15" MULTI MEDIA MONITOR	£119.99	£140.99

Sony		
SON626 SONY E220E 17" FD TRINITR	£219.99	£258.49
SON618 MULTISCAN A220 17" 1024X7	£200.00	£235.00
SON633 A420 19" TRINITRON 1600X1	£339.99	£399.49

50 PACK CD-R MEDIA & E-JAY SOFTWARE

£19.99
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Stock code MEM125



CPD-E220E SONY

- 17" CRT FD Trinitron Monitor
- Visually Flat screen
- Recommended Resolution 1024 x 768 @ 88Hz
- Aperture Grille Pitch 0.24mm - 0.25mm
- 3 Year On-site Exchange Warranty
- PC and Mac Compatible



SON626 CPD-E220E Ex VAT £219.99 Inc VAT £258.49

HMD-A420

- 19" Super Fine Pitch Sony FD Trinitron CRT
- Recommended Resolution 1600 x 1200 @ 78Hz
- Designer Monitor
- Unique Silver Casing
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- PC and Mac Compatible



SON633 HMD-A420 Ex VAT £339.99 Inc VAT £399.49

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- Wall Mountable
- TCO'99
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- PC and Mac Compatible



SON619 SDM - M51 Ex VAT £579.19 Inc VAT £680.55

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Quality is visible

Mitsubishi Plus 92

- Features
- 19 inch Diamondtron Natural Flat CRT
- 30-96kHz Horizontal scanning frequency
- 1600 x 1200 maximum resolution
- 3 year on-site warranty
- TCO99



NMD021 Mitsubishi Plus 92 Ex VAT £299.99 Inc VAT £352.49

NEC 1530V

- Features
- 15.1 inch TFT Active Matrix LCD
- 120 degree viewing angle
- 16.19 million colours
- 1024 x 768 resolution
- 3 year on-site warranty
- TCO99



NMD018 Nec 1530V Ex VAT £579.99 Inc VAT £681.49

CODE	DESCRIPTION	EX. VAT	INC.VAT
NMD015	NEC M5 95F FLAT SHADOWMASK 19" CRT	£251.24	£295.21
NEC028	FE750 17 INCH ULTRA FLAT CRT	£209.00	£245.58
NMD005	PRO920 19 INCH NATURAL FLAT CRT	£349.99	£411.24
MIT094	PLUS220 22 INCH NATURAL FLAT CRT	£561.80	£660.11
NMD018	NEC 1530V 15 INCH	£579.99	£681.38

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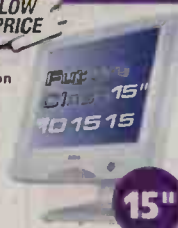


10 15 15 Monitor

A 15" TFT LCD monitor with a cool design and a sharp price. 1024 x 768 native resolution

- Features
- 15" TFT LCD monitor
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- 250:1 contrast ratio
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- TCO'99 compliant
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- VESA wall mount compliant

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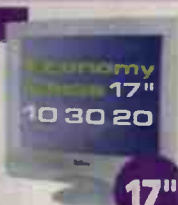


BEL776 10 15 15 Monitor Ex VAT £389.00 Inc VAT £457.08

10 30 20 Monitor

17" FST monitor, an ideal upgrade from a 15" screen.

- Features
- 17" FST monitor
- 1280 x 1024 maximum resolution
- 0.27mm dot pitch
- 3 year on site swap out warranty
- MPR II compliant
- Easy to use on-screen menu



BEL738 10 30 20 Monitor Ex VAT £123.00 Inc VAT £144.53

10 30 80 Monitor

A 17" DIAMONDTRON-NFT™ monitor designed to offer perfect pictures at high resolutions

- Features
- 17" DIAMONDTRON-NFT™ monitor
- 1600 x 1200 maximum resolution
- 0.26mm dot pitch
- 3 year on site swap out warranty
- TCO'99 compliant
- Easy to use on-screen menu



BEL788 10 30 80 Monitor Ex VAT £229.00 Inc VAT £269.08

Hansol Monitors

Hansol 500F

- Features
- 15" TFT
- 1024 x 768 maximum
- 0.297 dot pitch
- TCO 99 standard
- 5 language OSD
- 3-years on site warranty included



CODE PRODUCT Ex VAT Inc VAT
HAN015 Hansol 500F TFT £389.00 £457.08

Hansol 710D

- Features
- 17" Dynafiat (16" visible) CRT
- 1600 x 1200 @ 75Hz max resolution
- TCO 99 standard
- 0.25mm dot pitch
- 3-years on site warranty included



CODE PRODUCT Ex VAT Inc VAT
HAN017 Hansol 710P £129.99 £152.74
HAN016 Hansol 710D £167.78 £197.14

Hansol 920D

- Features
- 19" Dynafiat CRT (18" viewable)
- 1600 x 1200 @ 85Hz maximum
- 0.25mm dot pitch
- 5 language OSD
- 3-years on site warranty included



CODE PRODUCT Ex VAT Inc VAT
HAN024 Hansol Generic 19" Display £149.99 £176.24
HAN021 Hansol 920D £251.24 £295.21



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 - PerformaPro 600: Upgrades socket 8 motherboards to 600 MHz
 - Performa III 600 & 700: Upgrades slot 1 or Celeron "Stick" to 600 or 700 MHz
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fireLINE Cardbus:

2 external FireWire ports

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External CDRW, includes CD burning software for both PC & Mac

fireLINE Power Supply:

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CODE	DESCRIPTION	EXVAT	INC VAT
EVE400	Spectra 400MHz Processor Upgrade	£85.10	£99.99
EVE500	Spectra III 550	£68.99	£81.06
EVE600	Spectra III 600	£76.99	£90.45
EVE500	Performa 500 Via Version	£85.10	£99.99
EVE600	Performa 600 Via Version	£89.99	£117.49
EVE700	Performa 700 Celeron Version	£140.99	£165.66
EVE501	PerformaPro 600 Via Version	£189.99	£199.74
EVE702	PerformaPro 700 Celeron Version	£199.99	£234.99
EVE604	Performa III 600 (Intel Coppermine)	£219.99	£258.49
EVE700	Performa III 700 (Intel Coppermine)	£239.99	£281.99
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AMD044	AMD Duron 750MHz Socket A Heatsink & Fan Required	£42.99	£50.51
AMD050	AMD Duron 800MHz Socket A Heatsink & Fan Required	£52.99	£62.26
AMD062	AMD Duron 850MHz Socket A Heatsink & Fan Required	£63.99	£75.19
AMD066	AMD Duron 900MHz Socket A Heatsink & Fan Required	£81.99	£96.34
AMD055	Thunderbird Socket A 900MHz Heatsink+Fan Required	£99.99	£117.49
AMD056	Thunderbird Socket A 950MHz Heatsink+Fan Required	£114.99	£135.11
AMD057	Thunderbird Socket A 1GHz 200MHz FSB-Fan Needed	£121.99	£143.34
AMD067	Thunderbird Socket A 1GHz 266MHz FSB-Fan Needed	£123.99	£145.69
AMD059	Thunderbird Socket A 1.1GHz 200MHz FSB Fan Needed	£138.99	£163.31
AMD070	Thunderbird Socket A 1.1GHz 266MHz FSB-Fan Needed	£139.99	£164.49
AMD061	Thunderbird Socket A 1.2GHz 200MHz FSB-Fan Needed	£165.99	£195.04
AMD064	Thunderbird Socket A 1.2GHz 266MHz FSB-Fan Needed	£165.99	£195.04
AMD063	Thunderbird Socket A 1.3GHz 200MHz FSB-Fan Needed	£183.99	£216.19

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INT417	Celeron 766MHz Socket 370 128KB 3.3V FCPGA	£63.99	£75.19
INT416	Celeron 733MHz Socket 370 128KB 3.3V FCPGA + Fan	£63.99	£75.19
INT429	Celeron 800MHz 5370 FCPGA 128KB Cache 100MHz	£77.99	£91.64
INT443	Celeron 850MHz 5370 FCPGA 128KB Cache 100MHz	£115.99	£136.29
INT363	Pentium III 800MHz FCPGA 256K 133MHz Socket 370	£135.99	£159.79
INT364	Pentium III 850MHz FCPGA 256K 100MHz Socket 370	£135.99	£159.79
INT362	Pentium III 800MHz FCPGA 256K 100MHz Socket 370	£136.99	£160.96
INT365	Pentium III 866MHz FCPGA 256K 133MHz Socket 370	£137.99	£162.14
INT384	Pentium III 933MHz FCPGA 256K 133MHz Socket 370	£161.99	£190.34
INT411	Pentium III 1000MHz FCPGA 256K 133MHz Socket 370	£188.99	£222.06
INT432	Pentium IV 1.3GHz S423 400MHz 256K + 128MB RDIMM	£226.99	£266.71
INT421	Pentium IV 1.4GHz S423 400MHz 256K + 128MB RD-RAM	£245.99	£289.04
INT444	Pentium IV 1.7GHz S423 400MHz 256K No RIMMS	£290.99	£341.91
INT422	Pentium IV 1.5GHz S423 400MHz 256K + 128MB RD-RAM	£291.99	£343.09
INT445	Pentium IV 1.7GHz S423 400MHz 256K + 128MB RIMMS	£368.99	£433.56
INT442	Pentium IV 1.5GHz S423 400MHz 256K + 256MB RD-RAM	£369.99	£434.74
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Hard Drive E/IDE Bare	SEA393	U Series 5 30GB 5,400RPM ATA100 8.9ms	ST330621A	£74.99	£88.11
Hard Drive E/IDE Bare	SEA415	Barracuda 1X 20GB UATA100 7200rpm 8.2ms 2mb cache	ST320414A	£75.99	£89.29
Hard Drive E/IDE Bare	SEA394	U Series 5 40GB 5400RPM ATA100 8.9ms	ST340823A	£82.99	£97.51
Hard Drive E/IDE Bare	SEA416	Barracuda ATAIII 30GB Ultra ATA100 7200RPM 8.9ms	ST330620A	£89.99	£105.74
Hard Drive E/IDE Bare	SEA417	Barracuda ATAIII 40GB Ultra ATA100 7200RPM 8.9ms	ST340824A	£111.99	£131.59
Hard Drive SCSI ULTRA 50pin	SEA319	Barracuda 36ES 18.4GB Ultra SCSI 7200RPM 5.8ms	ST318417N	£177.99	£209.14
Hard Drive SCSI ULTRA 50pin	SEA311	Barracuda XL 18.4GB 50Pin 5.9MS 2MB 7200RPM 5Years	ST318416N	£206.99	£243.21
Hard Drive SCSI UWLVD 68pin	SEA312	Cheetah 18XL 9.2GB U160 68PIN 10000RPM 4mb	ST39204LW	£145.99	£171.54
Hard Drive SCSI UWLVD 68pin	SEA428	Cheetah 36XL 10K RPM 9.2GB 5MS U160 WIDE SCSI 68Pi	ST39205LW	£145.99	£171.54
Hard Drive SCSI UWLVD 68pin	SEA314	Barracuda 174; XL 18.4GB U160 68Pin 5.9MS 2MB	ST318436LW	£165.99	£195.04
Hard Drive SCSI UWLVD 68pin	SEA418	Barracuda 36ES 18.4 GB Ultra SCSI 7200 rpm	ST318417V	£173.99	£204.44
Hard Drive SCSI UWLVD 68pin	SEA421	Barracuda 36ES 18.4gb Ultra160 SCSI 7200 rpm	ST318437LW	£181.99	£213.84
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Hard Drive SCSI UWLVD 68pin	SEA424	Barracuda 181.6GB 7200RPM ULTRA 160 SCSI 68PIN 4MB	ST1181677LV	£1,276.99	£1,500.46
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Hard Drive SCSI LVD/SCA80pin	SEA315	Barracuda XL 18.4GB U160 80PIN 5.9MS 2MB 7200RPM	ST318436LC	£163.99	£192.69
Hard Drive SCSI LVD/SCA80pin	SEA422	Barracuda 36ES 18.4GB Ultra160 SCSI 7200 rpm	ST318437LC	£190.99	£224.41
Hard Drive SCSI LVD/SCA80pin	SEA427	Cheetah 36XL 10K PM 18.4GB 5.7MS U160 WIDE 80Pin	ST318405LC	£190.99	£224.41
Hard Drive SCSI LVD/SCA80pin	SEA389	Cheetah X15 18.4GB U160 3.5LP 3.9MS 15000RPM 80Pin	ST318451LC	£252.99	£297.26
Hard Drive SCSI LVD/SCA80pin	SEA419	Barracuda 36ES 36.7gb Ultra160 SCSI 7200 rpm	ST336737LC	£314.99	£370.11
Hard Drive SCSI LVD/SCA80pin	SEA426	Cheetah 36XL 10K RPM 36GB 5MS U160 WIDE SCSI 80Pin	ST336705LC	£344.99	£405.36
Hard Drive SCSI LVD/SCA80pin	SEA432	Cheetah 73LP 10000RPM 73.4GB ULTRA 160 SCSI 80PIN	ST373405LC	£630.99	£741.41
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MIR077	HD 40.9GB ATA100 5400RPM	£89.99	£105.74
MIR076	HD 10.2GB ATA100 72	£66.99	£78.71

