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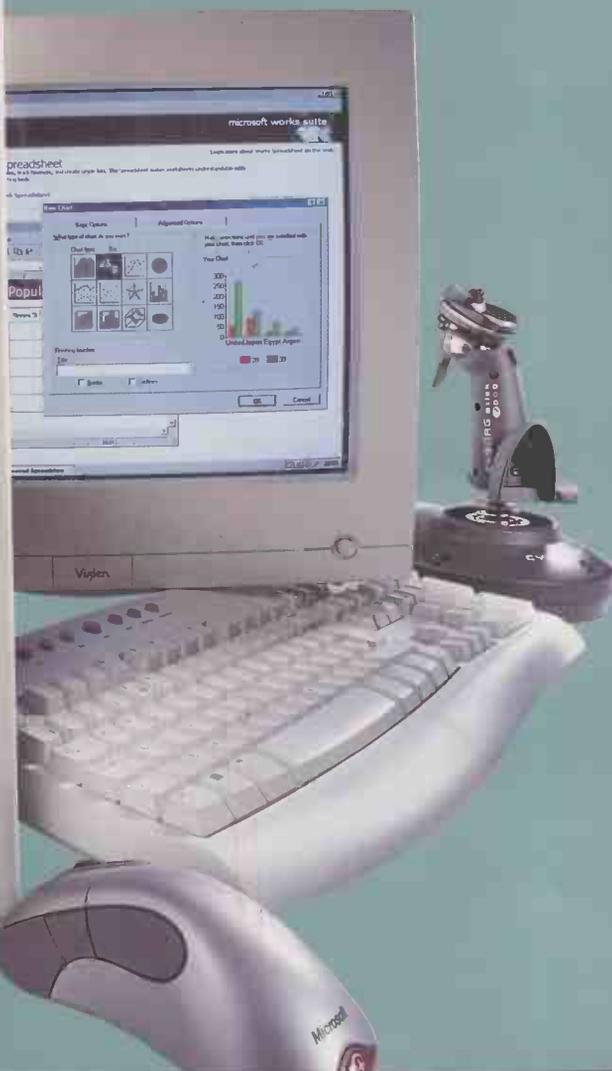
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- 15GB ATA-33 Hard Drive
- 17" Colour TCO95 SVGA Monitor (15.9" Viewable Area, 0.28 dot pitch)
- nVidia TNT M64 32MB 2X AGP Video Card
- 2/12X Max DVD ROM Drive with Software Decoding
- Creative Labs Sound Blaster 64 Voice PCI Sound Card
- Dell Stereo Speakers
- 56 Kb/s V90 Modem\* with
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#### UPGRADE OPTIONS

Upgrade above spec with these great value options:

- 30GB ATA-33 (7200 rpm) Hard Drive **£65 (£76.38 inc VAT)**
- Altec Lansing ACS ADA 885 120W with Dolby Digital Speaker System **£116 (£136.30 inc VAT)**
- Iomega 250MB Zip Built-in **£90 (£105.75 inc VAT)**

### DELL DIMENSION 4100 800MHz MULTIMEDIA



- INTEL PENTIUM III PROCESSOR 800MHz
- 64MB SDRAM (Upgradeable to 512MB)
- 20GB ATA-33 (5400 rpm) Hard Drive
- 17" Colour TCO95 SVGA Monitor (15.9" Viewable Area, 0.28 dot pitch)
- nVidia TNT M64 32MB 2X AGP Video Card
- 2/12X Max DVD ROM Drive with Software Decoding
- Creative Labs Sound Blaster 64 Voice PCI Sound Card
- Altec Lansing ACS 340 Speakers with Subwoofer
- 56 Kb/s V90 Modem\* with
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Upgrade above spec with these items:

- INTEL PENTIUM III PROCESSOR 866MHz
- 128 MB SDRAM (Upgradeable to 512MB)
- 32MB nVidia geFORCE 256 4XAGP Graphics Card

E-VALUE: 004 D2008

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### DELL DIMENSION 4100 933MHz MULTIMEDIA



- INTEL PENTIUM III PROCESSOR 933MHz
- 128MB SDRAM (Upgradeable to 512MB)
- 30GB ATA-33 (5400 rpm) Hard Drive
- 19" Colour TCO95 SVGA Monitor (17.9" Viewable Area, 0.28 Dot Pitch)
- 32MB nVidia geFORCE 256 4XAGP Graphics Card
- 2/12X Max DVD ROM Drive with Software Decoding
- Creative Labs SB Live Value 512 Voice Sound
- Altec Lansing ACS 340 Speakers with Subwoofer
- 56Kb/s V90 Modem\* with
- **FREE DELL Net INTERNET ACCESS\***
- Microsoft Windows 98 and Microsoft Works Suite 2000\*\*\*
- 3 Year Comprehensive Service\*

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- 256KB L2 Cache
- 10GB Hard Drive (Upgradeable to 20GB)
- Integrated Floppy Drive
- Modular 14/32X Max CD-ROM\* (Upgradeable to DVD)
- 3D Positional sound with wavetable
- ATI Mobility P 2X AGP High Performance Graphics with 8MB VRAM
- 56Kb/s V90 Modem\*
- Microsoft Windows 98 and MS Works Suite 2000\*\*\*



DELL INSPIRON 5000

E-VALUE: 004 i0908

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#### UPGRADE OPTIONS

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- 256KB L2 Cache
- 10GB Hard Drive (Upgradeable to 20GB)
- Integrated Floppy Drive
- Modular 2/8x Max DVD-ROM\* with Software Decoding
- 3D Positional sound with wavetable
- ATI Mobility P 2X AGP High Performance Graphics with 8MB VRAM
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- 56Kb/s V90 Modem\*
- Microsoft Windows 98 and MS Works Suite 2000\*\*\*

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#### UPGRADE OPTIONS

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- 256KB L2 Cache
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- 12 Cell (79Whr) Lithium Ion Battery
- 3D Positional sound with wavetable
- ATI Mobility P 2X AGP High Performance Graphics with 8MB VRAM
- Microsoft Windows 98 and Microsoft Works Suite 2000\*\*\*



DELL INSPIRON 7500

E-VALUE: 004 i1808

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#### UPGRADE OPTIONS

Upgrade above spec with these great value options:

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- 20/48 x CD-ROM Drive<sup>†</sup>
- Creative Labs 64 Voice Sound Card (Speakers Optional)
- 16MB ATI Rage Pro Graphics Card
- 5 PCI & 1 AGP Expansion Slots
- Microsoft® Windows® 98
- Microsoft Works Suite 2000\*\*\*

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E-VALUE: 004 D0608

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**3 YEAR SERVICE**

E-VALUE: 004 J0108

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<sup>†</sup> Source: International Data Corporation, Final Data, Q1 2000.

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- Integrated Intel 810 Video Controller
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- Dell Stereo Speakers
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- 56Kb/s V90 Modem\* with
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- INTEL PENTIUM III PROCESSOR 733MHz
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- Creative Labs 64 Voice Sound (Speakers Optional)
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- 3D Positional sound with wavetable
- ATI Mobility 2X AGP Graphics with 8MB VRAM
- Lithium Ion Battery
- 56Kb/s V90 Modem\*
- Microsoft Windows 98 and Microsoft Works Suite 2000\*\*\*



DELL INSPIRON 3800



E-VALUE: 004 i0308

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- 3D Positional sound with wavetable
- ATI Mobility P 2X AGP Graphics with 8MB VRAM
- Lithium Ion Battery
- 56Kb/s V90 Modem\*
- Microsoft Windows 98 and Microsoft Works Suite 2000\*\*\*



E-VALUE: 004 i0708

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- 7.5GB ATA-33 Hard Drive
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- Integrated Intel 810 Video Controller
- 20/48 x CD-ROM Drive<sup>3</sup>
- 4 PCI Expansion Slots
- Microsoft Windows 98 and Microsoft Works Suite 2000\*\*\*
- 3 Year Comprehensive Service<sup>2</sup>

E-VALUE: 004 D0108

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#### UPGRADE OPTIONS

Upgrade above spec with these great value options:

- 20GB ATA-33 Hard Drive **£50 (£58.75 inc VAT)**
- 100MB Zip Built-in and 1 x 100MB Cartridge **£45 (£52.88 inc VAT)**
- Add 64MB 100MHz SDRAM **£70 (£82.25 inc VAT)**

#### DELL DIMENSION L667

- INTEL® PENTIUM® III PROCESSOR 667MHz
- 64MB 100MHz SDRAM (Upgradeable to 512MB)
- 7.5GB ATA-33 Hard Drive
- 15" Colour TCO95 SVGA Monitor (13.7" Viewable Area, 0.28 dot pitch)
- Integrated Intel 810 Video Controller
- 20/48 x CD-ROM Drive<sup>3</sup>
- 4 PCI Expansion Slots
- Microsoft Windows 98 and Microsoft Works Suite 2000\*\*\*
- 3 Year Comprehensive Service<sup>2</sup>

E-VALUE: 004 D0308

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#### UPGRADE OPTIONS

Upgrade above spec with these great value options:

- 20GB ATA-33 Hard Drive **£50 (£58.75 inc VAT)**
- 3COM 10/100 Ethernet Card. **£35 (£41.13 inc VAT)**
- 100MB Zip Built-in and 1 x 100MB Cartridge **£45 (£52.88 inc VAT)**
- Add 64MB 100MHz SDRAM **£70 (£82.25 inc VAT)**

#### DELL DIMENSION 4100 733MHZ

- INTEL PENTIUM III PROCESSOR 733MHZ
- 64MB SDRAM (Upgradeable to 512MB)
- 15GB ATA-33 Hard Drive
- 17" Colour TCO95 SVGA Monitor (15.9" Viewable Area, 0.28 dot pitch)
- nVidia TNT M64 32MB 2X AGP Video Card
- 20/48 x CD-ROM Drive<sup>3</sup>
- Creative Labs 64 Voice Sound
- 5 PCI and 1 AGP Expansion Slots
- Microsoft Windows 98 and Microsoft Works Suite 2000\*\*\*
- 3 Year Comprehensive Service<sup>2</sup>

E-VALUE: 004 D0508

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Upgrade above spec with these great value options:

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- 20/48x CD-ROM Drive<sup>3</sup>
- 3.5" Floppy Drive
- 4 PCI/1 AGP Expansion Slots
- Mini Tower Chassis
- Microsoft Windows 2000
- 3 Year Next Business Day On-Site service<sup>2</sup>

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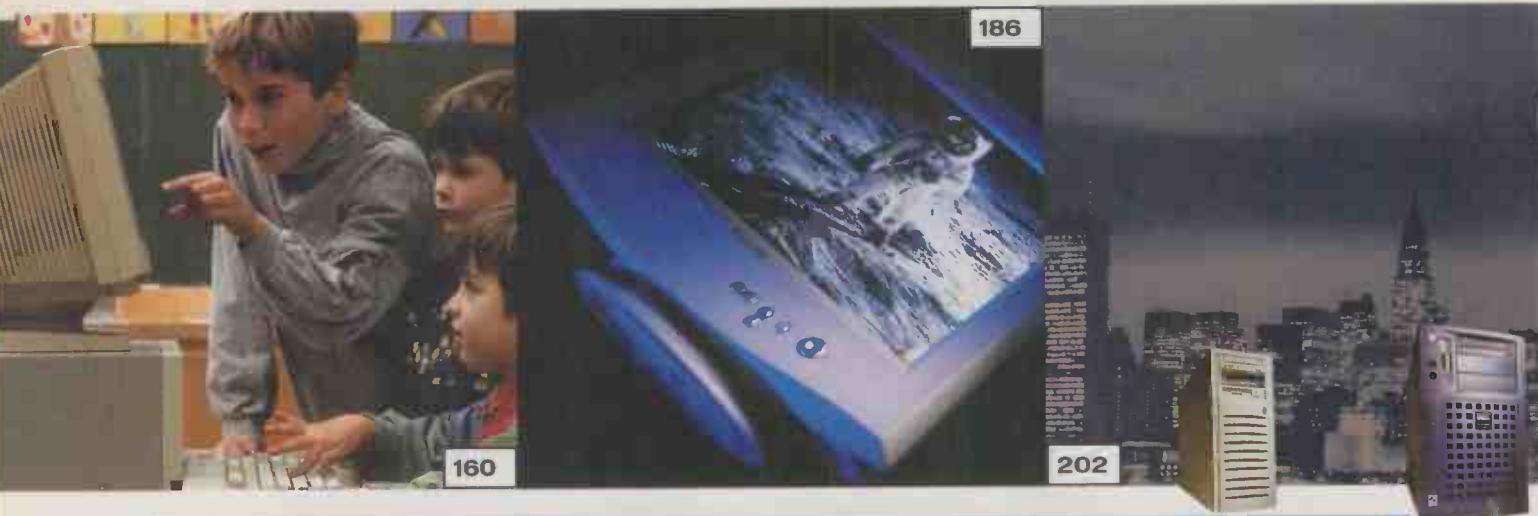
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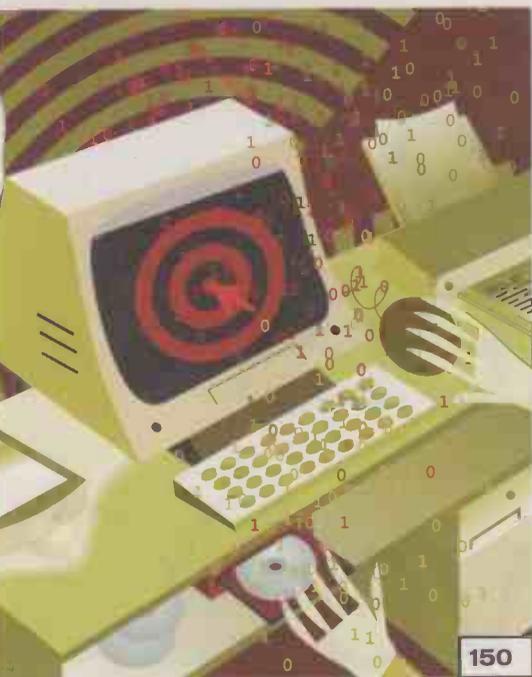
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Piracy of games and PC software is as rife as ever, but **does Microsoft really have the answer?**

## Pirates ahoy!



I recently found myself in Hong Kong and, succumbing to an impulse of consumerism, I decided to go shopping for a shiny new PlayStation2. I ventured into the Golden shopping arcade on Kowloon and wandered the aisles wide

eyed at the vast amount of computer entertainment housed under one roof. However, one thing amazed me far more than the sheer scale of the premises, and that was the modification that had been made to every PlayStation2 on sale. Every single retailer that I approached was selling PlayStation2 machines that had been 'chipped' for playing pirate software.

Even though the PlayStation2 incorporates a DVD drive, most of the software is still shipping on CD-ROM disc, so these modification chips fool the machine into playing games that have been copied to CD-R. Even the few games that do ship on DVD-ROM weren't safe, with ingenious pirates extrapolating the data and discarding non-essential files to bring the capacity below the 650MB CD-R limit. Considering how new the PS2 is, I was stunned that chips for converting it to play pirate software had appeared so quickly. Of course, the cynical among us will wonder if the machine was designed to be so easy to crack, making it a more attractive purchase. After all, it's doubtful that the original PlayStation would have sold so well if it wasn't so easy to chip up for cheap pirate games. Sony will, of course, deny this rumour and has already implemented a hardware change to get around the chipping. Although, no matter how good a mousetrap Sony comes up with, someone is bound to invent a better mouse.

Sega thought it had solved the piracy problem when it released its Dreamcast console. Instead of using CD or DVD technology, Sega plumped for a proprietary format called GD-ROM. The GD-ROM is basically a high-capacity CD that can store 1GB of data. The plan behind this design was that since no-one would produce GD-ROM writing equipment or even the blank media, it would be impossible to pirate the games. Unfortunately for Sega the proprietary format has not been enough to put off the pirates. Recently released on the web is a download that can be burnt to CD and run in a

Dreamcast. Once inserted, this disc will display a new boot profile that will allow games to be run from CD-R instead of GD-ROM.

However, no matter how alarming the piracy situation on games consoles is, it's but a drop in the ocean compared with the PC.

Microsoft is currently in the midst of a big media campaign and crackdown on software piracy, feeling that it's losing millions of dollars as a result of it. That said, the situation is considerably different to the console market. A retail game costs in the region of £40, whereas a full retail copy of Microsoft Office Premium will set you back over £600. For some home users that's more than the cost of their PC. Obviously there are cheaper alternatives available but, let's face it, the PC productivity world revolves around Microsoft Office. I'm not condoning piracy here in any way, but I can't help thinking there'd be less of it if PC applications were more affordable to the masses.

Microsoft's solution to unofficial installation of its operating systems looks set to be the end of OS

**I'm not condoning piracy, but I can't help thinking there'd be less of it if PC applications were **MORE AFFORDABLE TO THE MASSES****

distribution. Instead of receiving the OS on CD-ROM when you buy a new PC, it will be pre-installed with a backup image on your hard disk. It will also be locked to the motherboard BIOS to stop the image being used on another PC. Unfortunately, I've heard no decent explanation of what happens if your hard disk crashes or if you want to change your motherboard, thus losing the BIOS key.

Of course, this plan will not only save Microsoft revenue through less piracy, but also save it millions by removing the cost of disc production and distribution.

Ultimately I think that every user would rather have an original product complete with manuals than a pirate copy, but consumers need to feel that they're getting value for money. If the price of essential software like operating systems dropped to a reasonable level the piracy market might start to wither and die.

Riyad Emeran, Editor

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Original design WB Associés, Paris  
Origination Westside Digital Media,  
32 Great Pulteney Street, London W1R 3DE  
Printed St Ives plc, Plymouth  
Distributed Marketforce (UK) Ltd,  
247 Tottenham Court Road, London W1P 0AU

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146,704  
July-Dec '99

## EDITORIAL

Tel 020 7316 9315 Fax 020 7316 9313 [www.pcw.vnunet.com](http://www.pcw.vnunet.com)

Riyad Emeran Editor, [riyad\\_emeran@vnu.co.uk](mailto:riyad_emeran@vnu.co.uk)

Nik Rawlinson Deputy Editor, [nik\\_rawlinson@vnu.co.uk](mailto:nik_rawlinson@vnu.co.uk)

Clive Akass Associate Editor (News), [clive\\_akass@vnu.co.uk](mailto:clive_akass@vnu.co.uk)

Niall Magennis Features Editor, [niall\\_magennis@vnu.co.uk](mailto:niall_magennis@vnu.co.uk)

Jason Jenkins Senior Staff Writer, [jason\\_jenkins@vnu.co.uk](mailto:jason_jenkins@vnu.co.uk)

Scott Montgomery Staff Writer, [scott\\_montgomery@vnu.co.uk](mailto:scott_montgomery@vnu.co.uk)

Jalal Werfalli Staff Writer, [jalal\\_werfalli@vnu.co.uk](mailto:jalal_werfalli@vnu.co.uk)

Claire Morley Editorial Assistant, [claire\\_morley@vnu.co.uk](mailto:claire_morley@vnu.co.uk)

**Editorial contributors** Tim Anderson, Mick Andon, Tim Bajarin, Chris Bidmead, Ian Burley, Chris Cain, Matt Chapman, Brian Clegg, David Fearon, Barry Fox, Roger Gann, Terence Green, Guy Haslam, Toby Howard, Gordon Laing, Rozalia Mair, Ken McMahon, Richard McPartland, Dave Mitchell, Tim Nott, Liam Proven, Steve Rogers, Caroline Swift, Stephen Wells, Mark Whitehorn, Ian Waugh, Nigel Whitfield, Benjamin Woolley

## PRODUCTION

Debbie Oliver Production Editor, [deborah\\_oliver@vnu.co.uk](mailto:deborah_oliver@vnu.co.uk)

Andy Stewart Senior Sub-editor, [andrew\\_stewart@vnu.co.uk](mailto:andrew_stewart@vnu.co.uk)

Matt Whipp Sub-editor, [matt\\_whipp@vnu.co.uk](mailto:matt_whipp@vnu.co.uk)

## ART

Stuart James Art Editor, [stuart\\_james@vnu.co.uk](mailto:stuart_james@vnu.co.uk)

Chris Dias Assistant Art Editor, [chris\\_dias@vnu.co.uk](mailto:chris_dias@vnu.co.uk)

**Art & production contributors** Andy Baker, Patrick Llewelyn-Davies, Ciaran Bradley, Katy Holden, Daniel Mackie, David Whyte

## PUBLISHING

Sean Ferris Associate publisher, [sean\\_ferris@vnu.co.uk](mailto:sean_ferris@vnu.co.uk)

Juliet Parker Publishing Director, [juliet\\_parker@vnu.co.uk](mailto: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](mailto:mark_judd@vnu.co.uk)

Zoe Rouch Marketing Manager, [zoe\\_rouch@vnu.co.uk](mailto:zoe_rouch@vnu.co.uk)

Helen Muchmore Marketing Co-ordinator, [helen\\_muchmore@vnu.co.uk](mailto:helen_muchmore@vnu.co.uk)

Jonathan Hardy Newstrade Circulation Manager, [jonathan\\_hardy@vnu.co.uk](mailto:jonathan_hardy@vnu.co.uk)

## ADVERTISING

Matthew Tasker Head of Sales 020 7316 9727

Tom Wright Account Manager 020 7316 9529

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Stav Athanasiou Group Production Controller 020 7316 9227

Xenia Antoni Production Controller 020 7316 9486

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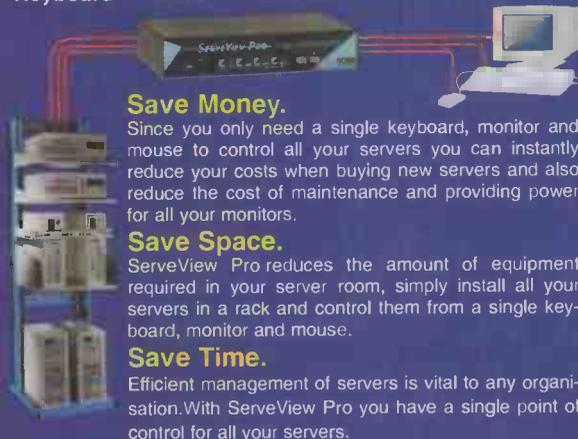
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The Solo 2550 SE includes v.90 Fax/Modem, MS Windows 98 and MS Works Suite 2000 software pre-installed.



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Gateway has a number of after-sales options to suit your pocket. There is a Technical support Line and also a 24-hour web support and fax-back query service.



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Gateway.net® is our own quality-driven free internet access. It's pre-loaded on every PC ordered with a modem. You get fast easy access, even at peak times.<sup>5</sup>



### SPOTSHOP

SpotShop is your number one on-line source for hardware and software accessories. For over 12,000 value for money products visit [www.gateway.com/uk](http://www.gateway.com/uk) and click the Accessories Link.



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call **0800 17 2000** click **www.gateway.**

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FINANCING Your:Ware (Consumer purchases only). Available on all our PCs. Assumes 1: no variation in interest rate; 2: all repayments made by due date; 3: no further advances are made. Credit is only available to persons aged 18 or over, subject to status. Written quotations available on request. Arranged by Schroder Leasing Limited. \*Schroder Business Leasing. Finance facilities are available to companies in business for over 2 years and subject to acceptance by Schroder Finance Limited. All business lease figures are shown as a weekly value, exclusive of delivery and VAT. Payments are collected quarterly by Direct Debit. Full details of the finance facilities are given when you call. Terms and conditions of the lease agreement will be sent to you before you sign. \*Typical Example: Cash Price including VAT and Delivery £1684.95, Credit Limit: £2070, Loan Value: £1684.95, 29 Payments of £69 (APR 18.9%), one final payment of £42.93, Total amount payable: £2043.93.

# ONE E-MAIL ADDRESS, ONE INTERNET, TWO WAYS TO KEEP IN TOUCH



## Gateway Essential 667 WAP PC and Free Nokia 7110 WAP mobile phone (Worth over £200)\*

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- Creative GCS200 Speakers
- 17" EV700 TCO-95 0.28dtp monitor
- V.90 56K data/fax/voice modem
- ATX Tower Case
- Microsoft® Windows® 98

**£799**  
**(£979.95\*)**

inc. VAT and Delivery  
From £39 a month (APR 18.9%)

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WELCOME TO THE **SEPTEMBER 2000** PERSONAL COMPUTER WORLD COVER DISCS

# September COVER DISCS

GAMES APPLICATIONS LIBRARY ENTERTAINMENT INTERNET

**S**tarring this month is the full program of the award-winning MAGIX music maker 2.0, plus a sound pool of more than 780 music samples. We've also got Xara 3D - to help you create great-looking, 3D text headings for use on the web. To avoid getting bitten by the next computer virus,

we've got protection in the form of AVG AntiVirus 6 (free edition) - a capable and comprehensive anti-virus package that even includes free monthly updates. You'll also find MusicMatch jukebox, PC MacLan trial version, Aquatica screensaver, and the powerful email package, Eudora.

## MAGIX Music Maker 2.0

**FULL VERSION** \*see box below



*You don't need to be able to sight read music to benefit from MAGIX Music Maker. Just stitch together the hundreds of samples available here and come up with your own top 10 hit!*

arrangements using that much less juice.

The samples are listed in a structured order on the CD so that you can quickly find matching drum loops or harmonising chords. An arrangement made from multiple samples can be saved at any time in a single hard-disk file (MIX-function); so that memory can be freed up and more tracks for new samples made available.

### Hardware requirements

Music maker runs on any computer with a 386DX CPU and 4MB of RAM or more, with at least 10MB of available hard drive space, VGA graphics card, CD-ROM drive, a 16bit sound card and Windows.

- We recommend a minimum 486/33 with 8MB of RAM and 100MB of available hard drive space (for MIX-files and effects).
- Music maker runs on Windows versions 3.11, 95 and NT.
- Synchronized playback of AVI videos requires 8MB of memory; 16bit colour is recommended.

MAGIX Music Maker 2.0 makes it easy for anyone to compose music, quickly and intuitively. You need no musical training - just good ideas. Drag and drop music samples from the huge sound library directly into Music Maker's eight-track arranger.

Features include an unlimited mixdown function (so you won't run out of tracks); professional effects such as reverb, echo, filter, distortion, fade-in and out and media link for video-soundtrack editing and MIDI integration.

The basic elements needed for creating music are all included on the cover disc. Professional music makers and sound designers have created hundreds of samples (music and sounds) which are just waiting to be arranged by a simple mouse click.

All the important functions operate while playing, meaning that you can load



another sound from the CD and place it, move it, blend it or even delete it again without interrupting playback.

All the samples on the cover disc are in 16bit, stereo and at 44.1 KHz - absolutely top CD-quality. If, however, you want to save memory or use the arrangement for video sound mixing, you can convert the music maker samples to 22KHz and/or mono. This way you'll save up to three-quarters of your memory capacity and be able to make long

### Important

More than 780 music samples are included with MAGIX music maker - across many genres of music from rock and pop to house, techno and jungle.

\*This software was originally sold as a two-CD set. In order to squeeze it all onto a single CD-ROM, we have had to leave out some of the files from the Sound Pool. The DVD edition of PCW contains the full set of 1,200 samples recorded at 100bpm, 120bpm, 140bpm, and 160bpm. (The CD-ROM edition, therefore, does not include the 160bpm samples for reasons of space, but we will be including them on a subsequent CD to complete your set.)

## Xara 3D V1

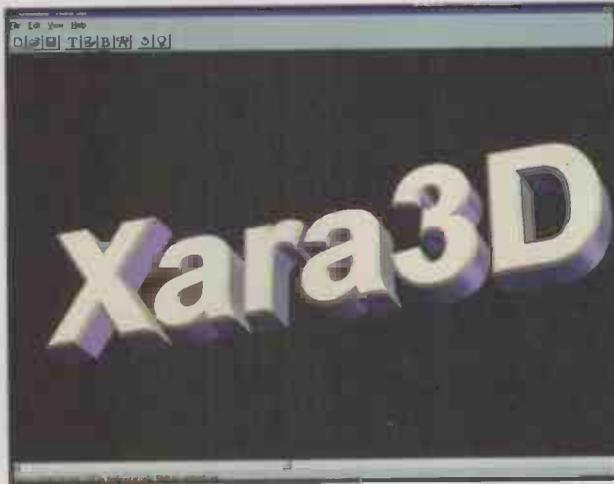
Xara3D is a 'slimware' Windows application designed specifically for creating high-quality, compact 3D textual headings, either still or animated, for use on the web.