IBM

Model	Capacity	Price (Ex VAT)	Price (Inc VAT)
IBM500	30GB UDMA66 8.5MS 2MB 720	£109.99	£129.24
IBM501	45GB UDMA66 8.5MS 2MB 720	£121.99	£143.34
IBM535	DESKSTAR 40GB 20.5GB ATA-	£80.99	£95.16
IBM503	75GB UDMA66 8.5MS 2MB 720	£229.99	£270.24

Maxtor

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MAX233	DIAMOND MAX PLUS60 30GB 72	£99.99	£117.49
MAX201	DIAMOND MAX+45 15.3GB UDMA	£73.99	£86.94
MAX202	DIAMOND MAX VL40 20.4GB 54	£72.99	£85.76
MAX205	DIAMOND MAX VL40 30.7GB 54	£79.99	£93.99
MAX206	DIAMOND MAX VL40 40.9GB 54	£92.99	£109.26
MAX167	DIAMOND MAX 7200RPM 15GB	£81.99	£96.34
MAX190	81.9GB UIDE100 9MS 5400RPM	£199.99	£234.99
MAX189	61.4GB UATA100 9MS 5400RPM	£139.99	£164.49

Quantum

Model	Capacity	Price (Ex VAT)	Price (Inc VAT)
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QUA222	FIREBALL LCT20 30GB UATA1	£75.99	£89.29
QUA223	FIREBALL LCT20 40GB UATA1	£89.99	£105.74
QUA214	20GB 8.5MS 7200RPM 2MB AT	£81.99	£96.34
QUA220	FIREBALL LCT20 10GB UATA1	£57.99	£68.14
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SIM068	64MB	SDRAM	64 BIT	168 PIN	10NS		£25.99	£30.54
SIM073	128MB	SDRAM	64 BIT	168 PIN	10NS		£37.99	£44.64
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SIM038	16MB	4X32	EDO	72 PIN	60NS		£18.99	£22.31
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CD-RW 12x10x32 Drive

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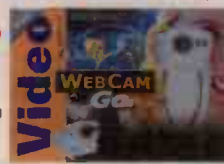
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ELS062 ELSA GLADIAC MX 32MB NVIDIA GeForce2 MX AGP	Ex VAT £65.50	Inc VAT £76.96
ELS071 ELSA ERAZOR III LT 32MB NVIDIA TNT2 M64 AGP	Ex VAT £47.95	Inc VAT £56.34

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MODEMS & NETWORKING

GRAPHICS CARDS

A-Open

	EX VAT	INC VAT
AOP070 NVIDIA RIVA TNT2 M64 32MB	£49.99	£58.74
AOP067 PA-256 DELUXE 32MB DDR GE	£149.99	£176.24
ADP068 GEFORCE 2 MX 32MB SDR AGP	£79.99	£93.99
AOP072 SIS 6326 2D/3D 8MB SDRAM	£24.99	£29.36

ATI Technology

	EX VAT	INC VAT
ATI137 ATI XPERT 98 PRO, RAGE PRO	£32.49	£38.18
ATI115 XPERT 2000PRO 16MB AGP	£32.99	£38.76
ATI116 ALL IN WONDER 128 PRO AGP	£126.99	£149.21
ATI139 XPERT 98 PRO RAGE XL 8MB	£27.99	£32.89
ATI121 XPERT 2000PRO 32MB AGP	£40.99	£48.16
ATI128 RADEON DDR 64MB VIVO	£137.99	£162.14
ATI138 ALL-IN-WONDER RADEON 32MB	£209.99	£246.74
ATI129 RADEON DDR 64MB VIVO	£157.99	£185.64
ATI124 RADEON SDR 32MB TV-OUT AGP	£78.99	£92.81
ATI122 XPERT 2000 PRO 32MB TV OUT	£44.25	£51.99
ATI077 XPERT@PLAY 98 8MB AGP BARE	£31.99	£37.59
ATI095 ATI RAGE FURY PRO 32 VIVO	£85.99	£101.54
ATI143 RADEON VE 32MB AGP DVI VGA	£72.99	£85.76
ATI127 RADEON DDR 64MB AGP	£132.99	£156.26
ATI132 RADEON 64MB DDR AGP DVI BARE	£131.90	£154.98
ATI105 RAGE FURY PRO DVI 32MB BARE	£65.99	£77.54
ATI120 XPERT 2000PRO 16MB AGP TV	£35.99	£42.29
ATI123 RADEON SDR 32MB AGP OEM	£74.89	£88.00
ATI117 ALL IN WONDER 128 PRO 32MB	£115.99	£136.29
ATI125 RADEON DDR 32MB AGP OEM	£111.99	£131.59
ATI142 RADEON VE 32MB AGP DVI VO	£69.99	£82.24

Creative

	EX VAT	INC VAT
CRE103 3D BLASTER GEFORCE 2 GTS	£170.00	£199.75
CRE137 3D BLASTER GEFORCE 2 MX 3	£72.99	£85.76

Elsa

	EX VAT	INC VAT
ELS062 GLADIAC GEFORCE2 MX 32MB	£65.50	£76.96
ELS061 GLADIAC GEFORCE2 ULTRA	£217.54	£255.61
ELS079 ELSA GLADIAC 920 GEFORCE	£254.47	£299.00
ELS071 ELSA ERAZOR III-M64-32SDR	£47.95	£56.34
ELS086 GLADIAC 511 TWINVIEW PCI	£78.95	£92.77
ELS060 ELSA GLORIA II 64MB AGP	£595.74	£699.99

Gainward

	EX VAT	INC VAT
CAR014 NVIDIA TNT2 VANTA 16MB AGP	£36.99	£43.46
CAR013 GEFORCE2 PRO 64MB SDR DDR	£189.99	£223.24
CAR015 NVIDIA GEFORCE 2 MX AGP4	£62.99	£74.01

Guillemot

	EX VAT	INC VAT
GUI083 3D PROPHET II MX 32 AGP	£89.99	£105.74
GUI102 GUILLEMOT COUGAR VIDEO ED	£65.99	£77.54
GUI110 HERCULES 3D PROPHET II MX	£110.83	£129.99
GUI109 HERCULES 3D PROPHET III AGP	£364.99	£428.86
GUI100 3D PROPHET II MX- DUAL DISPLAY	£85.10	£99.99
GUI071 COUGAR 32MB AGP M64 TNT	£51.24	£60.21
GUI112 HERCULES 3D PROPHET 4500	£103.99	£122.19
GUI099 HERCULES 3D PROPHET II PR	£281.40	£330.65
GUI111 HERCULES 3D PROPHET 4500	£109.99	£129.24

Matrox

	EX VAT	INC VAT
MAT149 MATROX G450 32MB DUAL HEA	£99.99	£117.49
MAT155 SOFTWARE DVD PLAYER+TV-OU	£9.99	£11.74
MAT148 MATROX G450 32MB DUAL HEA	£79.99	£93.99
MAT171 MARVEL G450 ETV 32MB DDR	£173.99	£204.44

Videologic

	EX VAT	INC VAT
VID104 GRAFIXSTAR 670 PCI 16MB B	£41.99	£49.34
VID098 GRAFIXSTAR 670 AGP 16MB	£41.99	£49.34

Radeon All In Wonder

If games video capture and TV all matter to you, this is the only card you need.

- Take control of your TV with TV-ON-DEMANDTM: pause live TV, instant replay, possibility to record TV broadcasts for later viewing.
- Create your own videos by capturing and editing MPEG-2 video from a VCR or camcorder.
- Watch flicker-free DVD movies.
- Get outstanding digital sound with the Digital audio S/PDIF output.



ATI138 Radeon All in Wonder Ex VAT £209.99 Inc VAT £246.74

Radeon VE

- Upto 32MB of powerful DDR (Double Data Rate) memory
- DVD Playback with integrated motion compensation and hardware DVD support
- Analogue video output support for both composite and S-Video
- Flexible multi-display support enabling any combination of VGA, DVI and TV
- Enjoy economical video output to TV's, VCR's and Camcorders



ATI143 Radeon VE Ex VAT £72.99 Inc VAT £85.76

Radeon SDR 32MB PCI

- Powered by Radeon graphics processing unit (GPU)
- 32MB of single data rate (SDR) memory
- Accelerates all of today's top 3D games
- Industry leading video playback
- TV/VCR output support
- AGP universal bus or PCI bus



ATI144 Radeon SDR 32MB PCI Ex VAT £93.99 Inc VAT £110.44

Dynamode 56K Modems

Dynamode

A Leap forward in technology, performance, reliability and ease of use.

This cost-effective modem range supports data rates up to 56Kbps using V.92 Standards. All data pump and protocol functions are executed on the processor. All modems interface for direct connection to the host PC for maximum flexibility and real plug & play operations.



CODE	PRODUCT	EX VAT	INC VAT
DYN075	V.92 56K SmartExpress Internal PCI Modem	£14.99	£17.61
DYN076	V.92 56K SmartExpress External USB Modem	£28.99	£34.06
DYN072	V.92 56K SmartExpress Internal AMR (Sec. Mode)	£12.99	£15.26
DYN073	V.92 56K SmartExpress Internal CNR (Auto Mode)	£12.99	£15.26
DYN039	V.90 56K Internal PCI (Connexant) Modem	£19.99	£23.49
DYN077	V.90 56K Internal PCI Ambient (Intel) Modem	£14.99	£17.61
DYN038	V.90 56K External (Connexant) Modem	£38.99	£45.81
DYN029	V.90 56K External Modem	£32.99	£38.76
DYN044	V.90 56K PCMCIA Modem	£32.99	£38.76

Hubs/Switches

Dynamode

Dynamode Hubs/Switches offer outstanding performance with versatile configuration and flexibility. Multiple duplex speed and 10/100Mbps autosensing available on selected models. This cost effective range is ideal for any home or office environment.



CODE	PRODUCT	EX VAT	INC VAT
DYN007	8 Port 10Mbps (BNC/RJ45) Plastic Case Desktop	£14.99	£17.61
DYN010	16 Port 10Mbps (RJ45/BNC/AUI) 19" Rack Mount	£34.99	£41.11
DYN011	32 Port 10Mbps (RJ45/BNC/AUI) 19" Rack Mount	£69.99	£82.24
DYN057	8 Port 10/100 Auto Sensing Hub Desktop	£49.99	£58.74
DYN053	16 Port 10/100 Auto 19" Rack Mount/Desktop	£99.99	£117.49
DYN034	24 Port 10/100 Auto sensing 19" Rack Mount	£189.99	£223.24

Full range of Dynamode Hubs/Switches and Networking products available on request.