The fact that it is small and compact does not mean that Xara3D is low quality or produces inferior results compared to more complex 3D programs; on the contrary, it produces better output, and is faster than just about anything else.

'Bloatware', while often capable, includes so many features that most people never get to use more than 10 per cent of the functionality. It's often huge, impractical to download over the Internet, requires large amounts of disk space and is nearly always so complex that to use its advanced features takes a considerable learning effort.

Xara3D is designed to be a program that does one thing and does it supremely well. It is also dead simple to use. It's small enough to be easily downloaded from the Internet.

Xara3D produces high-quality three-dimensional text images and nothing else. These images would typically be used



### It's easy to make web pages more dynamic

on web pages although they can be used anywhere. Xara3D can create animated rotating 3D images with ease (AVI movie or GIF). You have control over the text, the font, the depth of the 3D extrude, the type of the bevel on the text and the lighting. You can position and rotate the text just by dragging and it updates the image in realtime, interactively. You resize the image just by resizing the window. It couldn't be easier.

Xara3D allows you to:

- alter the 3D extrude length
- alter the lighting (three adjustable lights)
- alter bevel (15 different bevel types with adjustable bevel size)

## FULL VERSION

- alter the font and size as well as changing between matt and shiny text
- use real-time 3D positioning, simply by dragging the image on-screen
- quickly create smooth colouring with realtime shaded rendering
- select background colour or texture to match web page backgrounds
- full realtime anti-aliasing gives best possible on-screen quality
- output files as JPEG, GIF or BMP
- minimise file size and maximise quality through palette optimisation
- output animated GIF or AVI movie sequences of rotating text
- use any TrueType font - three fonts are included free

## Reader offer

Xara3D 4 can normally be purchased over the Internet from the Xara site for about £26 (ex VAT), but readers of PCW can buy a full copy of Xara3D 4 at the upgrade price online.

Just follow the upgrade link on the cover disc or go to the VNU Business Publications offer page at: [www.club.xara.com/x3dupgradevnu.asp](http://www.club.xara.com/x3dupgradevnu.asp).

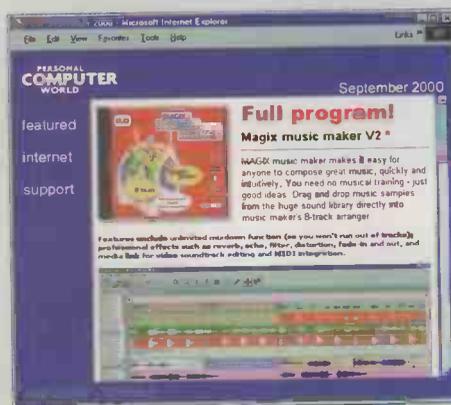
A Xara3D 4 CD with the program, tutorial movie, Xara3D sample graphics, over 800 textures and 50 TrueType fonts, screensaver etc will be sent in the post.

Xara3D 4 runs under Win 95/98 or NT 4.0. Full details on Xara3D 4 can be found at: [www.xara.com/xara3d](http://www.xara.com/xara3d).

A comprehensive program walkthrough can be found at [www.xara.com/xara3d/helpv4](http://www.xara.com/xara3d/helpv4).

## Using the cover disc

The PCW cover disc uses a web-browser-style interface. As well as cutting the time needed for development, content designed for the web can be easily ported to the disc (and vice versa). Compatibility issues are reduced as your browser has been installed to work on your individual PC. However, to get full functionality from it, you will need to use Microsoft Internet Explorer (version 4 or later). This is because we use a special ActiveX plug-in that allows us to install software directly from the browser, without all the options, dialogs and security warnings you normally get. Unfortunately, Netscape doesn't properly support this software. For non-Microsoft users, we've included a small installer that will run when you insert the disc, or when you run the program PCW.EXE in



the root of the disc. Of course, you can still launch the main browser to read all about the software on this month's disc.

## IMPORTANT

Please note that we cannot give support on individual programs contained on this disc.

If you have problems running the disc or any of its content, please follow these guidelines:

- Faulty disc (ie, the disc is physically damaged and will not load) - return the disc for a replacement to: PCW September cover disc, TIB plc, HelpLine Returns, Unit 5 Triangle Business Park, Pentrebach, Merthyr Tydfil, Mid Glamorgan CF48 4YB, quoting ref 'PCW Vol 23 No 9'

- You have problems installing/running the software. Check the support page on the CD, or the support website at [www.pcw.vnunet.com/cd](http://www.pcw.vnunet.com/cd). You should also check the manufacturer's website

- For general difficulties call 01685 354726
- If you're still stuck, drop us an email at [pcwcd@vnu.co.uk](mailto:pcwcd@vnu.co.uk) - we may be able to help

# party animal



## playR deLuxe

Nonstop music + video  
Control any party animal with MAGIX playR deLuxe:  
turntables and hi-fi system for your PC.

- >> Remixing with cool effects, filters & mixer
- >> Music & video for the perfect party mix
- >> Virtual hi-fi system + mp3 finder
- >> Visual effects (rhythm-controlled)
- >> 1,000 sounds + video files on 2 CDs

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MAGIX Entertainment Ltd. >> phone 020 - 8968 3666 >> fax 020 - 8968 1451

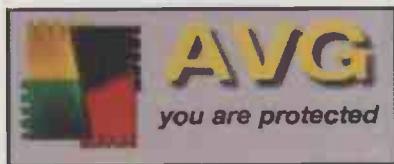
[www.magix.com](http://www.magix.com)

## AVG AntiVirus 6.0 FREE EDITION

### Reliable protection!

This special FREE version of AVG AntiVirus will help you protect your PC against attack and damage by computer viruses. As well as being completely free, it offers an excellent level of protection together with regular updates you can download from the web.

AVG Anti-Virus System's high detection rate is continuously certified by independent ICSA laboratories. AVG 6.0 Anti-Virus System uses the latest revolutionary technologies – Virus Stalker and Active Modular Core. AVG Virus Alert Network will bring you the latest information, the virus alerts and announcements of the latest AVG features



through your email on a regular basis and absolutely free of charge. You can find out more by visiting the AVG website at [www.grisoft.com](http://www.grisoft.com).

Features of AntiVirus 6.0 include:

- AVG Resident Protection
- AVG Email Scanner
- AVG On-Demand Scanner
- FREE updates on a monthly basis
- Automatic Update feature
- Easy-to-use interface
- Automatic Healing of infected files.

In order to start using AVG AntiVirus you will need to register your software by visiting the AVG website and answering a few questions. You will then be given your own unique serial number. Registration is free, and the process is handled automatically!

Why not visit the AVG website for the latest information about AVG AntiVirus? Please note: you will need to have an Internet connection in order to register your copy of AVG AntiVirus.

## Undelete 2.0 TRIAL

Undelete is a file recovery system designed and developed for use on Windows NT/2000 networks from the ground up. It provides an immediate file recovery solution for files accidentally deleted and lost between backups or faulty backups, and eliminates the need to search through backup tapes.

Undelete 2 captures and retrieves all deleted files, not just the ones that land in the Windows NT/2000 Recycle Bin, including files deleted over the network, from the Command Line or from within a program. It can restore files over the network with ease and even copes with those deleted from shared drives. Why not visit Executive Software's website to find out more?

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



## ZoneAlarm FULL VERSION

With the approach of unmetered Internet connections, PCs are becoming more vulnerable to intrusion. ZoneAlarm provides protection for all Internet users. Combining the safety of a dynamic firewall with control over applications' Internet use, ZoneAlarm gives protection against thieves and vandals roaming the web and makes ironclad Internet security easy to use.

If you think no-one's trying to get into your PC, give ZoneAlarm a spin – and be prepared for a shock! ZoneAlarm is a superb utility that you won't want to be without. To find out more about this program and check for the latest updates, visit [www.zonealabs.com](http://www.zonealabs.com).

With Stealth Mode enabled, ZoneAlarm's Firewall renders your computer invisible to the Internet and potential intruders. If you can't be seen, you can't be attacked. Because you tell ZoneAlarm how you use your computer, the firewall only allows traffic that you understand and initiate.

You can feel even safer when leaving your computer because the ZoneAlarm Internet Lock blocks Internet traffic while your PC is unattended or you are not using the Internet. The Internet Lock can engage automatically along with your computer's screensaver or after a set period of inactivity – you have absolute control over the use of your always-on connection.

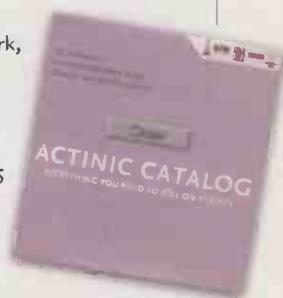
ZoneAlarm delivers comprehensive protection with its easy-to-use interlocking security services. Unlike any other security utility, ZoneAlarm incorporates a firewall, Application Control, the Internet Lock, dynamically assigned Security Levels, Zones and MailSafe. Combined, these elements yield the strongest security possible.



## Actinic Catalogue

The Internet is no longer just a network, it's a marketplace.

Entrepreneurs who use the web can be open for business 24 hours a day, 365 days a year – and find that sales are easier to fulfil and gathered at less cost. This month, *Personal Computer World* offers you the chance to set up and run your own online sales site with a free 30-day live trial of Actinic Catalog (RRP £300 ex VAT) – the UK's leading ecommerce solution from Business ISP Zen Internet. (Actinic Catalog is an all-British product). Actinic Catalog is self-installing and easy to use. It enables you to publish an illustrated, online catalogue without design or technical expertise. You'll find more details on the cover disc.



PCW COVER DISCS BROUGHT TO YOU IN ASSOCIATION WITH:



## MusicMatch, Eudora and PC MacLan



MusicMatch Jukebox 5.1, the software that lets you record, get, organise and play digital music, now also offers:

- FREE CD-quality MP3 encoding
- Seamlessly integrated CD burning
- Online artist bios, cover art, album notes, streaming sample clips, with links to other music you'll appreciate if you like the track you're listening to
- A new music matching feature – find music to match your tastes
- Auto-update feature – without having to download the whole program
- Stunning visualisations. Download and install direct from the jukebox. The one you mustn't miss is G-Force. You can get this from the MusicMatch site. Download and installation is performed seamlessly from within MusicMatch.

MusicMatch Jukebox is the fastest, easiest to use and most powerful personal jukebox software on the planet. It's the only free jukebox software that lets you record unlimited CD-quality MP3s. It features an easy, one-step process for recording MP3s from CDs, vinyl and cassettes. Industry-leading Fraunhofer MP3 encoding technology delivers recording speeds up to 12 times faster than real time – up to twice as fast as most other products. Integrated CDDDB support automatically adds artist, album title and song names to new MP3s when connected to the Internet.

Support for the ID3v2 tagging standard lets you add cover art, liner notes, lyrics and artist bios to MP3s. There's additional support for recording in Windows Media Audio (WMA) and WAV formats.

The integrated 'two-click' CD burning system lets you create custom audio CDs or MP3 CDs containing up to 150 tracks. MusicMatch supports most standard CD-R and CD-RW drives. You can create compilation CDs using saved playlists or by selecting individual tracks – an easy-to-read capacity meter tells you when you've filled up your disc with music.

You can access and download more than 39,000 free tracks on the Internet. Songs downloaded from the Internet are automatically added to your Music Library. 'Buy CD' links let you purchase CDs from Amazon.com and Barnesandnoble.com. You can sample thousands of streamed audio clips and view cover art, liner notes and artist bios while listening.

*MusicMatch is so versatile it will cater for all your musical needs, including MP3s*

**System requirements:** 166MHz processor or better; Windows 95/98, NT4 or Windows 2000; 32MB of RAM; 30MB of hard drive space; Microsoft Internet Explorer; SVGA or higher resolution monitor; four-speed CD-ROM drive; mouse; keyboard; SoundBlaster-compatible card; speakers; CD-writer installed and functional (for creating CDs in Jukebox 5.0); video card and installation of Microsoft's Media Player 6.4 for video.

### Aquatica

If you liked the Microsoft's Windows Aquarium screensaver, you'll love this. Three-dimensional-looking, brightly coloured fish swimming around your desktop. You can even download additional backgrounds and fish from Club Aquatica.



### Eudora Email version 4.32

This powerful professional-quality email software is now offered free. You'll find all the features you'd expect from a top-notch email client. Here are some of them:

- Find messages quickly with Eudora's powerful search functions
- Address emails quickly and easily with automatic name completion
- Manage multiple email accounts easily



*Eudora lets you get creative with your email*

and discretely within the single program

- Send and receive email in the background
- Enjoy the advantages of a word processor with spell checking and the ability to choose font, formatting and colour settings
- Engage in more complete communications through easy handling of attachments and the ability to view HTML and graphics right in the body of a message.



### PC MacLan

Thanks to the recent success of Apple's iMac, many homes and offices will now have both PCs and Macs. If you want to find a simple way of getting the two platforms to talk to each other, there's really only one choice. If you want to connect Macs and Win 95/98 PCs in a peer-to-peer network, you will need PC MacLan, from Miramar Systems. Windows 95/98 PCs access Mac resources directly through Network Neighborhood, while Macs view PC drives via the Chooser. The PC MacLans print services also permit your Windows 95/98 PC to print to any AppleTalk printer as if it were locally connected.

PC MacLan software for Windows 95/98 includes support for IP (Internet Protocol), giving your Windows 95/98 PC access to any AppleShare IP Server in your office, a branch office on your Wide Area Network (WAN), or any other location worldwide via either the Internet or standard phone lines.

This trial version will give you access to the full functionality of PC MacLan. The only restriction, other than nag screens, is that it times out after three hours, after which you will have to restart the connection again.

## Important

The programs described on this page are not accessible via the PCW menu, but you can install them simply by using Windows Explorer. The installation files can be found in the following folders:

- \Software\Aquatica\aq\_scr.exe
- \Software\Eudora432\Eudora432.exe
- \Software\Musicmatch\mmjbs1118eng.exe
- \Software\PC\_MacLan\_trial\pcm72.exe

# Get Serious Get AOpen Motherboards!

Very seriously... **AOpen** launches a number of new motherboards that take PC technology into the new millennium.

#### **AOpen AK33/MK33:**

- AMD Duron/Thunderbird motherboards with Socket A design (AK33: ATX, MK33: MicroATX)
- VIA KT133 chipset
- 4X AGP compatible
- PC-133 and UDMA/66 compatible

#### **AOpen AX34/MX34:**

- Intel P-III/Celeron motherboards with Socket 370 design (AX34: ATX, MX34: MicroATX)
- VIA 694X chipset
- 4X AGP compatible
- PC-133 and UDMA/66 compatible

These powerful new entries from **AOpen** will provide you with a smooth transition from the current platforms into the next generation. And you know how serious we are when it comes to leading technology and user-friendly designs. Contact your AOpen dealers now about these exciting new products, or simply click <http://www.AOpen.com>

**AOpen components. We are serious. Are you?**



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

Authorised Distributors:



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## What's on the DVD

You'll find everything from the cover disc, plus all these great packages below, six months' worth of PCW group tests and the new Essentials section, packed with more than 50 utilities, add-ins, and demos. Finally, there's 10 of the best games demos.

### M.Y.O.B version 6

The full version of the world's leading accounting and financial management package for small businesses. M.Y.O.B. provides everything you need to run the accounts of a small business, including:

- Nominal ledger
- Chequebook
- Flexible invoicing
- Records and analyses sales
- Tracks debtors and identifies slow payers
- Automatically creates and tracks purchase orders
- Records creditors; reminds

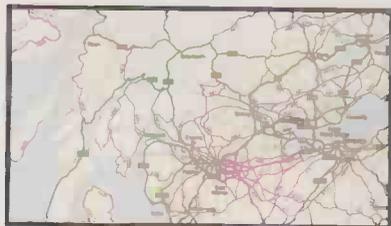
of expiring discounts

- Handles quotes and estimates
- Flexible stock management
- Financial and management reporting
- Report customiser
- Job management
- Card file with contact management
- Custom forms designer
- To do list
- Interactive cash flow for 'What If?' analysis
- Officelink/script/link
- VAT reports
- Clear bank account reconciliation.

PCW readers can upgrade to the latest version of M.Y.O.B. at a discount price. You'll find details plus a form on the DVD.

### AutoStreet 2000 Lite

Just in case you missed it last month, here's another chance to get your hands on the full version of this great new route-planning software, AutoStreet 2000.



### PhotoPaint 2000/Ability Office

If you can't afford PhotoShop, the full version of PhotoPaint 2000 has most of the features, including layers, undo/redo, tons of filters and a professional range of tools. Image Enhancement tools include brightness/contrast, hue/saturation, colour levels and histograms.

There are complex selection tools for



applying changes even to only parts of images. Selections can be added or subtracted and manipulated with Border, Similar, Expand/Contract and Free Transform Tools. There's a powerful Gradient Editor, supporting Linear, Bilinear, Radial, Square, Conical Symmetric, Conical Asymmetric, Spiral Clockwise and Spiral Anticlockwise. PhotoShop only supports the first three.

The Brush Editor supports brushes of any shape, with user-controlled opacity, colour and mode. There are no fewer than 94 filters in 10 groups. PhotoPaint 2000 also supports 25 image file formats.

When you install PhotoPaint, a 30-day trial of Ability Office is also installed. Fully compatible with Microsoft Office, it offers spreadsheets, databases and a word processor.

### Attica Interactive World Atlas

This is the essential multimedia reference atlas for education, business, and the home. Features include:

- Detailed mapping of the world
- Gazetteer of 150,000 places and geographical features
- Over 1,200 photos plus audio hotspots, 15 minutes of video
- Customisable maps
- Extensive countries database.

### CheckIt 5

CheckIt 5 is a powerful 32bit Windows diagnostic utility that tests your hardware and reports system information. It helps you pinpoint problems, test system components, locate system conflicts and restore Windows' Registry and system files.

The first time it runs, CheckIt performs a multi-step collection process that gathers hardware configuration information and performance data. The Snapshot records this information for use in comparisons. In future, when the software checks out your system, if you don't get a smiley face, you've probably got cause for concern. CheckIt will then try and identify the problem. CheckIt includes benchmarking, too.

### Ground Control

An adrenaline rush of real-time action and strategy, Ground Control is unlike any other real-time strategy. Features include incredibly detailed 3D landscapes and a controllable camera that allows you to view the battle from any position.



### MDK2

MDK 2 includes all of the intrigue and humour established by the earlier title. But now there are even more enemies, weapons and items, plus enhanced character models and game levels.

### Deus Ex

The year is 2052 and the world is a dangerous and chaotic place. Terrorists operate openly. Talk, fight or use your skills to get past the obstacles set in your path.

### Need For Speed – Porsche

This demo gives you a single cross-country trip, racing against up to seven opponents – all driving Porsches.

### Arabian Nights – episode 1

This new game from Visiware is a world first, in that it's being sold, in episodes, over the Internet. We've got episode one for you – Melissa's Letter – free. The graphics are superb, with an atmospheric soundtrack and locations and fast-paced action.

### PCW group tests

Six months worth of product testing from the pages of PCW. The group tests are presented as Adobe Acrobat files.

Plus there's the PCW Essentials collection, extra hot game demos and much more.

### Starting the DVD-ROM

The DVD should auto-start, just like the CD. If it doesn't, double-click the DVD-ROM icon in My Computer or, alternatively, run the file PCW.EXE on the root of the DVD. Check out the support website at [www.pcw.vnuet.com/cd](http://www.pcw.vnuet.com/cd) for late-breaking news on the programs on the disc.



we're

**No.1**

again

for customer service & reliability



"For the third year in a row Dan Technology is the overall winner in our service & reliability survey."

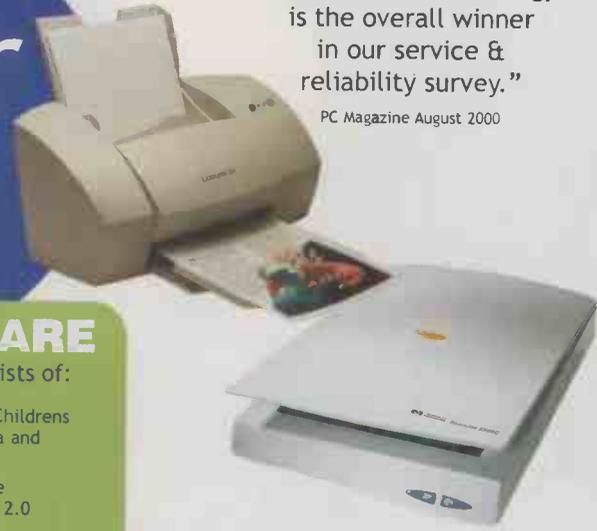


"For the third year in a row Dan Technology is the overall winner in our service & reliability survey."

PC Magazine August 2000

# introducing the homeworker

for those who care about their child's education



## HOME SOFTWARE

The Home Software Solution:  
Encarta 2000

- |                                  |  |
|----------------------------------|--|
| Fit For Life!                    | Full Mark Keystage 2 (PC & Internet teacher) |
| Rhodes on Rom                    | Know Your Stuff                              |
| Alan Titchmarsh 3D Garden Design | Skip To My Loop (Fat Boy Slim Music package) |
| Money Matters                    | Art Attack                                   |
| UEFA Champions League 2000       | Changing Rooms                               |

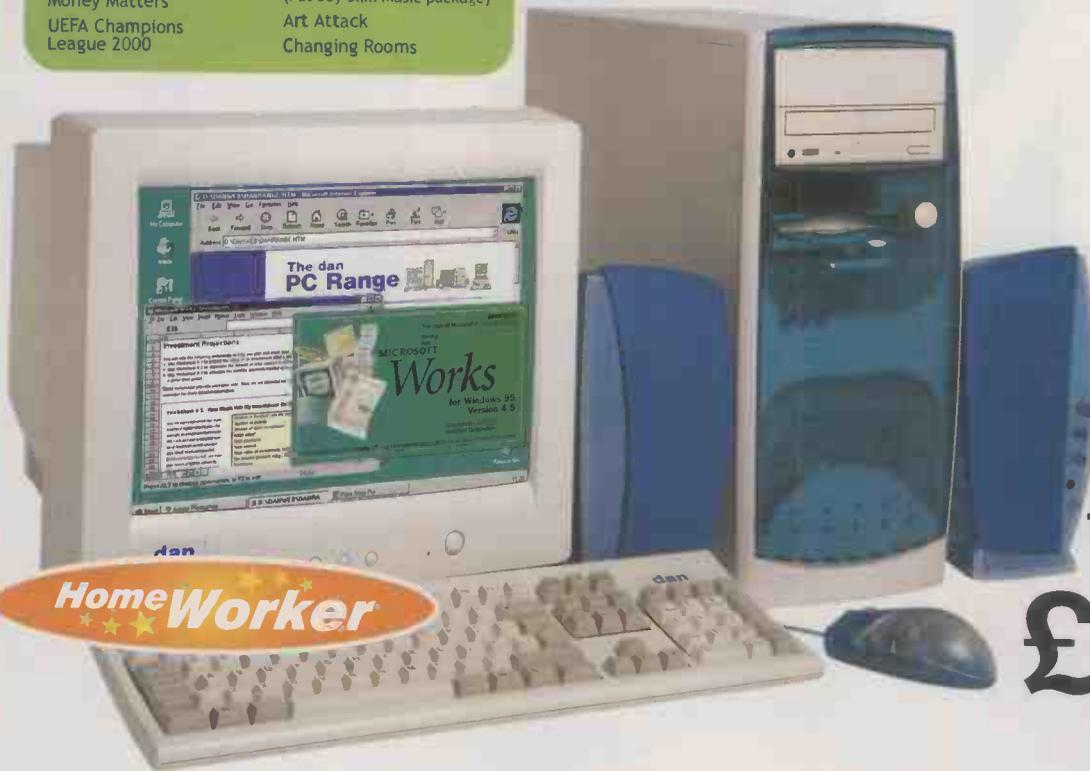
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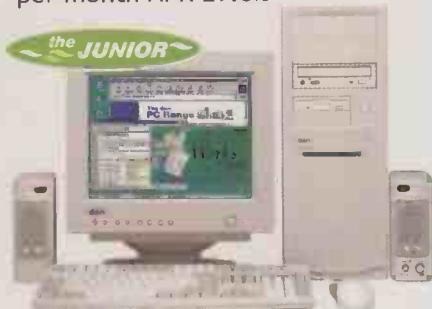
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PC Magazine August 2000

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# Goodbye, Desktop PC

Old friend. It's sad to see it go. It just didn't have the **Intel® Pentium® III** processor **power** of the TravelMate 730. It couldn't let you work anywhere with a **built-in modem**, as well as integrated **Ethernet LAN**. It didn't have the **15" TFT** screen. Nor the **management functions**. Nor the stylish and robust **Magnesium Alloy Chassis**.

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## Gates fights back with new web platform and Java rival

Microsoft has come back fighting with a fresh assault on the web following the big anti-trust ruling that could force it to split into two companies.

It has announced a new platform called .Net designed to dominate the web as Windows has ruled the desktop. Bill Gates boasted that it will cost as much to develop as putting a man on the moon... £1.25b.

Components will roll out over the next three years, with some appearing this year.

Fundamental is the use of HTML's 'grown-up' sibling XML, which allows machines of any flavour to exchange structured information.

The strategy includes the launch of a new object-oriented language called C#, seen as a direct rival to Java. This will use Microsoft's Visual Studio development environment and is designed to allow C and C++ coders to use their existing skills.

There will be compilers for different hardware to give C# the 'write once, use anywhere' portability of Java. C#, which will be available this year in beta, will also talk XML.

Java is an increasing threat to Microsoft's development tools, despite resentment at Sun's tight rein on it (see page 36). Microsoft is trumpeting .Net's own use of open standards such as XML to allay fears that it is simply shifting the base of its hegemony.

Microsoft says non .Net devices will be able to interact with its systems, but the 'richest experience' will come from .Net clients. The

platform will also require Microsoft development tools and third parties will be encouraged to create apps that work with Microsoft email, instant messaging, calendar, identity, storage and directory online services.

Microsoft is thus trying to hook users into services that could provide regular long-term revenues. Clearly, it also hopes to corner the emerging market in new appliances such as web TVs.

The craftiest aspect is what Microsoft calls the 'Universal Canvas', which makes a single working environment out of the operating system, browser and applications.

This has been the direction Microsoft has been pushing Office and Explorer for some time. Essentially, it means that the browser changes from being a largely read-only to a read-write environment.

It also sidesteps the break-up threat in a way that some believe will enable Microsoft to win whatever the outcome of its appeal - see *Tim Bajarin on page 44*.

## WAP confusion

BT Cellnet countered claims that WAP services have flopped with figures showing it had sold 175,000 WAP phones in the three months up to July. But this does not show how many people are using WAP and it falls well short of a predicted 500,000 users, despite massive advertising and subsidies on handsets.

According to the *Financial Times*, the figure is further distorted by the fact that organised gangs have bought half a million subsidised

phones from Cellnet and others for resale abroad.

Meanwhile watchdog Oftel criticised Cellnet for preventing some users from accessing rival WAP sites. User can now request an unblocking code.

Also on the WAP front, Microsoft has said Pocket Internet Explorer will not support WAP natively. Dilip Mistry, mobility solution marketing manager, told a TechEd conference in Europe: 'It is not a rich Internet experience for end users.' *More flak for WAP - page 38.*

## Pentium 4 named

Intel's next-generation processor, codenamed Willamette, is to be called the Pentium 4, the company says. It will debut later this year at 1.4GHz and supports a 400MHz bus.

But the emphasis in the mainstream market seems to be shifting from processor speed to factors such as price and power consumption. *See Transmeta forces rethink - page 26.*



**Samsung's 15in SM150MP and 17in SM170MP LCD panels, which include a TV tuner, let you watch TV while you work. They cost £999 and £1,819 ex VAT respectively. Telephone 0800 521652 for details**

## Short stories

## ROAMING OFFER

A startup called Mint Telecom is offering global cards with no roaming deposits that allow you to use your mobile phone from anywhere in the world for a flat 85p per minute calling, or 42.5p receiving.

The service works with pre-pay phones that do not normally allow global roaming or require special deposits. But your phone has to be able to take a new SIM card – some operators lock them out – and, of course, must support the bandwidths in use in the area from which you call.

You pay £34 to sign up, but this includes 300 minutes of phone calls from anywhere. [www.mint-tele.com](http://www.mint-tele.com)



## DO ME A FAVOUR

Tim Ellis (above) has launched a site called Favourites Online where you can store your favourite web links for access from anywhere, effectively creating your own net portal. Also available at the site is a Java application that allows you to have the portal on your desktop, regardless of whether you are online.

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

## FLIP TIP

A £48 utility called Flip Album enables you create photo albums on CD for distribution after events such as weddings. [www.printsbypost.com](http://www.printsbypost.com)

## PROCESSORS

## Crusoe forces Intel rethink

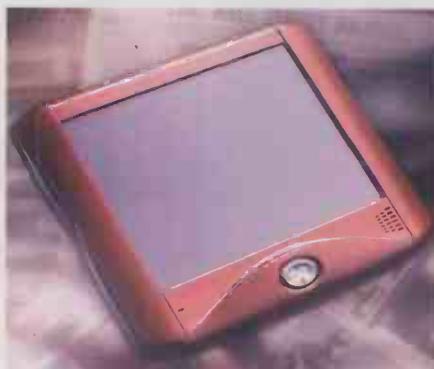
Intel showed signs of being rattled about its chips' power consumption as several manufacturers demonstrated prototype laptops using Transmeta's low-drain Crusoes.

A couple of days before the Crusoe demonstrations at PC Expo in New York, it announced no fewer than five new mobile processors – including a 600MHz PIII, operating at 1.1v, which it said draws less than 1w 'on average' in low-power mode.

This claim was met with some scepticism, but the chip is sure to be considerably more frugal than the previous mobile 600MHz PIII which drew as much as 13w. Intel also launched a 750MHz mobile PIII and mobile 500MHz, 600MHz and 650MHz Celerons.

Intel's SpeedStep technique for limiting power has only two states, with clock rates and operating voltage switching down during battery operation.

AMD's rival PowerNow has 32 states, in theory allowing consumption to be tailored more precisely to changing needs. Crusoes can adjust their power drain by switching voltage and clock rates in 0.05v and 33MHz increments. They are said to draw as little as 10mw when 'ticking over' and average



Crusoe-based DayTripper prototype webpad ...aiming for a day's work per charge

around 1w on typical tasks – a fraction of the consumption of Intel's recent mobile chips.

Screens account for more power drain than processors, but Transmeta's aim is to produce machines that run on one charge for a working day.

Gateway and AOL are jointly developing a Crusoe-based webpad and several vendors showed Crusoe models at Computex in Taiwan (see page 28), but the prototypes at PC Expo came from Fujitsu, Hitachi, IBM and NEC.

It is unclear if these will go into production. Leo Suarez, IBM's programme director for worldwide marketing, said: 'We need do some tuning of the power-management circuitry and talk to our customers to gauge their interest.'

Another contender in this

market is National Semiconductor with its integrated Geode chips. These have built-in graphics and other subsystems and are said to draw less than 1w.

Detlev Kunz, vice-president and general manager for Europe, said

that power drain must be estimated on the basis of the whole system. 'A chip like the Crusoe will need more peripheral chips that also draw power,' he said.

Transmeta is working with S3 to integrate a graphics subsystem.

At issue is the importance of speed over price and power drain at a time when even entry-level PCs are more powerful than many need.

Battery drain will be critical in the market for webpads and untethered appliances. Even on desktops people may prefer to sacrifice speed for a chip that doesn't need a noisy fan. But it would not be hard for Intel to come up with competitive, low-power, lower-speed chips.

CLIVE AKASS

ADDITIONAL REPORTING BY  
JO TICEHURST AT PC EXPO

## ...as midfield chip battle hots up

Intel also launched three new Celerons to counter the threat from resurgent AMD in the high-sales desktop market where users are no longer willing to pay huge premiums to get the fastest and latest chips.

The 633MHz, 667MHz, and 700MHz Celerons, using 0.18micron technology, were announced only a week after AMD began shipping its well-

received 600MHz, 650MHz, and 700MHz Durons, low-cost versions of the Athlon.

Volume prices for all six were virtually the same, adjusting for clock speeds: £86, £106, and £120 respectively for the Celerons; £70, £96, and £120 for the Durons.

Meanwhile, chipset maker VIA, already a thorn in Intel's side (see page 28), aimed for

Intel's soft underbelly with the announcement of a Cyrix III chip running at between 500MHz and 600MHz for the value PC market.

VIA bought the Cyrix name and high-end x86 technology from NatSemi, but oddly the new processor is based on the old IDT WinChip. Prices for the chips, which use the old 370 socket, could be as low as £30.

# Fast ADSL, slow rollout

**A** 'Love-Bug' type virus and continuing tests by BT have delayed the mass rollout of fast asymmetric digital subscriber line (ADSL), scheduled to start in July.

BT said service providers that will sell the high-speed connections had failed to provide sufficient trialists for high-volume tests to identify possible problems such as crosstalk, when signals in adjacent lines interfere with each other.

Installations were also disrupted when engineers imposed a two-week 'data freeze' after their files were hit by a virus. This effectively

blocked all new installations, at least in the London area.

There were also signs that BT staff are still going through a learning process, with contradictory information being given to callers. One service provider was said to be 'incandescent' about BT delays.

But companies such as BT OpenWorld and Thus (parent of Demon Internet) are starting to install ADSL links for businesses - cheaper home connections will not be available until later this year.

ADSL piggy-backs an RF signal onto a standard phone line to provide always-on

Internet access downstream at speeds of up to 2Mbits/sec - tests have reached as high as 8Mbits/sec. Initial services will offer 500Kbits/sec down and 256Kbits/sec up.

This is only one of several DSL technologies. US vendor Paradyne has accused watchdog Ofcom of favouring BT by blocking Paradyne offering a high bit-rate digital subscriber line (HDSL) service providing a 2Mbits/sec link in both directions.

BT, which has a final say on what equipment can be installed on its network, claims this would affect its ADSL transmissions.

## Short stories

### FLAT-RATE OFFER

A new 1p-per-minute 24 x 7 web access service provides better value than unmetered services, claims OneTel.Net. The company charges no connection or monthly fees and users do not need to switch phone companies.

OneTel.Net also claims that users will not suffer the slow and congested service that has been reported on some unmetered services. It says its service would cost the average home, spending between six and eight hours a month on the web, a maximum of £4 a month.

[www.onetel.net.uk](http://www.onetel.net.uk)  
0800 634 1954

### HANDHELD RISK

Security experts have warned that virus writers could switch their attention from PCs to handhelds, which some believe will be the major web access device within a couple of years. Symantec has already prototyped an anti-virus product for the Palm Pilot. The company's chief technology officer Ron Moritz said ubiquitous new devices 'pose new risks and challenges'.



## Lights, MiniDisc, action

*Sony pioneered the use of the humble floppy for storage on its early Mavica cameras and it has used an MD (MiniDisc) drive on a video camera. Its 2.1 megapixel Mavica MVC-1000 boasts a mini-CD writer providing 156MB of write-once storage on 3in CD-R discs (right). The model is due to ship in the US this August and prices are not yet known.*

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

## BT demands royalties from ISPs over hyperlink patent

**B**T claims to have invented and patented hyperlinks, which are fundamental to the World Wide Web, and is claiming millions of dollars in royalties.

The company is claiming the money from US service providers because, according to a BT spokesman: 'It is not practical to license every Internet user - it would be nonsensical.'

BT says the patent dates back to its early Viewdata online services that included Prestel. It applied for a US patent in 1976, but didn't

receive it until 1989. Its hyperlink patents have expired in other countries.

The BT spokesman cited the high licence fees enjoyed by other technology companies. IBM alone receives in excess of £63m a year in fees for the use of its intellectual property. 'We only want what is fair,' the spokesman added.

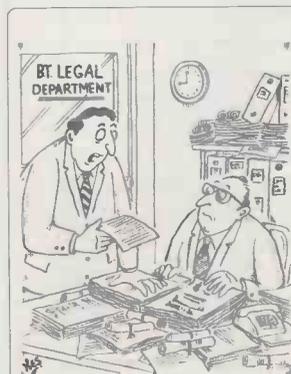
Critics say the patent is invalid because others had the idea first. Some cite Ted Nelson's 1971 book *Dream Machines*, and its 1974 follow-up *Computer*

*Lib*, which coined the word 'hypertext'.

Others trace the idea to a paper, entitled *As We May Think*, which was published by US academic Vannevar Bush in 1945.

Tim Pearson, a council member of Britain's ISP Association, said: 'It doesn't surprise me that this is crawling out of the woodwork because we've seen a general increase in the aggressive use of patents.'

He added: 'I don't think BT will win itself many friends.'



*It's a counter claim from General Motors... they've filed a patent for the wheel*

Riyad Emeran reports from Computex 2000 in Taipei and finds the future is twice as bright for VIA.

## VIA unveils RAMBUS rival

Taking pride of place on VIA's stand was 266MHz double data rate (DDR) SDRAM memory. Existing PC SDRAM is either 100MHz or 133MHz, with only the hideously expensive RDRAM running faster.

This new memory will handle two processes per

clock cycle and increase memory bandwidth to 2.1Gbytes/sec.

VIA has been working closely with industry leaders such as NEC, Samsung and Toshiba to ensure swift adoption of the new standard and should have a chipset that supports the new

memory within a couple of months.

Both AMD and Intel are looking to support DDR SDRAM, so bus speeds and, consequently, overall system performance should see a significant increase in the near future.

See Gordon Laing - page 41

## Crusoe handheld

Proving that it was more than just a groundbreaking news story, Transmeta put in an appearance at Computex 2000 (see page 26). Nestling on the FIC (First International Computing) stand was the Aqua 3200 WebPAD.

This handheld web browser sports the Transmeta TM 3200 CPU, running at 400MHz, along with 64MB of onboard memory and a 16MB Compact Flash card. The device runs mobile Unix, displayed on its 7.4in, DSTN, 640 x 480, LCD touch screen.

Connectivity comes via the inbuilt, wireless LAN module, but it also sports USB and IrDA. It's doubtful that a device such as this will take off in Europe, since its functionality is limited. It does, however, prove that Transmeta has more than just good ideas up its sleeve.



## DVD+RW ready to roll

Philips was pushing its DVD+RW technology in Taipei. It's been over three years since Philips, Sony and HP broke away from the DVD forum to create a separate rewritable DVD standard, but we're yet to see any products.

One of the original arguments for DVD+RW was that it could store 3GB per side rather than the 2.6GB DVD-RAM standard. Unfortunately, it was decided that the 3GB version should not be released, instead waiting for the implementation of 4.7GB per side capacity.

The other advantage of DVD+RW is that the discs can be read in any DVD drive, whether consumer or ROM. Philips has shown many demonstrations of this compatibility, but we'll reserve judgement until we see a drive ourselves.

However, Philips had mock-ups of both a consumer video recorder and a ROM drive, based on DVD+RW technology.

Philips has assured us that the consumer video recorder will be available by the end of the year, with the ROM drive appearing in early 2001. We can't help feeling that we've heard it all before.

## Palm pretender

Acer is a huge company that seems to be able to turn its hand to almost anything and now it's decided that Palm has had its own way for too long.

The Acer SlimMate is a PDA that, quite simply, looks just like the Palm V. Obviously there are a couple of cosmetic differences, but at a glance you would think that it was a Palm.

The SlimMate is powered by a 16bit RISC CPU running at 48MHz, backed up by 48MB of memory used for applications and storage. The operating system is designed by Acer and the

monochrome screen looks every bit as good as Palm's.

What was most impressive, however, was that Acer already has several snap-on modules for the unit, turning it into a GPS tracker, or a GSM phone, or even a digital camera.

Unfortunately, Acer has no plans to release the SlimNote in Europe until some time next year, instead choosing to concentrate on the Chinese market. Consequently, there is currently no indication of price, but don't think about importing one unless you can read Chinese.

## Gentle PC leads from front

For a long time the desktop PC has shunned some great connection protocols seen in mobile devices. Although every motherboard since early 1996 has supported IrDA, we've never seen PCs with infra-red ports at the front. Likewise, the PC Card standard that's become a lifeline for notebook users never made an

*The Gentle PC - it all makes sense*

impact on the desktop, even though it would be a great feature. Add to this the fact that sound ports and USB connectors are always mounted at the rear of a PC chassis, making it a real pain

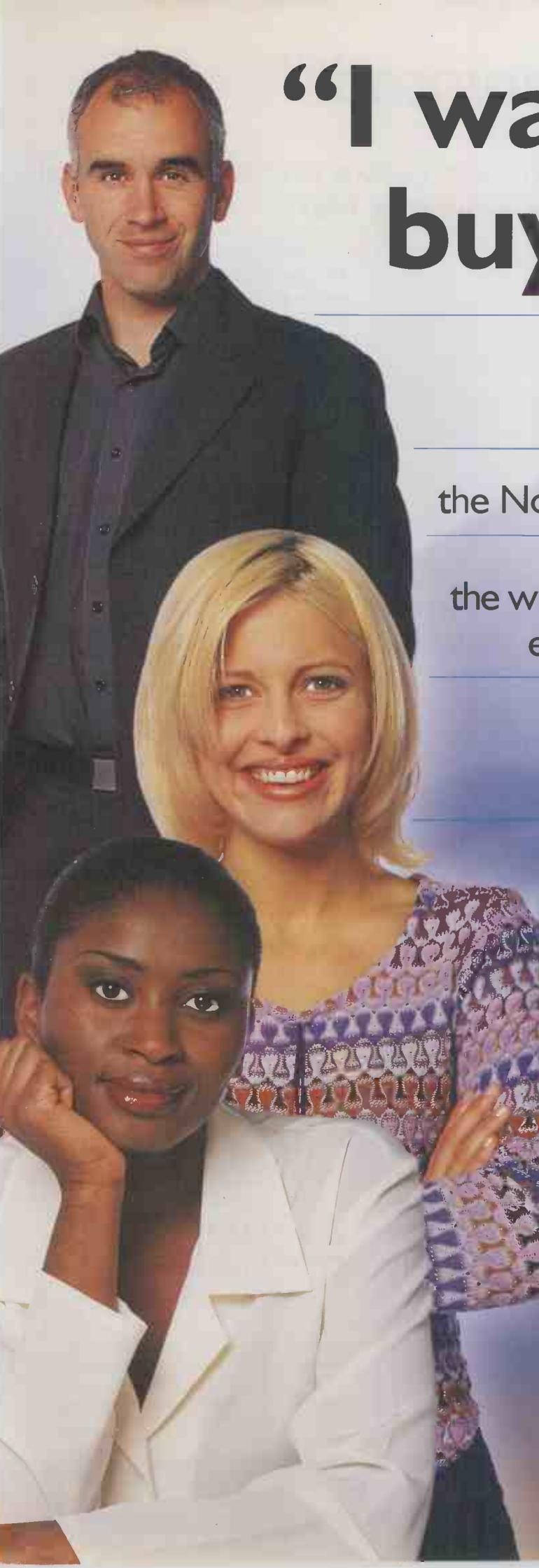
to connect anything and you start to wonder if the PC was designed to specifically make our lives harder.

Taiwanese company A-Standard Computer Systems has come up with the answer, the Gentle PC.



This slim PC system can be mounted flat or on its side, depending on your preference, but what's more impressive is the connectivity. At the front of the case you'll find an IrDA port for connecting to a notebook, PDA or mobile phone. Also, hidden behind a flap are a set of sound ports, a FireWire connector and a couple of USB ports. There's even a floppy/PC Card combo drive as an option.

Whether we see this box in the UK depends on whether a PC company decides to distribute it.



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## Elite Range



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667MHz to		£50 (£58.75 inc.)	£120 (£141 inc.)	£160 (£188 inc.)	£310 (£364.25 inc.)	£470 (£552.25 inc.)

### MESH Elite GeForce2

State of the art PC with a 19" TAXAN 975 TCO99 monitor, 32MB GeForce2 GTS card and a CD Re-Writer

- Processor:** Intel® Pentium® III 667MHz Processor
- RAM:** 128MB 133MHz High Performance SDRAM
- Hard Drive:** 30GB ATA-66 (7200rpm) Hard Drive
- Monitor:** 19" TAXAN FST Ergovision 975 TCO99 Monitor .26mm, with USB hub
- Graphics:** 32MB nVIDIA GeForce2 GTS DDR AGP Graphics Card (TV out)
- DVD-ROM:** 16x DVD-ROM Drive (40x CD-ROM)
- Plus:** CD Re-Writable (4x4x32)  
Creative SoundBlaster LIVE! I024 Sound Card  
Labtec 2514 speakers with Real-time Dynamic Bass Equalization  
Diamond 56Kbps voice/fax/data modem  
Package includes standard features (see overleaf)  
MESH Three Year Warranty†

Standard **£1429** £1679.08 inc. VAT  
WorksSuite **£1469** £1726.08 inc. VAT

Processor upgrades available (see below)

Simply add the price of the desired processor to the system you want. For example to upgrade a 667MHz model to a 750MHz add £120 (£141 inc.VAT) to the price.

Sales (London): **020 8208 4706**

Sales (Leeds): **0113 219 3460**

# ...“Over 31 Major Awards!”



\*Based on 850T model -reviewed in August '00



\*Based on 850GT Pro model -reviewed in August '00



\*Based on 800GTS model -reviewed in August '00



\*Based on Web 750 Developer model -reviewed in August '00



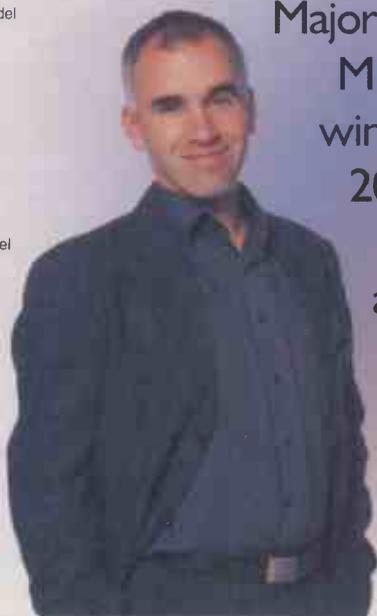
\*Based on 700GDR model -reviewed in August '00



\*Based on 700GDR model -reviewed in August '00



\*Based on 700GDR model -reviewed in July '00



\*\*\*“The Matrix range has now collected over 31 Major Awards and MESH are also winners of over 200 hardware editorial awards since 1997 for quality and value”



**E-Direct** at [www.meshcomputers.com](http://www.meshcomputers.com)

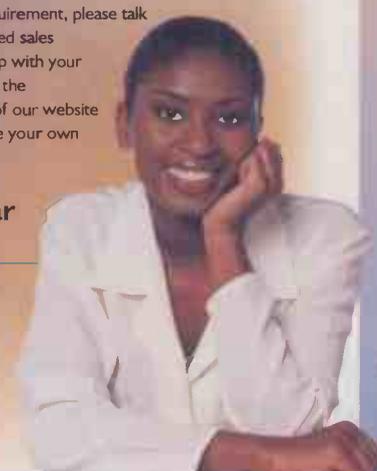
Never has on-line shopping been so simple. Just type in your **E-Direct** reference number within the MESH website and we'll take you to your specific PC showing specs, up to date pricing and upgrades.

## MESH Build to Order

If you have a special requirement, please talk to one of our experienced sales consultants who can help with your order. Alternatively, visit the [shop@mesh](mailto:shop@mesh) area of our website where you can configure your own system.

## MESH 3 Year Warranty

†All MESH PCs carry a comprehensive 3 year warranty comprising 1 year on-site parts and labour followed by 2 years back to base parts and labour. (UK mainland only)



## Matrix Range

Featuring the New Range of AMD Athlon™ processors with performance enhanced cache memory and 3DNow!™ technology



Overleaf is the Business Range, Upgrade options and prices plus important information about MESH

### MESH Matrix Fury



From the Award Winning Matrix range comes this excellent value PC with 17" monitor and 32MB graphics

- Processor:** AMD Athlon™ 700MHz Processor
- RAM:** 128MB 100MHz High Performance SDRAM
- Hard Drive:** 20GB ATA-66 Hard Drive
- Monitor:** 17" TAXAN 1710 TCO99 .27mm Monitor
- Graphics:** 32MB ATI Xpert 2000 128GL AGP
- DVD-ROM:** 10x DVD-ROM Drive (40x CD-ROM)
- Plus:** Creative Labs SoundBlaster Audio PCI 128 Sound Card  
Labtec speakers with Dynamic Bass Equalization  
Diamond 56Kbps voice/fax/data modem  
Package includes standard features (see overleaf)  
MESH Three Year Warranty†

### MESH Matrix GeForce



Leading Edge PC with a 17" Mitsubishi Naturally Flat Pro 720 monitor and the new 32MB GeForce 2 MX SDR graphics

- Processor:** AMD Athlon™ 700MHz Processor
- RAM:** 128MB 100MHz High Performance SDRAM
- Hard Drive:** 30GB ATA-66 Hard Drive
- Monitor:** 17" Mitsubishi Naturally Flat Pro 720 TCO99 .25mm AG (96kHz)
- Graphics:** new 32MB nVIDIA GeForce 2 MX SDR AGP Graphics Card
- DVD-ROM:** 10x DVD-ROM Drive (40x CD-ROM)
- Plus:** Creative Labs SoundBlaster LIVE! 1024 Sound Card  
Creative Labs PC Works four point surround speakers  
Diamond 56Kbps voice/fax/data modem  
Package Includes standard features (see overleaf)  
MESH Three Year Warranty†

### MESH Matrix GeForce2 Pro



This "Top spec" PC includes a 19" Mitsubishi monitor, 32MB GeForce2 GTS graphics and a CD Re-Writer

- Processor:** AMD Athlon™ 700MHz Processor
- RAM:** 128MB 100MHz High Performance SDRAM
- Hard Drive:** 45GB ATA-66 (7200rpm) Hard Drive
- Monitor:** 19" Mitsubishi D-Tron Naturally Flat TCO99 .25mm AG (96kHz)
- Graphics:** new 32MB nVIDIA GeForce2 GTS DDR AGP Graphics Card (TV out)
- DVD-ROM:** 16x DVD-ROM Drive (40x CD-ROM)
- Plus:** CD Re-Writable (4x4x32)  
Creative Labs SoundBlaster LIVE! 1024 Sound Card  
Labtec 2514 speakers with Real-time Dynamic Bass Equalization  
Diamond 56Kbps voice/fax/data modem  
Package Includes standard features (see overleaf)  
MESH Three Year Warranty†

Standard **£899** £1056.33 inc. VAT  
WorksSuite **£939** £1103.33 inc. VAT

Processor upgrades available (see below)

Standard **£1059** £1244.33 inc. VAT  
WorksSuite **£1099** £1291.33 inc. VAT

Processor upgrades available (see below)

Standard **£1519** £1784.83 inc. VAT  
WorksSuite **£1559** £1831.83 inc. VAT

Processor upgrades available (see below)

#### Processor Upgrades:

Athlon™	750MHz	800MHz	850MHz	900MHz	950MHz	1GHz
700MHz to	£30 (£35.25 inc.)	£70 (£82.25 inc.)	£140 (£164.50 inc.)	£230 (£270.25 inc.)	£370 (£434.75 inc.)	£550 (£646.25 inc.)

Simply add the price of the desired processor to the system you want. For example to upgrade a 700MHz model to a 800MHz add £70 (£82.25 inc.VAT) to the price.



Sales: [sales@meshcomputers.com](mailto:sales@meshcomputers.com)

# MESH

computers plc

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

Established 1987

Browse on-line @ [www.meshcomputers.com](http://www.meshcomputers.com)

# ... "Providing total solutions"

If your requirement is business based our MESH Business team can offer the kind of specialist expertise and dedicated technical support required within your business environments.

Our account managers can define your requirements and on this basis;

- provide an in-depth design process
- specify and supply PC's and servers
- provide system and network installation
- provide onsite maintenance for servers and networks
- develop training programmes
- provide business leasing

**For business based 'total solutions' we have teams in both London and Leeds ready to take your call**



London: 020 8208 4766  
Leeds: 0113 219 3500

MESH servers are custom built to suit your needs now and in the future

## MESH Pro Server



Intel® Columbus III Server Chassis  
Dual Intel Pentium® III LG440GX dual processor motherboard  
Intel® Pentium® III 700 processor  
128MB ECC parity (100Mhz) SDRAM expandable to 2GB  
9GB Ultra Wide SCSI hard drive (RAID Options available)  
Integrated Ultra 2 LVD SCSI controller  
6 PCI, 1 ISA expansion slots  
2MB Video Memory  
15" Digital SVGA Colour Monitor  
14/32x EIDE CD-ROM Drive  
Intel Ether Express Pro 10/100 network card  
Keyboard and Mouse  
MESH Three Year Warranty†

**£1399**

£1643.83 inc. VAT

Leasing available

## MESH Ultra Server



Intel® Cabrillo-C Server Chassis (pedestal or rackmount)  
Dual Intel® Pentium® III Xeon C440GX motherboard  
Intel® Pentium® III Xeon 550 (512KB Level 2 Cache) Processor  
256MB ECC parity (100Mhz) SDRAM expandable to 2GB  
27GB Ultra Wide SCSI hard drives in RAID 5 config (18GB available)  
"Hot swap" drive technology standard  
Mylex Acceleraid 4MB 150 SCSI controller  
6 PCI, 1 ISA expansion slots  
2MB Video Memory  
15" Digital SVGA Colour Monitor  
14/32x EIDE CD-ROM Drive  
Intel® Ether Express Pro 10/100 network card  
Keyboard and Mouse  
MESH Three Year Warranty†

**£3499**

£4111.33 inc. VAT

Leasing available

## Business Range

Featuring the **New Range** of AMD Athlon™ processors with performance enhanced cache memory and 3DNOW!™ technology



### MESH Matrix Classic



A value workstation with 15" colour monitor and 40x CD-ROM Drive

**Processor:** AMD Athlon™ 700MHz Processor  
**RAM:** 64MB 100MHz High Performance SDRAM  
**Hard Drive:** 10GB ATA-66 Hard Drive  
**Monitor:** 15" SVGA Digital Colour Monitor .28mm  
**Graphics:** 16MB ATI Fury 128GL AGP Card  
**Plus:** 40x CD-ROM drive  
Creative Labs SoundBlaster Audio PCI 128 Sound Card  
Package includes standard features (see opposite)  
MESH Three Year Warranty†  
 "Instant Website creator" CD

Standard **£699** £821.33 inc. VAT  
WorksSuite **£739** £868.33 inc. VAT

Processor upgrades available (see previous page)

### MESH Matrix Workstation



An excellent PC for the Education and Business sector, with 17" TAXAN monitor and 16MB Matrox G400 graphics card

**Processor:** AMD Athlon™ 700MHz Processor  
**RAM:** 128MB 100MHz High Performance SDRAM  
**Hard Drive:** 9GB Ultra Wide SCSI Hard Drive  
Adaptec Ultra Wide SCSI controller  
**Monitor:** 17" TAXAN 1710 TCO99 .27mm Monitor  
**Graphics:** 16MB Matrox G400 AGP Card  
**Plus:** 40x CD-ROM drive  
Creative Labs SoundBlaster Audio PCI 128 Sound Card  
Package includes standard features (see opposite)  
MESH Three Year Warranty†  
 "Instant Website creator" CD

Standard **£1099** £1291.33 inc. VAT  
WorksSuite **£1139** £1338.33 inc. VAT

Processor upgrades available (see previous page)

### MESH Matrix Plus



An advanced business PC with 15" TFT Flat panel monitor, 32MB AGP graphics and 40x CD-ROM

**Processor:** AMD Athlon™ 700MHz Processor  
**RAM:** 128MB 100MHz High Performance SDRAM  
**Hard Drive:** 15GB ATA-66 Hard Drive  
**Monitor:** 15" NEC TFT Flat panel monitor  
**Graphics:** 32MB Matrox G400 AGP Card  
**Plus:** 40x CD-ROM drive  
Creative Labs SoundBlaster Audio PCI 128 Sound Card  
Package includes standard features (see opposite)  
MESH Three Year Warranty†  
 "Instant Website creator" CD



Standard **£1349** £1585.08 inc. VAT  
WorksSuite **£1389** £1632.08 inc. VAT

Processor upgrades available (see previous page)

**SMALL BUSINESS STOP PRESS!**

For a limited period only, small businesses buying from the MESH business range (incorporating AMD processors) will receive the 'SAGE instant website creator CD', enabling you to create a 5 page, 15MB business website, with inclusive domain name **ABSOLUTELY FREE!**

# ... "for total satisfaction!"



Business Division (London): **020 8208 4766**  
Business Division (Leeds): **0113 219 3500**



Business Division:  
**business@meshcomputers.com**

# Features

## Standard features

All MESH models featured in this advertisement come with the following as standard:

**new** Tower Case  
(Includes modern design and tool free access)

Microsoft Windows 98  
(Second Edition)

Microsoft Internet Explorer (v.5.0)

1.44MB 3 1/2" floppy disk drive, 2 USB Ports

Microsoft Internet keyboard

Microsoft Intellimouse and mouse pad

FREE Virgin.net Unlimited Internet and E-mail



## Bring life to the internet!

All MESH Computers now include trial versions of Macromedia software including:

<b>Dreamweaver 3</b>	Professional web authoring software
<b>Fireworks 3</b>	Web graphics authoring software
<b>Flash 4</b>	Professional vector based web animation software

\*These are the full versions, functional for 28 days. (Full, permanent versions, for which there is a charge are available via a simple accessing procedure).