All orders exclude delivery. Next-day delivery available from £7.45 + vat E&OE. Internet (online) deliveries from £2.49 Inc Vat

Hercules 3D Prophet III

The most advanced GPU architecture with the fastest chipset and RAM

- 64MB onboard DDR RAM
- GeForce3
- DVI-Out
- TV-Out
- AGP 4x/2x
- PowerDVD™



GUI109 Hercules 3D Prophet III Ex VAT £364.99 Inc VAT £428.86

Hercules 3D Prophet 4500

- Kyro II chipset 64MB SDR RAM 128-bit memory
- Tile rendering for fast performance and superb image quality
- 8-layer multi-texturing, 1940 x 1440 true colour at 75Hz refresh rate
- Environmental Bump Mapping
- DVD support for motion compensation, overlay blending and video scaling



GUI112 Hercules 3D Prophet 4500 Ex VAT £103.99 Inc VAT £122.19

Gamesurround Muse XL

- 2 or 4 speakers or headphones out for amazing 3D audio experience with games and DVDs
- Full compatibility with 3D audio games thanks to Sensaura engine included
- Perfect digital sound fidelity with Yamaha Soft Synthesizer(tm)
- Internet audio ready!
- Great new software suite including Game Commander 2 SE



GUI113 Gamesurround Muse XL Ex VAT £19.99 Inc VAT £23.49

Hercules Game Theater XP Sound Card

- Experience surround sound on regular headphones, 4 or 6 speakers
- Connect joysticks, wheels and gamepads on the USB and game port and start playing via external rack
- Hardware MP3 decoding and 3D audio effects playback
- Integrated 4-port USB hub
- PowerDVD's certified Dolby Digital decoder
- Digital In & Out for connection to MiniDisc, DAT, etc.
- Includes Sensaura Virtual Ear technology
- A revolutionary gaming sound card with a powerful rack.



GUI103 Hercules GameTheater XP Sound Card Ex VAT £128.61 Inc VAT £151.35

Dynalink

Internal PCI Hardware Modem

KEY FEATURES

- V.90 and K56Flex auto-switched
- Quick Step Installation and comprehensive manual
- Plug-and-play compliant
- Auto dial/answer
- Answering machine function
- CTR 21 Pan European approval



CODE	PRODUCT	EX VAT	INC VAT
DYL001	INTERNAL PCI HARDWARE MODEM	£19.99	£23.49
DYL002	V90 56K SOFTWARE MODEM	£14.99	£17.61

Dynalink

10/100 PCMCIA Card

KEY FEATURES

- Compliant with 16 bit PC card standard
- Supports both 10Mbps and 100 Mbps data rates
- Full-duplex or half-duplex operation supported for both 10Mbps and 100 Mbps
- 10Base-T and 100 Base-TX compatible
- Dual 5V and 3.3V operation



CODE	PRODUCT	EX VAT	INC VAT
DYL005	10/100 Mbps PCMCIA FAST ETHERNET CARD	£29.99	£35.24
DYL004	V90 56K PCMCIA MODEM	£29.99	£35.24

Dynalink

V90 & 56K External Modem

KEY FEATURES

- V.90 and K56Flex auto-switched
- Quick Step Installation and comprehensive manual
- Plug-and-play compliant
- CTR 21 Pan European approval
- 9 LED indicators on front panel
- Tone or pulse dialling
- Tone detection/generation and call discrimination
- Asynchronous operation



£43.46
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Ex VAT
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BELKIN

Belkin USB Products



The Belkin BusStation™ 7-Port USB Hub

The BusStation™ is a 7 Port USB Hub. This means you can connect 7 USB devices (e.g. printer, mice, keyboard) to a single USB Port on your PC or Mac*. The BusStation™ enables you to plug devices into the PC or Mac* from the desktop.

"The BusStation fully justifies its near perfect overall mark"

Source: PC Plus



Win100
Winmag.com 2000

Go to Jungle.com for information on all Belkin USB products



7-Port Hub Standard configuration



Simply slide out any of the top three single USB ports and replace them with one of many Belkin USB modules available today!



The possibilities are endless! You can assemble your own custom USB system

The Belkin BusStation™ is modular! This means that you can take out the single USB Hubs and replace them with one of the following adapters:



USB 4-Port Hub

Connect up to 4 USB devices to a USB-ready computer with a free USB port.



USB PS/2 Adapter

Instantly add two PS/2 ports to your PC or notebook



USB Serial Adapter

Connect any serial device using USB.



USB 10/100 Ethernet Adapter

Instantly connect 10Base-T or 100Base-TX through USB



USB SCSI Adapter

Connect SCSI devices through your computer's free USB port

USB 4-Port PCI Card with QuadraBus™ Technology

4 Times the Power!

With the power of QuadraBus™ technology, the Belkin 4-Port PCI Card delivers 12Mbps of bandwidth to each of its four USB ports. Consider how sluggish four connected devices will run sharing 12 Mbps. Now see their performance rise four-fold once each USB device receives the full 12Mbps.



USB DockStation™

Leave all of your devices attached to the DockStation™; when you return to the office one cable instantly connects multiple devices to your laptop or PC with Plug-and-Play ease – you don't even need to reboot. The DockStation™ is an all-in-one multifunction USB Hub and it provides four USB ports to connect USB devices, one parallel port to connect your printer, two PS/2 ports to connect keyboards or mice and one serial port to connect your modem, digital camera or PDA.



While other 4-port PCI cards divide bandwidth, the Belkin 4-Port PCI Card multiplies it.

Code	Description	Ex VAT	Inc VAT	Code	Description	Ex VAT	Inc VAT
BEL720	Belkin BusStation™ Modular Hub	£45.10	£52.99	BEL760	USB 4-Port Hub (Stackable)	£19.57	£22.99
BEL724	4-Port Hub and BusStation™ Module	£35.74	£41.99	BEL840	USB VideoBus™ II NEW!	£59.57	£69.99
BEL861	USB 10/100 Ethernet Adapter & BusStation™ Module NEW!	£36.59	£42.99	BEL800	USB 4-Port PCI Card NEW!	£29.78	£34.99
BEL783	USB PS/2 Adapter and BusStation™ Module	£25.52	£29.99	BEL839	USB/FireWire Combo Card NEW!	£85.10	£99.99
BEL726	USB Serial Adapter and BusStation™ Module	£49.35	£57.99	BEL834	USB SCSI Adapter and BusStation™ Module NEW!	£48.50	£56.99
BEL294	Parallel Printer Adapter	£29.77	£34.99	BEL730	USB Direct Connect	£45.10	£52.99
BEL760	USB DockStation™ (4USB, 1S, 1P, 2 PS/2)	£85.10	£99.99	BEL862	USB Device Cable A/B 1.8m	£6.80	£7.99
BEL790	USB Pocket Hub	£33.18	£38.99	BEL863	USB Device Cable A/B 3.0m	£8.50	£9.99
BEL827	USB Multiport Hub (4USB, 2S, 1P)	£99.57	£116.99	BEL297	USB Extension Cable A/A 1.8m	£6.80	£7.99
BEL772	USB BusPort™ Mobile Adapter	£49.35	£57.99	BEL298	USB Extension Cable A/A 3.0m	£8.50	£9.99

BELKIN

Belkin FireWire Products



FireWire IEEE 1394 6-Port Hub



- Connects up to 6 FireWire devices
- Plug-and-Play Installation and built-in cable management
- Mac® OS 9.0 or higher and Windows® 98 SE or higher

FireWire IEEE 1394 SCSI Converter



- Connect SCSI devices through FireWire.
- Hot swap your hard drives, scanner or other SCSI peripherals.
- Compatible with Mac's and PC's.
- Faster data transfer speeds

FireWire IEEE 1394 4-Port Hub



- Connect three additional IEEE 1394 (FireWire or i.LINK™) devices, including hard drives, scanners and printers as well as digital video camcorders.
- 4 IEEE 1394 6-pin female connectors
- 6 to 6-pin cable included

FireWire IEEE 1394 CardBus™ Card



- Add two IEEE 1394/FireWire ports to your notebook (400Mbps)
- Connect DV camcorders, hard-drives & other FireWire devices
- Strata VideoShop v4.5 software CD-ROM
- Lifetime Warranty

Code	Description	Ex VAT	Inc VAT	Code	Description	Ex VAT	Inc VAT
BEL866	FireWire to SCSI Adapter	£79.14	£92.99	BEL801	FireWire-Cable 6-6 pin 1.8m	£11.06	£12.99
BEL839	FireWire/USB Combo Card	£85.10	£99.99	BEL802	FireWire-Cable 6-6 pin 4.2m	£17.01	£19.99
BEL847	FireWire IEEE 1394 PCI Card	£48.50	£56.99	BEL803	FireWire-Cable 6-4 pin 1.8m	£13.01	£15.99
BEL848	FireWire IEEE 1394 CardBus Card	£72.33	£84.99	BEL804	FireWire-Cable 6-4 pin 4.2m	£18.71	£21.99
BEL067	FireWire IEEE 1394 4-Port Hub	£54.46	£63.99	BEL805	FireWire-Cable 4-4 pin 1.8m	£15.31	£17.99
BEL868	FireWire IEEE 1394 6-Port Hub Silver	£68.08	£79.99	BEL806	FireWire-Cable 4-4 pin 4.2m	£20.42	£26.99
BEL869	FireWire IEEE 1394 6-Port Hub White	£68.08	£79.99				

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MODEMS/ NETWORKING

MODEMS & ISDN CARDS

	EX VAT	INC VAT
BT		
BT0015 BT SPEEDWAY ISDN PCI	£39.95	£46.94

Creative		
CRE091 MODEMLASTER 56K V.90 EXT	£42.00	£49.35

Diamond		
DIA062 SUPRAEXPRESS 56E PRO V90	£50.49	£59.33
DIA081 SUPRAEXPRESS 56i PRO PCI	£34.49	£40.53
DIA063 SUPRAEXPRESS 56i PRO BARE	£32.99	£38.76
DIA093 SUPRAMAX 56K USB EXT RETA	£42.99	£50.51

Dyna		
DYN039 56K INT PCI V90 ROCKWELL	£19.99	£23.49
DYN043 EXT USB 56K MODEM	£26.99	£31.71
DYN075 V.92 Internal PCI Modem	£14.99	£17.61
DYN076 V.92 External USB Modem	£28.99	£34.06
DYN060 DYNAMODE 56K ISA MODEM (R)	£30.49	£35.83
DYN077 Dynamode 56K Int PCI Mode	£14.99	£17.61
DYN072 V.92 SmartExpress Int AMR	£12.99	£15.26
DYN038 DYNANET 56K EXT MODEM	£38.99	£45.81

Dynalink		
DYL001 V90/K56Flex PCI Connexant	£19.99	£23.49
DYL003 V90/K56Flex Connexant Ext	£36.99	£43.46
DYL002 V90/K56Flex PCI PC Tel So	£14.99	£17.61

Elsa		
ELS058 Microlink 56K FUN Externa	£30.41	£35.73
ELS069 MicroLink 56K FUN USB V.9	£33.92	£39.86
ELS059 MICROLINK 56K-PCI V.90 P	£28.46	£33.44
ELS050 MICROLINK ISDN INTERNET	£54.39	£63.91
ELS023 MICROLINK ISDN USB EXT	£50.05	£58.81