## WorksSuite features

All MESH models with WorksSuite options can be upgraded from the standard features at a cost of £40 exc. VAT and will include the following:

### Microsoft WorksSuite includes:

✓ Word 2000	The World's most popular word processor, gives you the tools to create professional-looking documents
✓ Works 2000	The foundation for home computing, includes a word processor, database, spreadsheet, calendar & address book
✓ Money 2000	Manage your finances effortlessly, from transactions to monthly reports
✓ Publishing 2000	Publish with style on your PC, make cards, flyers & newsletters stand out
✓ Encarta® World Atlas 2000	Make learning easy with over 36,000 articles and multimedia files
✓ Autoroute Express Europe 2000	Travel with confidence, locate and navigate cities, towns and roads on your PC

# Important Information

## How to find us...



## Showrooms...

London: Apsley Way, NW2 7HF  
Leeds: 9 Gemini Business Park, Sheepscar Way, LS7 3JB

## Opening hours...

Mon - Fri: 9am - 6pm Sat: 10am - 4pm  
Sun: (London only): 10am - 2pm

## Sponsors

MESH are the official supporters of SPARKS charity (Sport Aiding medical Research for Kids).

## Deloitte and Touche Fast 50

We were identified as the UK's fastest growing IT hardware company in the Deloitte-Touche Fast 50.

## Business and Education

We have dedicated Account Management teams, with ISO 9002 certification, to provide a Total Solution for all system requirements.

## Payment

**Pay Now** - Pay the whole amount by credit card or cheque (No surcharge on credit cards)

For details of our finance options, please call the MESH sales team.



No Surcharge on Credit Cards

## Contacting MESH

Sales (London): 020 8208 4704  
Sales (Leeds): 0113 219 3460  
Business Division (London): 020 8208 4766  
Business Division (Leeds): 0113 219 3500  
Fax (London): 020 8208 4493  
Fax (Leeds): 0113 219 3461  
E-mail: sales@meshcomputers.com  
E-mail: business@meshcomputers.com

# Options

## Monitors

From 17" TAXAN Monitor to 17" Mitsubishi Naturally Flat Plus 73 TCO99 .25mm (70KHz) **£69** **£81.08** exc. VAT inc. VAT

From 17" Mitsubishi Naturally Flat Plus 73 to 19" TAXAN FST Ergovision 975 TCO99 .26mm with USB Hub **£110** **£129.25**

From 17" Mitsubishi Pro 720 Naturally Flat to 19" Mitsubishi Diamond Plus Naturally Flat TCO99 .25mm AG **£239** **£280.83**

From 17" TAXAN to 15" NEC TFT Flat panel with USB Hub and audio, TCO99 **£499** **£586.33**

## Printer & Scanner Package

**Lexmark Z11**  
1200 x 1200dpi output quality  
Print speeds up to 4ppm  
One click install  
Accufeed™ powerful paper feeding  
Precision thermal Inkjet printer



**UMAX Astra 2100US**  
Scan area up to 8.5" x 11.7"  
600 x 1200 dpi resolution  
Single-pass, colour CCD  
36-bit, 68 billion colours  
(only if purchased with a system featured in this advertisement) **£135** **£158.63** exc. VAT inc. VAT



## Upgrades

**Zip Drive** exc. VAT inc. VAT  
Internal 100MB drive **£65** **£76.38**  
Internal 250MB drive **£95** **£111.63**

**ISDN** **£39** **£45.83**  
From Diamond 56kbps modem to ISDN modem

**Memory**  
Additional 64MB of 100MHz SDRAM **£50** **£58.75**  
Additional 128MB of 100MHz SDRAM **£100** **£117.50**

**Sound**  
From Creative SoundBlaster Audio PCI 128 to Creative SoundBlaster Live! 1024 **£50** **£58.75**  
From TEAC Stereo speakers to Creative PC Works four point speakers with sub-woofer **£45** **£52.88**

**Hard Disc Drives**  
From 10GB to 15GB **£20** **£23.50**  
From 15GB to 20GB **£20** **£23.50**  
From 20GB to 30GB **£75** **£88.13**  
From 30GB to 45GB 7200rpm **£120** **£141.00**

**Graphics Card** P.O.A.  
Upgrade to the new 32MB or 64MB nVIDIA GeForce2 GTS DDR Graphics Card (TV out)

**Homestart**  
A qualified engineer will set up your system - phone for details

For additional information on any of the systems and options featured, please visit our website on [www.meshcomputers.com](http://www.meshcomputers.com) or phone our sales team

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Sales (Leeds): **0113 219 3460**

**MESH**  
computers plc

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

Established 1987

Browse on-line @ [www.meshcomputers.com](http://www.meshcomputers.com)

Edition - Sept '00

## Short stories from Networks Telecom 2000

### INTEL NETWORK

Intel launched a local network system for homes and small offices. The InBusiness product range centres around a server that incorporates LAN/Internet connectivity using ISDN or DSL – with a firewall, printer sharing and an eight-port 10-BaseT hub thrown in for good measure. However, the LAN support is for 10Mbps 10-BaseT only and there is no support for USB printers.

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

### SLEEPING GIANT

Digi International launched an ISDN adaptor card that accepts incoming fax, data or voice calls, even when the host PC is in sleep mode. The DataFire Micro takes an average seven seconds to wake up a PC, according to Digi. It costs £60 ex VAT.

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

### VOIP PHONE

Electronic Frontier launched a Voice over IP (VoIP) phone called the Ipico, manufactured by Lucid VON. It consists of a smart box that converts analog voice or fax audio from standard phones to VoIP data and routes it to similar boxes over a LAN or WAN. It can be connected directly to up to eight analog phone or fax ports, or connected to a small office switchboard.

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

Ian Burley reports from Networks Telecom 2000 in Birmingham.

## First GPRS handhelds

The spotlight was on emerging General Packet Radio System (GPRS) wireless links this year at Britain's big network show.

BT Cellnet, which has already launched a GPRS service for corporate customers, announced that later this year it will be trialling an adapted GPRS version of the stylish Blackberry email handheld that has been a success in the US.

The Blackberry, made by Canadian company Research in Motion (RIM), can work with Microsoft Exchange or Lotus Notes systems. It uses an i386 processor but lacks a web browser.

Vodafone, which is promising to launch its GPRS

*RIM's Blackberry email platform. There is also a version with a larger screen and keyboard*



service by the end of the year, showed some pre-launch service demos, including WAP over GPRS.

Vodafone will be offering packages based around the Casio PocketPC and Psion handhelds.

GPRS has taken a bit of a back seat after the recent fuss about the third-generation Universal Mobile Telecommunications System (UMTS) broadband wireless licences. Early GPRS handsets are in short supply and delivering nothing like the promised 100Kbits/sec.

Current systems deliver only 27Kbits/sec, about three times as fast as current GSM phones – although, unlike GSM, the GPRS service is always on.

A Cellnet spokesperson claimed the speed would increase to five times that of GSM in a few months, and to 100Kbits in less than a year.

[www.rim.net](http://www.rim.net)

## New boost for HomeRF

Bluetooth mania, after all the spring hype, was more subdued than expected, but there was a discernible increase in the profile of wireless LAN solutions. This is largely due to the widening adoption of the 11Mbps/sec 802.11 standard.

Nighthawk Electronics announced that it is adding Nokia 802.11 kit to its range and Elsa has introduced 802.11 products.

Wireless LAN specialist Proxim, of Rangelan fame, privately previewed its

Harmony product line, aimed at enterprise and service provider deployments. Also highlighted was Proxim's proprietary OpenAir standard-based Symphony product range aimed at home and small-office customers.

In addition, Proxim is involved in the beleaguered HomeRF combined voice and data standard.

But HomeRF was recently given a boost with news that US federal restrictions will be relaxed to enable it to evolve into a higher performance

standard – at the moment it is limited to a tenth of the maximum 802.11 data rate.

Proxim was basking in the afterglow of its finalised acquisition of rival Farallon. Farallon adds Apple Mac-compatible technologies to the Proxim armoury.

Proxim also let slip that it is working on wireless LAN products with integrated Bluetooth. However, Proxim dismisses suggestions that Bluetooth could be a wireless LAN platform in its own right.

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

## PCs could pack 'data by mains' networking

German firm Polytrax was pushing its wireline networking, which uses a building's mains wiring for a local data network. The company is seeking trade and manufacturing partners to

establish the technology in devices such as modems.

The technology, which is currently in prototype form only, is limited by European technical regulations to around 200Kbits/sec, but the unrestricted US market

could push it to megabit levels.

Polytrax has more ambitious plans than wireline modems. A spokesman said its long-term goal is to persuade motherboard and PC

manufacturers to integrate it into their hardware.

So maybe, one day, plugging your PC into the power socket will be rather more meaningful than part of simply powering up.

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

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[ Genius. ]

Buy your memory direct from one of the largest memory manufacturers in the world. Performance, reliability, selection *and* manufacturer-direct savings — Crucial Technology, a division of Micron.

*It's astonishing how much faster this machine suddenly got with the addition of a mere 32MB! It behaves like it just got a megadose of vitamins and joined a health club.*

John Brawley, Crucial Customer

**FREE**  
Shipping  
throughout mainland UK.

Power = Crucial  
RAM

## Memory upgrades . . .

	Description	32MB	64MB
<b>Compaq</b>			
Presario 2290	PC-100 168-pin DIMM	£27.89	£48.59
<b>Tiny</b>			
Home Entertainment System	PC-100 168-pin DIMM	£27.89	£48.59
Power Advantage System	PC-100 168-pin DIMM	£27.89	£48.59
Business Professional System	PC-100 168-pin DIMM	£27.89	£48.59
Ultra Performance System 500	PC-100 168-pin DIMM	£27.89	£48.59
<b>Gateway</b>			
G6-400	PC-100 168-pin DIMM	£27.89	£48.59
P5-133	EDO 72-pin SIMM	£64.78	£127.78
GP6-400	PC-100 168-pin DIMM	£27.89	£48.59
<b>IBM</b>			
Aptiva (2174) Model 595	PC-100 168-pin DIMM	£27.89	£48.59
PC 300GL (6288-53U)	PC-100 168-pin DIMM	£27.89	£48.59
PC 300PL (6892-50U)	PC-100 168-pin DIMM	£27.89	£48.59
<b>HP</b>			
Pavilion 8418	PC-100 168-pin DIMM	£27.89	£48.59
Vectra VL Series 8	PC-100 168-pin DIMM	£27.89	£48.59
	Description	32MB	64MB
	PC-100 168-pin DIMM	£27.89	£48.59
	FPM 72-pin SIMM	£63.89	£141.29
	EDO 72-pin SIMM	£63.89	£141.29

Prices do not include VAT.

Crucial prices reflect a 10% discount for placing your order online.

Prices were current as of 29/06/00; however, they can (and do) change daily.

Prices may vary according to your specific system requirements.

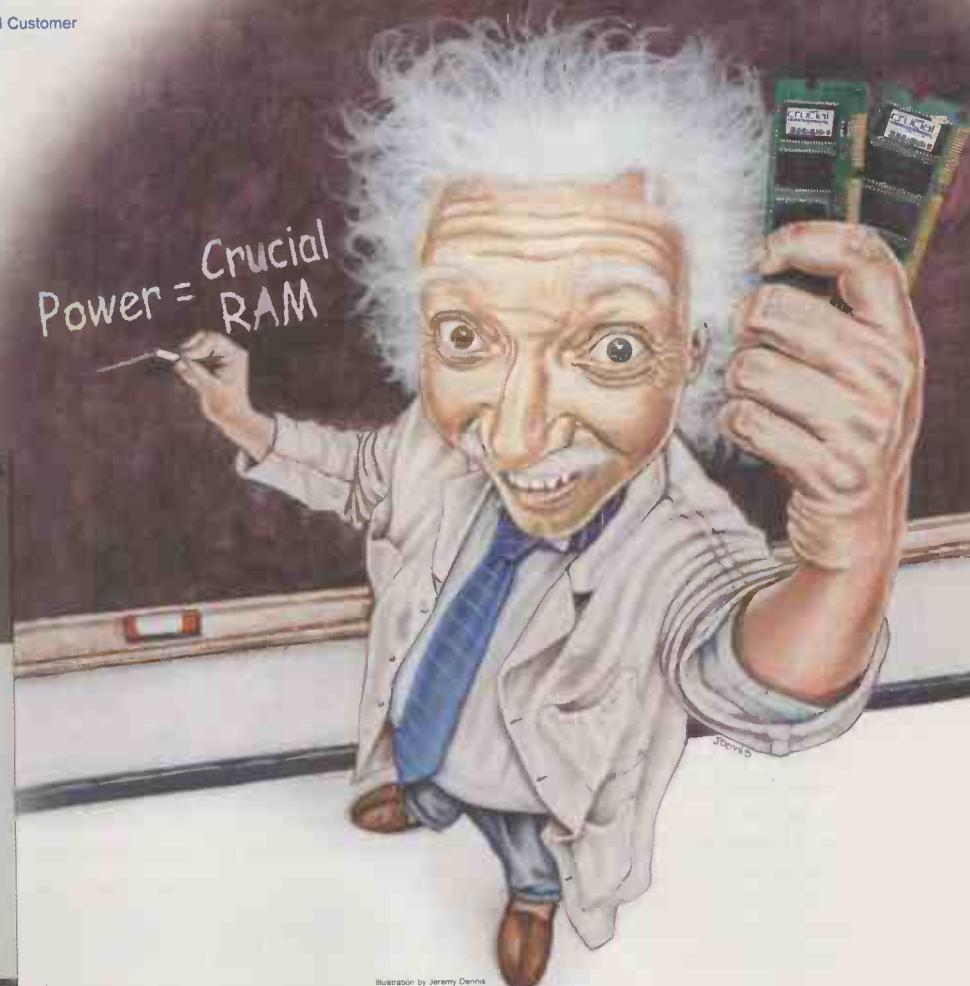


Illustration by Jeremy Dennis

Order online:

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Intl. Phone: +44 1355 586002 Fax: +44 1355 586101  
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The Memory Experts™

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## Short stories

## IBM THINKS LINUX

IBM has added support for Linux to two of its Thinkpad notebooks as part of its effort to push the open-source operating system further into the enterprise. Caldera's OpenLinux eDesktop 2.4 will come preconfigured on its A20m and T20. The company will also begin certifying other Linux distributors including SuSE, Red Hat and TurboLinux. Dell already offers Red Hat Linux 6.1 pre-installed on its Latitude CPx and Inspiron 7500 systems.

## SMUT SURFERS

One in three UK web surfers, almost a third of them women, look at X-rated websites, claims a new survey. It also found that 40 per cent of the most visited sites contain porn. The number of UK Internet users grew by 15 per cent to 9.9 million in the six months to May, according to the research by Net Value. Of these 6.1 million were men and 500,000 were pensioners. The average time online also rose, by 84 minutes, to just over six hours a month – apparently as a result of free or low-cost unmetered access.

## RAVEN DELAY

Lotus has postponed the release of its Raven knowledge management suite until the end of the year. The software, which aggregates Internet content and personal productivity files into a single portal, was originally expected to ship this summer.

## HOME FIREWALL

A product from Symantec is designed for home users who fear that new always-on broadband connections will leave their machines vulnerable to intruders. Norton Personal Firewall 2000 costs £39.99 inc VAT.

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

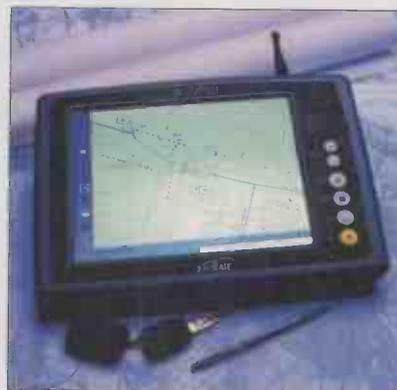
# Sun clings to Java reins

Sun faces increasing opposition to its tight rein over Java as the programming language celebrates its fifth birthday – and faces a new rival in the form of Microsoft's C# (see page 25).

But IDC analyst Rikki Kirzner said Java is challenging Microsoft's Visual Basic as the most popular means of developing applications.

However, Java has lost ground among the influential open-source community, where critics have accused Sun of turning its back on true standardisation efforts. Major vendors, especially Microsoft, are pushing for an independent standards body.

But Sun is committed to deciding on Java's technical future via its consultative Java Community Process (JCP). Pat Sultz, software products and platforms group president, said Sun retained its tight hold to nurture the



Cambridge-based Tadpole's J-Slate handheld, which runs Java apps, was honoured with a nomination for Best Mobile Wireless Solution at the JavaOne developers' conference in San Francisco  
[www.tadpole.co.uk](http://www.tadpole.co.uk)

language and maintain innovation. Sultz said: 'We did the same thing with the network file system with Solaris (Sun's version of Unix) and just turned that over to the standards body.'

But at the JavaOne conference in San Francisco, Sun appeared to be loosening its grip when it announced the creation of two executive committees to oversee the JCP, one handling desktop and server development, and the other dealing with embedded applications.

Gartner analyst Mark Driver said that, though this hardly constitutes democracy it does give JCP members, like IBM and Oracle, more input and control. He added that Java expects a number of vendors to release a range of devices using the revamped Java 2 Micro Edition.

However, if Sun's move does not satisfy critics there could be 'more aggressive efforts' to introduce compliant clones outside the company's control.  
JOHN GERALDS, VNUNET.COM

## Compaq iPAQs Linux in challenge to CE

In a blow to Microsoft, Compaq has ported Linux to its latest iPAQ H3600 handheld. The iPAQ was built around the latest PocketPC operating system, also known as Windows CE 3.0.

There is no question of Linux replacing the Microsoft operating system for the iPAQ but it could present a longer-

term threat. The port is part of Compaq's Open Handheld programme, an initiative aimed at developing applications for mobile computers using open-source code.

PocketPC has been easily the best received version of Windows CE to date but the handheld market is

dominated by Palms, especially in the US. Compaq was one of only five vendors at the PocketPC launch earlier this year to announce products based on the OS.

Linux for the iPAQ can be downloaded from a Compaq site: [www.handhelds.com](http://www.handhelds.com). However, the site warns: 'If this installation fails then your iPAQ could become unusable.'

Compaq is providing software components including drivers, X-Terminal emulation, handwriting recognition, touchscreen and multimedia support. It also provides hardware specifications for both the iPAQ and its Expansion Pack system. See iPAQ review on page 89. Additional reporting [vnunet.com](http://vnunet.com)

## Linux lovers get the bug

*Linux fans were asking for trouble when they boasted of the open-source operating system's security in the wake of the Love Bug virus that struck Windows, only to be affected themselves. A bug in the kernel allows attackers to gain access to files through a variety of programs, including Sendmail. It affects versions 2.2.15 and earlier, and some 2.4.0 versions – code that exploits the flaw has been posted widely. Sendmail 8.10.2 has been released with a patch but users are advised to update their Linux kernel to version 2.2.16.*

Psion is redefining portable radio in a way that could upset the 3G applecart, says Clive Akass.

## Enter the DAB handers

Radio lovers are bound to feel ambivalent about Digital Audio Broadcasting (DAB). They will welcome the boost in quality and the fact that it does not trail off as you travel down the motorway. But a major attraction of radio is that it is sound only: it is an affable companion, not an attention-grabbing tyrant like TV. You can listen as you do other things. But will this be the case with DAB, which can carry non-audio data, including images?

The issue has been academic for most people until recently because DAB receivers have been prohibitively expensive. This hasn't prevented major radio stations offering DAB services - the BBC has invested millions in the technology over the past five years. The uptake is even higher in other European countries such as Germany.

Now, as we reported last month, Psion is about to launch an affordable (if not, at £299, cheap) DAB receiver called a Wavefinder (right) that links into a desktop PC via the USB port. More exciting is the fact that the company plans to marry the receiver to the handheld computer.

You might well ask what is the point: we have TV, so why not leave radio to the audio it does so well? In fact, at present, there is not enough bandwidth to deliver anything like a TV service. Regulations limit non-audio content to about 35Kbytes/sec per channel. This is around the data rate of a dialup modem but it is considerably higher than that available on GSM phones and even, in practice, emerging GPRS.

Currently, DAB data is used mainly to deliver scrolling text with information about music being played. The BBC has also experimented with sending pictures and 'carouselling', or repeatedly broadcasting, the top-level web pages of BBC Online.

Wavefinder should be an excellent way of experimenting with other uses before the system goes mobile. 'The point is that with the PC you get a back channel,' said Geoff Kell, commercial director of Psion Infomedia.

An obvious application here is for adverts or even music sales. 'You could hear a piece of music and buy it on the spot,' said Kell.

This is a loaded point. There will be nothing to stop you recording music

straight from the radio and shoving it into an MP3 file. Kell points out that few recordings are played end to end on radio, to discourage piracy. However, with DAB the quality will be better than from analog broadcasts and the computer can make recording a simple drag-and-drop operation.

'We don't use the word copying. We say "time shifting",' said Kell ironically. Copying is illegal. Time shifting is a perfectly legitimate advantage of smart radio. You can choose what you want to listen to in advance and record it by simply clicking a listing. Then you can listen to it when it suits you.

At least you will be able to do this when the software is ready. Psion is still working on

it. The version Kell showed me scans the airwaves to find available stations and lists them as icons on your desktop.

Psion has bought a 7.4 per cent stake in London-based DAB specialist RadioScape, its partner in the project. 'We are concentrating on a software-based solution because bits and pieces of the DAB specification are still being changed so it is easy to upgrade,' he said.

Kell is wary of saying when the system will be

information: you drive into a new area, prod your phone or mobile and get a list of nearby petrol stations, hotels, flower shops, traffic jams or whatever.

This is an extremely inefficient way to deliver the information because it is sent separately to each user, who has to pay a commensurately

high premium. There would be nothing to stop local DAB stations carouselling the information, and regular updates, with users paying absolutely nothing. The service could be sponsored by local businesses.

Smart DAB radios (or DAB-enabled handheld computers, or DAB-hands, or whatever you want to call them) could simply cache the information in flash memory or IBM's MicroDrive. The user could then browse the information as if it were live on the web - non-cached pages could still be accessed via the 3G link.

Many local stations already offer DAB and the rest are getting in on the act. They are not the only ones. ITN has done a deal with programme maker UBC to deliver DAB content. This will initially be targeted at Wavefinder users, but could clearly be extended to mobiles.

Kell agrees that, as with all these convergent technologies, nobody really knows how smart radio will be used. It is a technological canvas, awaiting the painter. But, when you can buy a good analog radio for a tenner, DAB prices will have to come down a lot more before the technology finds a mass market.

*Wavefinder has been designed as a trendy piece of techno-furniture, likely to appeal to early adopters, but it should provide an excellent test-bed for the uses (not to mention abuses) of smart digital radio*

put into mobiles. 'It's a chipset issue,' he said. 'The chips used currently draw far too much power for something driven by a battery.'

But of course mobiles too will have a back channel, either using GSM, GPRS or third-generation UMTS cellular links. Kell believes DAB will 'complement' the kind of services planned for 3G mobiles. However, if I owned one of the companies that invested billions in a 3G licence, I would look very hard indeed at DAB's ability to grab my potential revenues.

A big 3G money spinner is expected to be local



## Short stories

**UNDELETE 2K**

Executive Software Europe claims its new Undelete 2.0 was only the second utility to be awarded Windows 2000 Certification.

It comes in network and server editions and also supports NT4. It can recover all deleted files, including those that bypass the Recycle Bin. A 30-day trialware version is on this month's cover disc or you can download it from [www.undelete-europe.com](http://www.undelete-europe.com)

**CELLPHONE CE**

Microsoft and Samsung have launched a joint project to develop 'super cellphones' using Mobile Explorer and Windows CE 3.0. Their first GSM 'feature phones' capable of web browsing and accessing corporate intranets will ship later this year. Dilip Mistry, mobiles marketing director at Microsoft, said: 'These will be very inexpensive handsets.' Devices using the rival Symbian operating system are not expected to ship until next year.

**HOT XML EDITOR**

The latest version 2.0 of SoftQuad's XMetal offers a Word-like interface, supports validation, forms and script editing, and expanded customisation options. It is designed for people who need to re-publish the same information in different media. A sister product to HTML editor HotMetal Pro, it costs £300 per single-issue licence. [www.softquad.com](http://www.softquad.com)

**NOTEBOOK ZIP**

Iomega has launched an internal version of its 250MB Zip drive for use in notebooks. [www.iomega-europe.com](http://www.iomega-europe.com)

# WAP under more fire

**W**AP is coming under increasing fire even though online services are falling over themselves to open gateways for it.

A recent report from analyst Ovum warned that the technology, designed to deliver information for tiny mobile screens, was in danger of being overhyped. Foreign analysts have gone further, saying it is a dead duck.

Handheld market leader Palm has eschewed WAP for the new mobile portal it has launched in Europe. Meanwhile, arch-rival Symbian has licensed a non-WAP iMode from Japanese mobile provider NTT DoCoMo. This is based on a cut-down version of HTML and a packet-switched wireless protocol, which has claimed 6.92 million

subscribers in Japan and is adding 20,000 users a day.

David Potter, chairman of Symbian partner Psion, told business leaders at Europe's Seventh Annual CEO Summit in London: 'While WAP is very worthy, it is also a little boring.' He added: 'iMode is really interesting, offering entertainment, messaging, transactions, games and screensavers, and is inexpensive.'

Psion is also developing alternative delivery systems such as DAB (see page 37), which could cut into WAP revenues.

IT and customer service managers believe interactive TV will generate more sales than WAP and other mobile services, according to a survey by customer-service specialist Graham Technology.

Anti-wappers (this reporter included) argue that WAP is trying to do something that, for a mass market at least, will be practicable only when the cellphone is truly integrated into a mobile computer with a usable screen and input system.

Pro-wappers point to the huge, unexpected popularity of SMS messaging among young people despite the difficulty of keying text into mobile phones.

But WAP is far from dead. Michele Mackenzie, an analyst at Ovum, said it will improve when packet-switched GPRS services arrive in the UK. She added: 'There is a lot of industry backing for WAP and it is difficult to see it failing.'

CLIVE AKASS AND VNUNET.COM

## IBM boosts MicroDrive to 1GB

**I**BM has tripled the maximum capacity of its MicroDrive hard disk to 1GB - a density of 12.4Gbits/sq in and equivalent to 12 CDs.

IBM claims the drives, which fit into any Compact Flash II slot, support a maximum sustained data rate of 4Mbytes/sec - faster than flash memory.

Digital cameras are seen as a major market for the drives, which could store hundreds of high-resolution images. But cheap high-capacity storage could have a major affect on WAP services.

The more users have, the more easily they will be able to cache free-to-air music and programmes from DAB (Digital Audio Broadcasting - see page 37) or even TV satellite broadcasts.

Prices of the MicroDrive are nowhere near cheap enough, though the US price of the 340MB version will



Small but cute - and the hamster's not bad either!

drop from around £312 to £186 when the new capacities ship this autumn. A 512MB one will cost about £250 and the 1GB around £310.

European product marketing manager John Fox said capacities will increase further and the cost per megabyte will drop. He said flash memory could not yet match MicroDrive capacities.

But those prices could come under pressure from solid-state memory if SanDisk president Eli Harari is to be believed. He predicted earlier this year that prices will drop by up to 30 per cent a year as capacities soar to the point where flash memory replaces all mechanical storage on mobile devices.

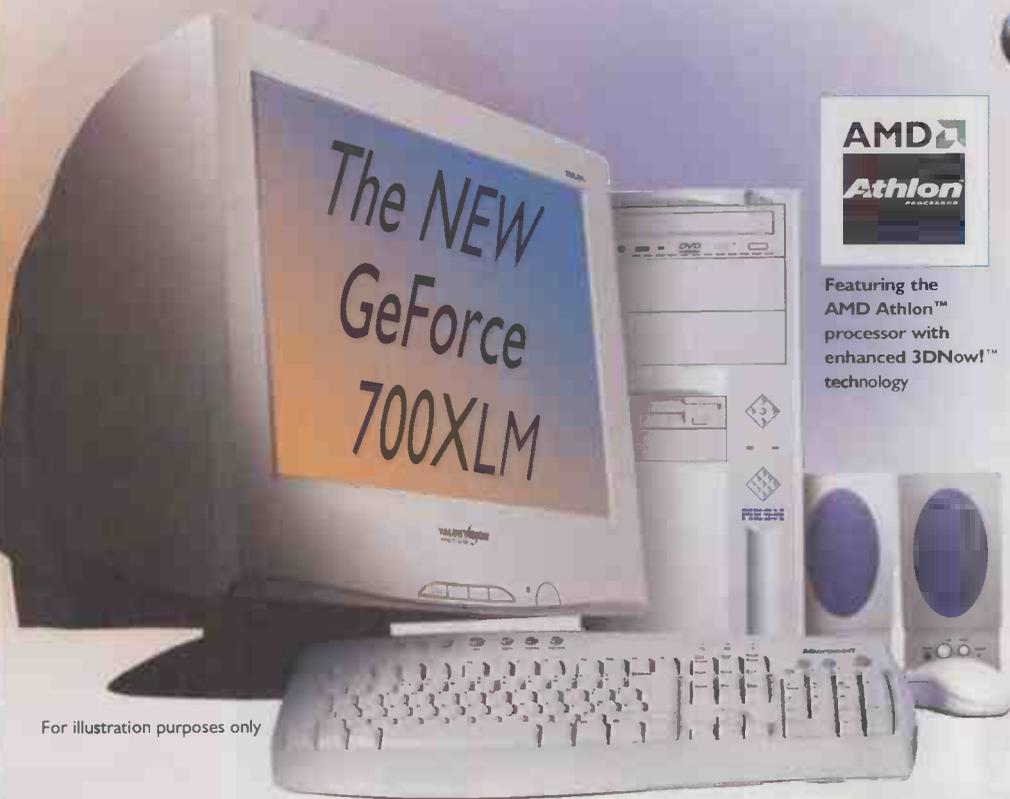
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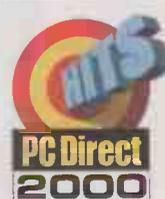
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## NETWORKING

Intel is courting danger by backing RDRAM as rivals plug cheaper DDR, warns Gordon Laing.

# Perils of fast memory syndrome

Most knowledgeable PC users could tell you that RAMBUS is the company behind RDRAM memory technology. Many will also have an opinion about RDRAM's price and performance compared to SDRAM. But few realise RAMBUS has been around for 10 years and owns patents for memory interfaces implemented in plain old SDRAM, not to mention Double Data Rate (DDR) SDRAM. In other words, RAMBUS owns intellectual property on virtually every computer system in the world.

Think about that for a moment: if RAMBUS exercises its patents, anyone who makes any kind of SDRAM memory owes it licensing fees. Indeed, the company has been chasing Hitachi through the courts claiming that SDRAM and DDR memory that the latter manufacturers infringes RAMBUS' patents. Hitachi has been pushing the anti-monopoly angle, hoping the other big memory manufacturers would support it.

Then on 15 June, memory giant Toshiba bit the bullet and signed a new licence agreement with RAMBUS for SDRAM, DDR SDRAM and the controllers that interface with them. Clearly on a high, RAMBUS unveiled the next day what it described as 'the

world's fastest memory bus technology'. Combining DDR with multi-level signalling to transfer four bits per clock cycle, the new Quad RAMBUS Signalling Levels (QRSL) technology could deliver as much as 12.8GB per second from a 64bit bus. Toshiba liked the sound of this and agreed to license QRSL too.

Hitachi couldn't hold out any longer and on 22 June it agreed to pay RAMBUS a settlement fee and royalties. With the litigation out of the way, it could proceed with the

much-rumoured sale of its memory division to NEC.

So good news all in all for RAMBUS, a company that doesn't get its hands dirty with any kind of manufacture and prefers to deal exclusively with its intellectual property. But where does this leave the memory technologies? Is RDRAM the future, or does SDRAM in plain DDR or even QRSL flavour stand a chance?

Intel remains committed to RDRAM but the company

was hardly cock of the roost at June's Computex show in Taiwan, where confidence in non-Intel products was at an all-time high. The company is still recovering from the impact of its RDRAM-related MTH/820 chipset problems. It showed off its new 815 and 815E chipsets which have native support for PC133 SDRAM, albeit only 512MB of the stuff.

The 815/815E look set to do good business, and VIA is

more expensive than SDRAM today and, in our SYSmark tests, offers no compelling performance advantage. Rob Eckelmann, Intel's European general manager, admitted at the same event that RDRAM was too expensive. I asked him when it would become affordable, to which he replied: 'It won't be multiple years.' I was rather hoping he

would be talking months.

This situation reminds me of when we were happily using EDO memory, only to be told we should change to new high-performance SDRAM, which was incompatible with our old motherboards. SDRAM cost more but it wasn't three times the price and we didn't really have an alternative. RDRAM may be the long-term memory solution but with DDR SDRAM just around the corner it is not a compelling buy today.

The recently agreed RAMBUS royalties may push up the price of SDRAM, but it will still have a significant edge over RDRAM for some time. This a dangerous situation for Intel, which is effectively saying you must commit to uncompetitively priced memory if you want to use the Pentium 4, or most of its Pentium III solutions. With increasingly tempting offers from AMD and VIA, Intel will have to work very hard to retain desktop customers in the future.

## An RDRAM module from Kingston Technologies

promising two new chipsets to support emerging 266MHz DDR SDRAM (see page 28). The new Pentium 4 (formerly known as Willamette) and its accompanying chipset are designed for RDRAM - but will Intel ever change its mind in favour of SDRAM?

I had the chance to ask its CEO Craig Barrett, at the opening of Intel's Wireless Competency Centre in Stockholm. He said: 'Intel's goal is to get RDRAM affordable and working with Willamette.' He admitted that RDRAM issues 'were more complicated than first anticipated', but stressed that Intel had 'no plans to abandon RDRAM'. On the recent QRSL announcement he said that it seemed like there was 'a new fastest memory technology every day.'

Yet RDRAM remains much



## NetFinity and beyond

IBM has developed a technology that it claims will double memory capacity without having to add extra physical memory.

The Memory eXpansion will be used initially in IBM's NetFinity servers but will migrate to other machines. It caches most used data and code close to the processor and uses hard-wired algorithms to compress other data on the fly.

John Gerald, vnunet.com

E snooping Bill shows criminals the way to getting away with it on the web, warns Clive Akass.

# The worldwide hiding place

Proposed legislation giving police and security services unprecedented access to your emails may have already proved to be counter-productive, as it highlights how easy it is to hide incriminating information on the web.

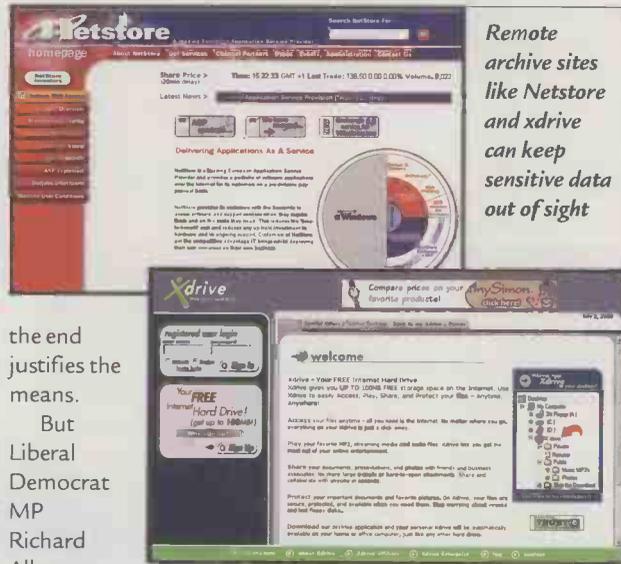
The Regulation of Investigatory Powers (RIP) Bill, due to be passed in October, has come under attack for other reasons and is almost certain to be watered down following a rough passage through the House of Lords.

It empowers police to obtain warrants to access specific files, in the same way that a warrant is required in order to search a house. However, you risk two years in jail if you refuse to reveal decrypt keys.

One amendment approved in the Lords overturns a requirement that it is up to you to 'prove' that you don't know or have forgotten the keys – contravening the principle that you are innocent until proved guilty, begging the question of whether it's possible to prove a negative.

Security services will monitor Internet traffic via 'black boxes' housed by service providers. Again they will need a warrant – in theory at least – to read the content of communications, but there is nothing to stop them tracking the sites you visit.

Critics claim that ecommerce firms, fearful of contravening confidentiality clauses, will migrate to places like Ireland, which have less draconian secrecy laws. Some firms may also fear Government-sponsored industrial espionage. Home Secretary Jack Straw argues that the threat of computer-aided crime is so great that



Remote archive sites like Netstore and xdrive can keep sensitive data out of sight

the end justifies the means.

But Liberal Democrat MP

Richard Allan,

chairman of the cross-party information select committee, said the Bill makes sense only if it can be enforced – and he has launched an investigation into ways in which the measures could be evaded. 'I warned the minister in committee that... alternative technology would provide ways of working round it,' he said. Methods include:

- Direct links: Sensitive documents can be encrypted and sent by a direct modem-to-modem link, as was common before the Internet went mainstream. It can be done using Windows Hypertextual or any 'old fashioned' comms program.
- Steganography: This is the hiding of messages within innocent looking files. Currently, its main use is to watermark digital images. The data is spread across pixels in such a way that the image is not affected. Alternatively, data can be hidden in inaudible frequencies within a music file – though care must be taken with compression, which may strip these frequencies out.

Police might still be able to insist that you tell them how

to extract steganographic data – but they have to know that it is hidden in the first place. Caspar Bowden, director of the independent Foundation for Information Policy Research, said: 'By analogy, you are no longer talking about whether someone has the key to a safe, the question is whether they even have a safe.'

But perhaps the easiest way to hide data is to use remote archives. These are perfectly legitimate services but, like safe-deposit boxes, which are often used to stash stolen goods, they can be of as much use to criminals as to their potential victims. They range from companies such as Netstore ([www.netstore.com](http://www.netstore.com)), that offer industrial-strength backup solutions, to free US sites such as [www.xdrive.com](http://www.xdrive.com) that act like an extra, password-protected hard drive – except that it can be accessed via a browser from anywhere in the world.

(A utility at the site claims to integrate the facility into Windows Explorer, so that it functions almost exactly like an extra drive. It would not work with the Windows

Millennium beta I'm running but browser access is quick and easy.)

Netstore, which pioneered the idea in Britain, is horrified by the idea that it might be used by criminals.

Co-founder and chief technology officer Jeff Maynard said: 'Netstore makes a lot of sense for all sorts of reasons but not as a way around any legislation – we would, of course, comply with any lawful request from a court or other authority.'

Nevertheless remote archives do offer two levels of protection. First, as with steganography, the investigating authorities would have to know about the hidden files. This could be the case if they have been monitoring a criminal's Internet use, or if a computer's browsing record was left intact on a hard disk. But criminals could easily use a service like xdrive from public access points like cybercafes or libraries.

Secondly, even if police did know about an archive it is far from clear whether RIP could enforce the release of decrypt keys to files resting, as in the case of xdrive, physically in the US.

It is also hard to see how the likes of former pop star Gary Glitter could have been prosecuted, as the law stands, for child-porn images held abroad. In practice many criminals are as careless as he was and are convicted on the basis of data that could have easily been hidden. The irony of the RIP Bill is that, by forcing criminals to look at simple workarounds, it may actually encourage their use of the Internet. After all, the web makes the whole world their hiding place.

Additional reporting by [vnnunet.com](http://vnnunet.com).

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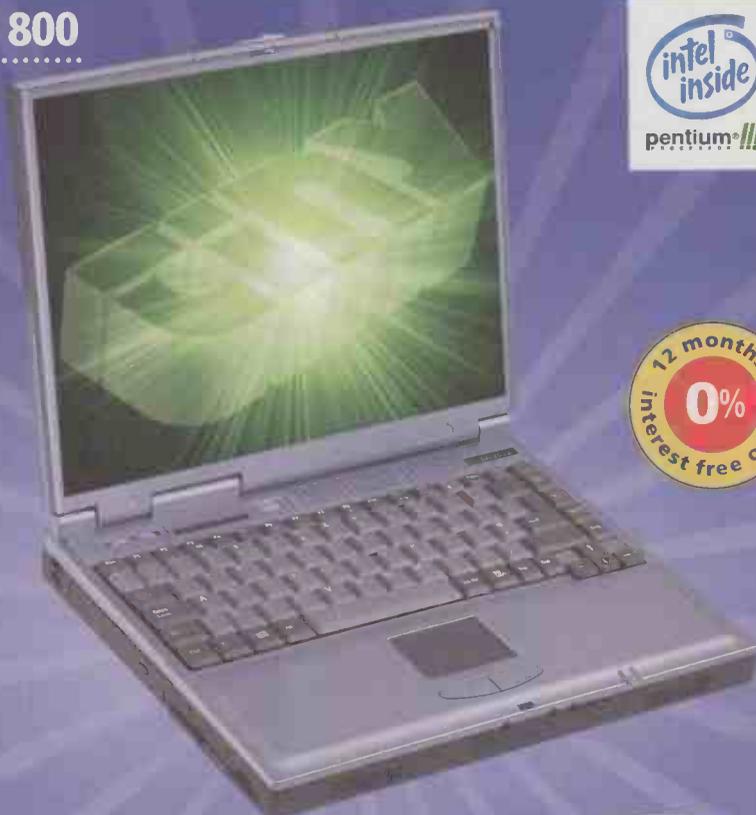
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Gloat ye not over the anti-trust case, Bill Gates could be in a win-win situation says Tim Bajarin.

# Microsoft at the Pearly Gates

Conversation over breakfast at a quaint resort in Maine, where I stayed recently, turned, for two days running, to the subject of the Microsoft anti-trust case. To my surprise almost everyone at these tables was pro Microsoft. In the US there is a growing sense that the Government is sticking its nose in too many businesses. Some analysts think the Microsoft case went too far and that a backlash is in the offing.

Microsoft clearly bungled its defence, but I have had a chance to read its full 39-page response to the ruling in which it states its case firmly and eloquently. It points out major legal inconsistencies and shares evidence in Microsoft's favour.

A friend who sat in court every day of the trial said after reading the document that he is now convinced Microsoft will get the case overturned. The twist is that the result is meaningless anyway.

When it was first filed two years ago, the case rested on the fact that Microsoft bundled its Internet Explorer browser with Windows.

Netscape called for an anti-trust investigation, claiming that this move would put it out of business. Many believed Netscape simply wanted to force Microsoft to bundle its Navigator browser as well; interestingly, that was not the real issue at all.

Netscape understood clearly that the next major development platform would be for the Internet, evolving not so much from Windows as from the next generation of browsers.

Once Microsoft started tying its Windows development platform to its browser platform, software



*Netscape's Jim Clark (pictured in his company's early days) has criticised the US Government's plans to split development of Microsoft's IE browser from the OS company*

developers began defecting to it in droves – eclipsing Netscape's own development platform, which had until then been highly successful.

While the lawsuit has been extended to cover many other issues, Microsoft has clearly become the dominant player in browsers. Meanwhile, Netscape has lost its chance to become a prime Internet development platform.

So, when the US Government won the case and had to suggest a remedy, it was in a quandary. The PC and Internet markets have changed dramatically since this case started. More importantly, Microsoft has had to change direction in order to position itself for the next wave of development, which involves PDAs, WAP phones and other Internet appliances as much as PCs.

By splitting up Microsoft into two companies, one for applications and the other for operating systems, the US Government would give Microsoft a golden spoon. This is because it insists that the browser be developed by the applications company – thus giving Microsoft the ability to create the next web development platform, via its new .Net strategy, regardless of the outcome of the case.

This problem came into sharp focus when Jim Clark, co-founder and chairman of Netscape, blasted the Government move, saying the browser should be with the OS company. But the Government has no choice but to put the browser with the applications group in order to keep its case intact.

As I sat through Microsoft's recent

presentation about its .Net strategy, I sat back and laughed at this whole situation. Microsoft has in essence split itself up already by starting to integrate the browser and applications into a new development platform that, in the end, can sit on top of any operating system, including Linux and Unix – although it will work best with Windows. The important issue is that Microsoft's browser and application tools form the heart of a next-generation Internet development platform and support all the major open standards such as XML and SOAP.

There is a gamble here for Microsoft. It assumes people will be willing to pay for using applications on the new browser-based development platform.

Sun Microsystems, Oracle and most major application vendors also believe that some day this is how software will be used.

But the main point is that even if Microsoft should somehow lose to the Government and is broken up, it will still be the big winner.

PC-based operating systems will become less important even though they will still have the lion's share of this market. And if Microsoft can create a browser/application-based development platform, which works better on devices that have some type of Microsoft OS on board, it will be well on its way towards extending its franchise beyond the PC.

It could actually become an even bigger and more successful company in the future. Put in this light, you can easily see why Bill Gates is doing commercials on TV stating that the 'best is yet to come!'



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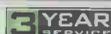
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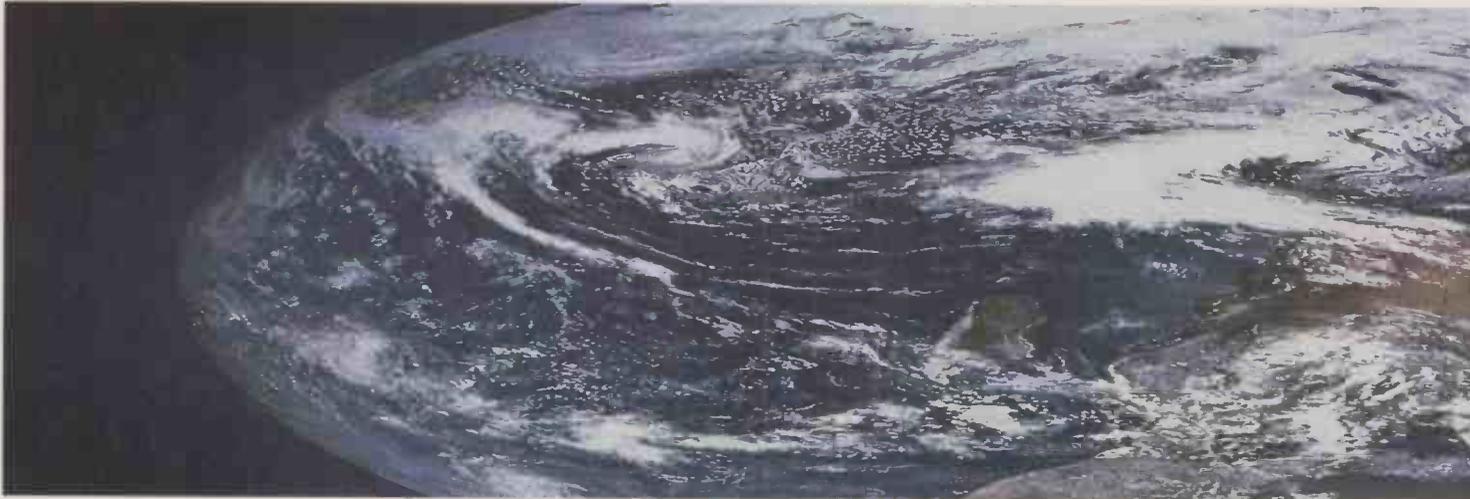
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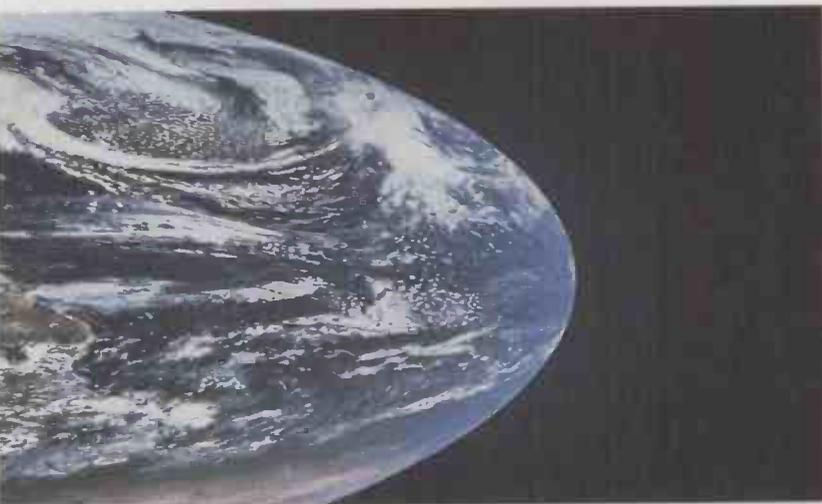
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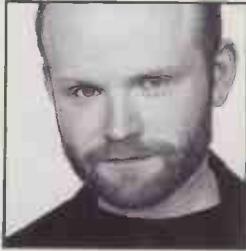
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The Celeron will have a tough time when **the next budget chips are released**, says Gordon Laing.

# The cheap chip challenge



It's hard not to notice that virtually every penny of Intel's advertising budget is spent promoting the Pentium – can you imagine how the poor neglected Celeron feels? On the upside, the Celeron can sleep happy in the knowledge that it

provides a great price over performance ratio to both entry-level buyers and hardware enthusiasts who know how to squeeze every last drop out of it. After all, the latest FC-PGA Celerons running at 566MHz or above are essentially nothing less than Pentium IIIs with half their on-die Level 2 cache and a 66MHz front-side bus (FSB). But get ready for bouts of insomnia, Celeron, as AMD's Duron CPU looks set to give you sleepless nights.

AMD recently had Intel grinding its teeth by releasing ever-faster Athlons. However, like the first PIIIs, the Athlon employed off-die Level 2 cache, running as slow as one-third of the CPU clock. So while Intel and AMD announced 1GHz CPUs within two days of each other,

On the upside, the Duron has 128KB of Level-1 cache, compared to 32KB (16 + 16) on the Celeron which, when added to the Level 2 cache, lets AMD quote a total 'on-chip' cache of 192KB, compared to 160KB on the Celeron. Then there's the issue of the FSB. As a differentiator to its PIII line, Intel still designs Celerons to use a 66MHz FSB and normally drives their memory at the same speed. In comparison, the Duron employs the same Double Data Rate (DDR) technology of the Athlon, thereby chatting to its chipset at 200MHz, albeit only driving memory at 100 or 133MHz, depending on the chipset. It's still a big difference, though.

As we've discovered, the chipset and memory type in a system have a massive impact on performance. Until forthcoming solutions from AMD, SiS, and ALI arrive, the Duron is only officially supported by VIA's KT133 chipset, which is essentially the same as the earlier KX133, except that it supports AMD's new Socket A form factor. With the launch of the Duron and Thunderbird Athlons, AMD is dumping its Slot A CPU interface in favour of the 462-pin Socket A.

A small number of Slot A Thunderbirds have been produced for testing in old AMD 750 chipset systems, but as far as end users are concerned, Sockets are the future. Will we see 'Sloket A' cards, allowing Durons and Thunderbirds to be used in existing Slot A motherboards? Sadly, it looks unlikely, at least for the old KX133 chipset,

which does not support the new CPUs.

So it looks like we'll have to invest in a new Socket A motherboard, although at least these will take both Durons and Thunderbirds. If you're interested in AMD's new CPUs, though, I'd wait until October when VIA's KT266 chipset arrives, supporting new 266MHz DDR SDRAM. A version for Intel CPUs is due a month earlier.

It's certainly an interesting time for budget CPUs. VIA's Cyrix III 'Joshua' chip is a cheap alternative for Socket 370 systems and Intel won't let the Celeron go without a fight. Then again, the Duron seems attractive: at the end of June we checked UK chip prices and found the 650MHz Duron at £89, compared to £90 for the 566MHz Celeron (inclusive of VAT). So long as the high power consumption of the Duron coupled with volume manufacturing isn't a problem, then AMD could again rule the value PC market that Intel fought so hard to capture. Is that the sound of grinding silicon teeth I hear?

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

## Will we see 'SLOCKET A' CARDS, allowing Durons and Thunderbirds to be used in existing Slot A motherboards?

the PIII's full-speed Level 2 cache ran at 1,000MHz, compared to 333MHz on the Athlon – and it makes a big difference to performance. AMD has now re-addressed the balance by matching the PIII's 256KB full-speed Level 2 cache on its new Thunderbird Athlons.

At first glance, the Duron appears to be to the Thunderbird what the Celeron is to the Pentium III – a budget version with cut-down specifications. So saying, it's worth looking at what's hiding under the hood.

Like the Celeron, AMD sells the Duron at slower clock speeds than its premium counterpart. Like the Celeron, the Duron has fast, on-die Level 2 cache, but what's this? Where the Celeron has half of the PIII's Level 2 cache, the Duron has only one-quarter of the Thunderbird – that's 128KB versus 64KB and one-nil to Intel. Look a little closer and those Celerons faster than 566MHz also talk to their Level 2 cache using the PIII's 256bit interface, compared to a mere 64bit interface on the Duron (and Thunderbird).

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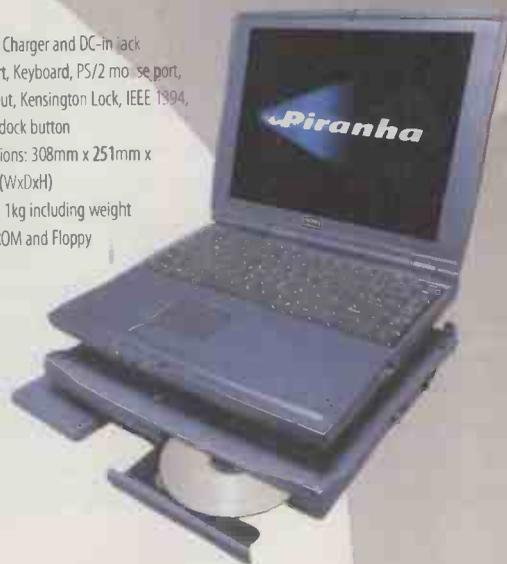
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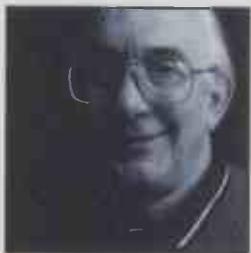
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## Variations on a theme



Americans, with three different and incompatible digital cellphone systems, say they envy Europe's simplicity of a single GSM standard.

But there are already three variants of GSM: the original (used by Cellnet and Vodafone)

works at 900MHz, while Orange and One2One are at 1,800MHz and the GSM services in the US are at 1,900MHz. So dual- or triple-band phones are needed for international roaming. Although it should be possible to take the SIM card from any GSM phone and use it in another, service operators interlock cards, phones and networks. Mobile Internet access, which is creating the need for higher data rates, is further fragmenting the standard.

Wireless Application Protocol (WAP) phones have been available for a year and have been absurdly overhyped. Market analyst Ovum has already pronounced a 'backlash' of consumer disappointment. Setting up a

### In Japan, NTT's DoCoMo I-mode service is a roaring success with **SEVEN MILLION USERS**, blowing WAP away

WAP phone can involve 100 key strokes. So service operators send the settings as an SMS message. But helplines have to be able to help users store and load the settings message. Often they can't.

Telecoms watchdog Oftel has now said it has no powers to stop cellphone companies ripping off consumers with national or premium-rate helplines that cannot help or give wrong advice. Exactly what useful purpose does Oftel serve? Answers on a postcard.

Most networks and services either offer free WAP phones, or give them to anyone who pushes for one. For example, Breathe promises a voice-activated WAP service later this year, with free phones and no subscription.

The third-generation mobile systems will deliver much higher data speeds, but at prices which reflect the £5b each of the five operators paid for their licences and the similar cost of building a new infrastructure. Meanwhile, existing operators are readying stopgap systems, that introduce more incompatibility.

France Telecom just paid £25b for Orange and promises a 'wire-free future'. But the takeover creates a split in standards that will stop New Orange subscribers roaming with multimedia across the English Channel.

In September 1998, Orange promised subscribers a video-cellphone which uses proprietary technology developed by the University of Strathclyde. Although Orange could initially show only mock-up dummies, finished phones are now working. They rely on a 28.8Kbits/sec link obtained by ganging together two 9.6Kbits/sec cellphone data channels and modifying the error correction to increase each to 14.4Kbits/sec.

Orange will use this High Speed Circuit Switched Data (HSCSD) system, delivering 28.8Kbits/sec to laptop PCs and handheld devices with plug-in PC Cards.