Euroserv		
EUR178 Internal PCI V.92 Ready L	£19.99	£23.49
ISDN01 BILLION PCI ISDN TA	£24.95	£29.32
EUR143 V.90 ROCKWELL SOFT FAX/DA	£12.99	£15.26
BILD01 USB ISDN EXTERNAL TA WITH	£49.95	£58.69

Hayes		
HAY040 Hayes AccuraPCI ISDN Term	£34.99	£41.11
HAY047 Accura 56K V.92 PCI Card	£49.99	£58.74
HAY044 Hayes Accura 56k External	£59.99	£70.49
HAY046 Accura 56K V.92 External	£69.99	£82.24
HAY045 Accura 56K Data/Fax Inter	£39.99	£46.99

Modulartec		
MOD010 MT 56K EXT V90 MODEM	£32.99	£38.76
MOD011 MT 56K INT PCI V90 MODEM	£19.49	£22.90

Olitec		
OLI029 UNIVERSAL SELFMEMORY PRO	£66.49	£78.13

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CABLES & ACCESSORIES

NETWORK CARDS

	EX VAT	INC VAT
3Com		
3CM080 10/100 RJ45 905B-TX PCI	£55.26	£64.93
3CM226 FAST ELINKOL PCI 10/100TX	£53.99	£63.44
Buffalo		
BUF008 BUFFALO PCI 10/100 NIC	£12.49	£14.68
Dlink		
DLK056 10/100 NIC RJ45 PCI	£17.67	£20.76
DLK055 PCI 10BASE RJ45/BNC NIC	£13.21	£15.52
DLK024 ISA ETHERNET BNC/UTP	£10.04	£11.80
Dyna		
DYN005 10/100TX PCI RJ45 NETWORK	£9.99	£11.74
DYN003 32BIT PCI ETHERNET RJ45	£6.99	£8.21
DYN004 32BIT PCI ET/NET BNC/RJ45	£7.99	£9.39
Intel		
INT256 PRO/100+ PCI SERVER ADAPT	£66.99	£78.71
Mayflex		
PLA079 PCI 10/100-TX NETWORK CAR	£12.20	£14.34
NetGear		
NET237 NETGEAR 10/100 PCI ADAPTE	£12.99	£15.26
SMC		
SMC023 E2 CARD 10/100 PCI WOL	£9.99	£11.74

SWITCHES & HUBS

	EX VAT	INC VAT
3Com		
3CM149 8 PORT 10/100 AUTO HUB	£79.99	£93.99
3CM205 10/100 16 PORT RJ45 HUB	£145.99	£171.54
3CM048 OFF/CONNECT HUB 8PRT 10BT	£49.99	£58.74
3CM103 OFFICECONNECT HUB 4PT 10B	£32.26	£37.91
Buffalo		
TEC051 BUFFALO 10/100 8 PORT PET	£73.99	£86.94
Dlink		
DLK011 DLINK 5 PORT 10BASET HUB	£22.25	£26.14
DLK053 16 PORT 10/100 CLIENT HUB	£201.49	£236.75
DLK020 D-LINK 809TC MINIHUB	£35.33	£41.51
Dyna		
DYN007 8 PORT 10MBT HUB BNC/RJ45	£19.99	£23.49
DYN057 8 PORT 10/100TX ETHERNET	£49.99	£58.74
NetGear		
NET244 NETGEAR 4 PORT COMPACT HU	£18.99	£22.31
NET247 NETGEAR 4 PORT COMPACT DU	£43.99	£51.69
NET258 NETGEAR 8 PORT 10/100 COM	£85.10	£99.99
NET249 NETGEAR 5 PORT 10/100 COM	£54.99	£64.61
NET235 NETGEAR ADSL/CABLE IP ROU	£99.99	£117.49
Nortel		
NOR057 NETGEAR HUB 10/100 4 PORT	£52.40	£61.57
NOR056 NETGEAR HUB 10/100 8 PORT	£90.59	£106.44
NOR123 8 PORT 10BASE-T HUB	£35.32	£41.50
SMC		
PROM20 SMC 16PRT FAST 10/100 SWI	£124.99	£146.86
SMC101 SMC 6405TX 10/100 5 PORT	£44.99	£52.86
SMC034 24 PORT 10/100-TX SWITCH	£227.99	£267.89
SMC035 8PORT 10/100 SWITCH	£52.99	£74.01

BELKIN

Belkin Keyboard, Video, Mouse Switches

The OmniCube™ is the most economical way of controlling up to four PS/2 computers from a single keyboard, monitor and mouse. Providing the ideal solution for the small-office/home-office user.



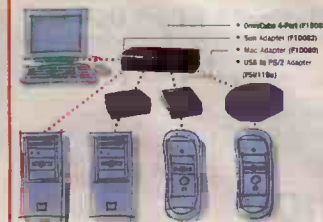
- PS/2 keyboard and mouse connectors.
- Keyboard and mouse emulation, for flawless operation.
- Microsoft Intellimouse and Intellimouse PRO support.
- 1200 x 1600 resolution.
- Push-button, HOT key and autoscanning.
- Compatible with Belkin SUN and MAC adapter.
- Certified for use with windows 95/98/NT/2000, Linux and Novell.

Code	Description	Ex VAT	Inc VAT
BEL415	2-Port PS/2 OmniCube™	£72.50	£85.19
BEL416	4-Port PS/2 OmniCube™	£93.61	£109.99

The Belkin OmniView™ USB KVM Switch is the most advanced USB KVM switch available. It permits convenient control up to four USB enabled PCs or Mac® G4s from one keyboard, monitor and mouse and with it's built in four port USB hub you can easily share any USB devices such as printers, scanners and cameras.



- Four USB ports to control PCs, G4s and laptops from one location.
- Built in four port USB hub.
- OSD (On Screen Display) to name and select attached computers.
- Up to 1600x1200@65Hz video resolution.
- HotKey, push button and Autoscanning.



LINUX
Novell
NetWare 5
Microsoft Windows 2000 Professional
Designed for

All Belkin KVM Switches have a one year warranty and are certified for use with Windows® 95/98/NT, Novell® and Linux

Code	Description	Ex VAT	Inc VAT
BEL017	OmniView™ Cable Kit, PS/2, 1.8m	£11.54	£13.56
BEL450	OmniView™ Cable Kit, PS/2, 3m	£17.25	£20.27

BELKIN

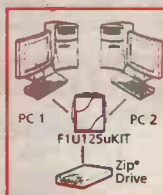
Belkin Keyboard, Video, Mouse Switches

Bitronics AutoSwitch Kits

The Ultimate AutoSwitch for Printers and Other Parallel Port Devices!

Unlike other autoswitches, the Bitronics AutoSwitch provides full IEEE 1284 bi-directional communication. The Bitronics AutoSwitch is also reversible, allowing 1 user to select between 2, 3, or 4 devices.

- IEEE 1284 bi-directional communication support - works with any parallel port device
- Fully Automatic
- Reversible, can be used with 2 PCs to 1 device or 1 PC to 2 devices
- Has special File Transfer Function between 2 PCs
- No power supply required
- Kit includes 6ft. (1.8m) IEEE 1284 DB25 M/M
- Lifetime Warranty

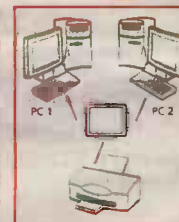
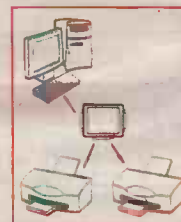


Code	Description	Ex VAT	Inc VAT
BEL287	Bitronics AutoSwitch Kit 2 Port	£36.32	£42.68
BEL314	Bitronics AutoSwitch Kit 4 Port	£63.49	£74.60

Parallel AutoSwitches

Belkin's Compact Parallel AutoSwitches are the most economical way to share a printer between 2, 3, or 4 users. It is fully automatic and requires no power or software. It switches to the appropriate computer on a first-come first-served basis.

- Reversible - multiple-PCs to single printer, or single PC to multiple-printers
- Fully automatic printer sharing
- Compact size reduces desk clutter
- Status LEDs indicate current active port
- Non-powered
- Easy to use Windows and DOS software for single-PC to multiple-printers setup
- Lifetime Warranty



Code	Description	Ex VAT	Inc VAT
BEL215	Compact Parallel AutoSwitch (2-Port)	£9.03	£10.61

BELKIN

Belkin Keyboard, Video, Mouse Switches



IEEE-1284 Parallel Printer Cables

IEEE-1284 is a standard that was developed to support high speed bi-directional communication between computers and parallel printers. Cable assemblies complying with the new specifications must be manufactured with special low-capacitance, impedance matched, twisted pair, double-shielded cable.

Code	Description	Ex VAT	Inc VAT
BEL025	PC Parallel Printer Cable (A-B), DB25 Male/36 Position Centronics Male 1.8m	£8.55	£10.05
BEL026	PC Parallel Printer Cable (A-B), DB25 Male/36 Position Centronics Male 3.0m	£15.22	£17.88
BEL152	PC Parallel Printer Cable (A-C), DB25 Male/36 Position Centronics Male 1.8m	£15.22	£17.88
BEL153	PC Parallel Printer Cable (A-C), DB25 Male/36 Position Centronics Male 3.0m	£18.99	£22.31

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CODE	PRODUCT	Ex VAT	Inc VAT
BEL764	Regulator Pro Gold Series 625 VA, CEW up to £60,000	£99.99	£114.99
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BEL762	Regulator Pro Gold Series 425 VA, CEW up to £40,000	£69.99	£82.24
BEL761	Regulator Pro Gold Series 325 VA, CEW up to £30,000	£59.99	£70.49



F6C625u220V

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Connected Equipment
Warranty

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NEW

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BEL849	Regulator Pro Silver Series 650 VA, CEW up to £40,000	£94.99	£111.61
BEL850	Regulator Pro Silver Series 500 VA, CEW up to £30,000	£74.99	£88.11
BEL851	Regulator Pro Silver Series 350 VA, CEW up to £20,000	£64.99	£76.36



F6C650uSER-58

Up to
£40,000
Connected Equipment
Warranty

BELKIN

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Belkin Maximum Grade

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- Up to 4m Power Cord
- 1.8m Telephone Cord Included
- 1.8m Coax Cable Included (AV version only)
- Surge Protection Indicator
- Earthed Wiring Indicator
- EM/RFI Filtration
- Thermal Fuses
- Lifetime Product Warranty



Up to
£30,000
Connected Equipment
Warranty

Code	Description	Joule Energy Rating	Connected Equipment Warranty	Tel/Coax Protection	Cord Length	Ex VAT Price	Inc VAT Price
BEL714	Maximum Grade 8-Way-SurgeMaster™	1440 + 104	£ 30,000	Both	2m	£34.03	£39.99
BEL852	Maximum Grade 8-Way-SurgeMaster™	1440 + 104	£ 30,000	Tel	4m	£29.78	£34.99
BEL853	Maximum Grade 8-Way-SurgeMaster™	1440 + 104	£ 30,000	Tel	2m	£25.52	£29.99
BEL854	Superior Grade 8-Way-SurgeMaster™	1080 + 104	£ 20,000	Both	2m	£25.52	£29.99
BEL855	Superior Grade 8-Way-SurgeMaster™	1080 + 104	£ 20,000	Tel	4m	£22.82	£27.99
BEL713	Superior Grade 8-Way-SurgeMaster™	1080 + 104	£ 20,000	Tel	2m	£19.57	£22.99
BEL856	Home/Office Grade 5-Way-SurgeMaster™	720 + 104	£ 10,000	Tel	4m	£19.57	£22.99
BEL711	Home/Office Grade 5-Way-SurgeMaster™	720 + 104	£ 10,000	Tel	2m	£17.01	£19.99
BEL857	Home/Office Grade 5-Way-SurgeMaster™	720	£ 10,000	None	2m	£13.60	£15.99
BEL858	Home/Office Grade 4-Way-SurgeMaster™	480 + 104	£ 3,000	Tel	4m	£21.27	£24.99
BEL859	Home/Office Grade 4-Way-SurgeMaster™	480 + 104	£ 3,000	Tel	2m	£19.57	£22.99
BEL710	Home/Office Grade 4-Way-SurgeMaster™	480	£ 3,000	None	2m	£9.35	£10.99
BEL709	Home/Office Grade 1-Way-MasterCube™	824	£ 6,000	Tel	Wall	£8.50	£9.99
BEL860	Home/Office Grade 1-Way-MasterCube™	720	£ 6,000	None	Wall	£5.95	£6.99

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BELKIN

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SONY



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- V51cm screen.
- Plug and play.
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Hitachi 24" Nicam Widescreen TV

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- V56cm screen.
- NICAM digital stereo sound.
- 4:3, 16:9 and 14:9 viewing modes.
- On screen display.
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- Easitune system.
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- Fastext.
- Front AV sockets.
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- Headphone socket.
- 2 x 10 watt RMS output.