Although the promised service launch is now six months late, Hans Snook, chief executive of New Orange, insists it will happen soon. 'The network is all ready to carry HSCSD but we have been hamstrung by hardware supplier Nokia,' he grumped.

Cellnet, Vodafone and One2One have all rejected HSCSD and are readying the incompatible General Packet Radio System (GPRS). This exploits the fact that multimedia devices handle data in bursts, so data from each of several devices can be chopped into labelled packets and the data capacity of several channels pooled. Devices can then transmit and receive bursts at over 100Kbits/sec.

'I have yet to see any GPRS devices,' said Snook. Funny, because Snook's new owner, France Telecom, runs the Itineris network, which started a GPRS service in May and says the whole of France will be covered by the end of the year.

In Japan, NTT's DoCoMo I-mode service is a roaring success with seven million users, blowing WAP away. I-mode can handle conventional HTML, whereas WAP sites have to rewrite their pages. Like GPRS, DoCoMo I-mode is a packet system. Users can be charged for data moved, not time online. A Dutch telecoms provider is working with NTT on a European I-mode service.

So far, the Japanese have been squeezed out of the Western cellphone market by giants Motorola, Nokia and Ericsson. Japan is waiting in the wings to pounce, just as it did with fax machines, VCRs and laptop PCs. The duffness of WAP and the HSCSD-v-GPRS pantomime gives it a window of opportunity.

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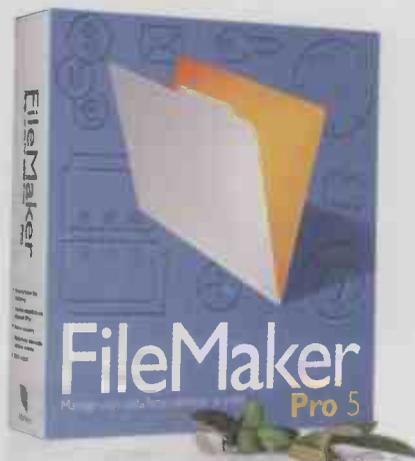
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Cutting out the publishing middleman is attractive, but Brian Clegg doesn't think it'll work.

# To ebook or not to ebook



For trendy businesses the Internet is an unparalleled opportunity – at least until the bubble bursts – but for some, it's a source of fear. A horrible word hangs over book publishers like the blade in Poe's *The Pit and The Pendulum* –

disintermediation (I said it was horrible). All publishers, whether heavyweight book companies, such as HarperCollins or magazine publishers like VNU, are middlemen. They take writers' words, package them, distribute them and extract revenue from the buying public. This is a very necessary service. While desktop publishing and computer typesetting mean it's easy to produce your own book, all you achieve is a mouldering pile of print in your garage. With a million other titles to choose from, chances are WH Smith and friends will turn up their noses at your offering, so it will never reach the public.

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Disintermediation. Of course, this didn't seem a threat until big-name authors started to take part, but Stephen King set the cat among the pigeons by publishing a novella this way. From the publisher's viewpoint, the rot has set in.

Now publishers (not surprisingly) argue that they add value. They point out that most writers have the design sense of a halibut; it's the publisher that adds the zappy cover that makes you want to buy the book. It's the publisher that filters out thousands of unreadable manuscripts. And it's the publisher that delivers the physical book into our hands. In reality, though, many of these arguments are dubious. After all, it's usually an independent designer that develops the cover, and no doubt direct edesign services will spring up alongside ebook vendors.

As for the filtering role, it's certainly true that a published book will usually be readable and relevant – but there are plenty of good books that never make it into print. For those who only buy books by an author they know, there would be no real difference. For the

more adventurous reader, an ebook emporium should be able to give tasters of a much wider range of writer before buying, opening up choice.

While it's easy to shoot down most of the publishers' claims, the one about producing the physical book needs attention. There is something special about a book. It's quite different from a document produced at work, or even a newspaper or magazine. A book might not be ideal for every use – CD-ROM encyclopaedias are demonstrably better – but when you want to sit down and read, a book is compact, robust and kinaesthetically satisfying, as psychologists would say. So what's the alternative? Ebooks on PC monitors are non-starters. A screen is neither clear nor convenient enough for comfortable reading. A palmtop gives you portability, but you lose even more detail – the page is too small and low resolution compared with print – and the device is too delicate to be thrown into a beach bag. Printing isn't a solution either. No-one wants to print off a whole book, and unbound A4 sheets simply aren't practical. The difficulty of reading ebooks makes them currently little more than novelties.

One day, though, the technical problems will be overcome. Last year IBM announced flexible transistors that could be sprayed onto sheets of plastic

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to produce a screen that could be rolled up and stuck in the pocket – a precursor to electronic paper. Recognising that technology will eventually succeed, some publishers are trying to avoid being squeezed out by getting involved themselves. The UK's largest independent business publisher Kogan Page, for instance, is trying out 200 of its titles in ebook form to see what will happen. These will be available alongside printed versions in online bookshops like Barnes and Noble, as well as from ebook sites. But don't expect many ebestsellers. Ebooks will grow in popularity and may eventually kill publishers, but any panic is premature. Traditional books will put up more of a fight than vinyl records ever did.

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We all want **privacy and security**, says David Fearon, but unfortunately they don't go hand in hand.

# A private matter?



I have to confess that on the all-important issue of my electronic privacy, I don't fit the usual mould of Internet geeks to whom it's a subject to get into a screaming rage over. It's just not something I've ever had cause to get worked up about.

I've never produced anything important or revolutionary enough to worry about the security of my emails in the face of possible corporate espionage. And if I thought that any of Her Majesty's finest were taking the trouble to monitor my electronic communiqués, well, I'd probably be quite flattered. At least, that's how I used to think.

Recently, I've had cause to do some research into cryptography. Now governments, even big ones such as the US, are terrified of modern cryptography. It's generally accepted that a decent strong encryption algorithm, such as the IDEA algorithm used in Phil Zimmerman's PGP, will be secure against even the world's most powerful computers for decades to come. Naturally, the fact that a single individual with a PC can hide any digital information from the planet's largest governments makes them a bit nervous.

So, while I'm doing my research and sending emails back and forth, I get sucked into the paranoid mindset of the cryptographer. Have my emails been flagged by some supercomputer buried in Reading because they contain sensitive encryption-related keywords? If the Government's Regulation of Investigatory Powers Bill is passed, that type of scenario may become a reality.

Under the Bill, the UK Government could gain all sorts of powers, not only over encryption schemes, but also the routine interception of plain emails. Hop over to [www.cyber-rights.org](http://www.cyber-rights.org) for more information. Suddenly, and for about five minutes, I become the world's most fanatical electronic privacy campaigner. Then I wander into the living room and switch on the news and my views do a rapid about-turn: the top story is the conviction of nail bomber David Copeland.

It was reported after Copeland's conviction on several counts of murder that he learned how to make bombs via the Internet. A couple of years back, when the mass media jumped at any chance to portray the Internet as a sea of corruption for the sake of a juicy story, I'd have

taken that assertion with a pinch of salt. But now, with so many people having web access, I'm fully prepared to believe that Copeland learned how to build his awful devices solely via the anonymity of the web and it's possible, although I've no proof, that if he hadn't had web access, he would have stood more chance of being noticed by the police before he killed two men and an expectant mother last year.

I walked down Old Compton Street the day before the bomb in the Admiral Duncan pub went off, so the Copeland case is something I've been particularly aware of, but it's something that concerns us all. It's true that we need to be incredibly vigilant where incursions into electronic civil rights are concerned, but at the same time we need to curb knee-jerk reactions of opposition to any government-led surveillance initiatives.

I disagree with electronic rights campaigners that claim a criminal who's going to commit a crime will do it whether the Internet is there or not. As far as I'm concerned it's an undeniable fact that the Internet makes it easier to commit certain types of crime. Whether it's the irresistible ease of firing up Napster and illegally downloading the tune that's been floating around your head, the porn sites that rip off people stupid enough to give them their credit card numbers,

**I'm fully prepared to believe that Copeland learned how to build his awful devices solely via THE ANONYMITY OF THE WEB**

or the darker and thankfully rarer information-gathering forays of the likes of Copeland, that near-perfect anonymity and ease of information retrieval make the web a one-stop shop for the nascent baddie.

The world always needs opposing points of view, and the Internet is no exception. Hopefully, with the governments frantically pulling in one direction and the electronic privacy lobby heaving away in the other, neither side will win the tug of war and we'll end up with a sensible compromise that will allow me to send my emails without fear of a commando raid on my house, but will also go some way to ensuring that deranged monsters, such as Copeland, get stopped before they destroy any more people's lives.

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



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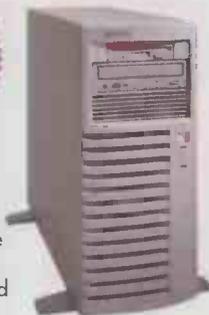
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### PATENTLY CONFUSING

I read the article entitled 'Patently absurd' in the July issue with some concern. The main thrust of the feature was that the granting of patents in the field of computer software is being badly managed. The author even went to the extreme of referring to the 'murky world of patenting laws', 'sinister and self-interested motives' and even to 'a badly policed jungle where might is right and lawmakers are out of their depth'. Words worthy of a thriller!

As a patent attorney I am concerned that this is overly negative and can easily lead the reader to misunderstand the position in Europe. I must confess that I agree the position in the US has swung very much in favour of the applicant for a patent. The US courts have made it quite clear that there is no bar to

patenting computer software even for business methods so long as a 'useful, concrete and tangible result' is achieved.

Hence, not only large software houses but also many small businesses have woken up to the fact that protection is available for their ideas embodied in software. The problem has been that this awakening has caught out the US Patent and Trade Mark Office and it is taking steps to improve the quality of the examination process.

The position in Europe is, I believe, much better. The procedure for granting patents in Europe before the European Patent Office and the UK Patent Office generally takes much longer. Under European practice a patent will only be granted for an invention, which is a technical advance.

It is generally acknowledged that it is more difficult to get a patent in Europe than in the US. Unfortunately (or in some minds fortunately) there has been very little litigation in Europe in the field of software. This can be attributed partly to the time delay in getting patents granted in Europe. However, I believe that the main reason is the bias in the US towards the patent owner: under the US system there is a strong assumption that the patent is valid and the courts will try to interpret the patent as being valid once granted by the US Patent and Trade Mark Office.

With regard to the global issue, the patent laws as they exist are restricted to national jurisdictions. Thus a software dealer or manufacturer must consider the US law if the US is a market for the software or if the Internet is involved. Also, because of the global nature of the Internet, any Internet developer providing a commercial presence on the web must give due consideration to the situation in the US.

DR JOHN COLLINS

### NIALL MAGENNIS replies >

Dr Collins was also kind enough to clarify some issues covered in our feature. The first was our definition of 'obvious/non-obvious' as used in patent law. In Europe any public disclosure any-

where in the world, by whatever means, of the technology prior to the filing of a patent application will invalidate a patent so long as it discloses sufficient detail to enable someone to understand and make the invention.

The situation in the US is more complex. There, the patent system is based on the principle that the first person to invent something is entitled to a patent, whereas in Europe the first person to file a patent for an invention not previously in the public domain is entitled to a patent. The US operates a 12-month grace period during which disclosure of the invention by the inventor(s) will not invalidate a subsequently filed patent.

Also we said that 'an idea or a process may not be patented'. While it is correct to say that ideas on their own are not patentable, an idea or process can be patented if it is embodied in a physical product. Software certainly comprises a physical product when carried by a medium such as a floppy disk or an FTP protocol signal over the Internet. This is the physical entity that is purchased: software as an idea is not what is purchased.

### PLAYING FINANCIAL RUSSIAN ROULETTE

Deciding the time was right to buy a PC, I searched all of the main brands, but in the end decided to build my own.

I created a spreadsheet with ratings and prices for the various products suitable for my PC. That came out at £1,620 inc VAT, which was above my £1,500 limit. Having 14 weeks before I started my A-Level computing course I thought I'd wait a bit until the price decreased and then I could start building... but this was not to be.

Within a few days, the hard drive I was planning to buy increased by a few pounds, and then the memory shot through the roof, jumping by almost £50. I dropped the spec to something a little less nippy costing £1,550 and contemplated starting - but I disciplined myself as, once again the prices of components rose.

Why is it that the components fluctuate so much when the demand and supply does not change much - especially with RAM? Surely individual components should fall in price rather than increase. I have decided to hold



back from building a PC at the moment and will use the school facilities.

STUART HOLYWELL

## SCOTT MONTGOMERY

replies > *There's always a bit of financial Russian roulette involved in building a PC from scratch, and you regularly find yourself stung by prices dropping mere days after you've parted with your cash. The reason for these fluctuations range from varying exchange rates, to geographical disasters hitting the producing countries. Computer fairs are a good place to pick up some bargains, but apart from that it's all patience and opportunity buying. Follow the prices for the*

*parts you want and when you think they've bottomed out, buy them – and don't look back...*

## POWER OF A COUCH POTATO

PCs are getting cheaper, Internet access is now more or less free and almost half the homes in this country are connected. Like the video recorder, the PC has become a standard household item. But that could all be about to change, due to the power – or lethargy – of the couch potato who has no interest in computers or the net, because 'it ain't on TV'. So, if they won't get off their backsides, the new technology must come to them.

And what better way could there be to reach them than through their TVs?

In the near future TVs will not only show endless repeats, but also function as computers, DVD recorders and phones. The computers in these new combinations will be like many TV programs – dumbed down (half the population still haven't worked out how to program their videos yet). When the new, do-it-all, TVs begin to make an impact, their prices will fall rapidly until almost every home has one. Is it possible that the common PC will become a specialist item? If so, it follows that it will have a specialist price. Still, we'll all be happy to pay more for our PCs if it means one couch potato can use their TV to look at and talk to another couch potato, eating pizza. Won't we?

ALAN AITCHISON

## NIK RAWLINSON replies >

*I don't doubt that the PC as we know it will become a specialist item. Even today there is little incentive to buy a fully-fledged computer when something like a Dreamcast or PS2 will do everything you need. As for programming the video, let's hope that the TV-connected net appliances of the future will be as foolproof as a toaster or we're in for trouble. See Reviews p71*

## LETTER OF THE MONTH

### I WANT TO BREAK FREE...

I had to reply to Richard Lee's letter, 'Deny responsibility and let the users suffer' in the July issue of PCW. I agree that buying proprietary software is like buying a car with the bonnet welded shut: if it breaks down, you have to pester the manufacturer for a fix. If they don't give you one, you're out in the cold.

The software market is a free one; so it follows that if licence agreements that disclaim warranty are prevalent, it is because computer users have decided it doesn't matter that they will be helpless in the event of a software fault. We have accepted such licence agreements, and so we must take at least part of the blame for today's problem.

There is an alternative to proprietary software: GNU-style free software (see [www.gnu.org](http://www.gnu.org)). 'Free' in this instance refers to freedom, not price. Here, the bonnet is not welded shut; users have source code available and are free to take the software to any programmer and pay them to fix it, just as it is possible to take a car to any mechanic. The developers of

free software almost always disclaim warranty, but that doesn't matter in this instance as users are not helpless – they can have the software fixed themselves in the unlikely event that the developers are unwilling to do so. Not being able to sue the developer is a small price to pay for such freedom.

So a strong argument for not forcing software developers to give users warranties is that, if such a law were passed, free software development would have to cease. Free software developers usually work collectively; no one individual or company has exclusive control over what goes in. Such people cannot afford to take responsibility for their own and others' mistakes. A law such as Mr Lee describes would also curb software development in academic institutions and in non-profit settings. It would be possible to force only large software companies to give warranties, but this is discriminatory: everyone is entitled to equal treatment under the law.

Consumers have power over businesses in a free market. If we want to

solve the problem of proprietary software with no warranty, we must all choose software that doesn't have these problems. I have moved over to Linux for this and many other reasons. I no longer use any proprietary software at home, because I do not want to support companies that deny me freedom.

ANDREW MEDWORTH

### CLIVE AKASS replies >

*Open-source software is not yet ready for the mass market, as Linux guru Linus Torvalds recently admitted; users who can barely cope with Windows cannot be expected to mess with source codes and version control. Warranties seem a good idea but they would bog down development: I'd rather have a 98 per cent working Windows 2000 now than a perfect, legally watertight version in 2020. Warranties are not workable because you cannot guarantee the unguaranteeable: no-one can be absolutely sure complex software is bug-free. Products are, in practice, released when the bug level is considered tolerable. Commercial pressure being what it is, that is too early too often. But if a product simply does not work you still have recourse to the law.*

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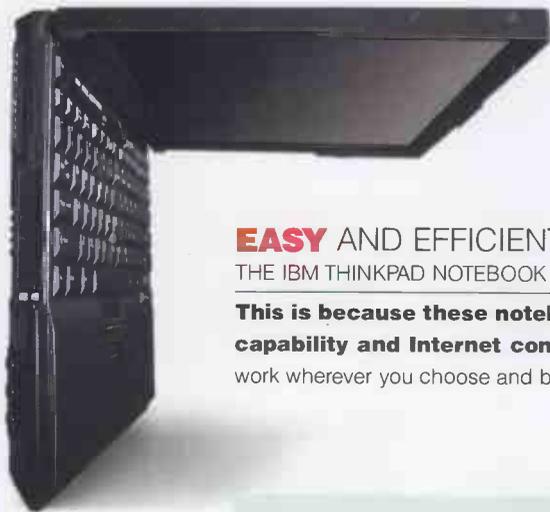


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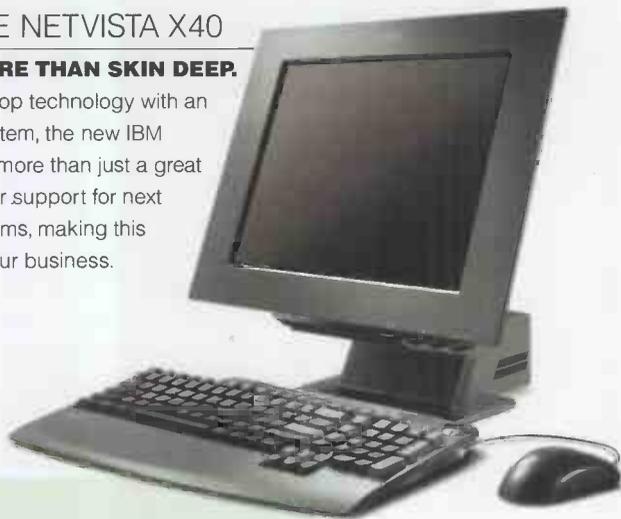
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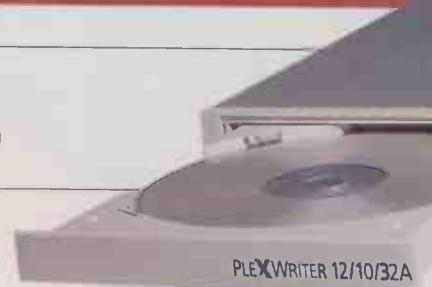
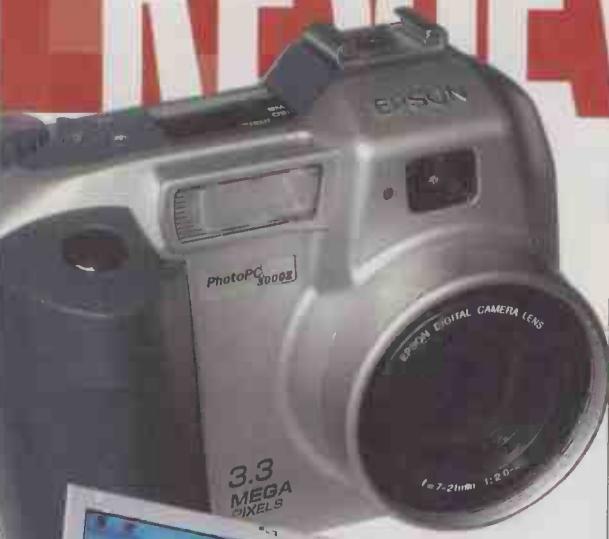
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**Jason Jenkins**  
SENIOR STAFF WRITER

# The end is nigh for today's PC

**M**any have predicted the end, but few could say for sure when it would come. Now we have a better idea. The Internet TV we have reviewed on page 85 doesn't mark the end of the road for the PC as we know it, but it brings us one step closer.

The PC market has seen astronomical growth over the past few years, fuelled by consumers. They have been buying PCs for three main reasons: to use programs like Word, Excel and PowerPoint, to play games and, crucially, to access the Internet. To do all three, however, has meant that consumers had to buy a machine with components many times

and other products like it, will remove the need to buy a PC specifically to access the Internet. Like consoles, Internet TVs are true plug-and-browse devices, with no system hangs, reboots or corruptions. Admittedly, the Internet is not currently designed to be viewed on your average television, but as surely as there are now pages optimised for viewing on a mobile phone, more and more sites and content will be changed to accommodate the lower resolution of a telly.

So, if you don't need a PC to play games or browse the Internet, what do you need one for? This is the question most PC manufacturers are asking themselves. They've done some

## The PC will become much more of a specialist device, rather than a consumer 'must have' item

more powerful than those used to put men on the moon. This type of machine is often fantastically expensive and no sooner has it been bought, than the tremendously powerful components start to look less impressive as new ones are brought to market, instantly wiping a third off your investment.

And, of course, the story never ended there – configuration problems, crashes, lost data, reinstallations: you name it, and every PC will experience it at some stage in its lifetime.

Games consoles have been around for donkey's years, but now more homes than ever play host to one. And with the upcoming launch of the Playstation 2, together with the ever-expanding reach of the Dreamcast, that trend is set to continue. Consoles don't have the same problems as PCs. They are cheaper to buy and they just work – put a disc into a console and you'll be playing games in no time. Try and do the same thing on a PC and you'll probably be downloading new drivers for the next half hour before you can start.

The Internet TV we had in our offices,

predictions and their figures make gloomy reading for them. But it would be wrong to write off the humble PC just yet. What we will see over the coming months and years is the PC becoming much more of a specialist device, rather than a consumer 'must have' item. This is why PC vendors are starting to diversify. High-end workstations, video-editing machines and professional-standard music PCs are being sold by an increasing base of manufacturers in an attempt to protect themselves when their core market – consumers buying a PC for surfing the Internet, gaming and wordsmithing – collapses.

The era of the PC as an all-encompassing consumer device is coming to an end, and a good thing it is too. Despite hardware and software designers' best efforts, the PC is still not a consumer-friendly plug-and-play device, and it never will be. The sooner we get to the stage where accessing the Internet is as simple as plugging in a new television, the faster the promised social and economic benefits of the Internet will become evident.

### ratings

- ★★★★★ EXCELLENT
- ★★★★☆ VERY GOOD
- ★★★☆☆ AVERAGE
- ★★☆☆☆ BELOW AVERAGE
- ★☆☆☆☆ POOR

# Panrix Fusion SCSI 933

The first dual-FC-PGA system is impressive – and a 22in screen is thrown in for good measure.

Over the past few months we've tested several interesting dual-processor systems, but all have had one thing in common: they employ Slot 1 Intel CPUs. While there's essentially no performance difference between, say, a 933MHz PIII in Slot 1 or socketed FC-PGA housings, the one crucial problem for high-end workstations has been the lack of dual-FC-PGA motherboards.

Until now that is. At June's Computex show in Taiwan, several manufacturers showed dual-FC-PGA motherboards, and Panrix is the first to build us a system with one. Panrix has plumped for an MSI 694D Pro, based on a VIA Apollo Pro 133A (694X) chipset. This supports AGP 4X and an UltraDMA33/66 IDE hard disk controller. In addition, Microstar's motherboard has four DIMM slots housing up to 2GB of SDRAM, and enthusiasts will welcome 11 overclocked FSB (front-side bus) speeds between 133MHz and 200MHz. Versions of the motherboard are available with a 1394 (FireWire) controller, and a Promise UltraDMA100 controller, which can talk to an additional four IDE drives.

At the business end, Panrix has fitted a pair of speedy Intel Pentium III 933MHz FC-PGA CPUs and a pair of 128MB PC133 DIMMs; that's a total of 256MB, and two spare memory slots. Graphics are supplied by a Hercules 3D Prophet, based on the supremely quick nVidia GeForce 2 GTS chipset, with an impressive 64MB of DDR memory. The card features TV output via an S-Video socket with composite converter, and a DVI digital display connector, along with the conventional analog VGA port.

Complementing the graphics card is a good 22in Mitsubishi Diamond Plus 200 monitor with a perfectly flat Diamondtron NF aperture-grille tube with a 51cm/20in viewable diagonal. With a maximum horizontal scanning frequency of 108KHz, it'll handle impressive non-interlaced resolutions up to 1,800 x 1,440 at 72Hz. There's also a

pair of 15-pin VGA ports and a USB upstream port to control the monitor.

On the storage front, as the system name suggests, Panrix has fitted a SCSI hard disk: a Quantum Atlas 10K 18WLS 10,000rpm Ultra 160 drive, connected to

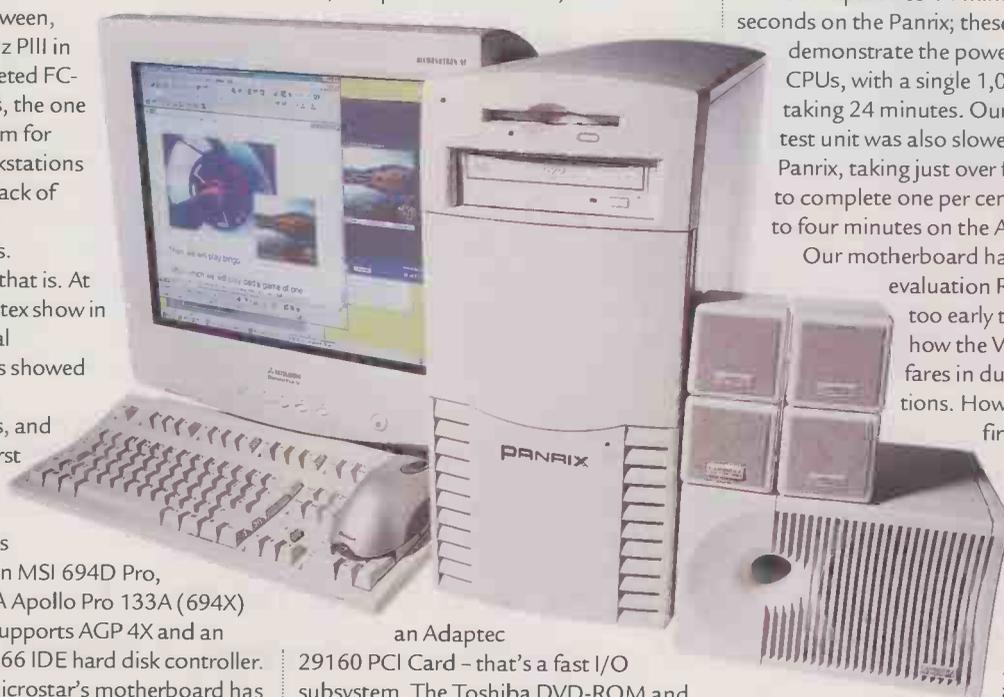
score of 115fps compared to the Armari's 107fps, although its graphics card had double the memory. The Armari was fractionally faster in our 3D Studio Max test, taking 14 minutes to render our test frame compared to 14 minutes 10 seconds on the Panrix; these results

demonstrate the power of dual CPUs, with a single 1,000MHz PIII taking 24 minutes. Our Seti@home test unit was also slower on the Panrix, taking just over five minutes to complete one per cent, compared to four minutes on the Armari.

Our motherboard had an evaluation ROM, so it's too early to conclude how the VIA chipset fares in dual configurations. However, as the first dual-FC-PGA system we've tested, coupled with a very high SYSmark 2000 score, it's an

impressive start. By employing SDRAM, Panrix's system is cheaper than Armari's while additionally boasting Ultra 160 SCSI and a 22in monitor – it may not match the build quality of Armari's workstation, but all in all it's an impressive and capable system.

GORDON LAING



an Adaptec 29160 PCI Card – that's a fast I/O subsystem. The Toshiba DVD-ROM and HP 9100 CD-RW drives are, however, connected to the secondary IDE channel on the motherboard. The case can also accommodate a pair of 3.5in and one 5.25in drives, and Panrix has installed two extra cooling fans along with a 300w power supply.

The system also features an Ethernet card, an internal 56K PCI modem, and a Creative Labs SoundBlaster Live 1024 Player card; a Cambridge SoundWorks PCWorks FourPoint Surround speaker system is also included. This leaves the system as supplied with only one free PCI and an unused CNR slot but, to be fair, virtually all bases are covered.