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- Standby time 135 hours
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- Quick access menu.
- 11 ring tones



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- Up to 230 hours standby
- Weight 170g
- Calls from 5p per minute
- Free voicemail service
- Up to £10 air time included



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£59.53 Ex. VAT
Stock Code ONE202

- Text messaging
- Vibrator call option
- 3 line graphical display
- Up to 4 hours talk time
- Up to 65 hours standby time
- Free voicemail service
- Upto £10 airtime included.

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- Off-peak calls from only 5p per minute.



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- Intelligent navigation system makes using this phone a pleasure.
- WAP compatibility always ensures you have the most up-to-date information.
- By using both pictures and sound on your text messages.



Nokia 3310

£99.95 inc. VAT
£85.06 Ex. VAT
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- Voice activated dialling.
- Vibrating call alert.
- Send multiple text messages.
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- Up to 55 hours standby.
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- Up to 3 hours talk time
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- Standard battery charger
- Weight 115g
- Calls from only 5p per minute
- Up to £10 air time included.

**NEW
PRODUCT**



Nokia 3210 Smartstep

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£85.06 Ex. VAT
Stock code VOD005

- Front and back covers can be changed for individual preference.
- Sleek pocket sized phone with internal antenna.
- Predictive text input - an internal dictionary makes keying in words faster.
- Calls from only 5p per minute.

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as you
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By using the handset for the Pay as you Talk services you are agreeing to be bound by the rules of the service.



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£85.06 Ex. VAT
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Access the Internet*

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- Up to 300 minutes of battery talk time.
- 190 names and numbers memory.
- Choice of 20 ring types.
- Calls from 2p per minute.
- £5 of inclusive calls.



Nokia 3310

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£110.60 Ex. VAT
Stock code BTC108

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- Vibrating call alert.
- Send multiple text messages.
- Up to 150 minutes talktime.
- Up to 55 hours standby.
- 35 ring tones.
- Calls from only 2p per minute.
- £5 of inclusive calls

**NEW
PRODUCT**



Nokia 7110 WAP

£149.95 inc. VAT
£127.62 Ex. VAT
Stock code BTC107

- Up to 260 hours standby.
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Terms and Conditions
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* Subject to availability of content and WAP enabled web sites.

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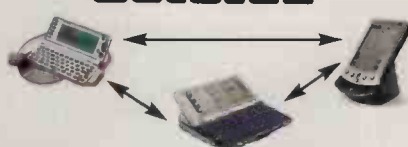
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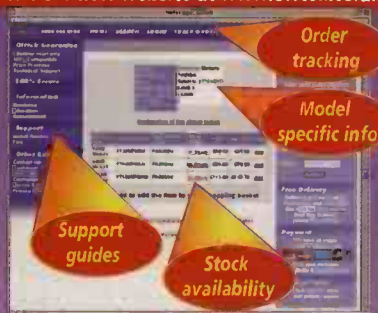
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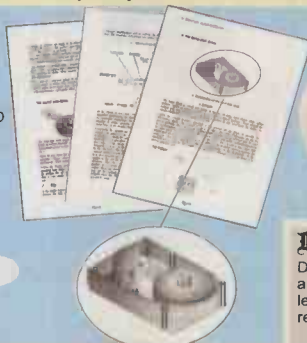
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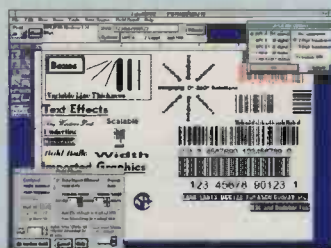
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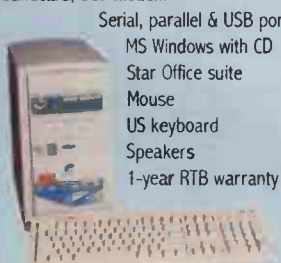
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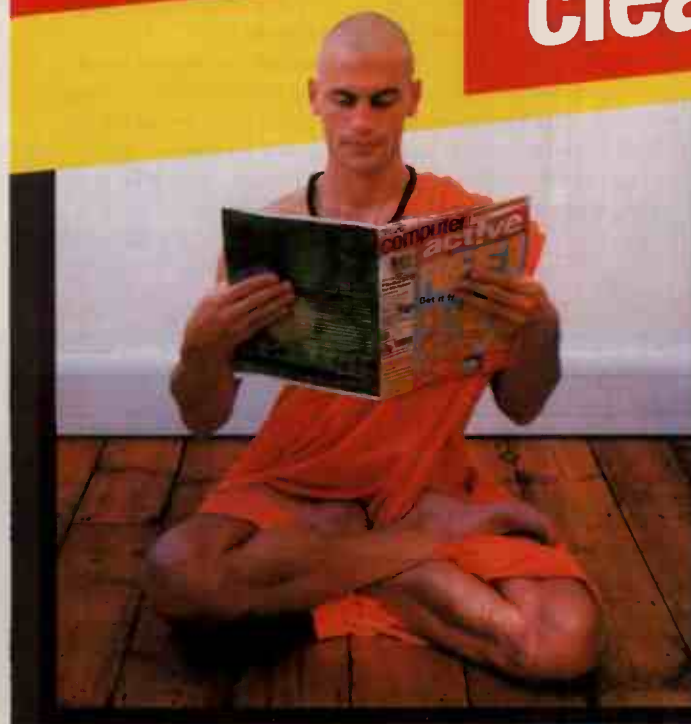
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LEISURE LINES

PREVIEW

Xbox unleashed

Microsoft has unveiled the product it hopes will shake Sony from the top of the console tree

Bill Gates chose the PlayStation's home turf to publicly unveil Microsoft's entrant to the games console arena. The crowds at the Tokyo Games Show in March were treated to the sight of Bill Gates' green-eyed monster and a selection of the games Microsoft hopes will ensure the Xbox becomes an essential part of your living room.

The console itself boasts an Intel 733MHz processor and a custom-designed 250MHz nVidia graphics chipset, which the company promises will make the console three times faster than its competitors. Add to this its 8GB hard disk and built-in Ethernet port providing broadband connectivity and you've got online gaming. A DVD drive and four built-in controller ports round off the package that owes a lot to PC design.

One of the first games to grace the platform is a sci-fi shoot-'em-up called Halo. Roaming about both on foot and in a selection of vehicles on a strange planet, you take on a mysterious enemy called the Covenant. Allowing both single-player and multiplayer missions Halo boasts groundbreaking graphics that (the developer says) will 'blur the line between your couch and fantasy'. If only half of what is being said is true, Halo is guaranteed to be good.

The third installment of the Oddworld franchise, Oddworld: Munch's Oddysee, is a 3D adventure populated by a bunch of strange creatures and even stranger situations. The two heroes Abe and Munch are out to save Abe's mother and a combination of each character's unique psychic and physical abilities will help them reach their goal. In a similar vein the darkly comic Malice mixes the madness of *Alice in Wonderland* with the wizardry of *Sacrifice* as our eponymous heroine fights her way through burning and flooded levels gathering greater magical powers as she goes.

Racing games are currently represented by a game codenamed Project

Gotham, which has more than a passing resemblance to Metropolis Street Racer on the Dreamcast. Like its predecessor, winning in this city racer requires a mixture of style, speed and risk taking in order to accrue kudos. The greater the kudos the more successful you become as you tear up over 300 tracks in four cities. Similarly, snowboarding title Amped requires you to grab the attention of the media and sponsors in order to get all-important exposure and thus rise up the career ladder. Unlike other snowboarding games Amped allows you to roam freely around courses performing stunts rather than trying for the fastest time.

Role-playing games such as Azurik: Rise of Perathia and Nightcaster round off the preliminary line-up. Both follow magicians who must acquire greater powers to overcome the forces of evil. So far, so uninspired. At least Azurik's immense free-roaming 3D environments promise to put the Xbox's hard drive to good use.

Another established games title that Microsoft has secured for exclusive release is Tecmo's graphically rich arcade beat-'em-up Dead or Alive 3 (its current incarnation, Dead or Alive 2 can be found on both PS2 and Dreamcast). With a requisite quota of buxom babes and hulking brutes fighting it out in beautifully rendered arenas, it could prove to be exactly what Microsoft needs to steal the competition's thunder.

Recent deals with Sega to develop 11 new titles and Konami, which will release special versions of its Metal Gear Solid and Crash Bandicoot games for Xbox, have added to the growing anticipation among gamers. However, the first consoles don't go on sale until the autumn in the US while UK gamers will have to wait until spring 2002 to get a piece of the action.

www.xbox.com

Andy Stewart



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Black & White

The more people worship you the more power you have – addictive isn't it?

Black & White has attracted a lot of hype thanks to the early promise of previews and its protracted development programme. But when you realise that the man behind B&W is none other than Peter Molyneux, inventor of the original god sim Populous, perhaps it's right to expect a lot of the game.

It begins with you saving a drowning child and his parents telling their village to worship you. Once you've helped them build a temple in your honour you can figure out what you're supposed to do next.

Having people worship you is the key to your power and the more people who believe in you, the stronger you become. You can choose to be either good or bad, depending on your personality or mood. One of the more amusing aspects of the game is the angel and devil helpers. Each one tries to lead you down an opposite path, but are both worth listening to.

Around your village are scrolls that give you tasks. These can be anything from finding lost sheep to collecting gate stones. One task is to help villagers build a boat. The would-be sailors are so demanding and insist on singing to you, making you want to just smash

them and their boat to bits. But that's what it's all about – can you remain good in the face of adversity or do you become a tyrant and scare everyone into worshipping you?

What sets B&W apart from other god sims is the creature – a pet every god should have. Once you've located all the gate stones, you can choose a monkey, tiger or cow. Your creature needs a lot of looking after, discipline and love. You can teach him all sorts of things, including performing miracles. This is vital when you want to expand your influence into another god's territory. You don't have access to areas where you don't have followers, but you can send your creature in to perform miracles on your behalf in order to convert the people.

If you're not into subversion, you can just throw large rocks at your rival god's village, but beware, he might be a better shot than you.

B&W also embraces online elements. You can set the game

to log on to the net to check the weather for your area which it will match in the game. Unfortunately for UK residents it will mean your villagers are always being rained on. You can also give B&W access to Outlook, then it will name all your villagers after your contacts, and if you get an email from anyone, the villager with that name will tell you. You can even go online and let your creature do battle with other beasts.

B&W is an immense game that will keep you playing well into the early hours of the morning for weeks on end. It's visually breathtaking and watching the landscape change as you turn evil or revert to good is amazing. Even the music takes on a more sinister turn if you start to show your dark side.

B&W may not have the instant appeal of, say, Quake III or Half Life, but if you're willing to put in a bit of time and effort you'll find it's one of the best games ever to grace the PC.

Riyad Emeran

DETAILS

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SCORE ■■■■■



Summoner

A sword-swinging country bumpkin is on a mission...

In a perfect world the simultaneous release of a game onto both console and PC – particularly a next-generation console like the PlayStation2 – would be a good thing. You'd think the game would combine the best elements of both platforms. But, as is apparent with this latest sword and sorcery role-playing epic, the result of such a hybrid fails to be either the next Baldur's Gate or Final Fantasy IX.

Ultimately, what you do get is a mish mash of both platforms' good and bad elements. The most immediate problem is the game's pitiful draw distance. Fogging and pop-up conspire to create strange pale phantoms that appear from nowhere before taking shape as a building. However, the 3D environments are imaginative and do provide expansive and atmospheric locations to explore.

Things are only marred by an in-game camera with a downward perspective that makes picking out enemies nigh on impossible unless you're virtually on top of them. This seems to be compensated for by giving your enemies a sub-standard

AI whereby you can clearly see them and they you, but they will only attack once you've moved a lot closer.

Your main role is that of Joseph a sword-wielding country bumpkin who carries the mark of the Summoner, which is as much a curse as a blessing. This strange power enables him to summon beasts to help him in his mission. Your quest takes you to the city of Lenele where Joseph meets up with the other playable characters that make up his motley band. The first is Fleece, a lady thief, who you get to control soon after meeting in order to complete a solo mission to break into the palace. Jekhar is a soldier from Joseph's bad old days who still harbours a chip the size of a melon on his shoulder. The quartet is rounded off by Rosalind, a wizard monk.

The system of menus and inventory is straightforward, allowing you to control most of the action with a mouse, the characters can be made to walk by pointing in front of them and holding down the mouse button. These simplified controls seem to be an offshoot of designing the game for a PS controller.

The combat system relies entirely upon a system of 'chain attacks', which require good timing on your part in order to sustain a character's attack. Do it often enough and that character will acquire greater levels of skill. Each character has their own particular set of skills that they can enhance and add to, and which can prove essential in the completion of particular tasks. Also, when fighting alongside one of your colleagues the character you're not controlling can be assigned a script that makes them help fight the foe, be more defensive or even stand idly by.

Roaming the city streets of Lenele and talking to virtually anyone who'll listen will garner either some quaint olde worlde chit chat or a quest that will take you from your main objective but could prove handy. Perform some successfully and you'll be paid, then you can buy potions or weapons from a shady character in the market. The more relevant non-playing characters are distinguished by a couple of exclamation marks floating above their heads, which makes them look like Sims characters that have lost their way. These side quests help add depth to the game, especially if you grow tired of the main tasks.

An additional multi-player option allows you to leave the story behind and play online with a group of friends.

Summoner is an impressive achievement that will amaze PlayStation owners but will seem par for the course to PC RPG fans. It plays well, looks good and the story doesn't let it down. However, it's not about to set the genre alight.

Andy Stewart



DETAILS

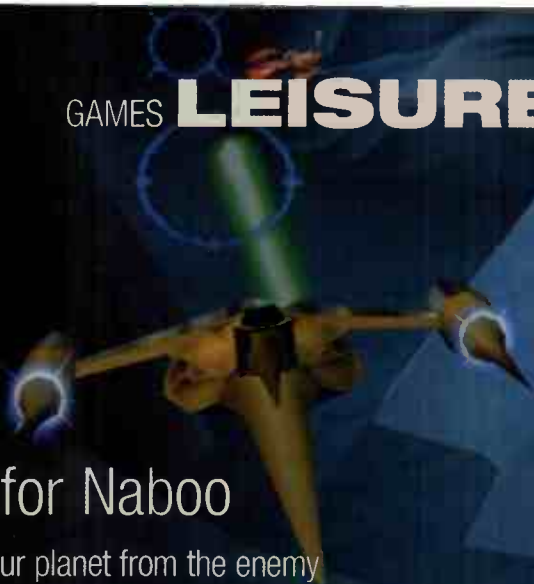
PRICE £29.99 inc VAT

CONTACT THQ 01483 767 656

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SYSTEM REQUIREMENTS Pentium II 300MHz, Windows 95, 98 128MB of RAM

SCORE ■■■■



Star Wars: Battle for Naboo

Take control of a starship to save your planet from the enemy

Following in the 'tradition' of *Star Wars: Rogue Squadron*, the classic sci-fi shoot-'em-up, *Star Wars: Battle for Naboo* does little to inject anything new into the genre. Considering how far PC combat flight sims have come since *Rogue Squadron*, this is extremely disappointing. So, although it has the familiar *Star Wars* music, the opening text disappearing into the cosmos and the same great laser sounds, it is let down by clunky game play and poor graphics.

What story there is takes place at the same time as the events in *Episode I: The Phantom Menace*.

Taking control of the exotically named Gavyn Sykes you embark on a series of missions to save Naboo following its invasion by the evil Trade Federation. Beginning with a humble landspeeder you labour through a series of uninspired levels for the opportunity to fly bigger and better ships until you take control of a starfighter. Eventually, the action coincides with the film's big finale, where you have to retake the palace and destroy the orbiting droid control ship.

Sadly, the 3D environments you get to fly through are quite bland and featureless, their basic textures

and use of fogging betraying the game's Nintendo 64 origins. Meanwhile, the missions follow linear paths from one fracas to another, each requiring an inhabitant of Naboo to be rescued or something to be destroyed. The vehicle's awkward handling rounds off an unsatisfying package.

If this game didn't come with the *Star Wars* licence attached it wouldn't register on most people's radar. As it is, it can be mildly diverting, particularly if you're a *Star Wars* fan, but at the end of the day it has little to keep you coming back for more. It's a sad state of affairs

when the best bit of the game comes in the first few seconds when Jar Jar Binks is flattened by a falling *Star Wars* logo. Lucasarts clearly wants to get us on its side, but this game is just too little too late.

Andy Stewart

DETAILS

PRICE £29.99 inc VAT

CONTACT Activision 01753 756 100

www.activision.com

SYSTEM REQUIREMENTS Pentium II 233MHz processor; 64MB of RAM; 4x CD-ROM; DirectX 8, Windows 95, 98, 2000, Me

SCORE ■■■■

Star Trek: Away Team

Join Starfleet officers on USS Incursion for some stealth missions

Today is a good day to die, as a Klingon once said. But not to worry, a crack team of elite Starfleet officers is on its way. Billed as a squad-based, realtime strategy game, *Away Team's* action begins – not long after the Dominion War – aboard a prototype Federation Starship named the USS Incursion. You can forget those saucer-shaped ships of old, this is a holographic stealth model that can assume the identity of any vessel.

In the first mission, you take on the role of Captain Rafelian. Starfleet Command and your technical advisors have briefed you on your objectives and now you must choose the *Away Team* members from 17 highly trained individuals. These consist of command, medical, security, engineering and science officers, so let's just say it pays to consider the skills, weaponry and tools they offer.

Once you've selected your team

the 3D isometric view is called into play and your *Away Team* is beamed down to the planet surface. The interface is the usual RTS affair, but it has a good uncluttered design that makes inventory selection slicker and aids your chances of defeating or outwitting the enemy.

Unfortunately, some of the missions are just too easy and suffer from a timed puzzle format rather than a truly strategic one. However, stealth is a big issue, especially when some of the *Away Team* are equipped with cloaking devices, sniper rifles, holographic projectors, close-range neural disruptors and the Vulcan nerve pinch and mind meld. More direct approaches include the trusty phaser, mines and audio decoys, and for scouting tasks there's the tricorder.

Unfortunately the AI can hardly be described as the best we've seen. If you make a lot of noise chucking a concussion grenade behind several Romulans, you can watch them die,

oblivious to the noise as it detonates. Unfortunately the same applies to your own team – if someone gets stranded the rest of the team will just stand there and get mashed – annoying when the loss of one officer will end the mission. Luckily in those situations the pause-time button halts everything so you can plan a response.

The graphics are not earth shattering, but there's enough detail to portray the lush vegetation of a Romulan outpost and the menacing innards of a Borg Cube. The music also creates a tense atmosphere, while the voices of Commander Data and Ambassador Worf add authenticity.

In all there are 18 missions dotted around the Alpha and Beta Quadrants and if you don't want to complete them alone there's a co-operative multiplayer mode for network play. At the end of the day, *Trekkies* will love *Away Team*, but hardcore strategists will find it limited.



DETAILS

PRICE £29.99 inc VAT

CONTACT Activision 01753 756 100

www.stawayteam.com

SYSTEM REQUIREMENTS Pentium II 266MHz; 64MB of RAM; 500MB of free hard drive space; CD-ROM; DirectX 8 installed; 4MB graphics card; 16bit sound card

SCORE ■■■■

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

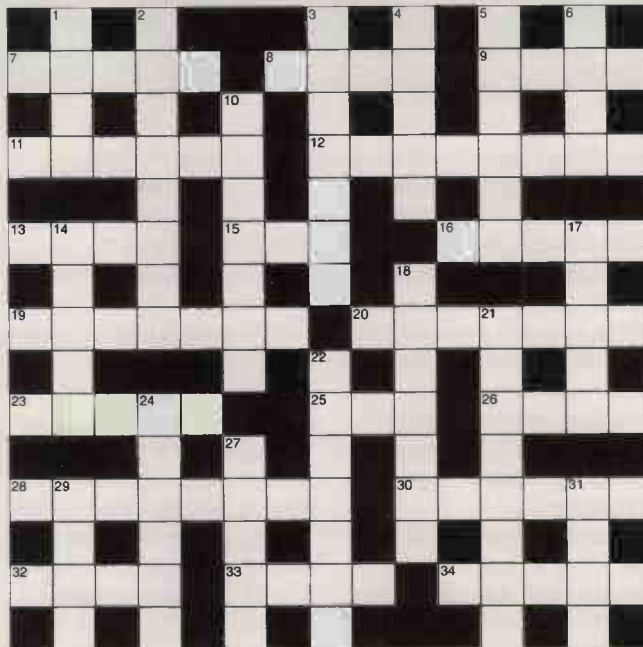
prize crossword

ACROSS

- 7 Erased a file (5)
- 8 __ shell, Unix command-line interface (4)
- 9 Steve's fruity friend? (4)
- 11 Placed information into memory (6)
- 12 Failure to account for all programming situations (8)
- 13 __ chart, graphical representation (4)
- 15 Three-way prefix (3)
- 16 __ table, Boolean chart (5)
- 19 Trying out a new system (7)
- 20 Printer paper transport method (3,4)
- 23 Code where a=65 etc (init) (5)
- 25 Fetch a stack's topmost element (3)
- 26 Erase an entire hard disk (4)
- 28 Mathematical statement (8)
- 30 Append a document to an email (6)
- 32 Internet location (4)
- 33 Electrical unit (4)
- 34 __ trails, screen shadows (5)

DOWN

- 1 Missile shelter (4)
- 2 Complete stop (4,4)
- 3 Set of implements (4,3)
- 4 Bullion bar (5)
- 5 Sea area off Denmark (6)
- 6 Part of a wicket (4)



- 10 Amending proofs (7)
- 14 Stinks (5)
- 17 Pluck sharply (5)
- 18 Exhibit (7)
- 21 Specific use (8)

- 22 Long and leggy (7)
- 24 Mental pictures (6)
- 27 Colander (5)
- 29 The Weakest Link, eg (4)
- 31 Ready money (4)

SOLUTIONS

June crossword

- ACROSS** 7 Grade 8 Fans 9 Reel
 11 Chains 12 Launcher 13 Atto
 15 ISO 16 Using 19 Playing
 20 Emulate 23 Psecs 25 Ado
 26 Most 28 Data Bank 30 Hot Key
 32 Ring 33 Ions 34 Unzip
DOWN 1 Arch 2 Advisory 3 Balloon
 4 Issue 5 Tricks 6 Fete 10 Assign
 14 Tiles 17 Notes 18 Smooths
 21 Limiting 22 Catkins 24 Charge
 27 Palln 29 Arid 31 Eric

April brainteaser

Seat	Name	Age
1	Darren	6
2	Susie	10
3	James	8
4	Jane	9
5	Peter	7
6	Amanda	6
7	Francis	9
8	Sally	7
9	Alan	10
10	Emma	8

The waiting game

At the village surgery, Dr Kurall operates an appointment system every morning. The first patient is booked in at 08.30 and then there is an appointment every 10 minutes until 10.00. Last Monday however, it was very important that the doctor got away as early as possible, so in case any of the patients turned up late, his receptionist arranged that his 10 booked-in patients would be seen in the order in which they arrived at the surgery, starting at 08.30 as usual. The first one arrived at 08.20 and from then on, luckily, they turned up at ten-minute intervals. The doctor saw each patient for as long as was necessary, no two of them for the same length of time and as usual he always allowed two minutes between appointments to write up his notes. He finished writing his last notes by 10.05.