As befits a dual-CPU system, Panrix has installed Windows 2000, and it scored an impressive 200 in SYSmark 2000 – compare this to last month's Armari dual-933 system that mustered a score of 189. Both systems featured a pair of 933MHz Pentium III processors, 256MB of RAM and GeForce 2 GTS graphics cards, but the Armari used an UltraDMA66 hard disk and 840 chipset talking to expensive PC800 RDRAM, compared to the Panrix's Ultra 160 SCSI hard disk and a VIA chipset with PC133 SDRAM.

In Quake III, the Panrix won, with a

## DETAILS

★★★★★

PRICE £3,871.63 (£3,295 ex VAT)

CONTACT Panrix:

0113 244 4958

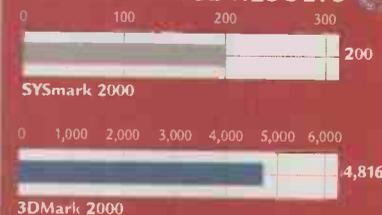
[www.panrix.com](http://www.panrix.com)

**PROS** Very quick. First dual FC-PGA system

**CONS** None to speak of

**OVERALL** A very impressive performer, proving you don't need RDRAM

## PERFORMANCE RESULTS



# Mesh Matrix GT Ultra

If you need a 1GHz Athlon system **this PC has the speed you need** but check the motherboard.

**A**MD beat Intel to a 1GHz processor by a whisker, but the processor had slower, off-die cache. This gave the old Athlon a large performance bottleneck compared to the 1GHz Pentium III with full speed, on-die cache. Last month we took a look at the new Athlon (codenamed Thunderbird) designed to address this problem, and this month Mesh has submitted a system with that processor clocked at 1GHz. This features 256KB of on-die Level 2 cache, and with the Athlon's impressive architecture, should be able to give the equivalent Pentium III (still in short supply) a run for its money.

The 1GHz processor inside this machine is Socket A, and is produced using 0.18micron process technology - there can be no doubting that this is AMD's flagship product at the moment. There is a problem with this form factor, though - motherboards. It's the same problem that has dogged the company for years - there are simply not enough Socket A boards out there at the moment. They will come, sure, but for now end users and system integrators have a severely limited choice.

This explains why Mesh has given us a seemingly crazy choice of board - an MSI 6340, which is a Micro ATX model. There is no way a system costing over £2,000 should come with a Micro ATX board, especially as it is mounted in a full-size ATX case. Mesh knows this, and promises to have a full-size ATX board available when the system ships. Given the current situation, it is unable to commit to a certain model, except to say that it will be based on VIA's KT133 chipset. This means the board will have support for PC133 SDRAM, AGP 4x and UltraDMA 66. On the machine sent in for review, only one PCI and one memory slot are free, together with the solitary CNR.

A whopping 256MB of PC133 SDRAM is supplied, all on one stick. If you are paying for the extra processing speed, you might as well opt for more than 128MB of memory, so it's good to

see it here. A huge 60GB hard drive sits in one of the internal bays - it is one of the 7,200rpm drives from IBM's new Deskstar range (see page 109). The bay it is housed in has been turned sideways and by pinching a clip, you can quickly and easily pull it out.

A Philips eight-speed write, four-speed rewrite, 32-speed read CD-RW drive is

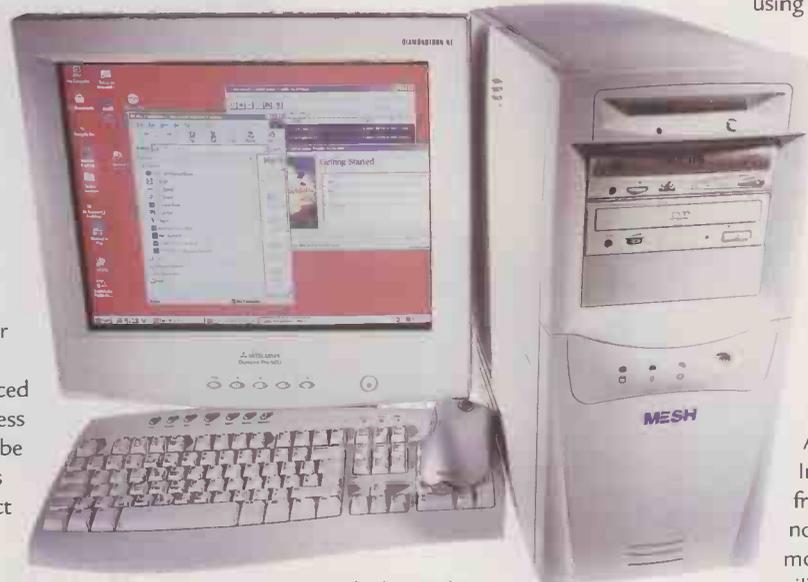
is pretty fast. Interestingly, on our SYSmark 2000 benchmark it scored one point less than the Dell 1GHz Pentium III featured in our June issue, but in 3D it really took off. Our Quake III time demo was completed with an average frame rate per second of 104.6 - so if you have a bottomless wallet and are looking for an ultimate games machine, then this could fit the bill. We also ran our test 3D rendering scene using 3D Studio Max. This

took 23 minutes 9 seconds to render, slower than the Panrix dual-Pentium III 933 PC reviewed opposite, proving that two processors are better than one when it comes to this kind of operation.

This machine shows off the potential of the 1GHz new Athlon well, and it's good to see that AMD has caught up with Intel on the performance front. Because we could not properly evaluate the motherboard this system will finally ship with,

together the fact that it is a tad on the pricey side, we could not award the full five stars. If you are one of the few that needs a 1GHz processor, then this well-built PC could be the one for you, albeit with a bit of further research first.

JASON JENKINS



supplied, together with Nero Burning ROM version 5, to help you create your CDs. Should you wish to copy on the fly, you can use the Pioneer DVD drive, a DVD115. InterVideo DVD is provided so that you can watch films. A 56K PCI modem is present too.

Sound comes from an OEM version of Creative's SoundBlaster Live 1024, with coloured connectors as opposed to the golden ones sported by the retail version. This card did not have a CD-SPDIF connector, which is something of a cheap omission for a machine of this price. You can listen to the sound it generates using the Labtec LCS-2514 speakers, which consist of four satellite speakers and a subwoofer.

The monitor is the excellent Mitsubishi Diamond Plus 91. This 19in model uses a Diamondtron NF screen to generate an excellent image, and is a good choice for a machine in this price range.

The amazingly fast Hercules 3D Prophet II, with 64MB of DDR memory, provides the image and 3D acceleration. This GeForce II GTS card is reviewed on page 99, and it really give this system a kick in the 3D stakes.

Speaking of performance, this machine

## DETAILS

★★★★

**PRICE** £2,583.83 (£2,199 ex VAT)

**CONTACT** Mesh 020 8208 4706

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

**PROS** Speedy system; good monitor, hard drive and lots of memory

**CONS** A little pricey, no CD SPDIF connector

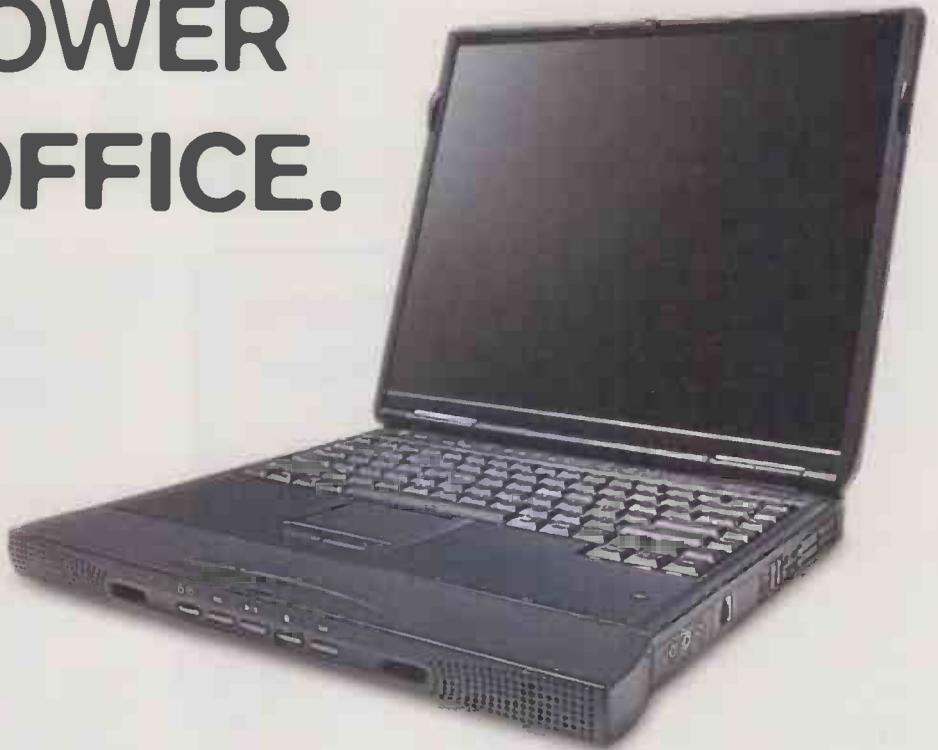
**OVERALL** Worth consideration if you check which motherboard it will ship with first

---

### PERFORMANCE RESULTS

0	100	200	300			
				183		
<b>SYSmark 2000</b>						
0	2,000	3,000	4,000	5,000	6,000	7,000
						6,791
<b>3DMark 2000</b>						

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# Dell Precision 420

Linux's growing popularity gets a boost as Dell entrusts its latest high-end workstation to the OS.

**A** sure sign of Linux's growing popularity is that vendors are starting to offer it as a pre-installed OS. Until recently, this has largely been confined to specialist Linux system builders such as Penguin Computing, Digital Networks UK or the large US company VA Linux Computing. Now, though, mainstream corporate vendors are starting to preload Linux and Dell is one of the first to deliver.

The Precision Workstation 420 is a high-end workstation system. The mid-tower case can be opened without tools and internal components, such as the PSU and drive cage, can be released with latches and swung out on hinges for access to the i840-based motherboard. This supports dual Pentium III processors running at up to 1GHz and up to four RIMMs; the review machine had two 64MB modules for 128MB of dual-channel RDRAM.

The highly-integrated motherboard includes Cirrus Logic sound, 3Com Fast Ethernet and Adaptec Ultra2 Wide LVD SCSI controllers. The only expansion card fitted is a Diamond nVidia TNT2 32MB graphics adaptor driving a flat-screen 19in Dell UltraScan Trinitron monitor, leaving the four 32bit PCI slots and one PCI/RAID port free.

Internal components include an 866MHz Pentium III with a 133MHz front-side bus (FSB) and full-core-speed 256KB secondary cache, an 18GB Quantum Atlas Ultra2 SCSI hard disk, LiteOn 48-speed ATAPI CD and an ATAPI Iomega Zip250 drive.

It is certainly a powerful and expandable high-end workstation with very few corners cut. However, all-SCSI storage might be more preferable and the 3D card, while ideal for gamers, is somewhat wasted in business use. However, the real interest lies in the operating system installed: RedHat Linux 6.1. (Since this machine was supplied, Dell has upgraded this to Red Hat 6.2.) When appropriately configured with a

GUI desktop, Linux isn't much harder to use than Windows or any other graphical OS; the hardest part is often getting it installed. Buying a pre-configured system is therefore attractive, as the vendor does this for you, but what matters is how well the job is done.

The system boots into the Linux loader, LILO, offering a choice of kernels – the default multiprocessor one and one for single-processor machines. Choosing either takes you straight

settings: a 20MB boot partition close to the start of the drive, a 5GB (root) partition, 2GB home and 10GB usr volumes, plus 128MB of swap space (larger for machines with more memory).

There were some niggles, though. The mount point for the Zip drive was created as a symbolic link instead of a directory, which had to be corrected before the Zip drive could be used, and the GNOME desktop icon for the CD-ROM drive didn't work correctly.

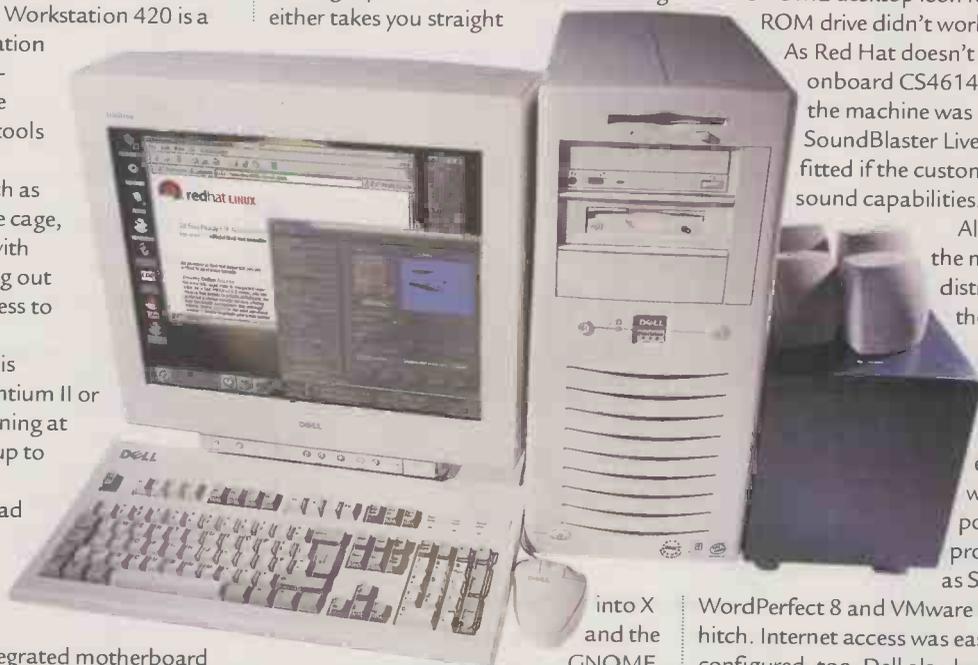
As Red Hat doesn't support the onboard CS4614 sound chip, the machine was mute; a SoundBlaster Live will be fitted if the customer requests sound capabilities.

Although it's the most popular distribution in the US, Red Hat is quite spartan, with few added extras, but we tried popular programs such as StarOffice,

WordPerfect 8 and VMware without a hitch. Internet access was easily configured, too. Dell also bundles 90 days' free phone and email support through LinuxCare alongside the three-year on-site warranty.

The system has some teething problems, although they aren't critical and as shipped it was usable – but they would require some Linux expertise to repair. Once these are smoothed out, though, this will be an excellent high-specification Linux workstation.

LIAM PROVEN



into X and the GNOME

login screen. There's only one pre-configured user account, root, with no password. Logging in as root reveals a standard GNOME default desktop, but with Dell-logo wallpaper. The installation is largely a default Red Hat one with some minor tweaks, such as the AfterStep window manager offered as an alternative to Enlightenment.

Most of the system's hardware was correctly configured. XFree86 was correctly set up for the graphics card with a default resolution of 1,024 x 768, the SCSI controller, Ethernet, Zip and CD-ROM devices were all configured, and TCP/IP was set to auto configure itself using DHCP. Red Hat's linuxconf tool made it easy to check and adjust the various parameters, and a Dell directory of drivers and basic documentation was provided on the hard disk to accompany a slim paper manual introducing Red Hat Linux.

One area where Linux is more complex than Windows is disk partitioning. Dell has chosen sensible

## DETAILS

★★★★

PRICE £3,053.83 (£2,599 ex VAT)

CONTACT Dell 0870 152 4699

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

**PROS** Well-built, high-specification hardware; reasonable Linux configuration

**CONS** Some rough edges to Linux configuration; no sound support; no ISA slots

**OVERALL** A good first try. Dell's inexperience with Linux shows, but the problems are minor and the hardware is excellent

# Sharp PC-AX10

An ultra-slim, lightweight notebook with an exceptional screen and power to die for.

The days when notebook computers were the sole domain of high-flying executives with company gold cards are long gone. That said, portable PCs still cost significantly more than their stationary counterparts and if it's a top-performing ultra-portable that takes your fancy then prepare to say goodbye to a fair wad of cash.

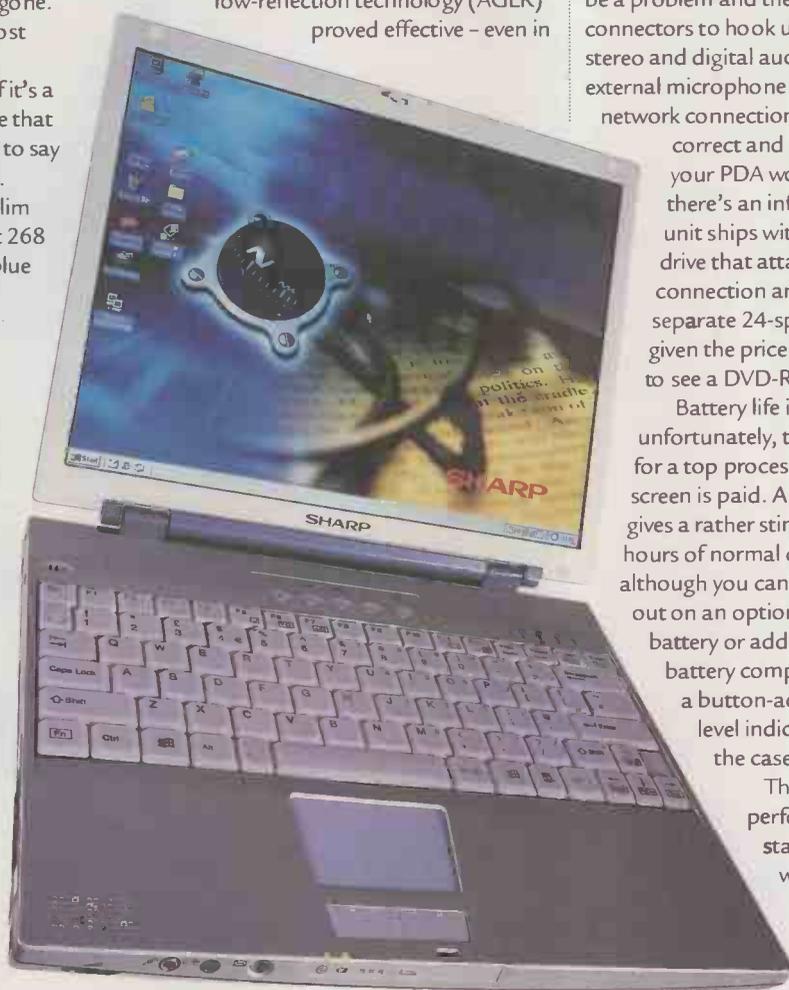
With a lightweight, ultra-slim design (the unit measures just 268 x 223 x 28mm) and metallic blue casing, Sharp's latest model caused quite a stir when it landed on the PCW testing tables. However, looks and diminutive stature alone do not a great machine make, so it's just as well it proved more than capable in our bench tests as well.

The Sharp makes good use of a 500MHz Mobile Pentium III processor coupled with 64MB of RAM, and can be further expanded to 192MB of RAM. The chip's 256KB Level 2 cache, coupled with a decent clock speed, means it can ship data around swiftly and, because the it's designed for mobile use, it does this incredibly efficiently. No wonder the machine managed to notch up a score of 90 in our SYSmark 2000 test. Although we have seen 500MHz notebooks turn in scores over 100, it's a more than respectable tally, and the unit had no problem running several office applications at once.

An onboard Rage Mobility M chip with 4MB of memory takes care of graphics, with sound handled by a chip from Crystal. Both a mono-speaker and microphone are built into the casing.

The screen is one of the most important parts of a notebook and, thankfully, TFT screens have come along in leaps and bounds in recent years. They can now be constructed more efficiently with fewer components making for thinner, brighter panels and Sharp's 12.1in screen is as good as they come. It proved capable of displaying a stable, clear image at the optimal 1,024 x 768 resolution with not a dead pixel in sight.

This is one machine we'd be happy to use on a daily basis even over our desktop PC without fear of eye strain. The anti-glare, low-reflection technology (AGLR) proved effective - even in



Luckily, it scores well. With two USB ports and two Mini-USB ports, connecting the latest peripherals won't be a problem and there are also connectors to hook up a monitor, plus stereo and digital audio outputs and an external microphone input. Modem and network connections are present and correct and synchronising with your PDA won't be a problem as there's an infra-red port. The unit ships with a separate floppy drive that attaches via a Mini-USB connection and there's also a separate 24-speed CD-ROM, but given the price tag we would prefer to see a DVD-ROM drive.

Battery life is crucial but, unfortunately, that's where the price for a top processor and an excellent screen is paid. A standard battery gives a rather stingy 1.3 hours of normal operation, although you can always shell out on an optional high-capacity battery or add a cell to the second battery compartment. There's a button-activated battery level indicator on the front of the case.

The Sharp is a top performer by today's standards and well worth a look for those who like the styling.

RICHARD  
MCPARTLAND

direct sunlight we could make out an image.

Unfortunately, anti-glare isn't a phrase you could easily apply to the keyboard. The decision to use purple keys and black legends isn't the wisest of design choices, however it's a minor quibble as the keyboard itself is responsive and the touchpad is equally good. Inside the machine there's a 12GB hard drive, which should be more than adequate for most users, and a 56K fax modem and network card to get you connected to the Internet or your network. Although the unit ships with Windows 98, all the relevant Windows 2000 drivers are included, so if you want the Sharp to integrate with your office environment you'll have no problems.

Expansion and connectivity are likely to be important whether you're using the notebook as your main or mobile PC.

## DETAILS

★★★★

PRICE £2,109.13 (£1,795 ex VAT)

CONTACT Sharp 0800 262 958

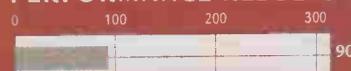
[www.sharp.co.uk](http://www.sharp.co.uk)

**PROS** Powerful, good-looking machine; excellent quality screen

**CONS** Garish keyboard; no DVD-ROM drive; battery life using standard cells could be better

**OVERALL** If you are after a capable ultra-portable machine with an exceptional screen that will meet your needs for some time to come, the Sharp comes highly recommended but battery life seems a little low

## PERFORMANCE RESULTS



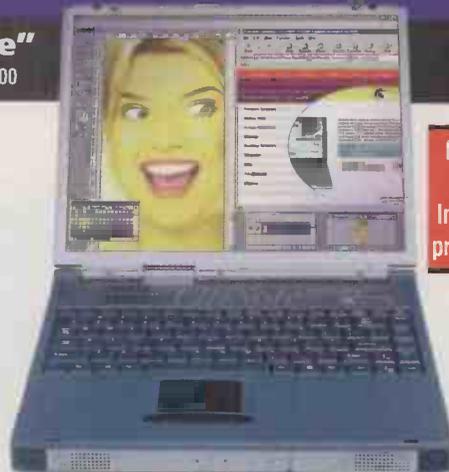
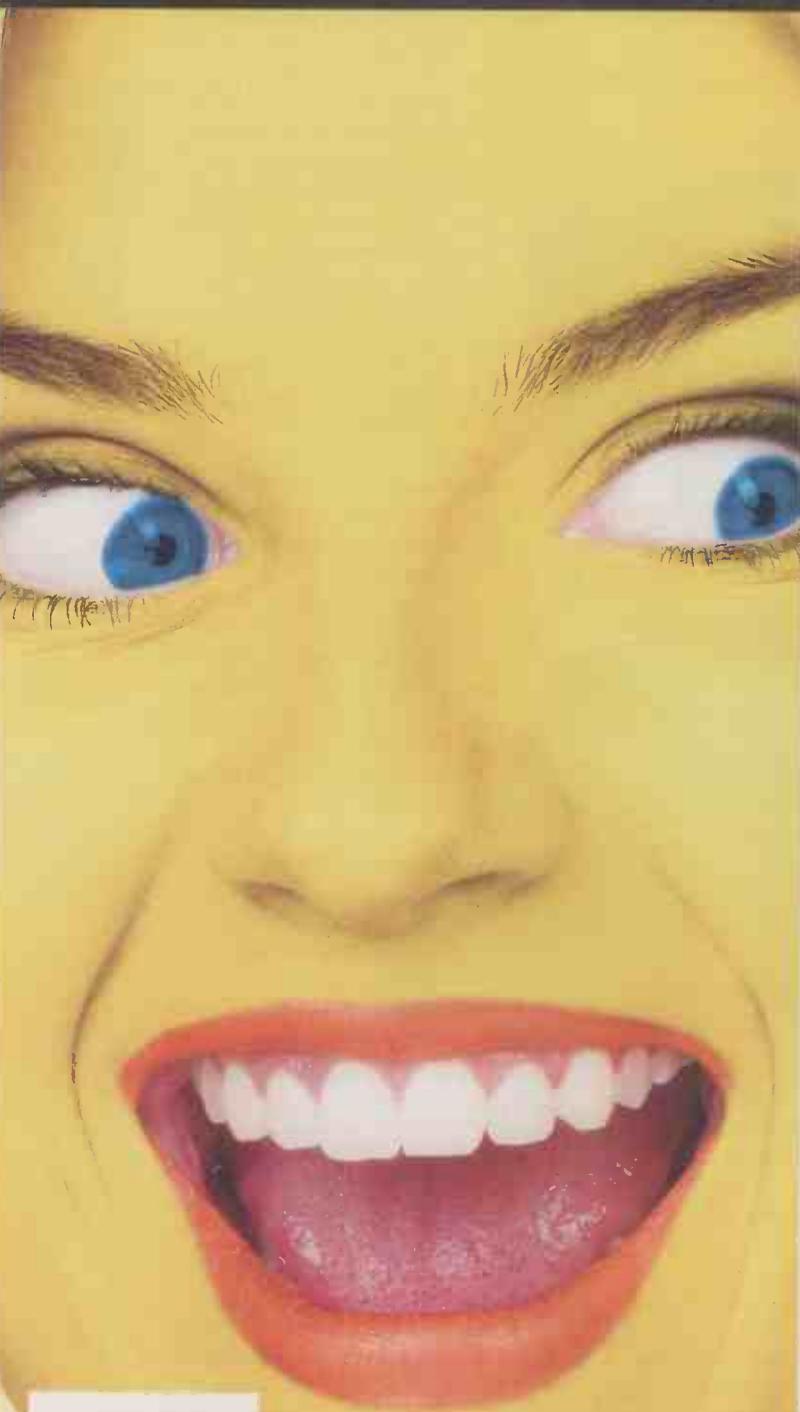
SYSmark 2000

# Performance scores exceed anything we've ever seen from a portable PC

PC Advisor, July 2000

**"An incredibly fast notebook at a great price"**

Personal Computer World, July 2000



Now even faster with a Mobile Intel® Pentium® III processor 750MHz

A clear winner with the PC press, the UltiNote AS8400 has received awards from July issues of PC Advisor, Personal Computer World, What Laptop and PC Direct. Lightweight and power packed, the AS8400 really kicks it at the cutting edge of portable computing. "At 700MHz its performance score blew us away" PC Advisor, July 2000. With its Mobile Intel® Pentium® III processor featuring Intel® SpeedStep™ technology, the AS8400 is making friends in the press and has the awards to prove it!

ASUS/HI-GRADE ULTINOTE AS8400-600	ASUS/HI-GRADE ULTINOTE AS8400-750
-----------------------------------	-----------------------------------

Mobile Intel® Pentium® III processor 600MHz  
- Intel® SpeedStep™ technology  
(The processor may be reduced to a lower operating speed when operating on battery power)

Mobile Intel® Pentium® III processor 750MHz  
- Intel® SpeedStep™ technology  
(The processor may be reduced to a lower operating speed when operating on battery power)

256K cache on-die  
Intel® 440BX-100  
128Mb SDRAM exp. 320Mb  
6Gb hard disk  
14.1" TFT XGA colour LCD

256K cache on-die  
Intel® 440BX-100  
192Mb SDRAM exp. 320Mb  
12Gb hard disk  
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S3 Savage MX 2x AGP graphics accelerator with 8Mb video RAM, PCI Aureal 3D-effect sound

S3 Savage MX 2x AGP graphics accelerator with 8Mb video RAM, PCI Aureal 3D-effect sound

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Built-in 56K V90 data/fax modem

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Built-in 10/100Base-T Ethernet

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Inc VAT

**£1899** **£2231<sup>33</sup>**  
Inc VAT

### STANDARD ULTINOTE 8400 FEATURES

Internal 1.44Mb floppy disk drive • 8 cell Li-ion smart battery (2 - 2.5hrs) • two PC-cards slots (support zoom video mode) • ports: fast serial, enhanced parallel, PS/2 keyboard/mouse with Y-cable, FIR port (4Mbps), TV out (NTSC/PAL), headphone/speaker out, m/c 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® 98 (optional NT) • Lotus SmartSuite Millennium • IBM ViaVoice 98 Office with headset • Norton AntiVirus™ and Ghost • leather carry case • 1 year return to base warranty for labour and parts.