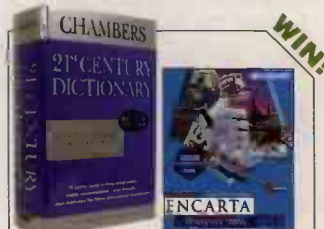
Kate had booked the first appointment, but was not seen until

immediately after Mary, who wanted to see the doctor about her sprained ankle. This consultation took two minutes more than Dave's who arrived at 09.50 and only half as long as the asthma patient's, who went in immediately before his sister Wendy. George spent two minutes less with the doctor than the girl booked in immediately before him and two minutes more than the girl who was seen straight after him. Tom felt he was lucky to have to wait only three minutes to see the doctor.

Two patients arrived on time. One patient had to wait nine minutes to ask about her tennis elbow. Strangely enough, the doctor saw his last patient at exactly 10.00, though it was not the girl booked at that time. She had arrived 20 minutes early and saw the doctor after a six minute wait. Of all the patients, Joan benefited most from the system, as she was seen 21 minutes before the

time of her appointment, just after Wendy. Nick was seen five minutes early. The patient with a cough was seen immediately before the man with indigestion, but her consultation was only two-thirds as long as his. The longest consultation was with the patient with backache. Mary arrived at 08.30 and saw the doctor 18 minutes before Bill, whose consultation was twice as long as hers. The patient with arthritis saw the doctor for two minutes less than the one with the earache. The last patient to be seen had only called in for a flu jab. Sue did not have eczema, but was seen immediately after the patient who did.

Can you work out why each person wanted to consult the doctor and give the times of their appointment, the times they arrived and were seen and the length of their consultation? See panel on the right for details of how to enter.



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 **14 June 2001**.

Send the answers to the brainteaser to: 'PCW July - Prize Puzzle', at the address above or email letters@pcw.co.uk, to arrive no later than **23 June 2001**. Please note we DO NOT open attachments.

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Winners

The winner of May's crossword is Sarah Mosley from Harrow; and April's brainteaser prize has been won by Stuart Wale from Aberdeenshire.

monitors

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Scanjet 7540C		£362	£425.35	Perfection 1640SU Office		£269	£316.08
Scanjet 7490C		£519	£609.83	Expression 1680 Scanner		£476	£559.30
UMAX		Ex VAT	Inc VAT	MICROTEK		Ex VAT	Inc VAT
Astra 3400U		£51	£59.98	ScanMaker 3600		£55	£64.63
Astra 3450U		£76	£89.99	ScanMaker 3700U		£64	£75.20
Astra 5400U		£85	£99.88	ScanMaker 4600U		£93	£109.28
Astra 5450U		£127	£149.23	ScanMaker 4700U		£142	£166.85
Astra 6400F		£170	£199.75	ScanMaker X12 US		£179	£210.33
Powerlook 1100 Graphic		£749	£880.08	ScanMaker 5700		£299	£351.33
Powerlook 1100 Pro		£899	£1056.33	ScanMaker 6700		£649	£762.58
Powerlook 2100XL Pro		£2199	£2583.83	CANON		Ex VAT	Inc VAT
AGFA		Ex VAT	Inc VAT	Canon N640P		£55	£64.63
Snapshot e20		£59	£69.33	Canon N650U		£55	£64.63
Snapshot e25		£77	£90.48	Canon D660U		£85	£111.63
Snapshot e40		£126	£148.05	Canon N1220U		£119	£139.83
Snapshot e50		£145	£170.38	Canon FB1210FAU		£199	£233.83
Arcus 1200		£455	£534.63	Canon FB1200S		£308	£361.90
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Deskjet 350CBI		£154	£180.95	PX880		£246	£289.05
Deskjet 640C		£55	£64.63	PX980		£259	£301.33
Deskjet 840C		£67	£78.73	FX1170		£264	£312.95
Deskjet 843C		£74	£86.95	FX1180		£271	£321.33
Deskjet 930C		£82	£96.35	PX2180		£371	£435.93
Deskjet 950C		£127	£149.23	LQ380		£112	£131.60
Deskjet 959C		£119	£139.83	LQ580		£209	£245.58
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Deskjet 1220C		£268	£314.90	DLQ3000+		£772	£907.10
Busines 2200		£264	£310.20	DFX5000+		£1197	£1406.48
Busines 2250		£392	£460.60	DFX8500		£1777	£2087.98
PhotoSmart P1000		£153	£179.78	Stylus Color 480SXU		£37	£43.48
PhotoSmart P1215		£195	£229.13	Stylus Color 580		£44	£51.70
PhotoSmart P1218		£220	£258.50	Stylus Color 680		£64	£77.55
Laserjet 1200		£263	£309.03	Stylus Color 880		£103	£121.03
Laserjet 2100N		£395	£464.13	Stylus Color 980		£170	£199.75
Laserjet 2200D		£527	£619.23	Stylus Color 980N		£318	£373.65
Laserjet 2200DT		£629	£739.08	Stylus Photo 790		£89	£104.58
Laserjet 4100		£773	£908.28	Stylus Photo 890		£148	£173.90
Laserjet 4100N		£972	£1142.10	Stylus Photo 875DC		£148	£173.90
Laserjet 4100TN		£1040	£1222.00	Stylus Photo 1290		£296	£347.80
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Laserjet 5000		£965	£1133.88	Stylus Color 1160		£592	£695.60
Laserjet 5000N		£1389	£1632.08	Stylus Colour 1520		£315	£370.13
Laserjet 5000GN		£1719	£2019.83	Stylus Colour 3000L		£792	£930.60
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Laserjet 8150N		£1769	£2078.58	EPL-5800L		£169	£198.58
Laserjet 8150DN		£2149	£2525.58	EPL-5800		£236	£277.30
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Officejet G85		£344	£404.20	EPL-5800 PS		£443	£520.53
Officejet G95		£419	£492.33	EPL-1600		£456	£535.80
Officejet K60		£199	£233.83	EPL-N2050		£657	£771.98
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Laserjet 3200		£409	£480.58	AcuLaser-C2000		£1280	£1504.00
				AcuLaser-C8500		£2753	£3234.78
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HL1250		£239	£280.83	ML321		£381	£447.68
HL1250 8Mb		£259	£304.33	ML380		£225	£264.38
HL1270N		£349	£410.08	ML390F		£259	£301.33
HL1270N 8Mb		£369	£433.58	ML3320		£289	£339.58
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FS3800		£729	£856.58	Magicolor 330GX		£2899	£3406.33
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FS7000+		£1679	£1972.83	Phaser 750N		£1609	£1890.58
FS9000		£1899	£2231.33	Phaser 750P		£1939	£2278.33
CANON		Ex VAT	Inc VAT	Phaser 850N		£1979	£2325.33
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BJC 85 Col + Scanner		£208	£244.40	Phaser 790N		£4699	£5521.33
BJC 2100		£46	£54.05	Phaser 790DP		£5595	£6574.13
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S600		£147	£172.73	Jetprinter 242		£76	£89.30
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CL34		£169	£198.58	PhotoPC 3000Z		£605	£710.88	DC 21S		£185	£217.38
CANON		Ex VAT	Inc VAT	FUJI		Ex VAT	Inc VAT	SONY		Ex VAT	Inc VAT
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Digital IXUS 300		£389	£457.08	FinePix 1400Z		£205	£240.88	DC 3400		£259	£304.33
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MV-31		£765	£899.00	FinePix 4800		£611	£717.13	MVC FD92		£422	£495.85
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C-960Z		£299	£351.33	Coolpix 880		£495	£581.63	Cybershot P50		£309	£363.08
C-990Z		£349	£410.08	Coolpix 950		£385	£452.38	Cybershot DSC-F505V		£599	£703.83
C-2020Z		£409	£480.58	Coolpix 950 Premier		£440	£517.00	Cybershot DSC-P1		£485	£569.88
C-3030Z		£595	£699.13	Coolpix 995		£619	£727.33	DCR-PC4		£799	£938.83
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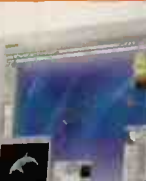
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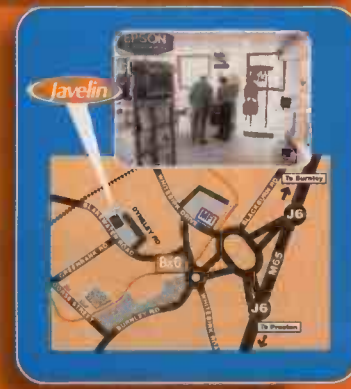


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May winners

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EVESHAM.COM PENTIUM 4 PC

WIN!



This month we've teamed up with evesham.com to celebrate the launch of the Intel Pentium 4 processor and one PCW reader will win a Pentium 4 PC, the Evolution 1300MX. At the heart of the system is Intel's 1.3GHz processor. Coupled with 128MB of PC133 RAM, you get blistering performance.

As well as great power performance, evesham.com has ensured sensational 3D graphics. Inside is an award winning nVidia graphics card incorporating the GeForce GPU engine. The GeForce2 MX provides the perfect blend of performance and dramatic graphics.

To take advantage of these superb graphics, the 1300MX includes a 17in evesham.com monitor. With its excellent ergonomic design and ability to display a top flicker-free resolution of 1,024 x 768, it will make light work of even the most demanding tasks.

With a three-year warranty, lifetime telephone technical support at local rate and 24-hour, seven-days a week online support, this system is a real winner. evesham.com's PCs are backed up by a team of engineers, trained in evesham technology.

For a chance to win the evesham.com Evolution 1300MX PC, answer the question below and follow the 'How to enter' instructions on the opposite page.

What is the top resolution of the 1300MX's 17in monitor?

PCW JULY 2001 EVESHAM.COM COMPETITION ENTRY FORM

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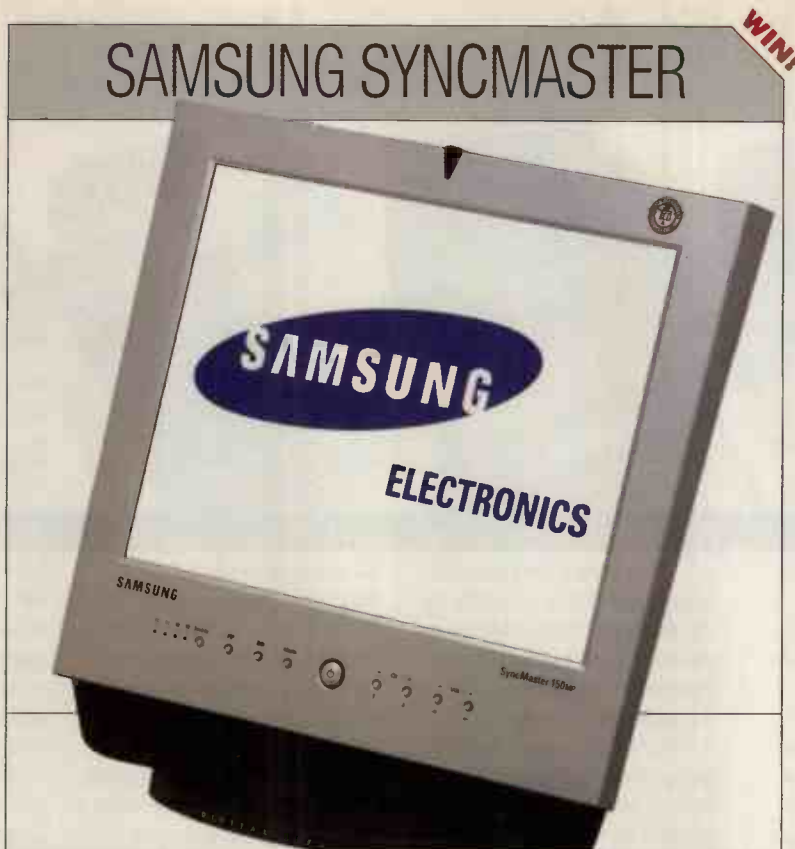
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Answer What is the top resolution of the 1300MX's 17in monitor?

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Whether you are looking for a high-resolution computer display or a stylish flat-screen TV, the Samsung SyncMaster 150MP fits the brief. This sleek metallic device integrates a high-resolution computer display with a TV tuner and built-in multimedia speakers, together with remote control and picture-in-picture capability. We are giving away one of these award-winning monitors to a lucky *PCW* reader, and it could be you.

The 15in flicker-free screen produces crisp, distortion-free images of up to 16.7 million colours at natural screen resolutions of 1,024 x 768. With high brightness and contrast ratios, wide viewing angles, and a viewable screen equivalent to a conventional 17in CRT monitor, you don't have to sacrifice image size, definition or viewing comfort when space is at a premium.

Weighing in at less than 10lb and measuring just 200mm from front to back, the included VESA mount means you can easily put it up on the wall.

The new model features a 64x zoom facility together with picture-in-picture capability and Samsung's image scaling pixel interpolation technology, which eliminates undesirable jagged edges on images.

For a chance to win the Samsung SM150MP, answer the question below and follow the 'How to enter' instructions.

Where does the VESA mount enable you to put the SM150MP?

Rules of entry

This competition is open to UK readers of *PCW*, except for employees (and their families) of VNU Business Publications, evesham.com and Samsung. *PCW* is the sole judge of the competition, and our decision is final. No cash alternative is available in lieu of prizes.

How to enter

Fill in the coupon and send to the following address by 23 June 2001:

July competition
PCW

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London W1A 2HG

Or email your answer, name, address and daytime telephone number to us at

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Competition open to UK residents only.

PCW JULY 2001 SAMSUNG COMPETITION ENTRY FORM

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Answer Where does the VESA mount enable you to put the SM150MP?

- ☐ Please tick this box if you DO NOT wish to receive information about other products and services from VNU Business Publications Ltd
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JULY 1981

The cover illustration pretty much says it all. The connection is accident research and how Tom Ravensdale used his Tandy TRS-80 and a pocket calculator to investigate road accidents. After collecting a range of vehicle and accident data, he was able to run routines to work out key factors, such as the safe negotiating speed for a given bend, the collision speed, and the influence of hydroplaning. Armed with his system, Tom had the potential to make a fortune by

JULY 1986

July 1986's cover feature opened a series by Mike James examining the role of data structures in determining algorithms. Fuelled by the desire to make programming more precise and mathematical, languages such as Pascal were developed to make coding less demanding. But these methods ignored the processes that preceded the coding stage – defining the program's algorithm.

Remember the MSX standard? This was intended to make sure that all Japanese home computers were

JULY 1991

Ten years ago the Zenith MastersPort 386SL graced our cover with the promise of lasting six times longer than the average notebook. Although the main selling points were the three different modes of use, standby and sleep, Simon Rockman didn't expect the machine to be that much more efficient than a 386SX, as the most power that would be saved would be in coma mode, when the machine was not actually being used.

MS-DOS 5 made its way onto the market and into the pages of *PCW* with Robert Schifreen examining Microsoft's claim that it was the biggest overhaul of the operating system since it was first introduced 10 years earlier. Although it didn't yet take full advantage of the 386 chip and couldn't support multi-tasking, our writer felt it was the DOS that users had been waiting for and was well worth the upgrade.

In an article entitled, *Freedom in sight*, Joseph Lazzaro, co-founder of Talking Computer Systems, examined various pieces of hardware and software that could be used to make computers accessible to the blind and visually impaired. With Speech Synthesis and Screen Reader, a blind user would have a computer with a verbally interactive keyboard and monitor, with a voice being added to various programs, terminal emulators and programming languages.

Along with optical character reading machines and large print processing programs was the Braille'n'Speak, a device that could be used to take notes with the Braille keyboard, and receive voice-powered online activity via a modem.

JULY 1996

The main feature of this month's issue was the *PCW* Awards, nominated by readers and voted upon by our editorial staff. Keeping in touch with the times and the growing importance of the Internet, we introduced the new categories of 'Best UK website' and 'Best website by a small company', with hats off to Electronic Telegraph (www.telegraph.co.uk) in the former category.

Winning the award for 'Best PC system' was the Gateway P5-166 Sovereign, a fast and well-specced machine that offered great value for money. Microsoft came up trumps in most of the software categories winning 'Most innovative software' with Windows 95, 'Best business software application' with Word for Windows, 'Best suite' with Office 95 Professional and 'Best CD-ROM' for Encarta 96.

'Best utility', however, went to Symantec's Norton Utilities, the diagnostic program that has remained a standard for many PC and Mac users.

In this fun issue five members of our editorial team took a day out to go shopping to see what kind of complete business systems they could purchase within a budget of £2,000. Although the majority stuck with PCs, our then features editor, Chris Cain, decided to go with the Macintosh Performa 5320.

Along with peripherals, such as an extra 8MB of RAM, a StyleWriter 2500 colour inkjet printer, Doom II and RAM and Speed Doubler, Chris still had enough money left in the kitty for a subscription to *PCW* and some light refreshments.

Janet Heil and Jalal Werfalli



Shino Zuka Igo No Kaml, one of the 12 heroes of ancient Japan, dressed up as a lance man – one of the Shogi chess pieces

applying the same principles to shipping and aeroplanes, but he continued with his vital work on road safety.

Contrasting the practical use of computers with their employment in leisure, Shogi is a Japanese game that chess lovers will find intriguing. David Levy considered the implications of designing a Shogi-playing program, highlighting that the 40 pieces, the 9 x 9 board and the possibility of re-using pieces captured from your opponent made programming tricky. To get round this, Shogi heuristics or 'proverbs' could be used to reduce the list of legal moves to a manageable size.

compatible with each other, but it failed to take off worldwide because of the ongoing price-cutting war. Spectravideo was one of the MSX flop victims, but three years on it bounced back with the X'press – a 3.58MHz, high-specification, 8bit MSX and CP/M system with an impressive business software range.

Finally, it seems that little has changed since the enactment of computer crime laws in the US. Programmers and students with an average age of 22 committed most offences. Banks, commercial and telecommunications companies, and government agencies were and still are favourite targets.



The Imagine name carried on after the Ocean takeover with games such as Mikie, but other developments like Psychclapse never got off the ground

Imagine

No, it's nothing to do with John Lennon, but there is a Liverpool link for this games company

The early Eighties were great for teenage gaming addicts. Not only were these the golden years of home computing, but previously sceptical parents were often found persuading their square-eyed offspring to play more games, in the hope that they too could become multimillionaire programmers, like teenager Eugene Evans. He was earning £35,000 a year and owned a flash sports car, despite not being old enough to drive it.

Back then, barely a day went by when the papers weren't talking about the latest whiz-kid programmer and, looking back, a large proportion of them (including young Evans) worked for a Liverpool-based games company called Imagine.

In terms of games, Imagine had a fine pedigree. Arcadia, a shoot-'em-up classic first written for the ZX Spectrum, kicked off the company's good fortunes, selling by the bucketload over the Christmas of 1982. Within a short period came Ah Diddums, Molar Maul, Schizoids, Stonkers, Zoom, Zip Zap, Leggit, Pedro, Alchemist and Evans' own Wacky Waiters. Most exciting of all, though, were the promised Psychclapse and Bandersnatch, possibly the most hyped and yet doomed games ever. So where did it all go wrong?

Interestingly, Imagine's rise and fall was almost accidentally documented by a BBC2 film crew working on a series called *Commercial Breaks*. Director Paul Anderson was looking for companies

successfully working in new markets, and Imagine seemed to be the perfect subject to illustrate people making a quick fortune from computer games.

The story began at Microdigital, a computer store in Liverpool, where Mark Butler and Evans worked. Butler left to become a sales manager at Bug Byte software, where Dave Lawson was a programmer. After disagreements with management, Butler and Lawson set up Imagine and Lawson wrote Arcadia.

So far so good, but in just 18 months several things secured Imagine's fate. First it founded a design and advertising agency that could offer discounted ad rates for the games company. The final details are uncertain, but the agency was eventually lumbered with unpaid magazine debts and a stake in a games company worth nothing.

Imagine also signed a deal to produce games for publishing giant Marshall Cavendish's *Input* magazine, but this later fell through, apparently because the software wasn't delivered fast enough.

The third problem was rumoured industrial sabotage that, if true, eliminates any sympathy you may have had for Imagine. In 1982 there was a shortage of games in the shops, and the projected demand for 1983 was enormous. Thinking it would cash in on the desperate Christmas market, Imagine allegedly booked up the entire facilities of Kiltale, then one of the largest software duplicators. The idea was that Imagine would have plenty of software for sale, and its competitors would be left with next to nothing. Sadly for Imagine, and indeed many others, the home computer market collapsed after

Christmas, leaving one huge warehouse full of unsold cassettes and a large bill.

While all this was going on, Imagine was staging its biggest publicity stunt yet, with the incredible hype campaign for Psychclapse and Bandersnatch. The advert featured a group shot of its star programmers geekily standing around a terminal. These titles were going to be so amazing that Imagine coined the term mega-game to encompass their wonder. As if the photo wasn't enough to whet the appetites of young consumers, the games were also going to be sold with additional processing hardware, and might be delivered in breakfast cereal-sized boxes.

The required investment coupled with Imagine's debts proved too much, and on 9 July 1984 a petition presented to the British High Court of Justice (by PCW's publisher VNU) went unopposed and Imagine was officially finished.

Where are they now? Several of Imagine's programmers ended up at Ocean or start-up Denton Designs. Psychclapse never got beyond the drawing board, but Bandersnatch appeared as the poorly received Brattacus on the Atari ST and Amiga, via development on the Sinclair QL.

As for Evans, he worked at Viacom New Media then formed his own company Infinite Ventures, which produces DVD-video games and Shadowgate for a variety of platforms. We don't know how much he earns, nor what car he owns, but one thing's for certain: at least he's now old enough to drive. Rock and roll.

Gordon Laing



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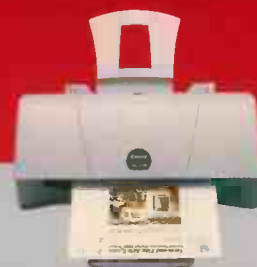
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