### 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

Notebooks	up to 2 years	up to 3 years
Collection & return including parts & labour	£85	£160

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1999 Hi-Grade Nolino Range



May 2000 Hi-Grade Ultis PV3



June 2000 Hi-Grade Nolino AS7200



July 2000 ASUS/Hi-Grade UltiNote AS8400



July 2000 ASUS/Hi-Grade UltiNote AS8400



July 2000 ASUS/Hi-Grade UltiNote AS8400

# A top notch buy for users on a budget

PC Plus, June 2000 (AS7200)



"The AS7200 is good looking with a high quality screen and keyboard and a battery performance of over three hours that outshines all others in the group." PC Plus, January 2000. "The Notino AS7200 stands out with its great build, impressive performance and long battery life." PC Direct, April 2000. The Notino AS7200/AS7300 is the perfect choice for users on the move or at home.

# A great choice for serious road use

PC Pro, November 1999 (AS8300-366)



Now with magnesium casing and modem/LAN as standard

"With a low carrying weight and excellent battery life, it is the perfect choice for the serious road user." PC Pro, November 1999. "One of the faster models we looked at, and despite small proportions it has one of the best battery life figures." PC Direct, January 2000. The UltiNote simply connected to a docking station with a floppy disk drive and additional hard drive provides desktop functionality and performance. Undoubtedly, the ultimate combination of power, portability and flexibility.

ASUS/HI-GRADE NOTINO AS7200-500A	ASUS/HI-GRADE NOTINO AS7300-600A
-------------------------------------	-------------------------------------

Mobile Intel® Celeron™ processor 500MHz  
128K cache on-die  
Intel® 440MX-100 AGPset  
64Mb SDRAM exp. 192Mb  
6Gb removable hard disk  
12.1" TFT SVGA colour LCD  
SMI 910 Graphics Accelerator with 4Mb video RAM, supports LCD and dual-view for external display  
24x speed CD-ROM drive  
Internal 56K V90 data/fax modem

Mobile Intel® Celeron™ processor 600MHz  
128K cache on-die  
Intel® 440MX-100 AGPset  
128Mb SDRAM exp. 320Mb  
6Gb removable hard disk  
13.3" TFT XGA colour LCD  
SMI 910 Graphics Accelerator with 4Mb video RAM, supports LCD and dual-view for external display  
24x speed CD-ROM drive  
Internal 56K V90 data/fax modem

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20% after 3yrs

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inc VAT

**£1199** **£1409<sup>08</sup>**  
inc VAT

ASUS/HI-GRADE NOTINO AS7200-550A	ASUS/HI-GRADE NOTINO AS7300-650
-------------------------------------	------------------------------------

Specification as the Notino AS7200-500A but with:

Mobile Intel® Celeron™ processor 550MHz • 12Gb removable hard disk • 6x speed DVD-ROM drive with S/W MPEGII

Specification as the Notino AS7300-600A but with:

Mobile Intel® Pentium® III processor 650MHz - Intel® SpeedStep™ technology (processor battery speed may be reduced when operating on battery power) • 128Mb SDRAM • 12Gb removable hard disk drive • 6x speed DVD-ROM drive with S/W MPEGII

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**NEW** **£1399** **£1643<sup>83</sup>**  
inc VAT

### STANDARD NOTINO AS7200 AND AS7300 FEATURES

1.44Mb floppy disk drive • Li-ion 48Wh smart battery (3 - 3.5hrs) • two PC-cards slots • built-in 16-bit 3D stereo sound • ports: fast serial, enhanced parallel, PS/2 keyboard/mouse with Y-cable, infrared port (4Mbps), headphone/speaker out, mic-in, line-in, VGA for external monitor, USB • dimensions: 294mm x 232mm x 38mm, weight: 2.65kg • Windows® 95/98 (optional NT) • Lotus SmartSuite Millennium • IBM ViaVoice 98 Office edition • Norton AntiVirus™ and CrashGuard • leather carry case • 1 year collect and return warranty.

ASUS/HI-GRADE ULTINOTE AS8300-600	ASUS/HI-GRADE ULTINOTE AS8300-650
--------------------------------------	--------------------------------------

Mobile Intel® Pentium® III processor 600MHz - Intel® SpeedStep™ technology (The processor may be reduced to a lower operating speed when operating on battery power)  
µPGAII, .18u specification  
256K cache on-die  
Intel® 440MX  
64Mb SDRAM exp. 160Mb  
12Gb removable hard disk  
13.3" TFT XGA colour LCD  
SMI 710 Graphics Accelerator with 4Mb video RAM, supports LCD and dual-view for external display  
Module device 1.44Mb FDD/ 24x speed CD-ROM interchangeable (DVD-ROM, 2nd HDD optional)  
Internal 10/100Base-T Ethernet  
56K V90 internal data/fax modem  
PortDock @ £155 +VAT, PortBar @ £85 +VAT

Mobile Intel® Pentium® III processor 650MHz - Intel® SpeedStep™ technology (The processor may be reduced to a lower operating speed when operating on battery power)  
µPGAII, .18u specification  
256K cache on-die  
Intel® 440MX  
128Mb SDRAM exp. 160Mb  
12Gb removable hard disk  
13.3" TFT XGA colour LCD  
SMI 721 3D Graphics Accelerator with 8Mb video RAM, supports LCD and dual-view for external display  
Module device 1.44Mb FDD/ 6x speed DVD-ROM with S/W MPEGII  
Internal 10/100Base-T Ethernet  
56K V90 internal data/fax modem  
PortDock @ £155 +VAT, PortBar @ £85 +VAT

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### STANDARD ULTINOTE AS8300 FEATURES

Li-ion 45Wh battery 8 cells (approx. 3 hours) • one type II PC-card slot • built-in AC'97 3D stereo sound • ports: fast serial, enhanced parallel, IrDA, speaker out, mic-in, VGA for external monitor, USB, Port replicator, PS/2 keyboard/mouse with Y-cable • dimensions: 298.5mm x 236mm x 30mm, weight: 2.2kg max • Windows® 95/98 (optional NT) • Lotus SmartSuite Millennium • IBM ViaVoice 98 Office edition with headset • Norton AntiVirus™ and Ghost • leather carry case • 1 year collect and return warranty.

**Y2K** All Hi-Grade products advertised above accommodate the rollover to the year 2000. System hardware controlling time and date functionality will remain unaffected. However, customers must ensure that the software they are running is also 2000 compliant.



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July 2000  
ASUS Hi-Grade  
UltiNote AS8400



July 2000  
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Notino AS7300



August 2000  
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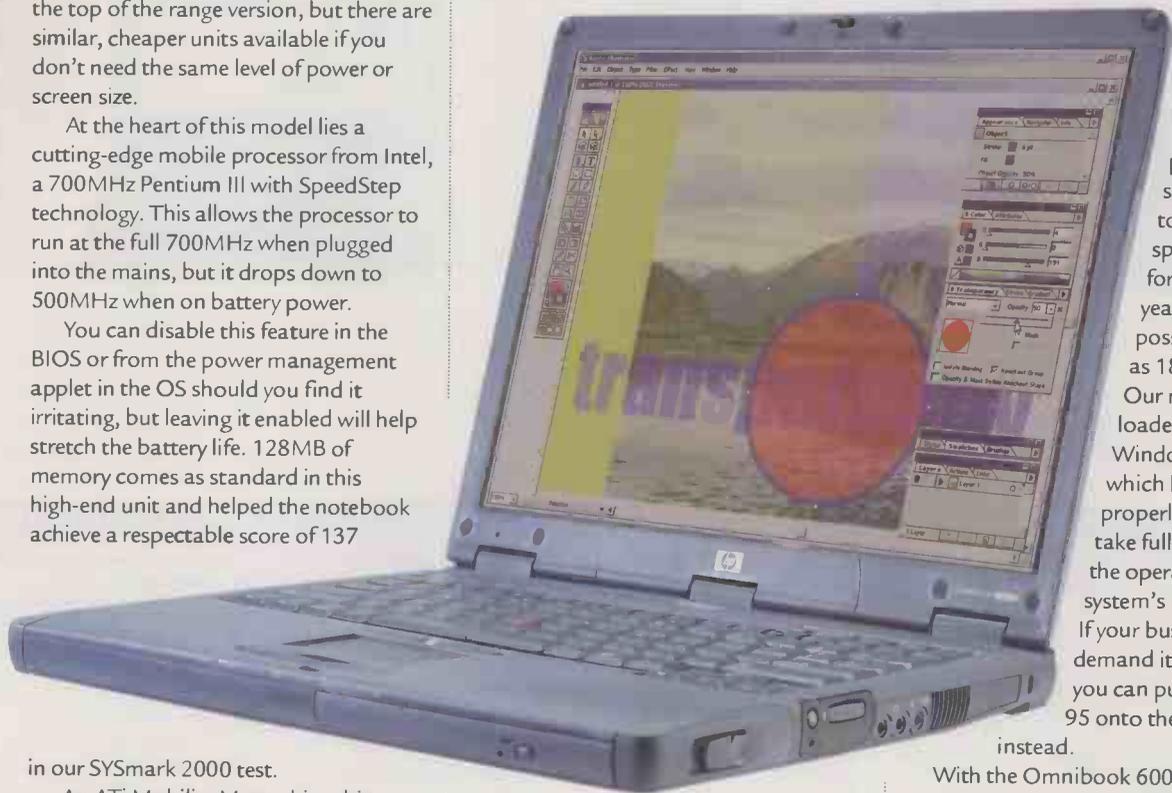
# HP Omnibook 6000

Stylish corporate notebook including a V.90 modem, network card and **the prospect of a long life.**

**T**he ever-present Hewlett-Packard (HP) has updated its corporate notebook range and improved on an already well-designed product. The Omnibook 6000 model reviewed here is the top of the range version, but there are similar, cheaper units available if you don't need the same level of power or screen size.

At the heart of this model lies a cutting-edge mobile processor from Intel, a 700MHz Pentium III with SpeedStep technology. This allows the processor to run at the full 700MHz when plugged into the mains, but it drops down to 500MHz when on battery power.

You can disable this feature in the BIOS or from the power management applet in the OS should you find it irritating, but leaving it enabled will help stretch the battery life. 128MB of memory comes as standard in this high-end unit and helped the notebook achieve a respectable score of 137



in our SYSmark 2000 test.

An ATI Mobility M graphics chip supplies the image on the 15in TFT display. This has 8MB of video memory and supports MPEG-2 hardware acceleration. A D-SUB output at the back means you could use the chip to drive two displays – the Omnibook's and an external monitor. The 15in TFT display itself is good – the whole thing looks bright and even, with no dark patches and the viewing angle is wider than on many notebooks we've seen.

The native resolution is 1,024 x 768 but 1,280 x 1,024 would have been better. One small drawback, though, is the fact that the screen does not fold down flat against the desk (useful for one-to-one presentations).

The keyboard is fairly good – it's very easy to type on, and HP has made sure that most of the keys are in similar positions to a standard QWERTY desktop keyboard. One thing that irritated us was the small return key – it is very easy to hit the backslash key above it instead. It's a matter of personal taste, though, and the keys are solid to use, with good travel.

As in the previous incarnation, HP has included both a trackpoint and a touchpad. Each of these has its own set of buttons, with the uppermost set sporting a new scroll button.

notebook is perched on your lap, it's very easy to accidentally knock the button and trigger the opening mechanism.

On the corporate side, one of the biggest draws is the promise of a long product life. HP has promised to sell this model to the same specification for at least one year, and possibly as long as 18 months. Our model came loaded with Windows 2000, which had been properly set up to take full advantage of the operating system's use of ACPI. If your business needs demand it, however, you can put Windows 95 onto the hard drive instead.

With the Omnibook 6000, HP has come up with another great product. It's more stylish than previous incarnations, and it has a good feature set. There are a few minor points we would like to see addressed in future versions, but for corporate customers this is definitely worth a look.

JASON JENKINS

As this notebook is aimed at corporate users, it's good to see both a V.90 modem and network ports integrated into the chassis, with the ports placed on the left-hand side towards the screen. Next to this is the PC Card slot, with room for one Type III or two Type II cards.

On the other side is a handy rocker control to increase or decrease the speaker's volume, and there's also a mute button to silence the speaker with a single touch. The standard headphone out, microphone in and line out ports are situated next to this, together with an infra-red port. Single PS/2, USB, serial, parallel and docking connectors adorn the rear.

A single drive bay at the front can house the supplied DVD or floppy and a software decoder is provided for those who plan to watch films. Should you want to use both drives at the same time, you'll have to use a special cable that, in contrast to the previous generation of the Omnibook, HP has elected to supply. We would have preferred the DVD to be situated on the side as, when the

## DETAILS

★★★★★

PRICE £3,641.33 (£3,099 ex VAT)

CONTACT Hewlett-Packard 0990 474 747

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

**PROS** Fast mover; good screen and keyboard; DVD; stylish; choice of operating systems

**CONS** Small return key; DVD mounted at the front; only 1,024 x 768 resolution

**OVERALL** A great little product that will look good in the boardroom as well as appealing to IT managers

## PERFORMANCE RESULTS



SYSmark 2000

## A good feature set and great value for money

PC Pro, August 2000

## A well focused business system at a good price

PC Pro, March 2000



"If you're after a high-performance PC and the cream of the graphics card crop, the Hi-Grade Ultis is an excellent choice." PC Advisor, August 2000. "The Ultis PV3 stormed ahead of the competition. With such a good array of peripherals, it is the best value PC in the Labs this month." PC Pro, January 2000.

"A fast machine that's aimed at the business user, with a far better monitor than we are used to seeing with budget PCs." PC Pro, March 2000. These systems have been configured for maximum compatibility and performance for a hassle free business environment.

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### HI-GRADE ULTIS PV3 933

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### HI-GRADE WINPUTER PV3 733

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• 20Gb EIDE Ultra DMA/66 7200 rpm hard disk drive  
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• 56K V90 modem

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### HI-GRADE ULTIS PV3 866

Specification as the Ultis PV3 800 but with:

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#### STANDARD MULTIMEDIA DESKTOP FEATURES

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Software: Tomb Raider III, Michael Owen Football League, Half Life, Mega Warrior.

#### 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

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# Gateway Solo 9300XL

This highly-specced desktop replacement is a **well-priced successor** to the 9300LS.

**W**e first looked approvingly at Gateway's new 9300 solo range in our notebook group test in April, but the company hasn't sat on its laurels since then. This new desktop replacement, the Solo 9300XL, is based on our April Editor's Choice, the Solo 9300LS, but boasts improved specs.

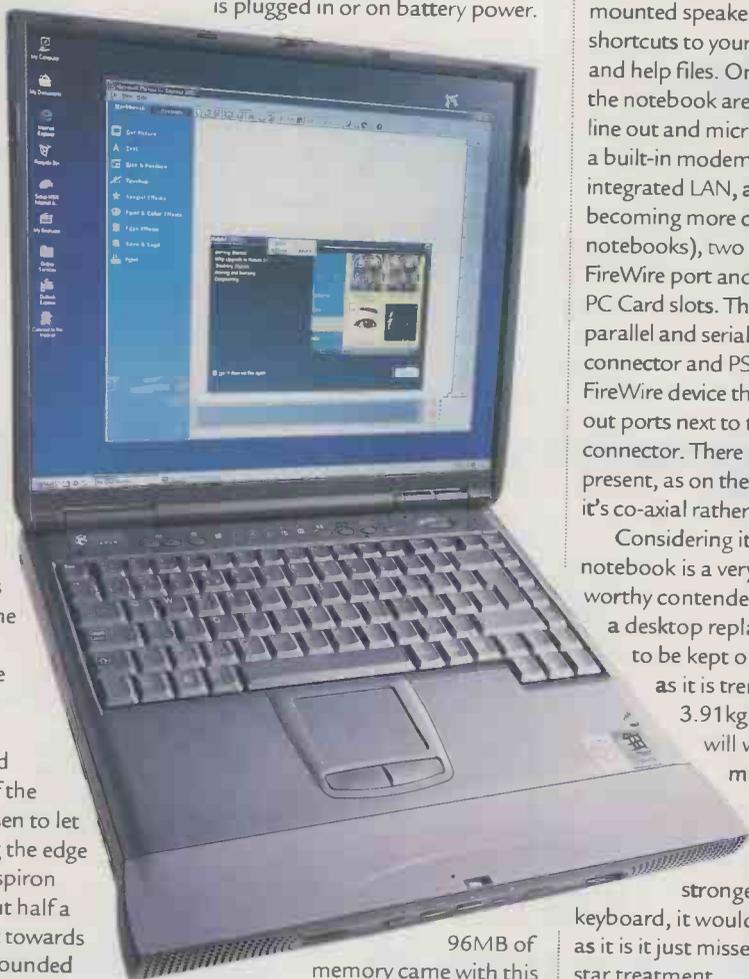
The new feature that is most immediately apparent is the larger screen. The original has been boosted to a 15.7in TFT, with a native resolution of 1,280 x 1,024. It is exceptionally bright and clear, and there are no dead pixels evident. With this higher resolution, we were able to have multiple windows open without cluttering the screen – a useful feature, especially if you are considering abandoning your traditional desktop PC for this model. We found that using the screen at this resolution took some getting used to, but once we'd used the system for a few hours, it seemed normal.

The larger screen has forced Gateway to increase the size of the unit, and it has wisely not chosen to let the screen drastically overhang the edge of the system, as with Dell's Inspiron 7500. The screen juts out about half a centimetre along the sides, but towards the front the edges have been rounded outwards, so that when the screen is closed it lies flush. The effect of this is that you simply do not notice the small overhang.

Unfortunately, though, Gateway has not made full use of the increased form factor in the keyboard and touchpad. The keyboard is smaller than it should be. It covers just over half of the available surface area, leaving a lot of wasted space. We felt that the keyboard should have been made larger, or at least moved towards the front of the unit slightly. As it is, when typing, you have to reach over quite a lot of wasted space. This doesn't make for the most comfortable typing experience, and it is made worse by the fact that the touchpad buttons are fairly small compared to the acres of space around it.

The basic hardware specs are

impressive. There is a 700MHz Pentium III inside this box. This is one of the latest processor to use Intel's SpeedStep technology, allowing it to run at two different speeds depending on whether it is plugged in or on battery power.



96MB of memory came with this review system – enough for everyday use, but as we are starting to see the arrival of 128MB as standard on new notebooks, it is beginning to look a little stingy. 32MB is soldered onto the board, and 64MB is present in one slot, leaving one free for expansion. Graphics are supplied by an 8MB ATi Mobility-P that help the screen achieve its high resolution. It also supplies good-quality hardware decoding for the Torisan DVD-U824 drive. This is located at the left-hand side of the notebook, and Gateway has been sensible enough to include a floppy drive next to it for good measure.

What this notebook lacks in ergonomic perfection, though, it more than makes up for in added features. At the front are four dedicated buttons to start, stop and skip through your DVD or

CD, and there is also a lock button to prevent them being pressed accidentally. Above the keyboard are more dedicated buttons, this time for volume control (with one button reserved for muting the front-mounted speakers in one touch), and shortcuts to your email program, browser and help files. On the right-hand side of the notebook are ports for headphones, line out and microphone in. Next to this is a built-in modem port (there's no integrated LAN, also a feature that is becoming more common in other notebooks), two full-size USB ports, a mini FireWire port and one Type III/two Type II PC Card slots. The rear sees covered parallel and serial ports, a docking connector and PS/2. For those without a FireWire device there are composite in and out ports next to the standard D-SUB connector. There is still a digital out port present, as on the 9300LS, but this time it's co-axial rather than optical.

Considering its low price, this notebook is a very good effort and is a worthy contender if you are looking for a desktop replacement. It would have to be kept on a desktop, though, as it is tremendously heavy, at 3.91kg. There's no way you will want to transport this much further than from one room to the next, unless you happen to be the world's strongest man. With a larger keyboard, it would be a winner, but as it is it just misses out on the full five-star treatment.

JASON JENKINS

## DETAILS

★★★★

**PRICE** £2,583.83 (£2,199 ex VAT)

**CONTACT** Gateway 0800 552 000

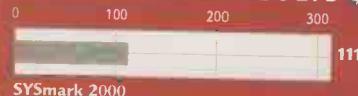
[www.gateway.com/uk](http://www.gateway.com/uk)

**PROS** Highly specified; large high-resolution screen; keen price

**CONS** Keyboard could be improved; no LAN; heavy

**OVERALL** It could be better, but for the money this desktop replacement is certainly worth a look

## PERFORMANCE RESULTS



SYSmark 2000

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Y2K

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# Hi-Grade UltiNote AS8300

A notebook with **room for expansion** that can give some desktop systems a run for their money.

**W**henever we review a PC, expandability is one of the first things we look for.

When you're shelling out a lot of cash for a computer, you rightly expect your machine to grow with your needs in the months and years to come. Unfortunately, when it comes to notebooks, expandability is often sacrificed to make a smaller, lighter or cheaper machine. That's why this top-performer from Hi-Grade came as a breath of fresh air as there are more expansion opportunities than even we know what to do with.



The unit has a 650MHz SpeedStep Pentium III chip at its heart and, as its score of 122 in our SYSmark 2000 test proves, it's a very capable performer. There's also a healthy 128MB of RAM (expandable to 160MB) so running several applications at once doesn't slow the system too badly. A 12GB hard drive is included for storage.

The AS8300 doesn't fare badly when it comes to graphics either, with a Silicon Motion Lynx3DM chipset backed by 8MB of video memory. That said, you won't be able to while away hours playing Quake III.

The UltiNote definitely looks the part with its metallic finish and it isn't all that heavy either, weighing in at just 2.2kg. In fact, it's barely much taller than the six-speed DVD-ROM drive, which can be removed from the bottom of the unit, or wider than the 13.3in TFT screen. Crucially, the screen is a good one, capable of a maximum resolution of 1,024 x 768 and displaying a clear and vibrant image.

The unit's keyboard has been improved over previous offerings we've seen from Hi-Grade, with this

one ranking among the better ones we have tested.

As with all portable computers its battery life is key. The unit holds a single

lithium-ion battery and Hi-Grade claims a battery life of about three and a half hours in normal use – a claim we find hard to dispute. We managed about four hours of word processing from a single charge.

The notebook itself boasts a parallel, serial and USB port for expansion and if that isn't enough you can connect a break-out box to increase expandability still further. The box boasts a serial port, parallel port, two PS/2 ports, a VGA connector and two USB ports.

Although not all that practical for use on the road, for desktop use it's a valuable addition. Unfortunately there's just one Type II PC Card slot but as there's a built-in 56K modem and onboard network connection it shouldn't prove too much of a problem. There's also no FireWire connector, so if you've got your eye on the next generation of peripherals, think again.

Just in case you need more ports, the 'port dock' boasts serial, parallel, VGA and two PS/2 ports. There's also an audio jack to hook up some headphones

or speakers. The dock comes with a removable floppy drive and there's a free bay for a CD-ROM, DVD-ROM or hard disk drive. There's even a set of built-in speakers and an amplifier. Using the controls on the top of the unit you can use it as a CD player although, as it draws power from the notebook, this needs to be switched on. The dock works well but the cable that connects to the notebook is a little short, which means you can't easily place the unit next to the notebook. It's also worth pointing out that you can't use the break-out box at the same time as the 'port dock'.

The UltiNote is a keenly priced machine, and you're getting a well-connected laptop with a certain degree of future proofing built-in. It would make an excellent

desktop replacement and our only real qualm would be the solitary Type II PC card slot, although as there's a modem and network capability built-in, it shouldn't be too much of a problem. Some people may prefer the neater solution of a removable docking bay but Hi-Grade's break-out box and 'port dock' do the job just as well.

RICHARD MCPARTLAND

## DETAILS

★★★★

**PRICE** £1,938.75 (£1,650 ex VAT)

**CONTACT** Hi-Grade 0800 0740 402

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

**PROS** Good-looking, capable performer.

Great screen, keyboard and touchpad.

Additional expansion opportunities with the break-out box and 'port dock'

**CONS** You may not want to pay for ports you never use

**OVERALL** A good looking, capable performer with more connections than a BT switchboard

## PERFORMANCE RESULTS



SYSmark 2000

# Bush Internet TV

A cheap way to get onto the web if you don't want to use a PC, and you can watch the footie too.

At first glance it looks just like any other television, but this one has a little surprise up its sleeve: you can use it to browse the Internet and email your friends. As a television, it is very average. The 14in screen is quite reflective, but the picture is clear and bright enough. The sound is mono, and there is a SCART socket on the rear to connect the television to other devices.

When you come to use the box's more advanced facilities, though, you can't help but be impressed, although Bush still has some way to go before people start abandoning their traditional PC for an Internet television.

There are only four buttons on the set itself – on/off, volume up and down and channel up. The rest is controlled by the television's mammoth remote control. This is about a foot long, and is heavier than a standard remote. It takes four AAA batteries. At the top is a circular pressure pad that moves your mouse pointer – but more on that in a minute. All the standard channel and volume controls are there, together with a selection of buttons help you set up the TV in the first place. Underneath the main panel, however, is a mini QWERTY keyboard, and a yellow function button that activates certain features tied to letters and numbers. The infra-red window curves around the top left of the control so you can transmit while holding it longways or sideways.

To access the Internet, you simply press the Internet button on the remote and confirm that you want to connect. The set dials the ISP, Bush Internet via Telinco, and, if it is your first time dialling, takes you through a standard sign-up procedure. Once this is complete, you don't need to remember your username and password to browse – the server uses CLI (caller line identification) to determine who you are and does the rest.

From here, you are taken to Bush's home page, which is optimised for viewing on a television. This contains links to other sites, some of which have also been optimised for this kind of

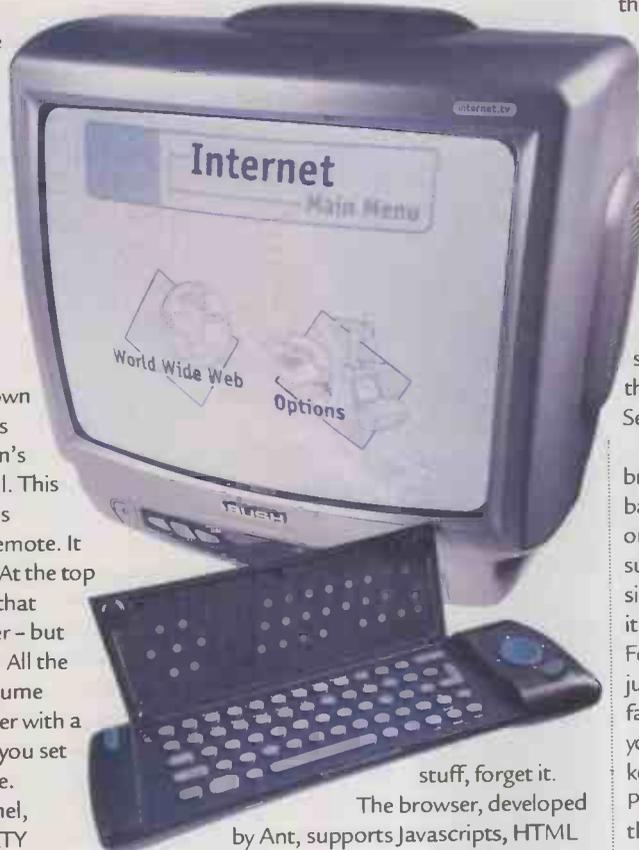
browsing. As with any other browser, you can simply type in the URL to view the page. It is here, though, that one of the problems with the TV, and other products like it, shows itself. Web pages are generally not designed to be viewed on a low-resolution 14in screen. Moreover, if you want to view video, listen to MP3s, or look at Shockwave or Flash

though, we expect that you would get used to the TV's eccentricities.

The email facility allows you to have up to four separate accounts. You have to specify a username and password to log in. Once there, you can look at your stored and new messages, and there's an address book too. You can also specify a signature to round off each message. Unfortunately, the email facility is text only – you won't be able to open any attachments (except text files) that you receive. It is all very easy to use, but here another problem rears its head. The mini keyboard is simply not the best to type on – you can get a message out, sure, but it is not a very comfortable typing experience. Ideally, we would have preferred Bush to have bundled a wireless keyboard and a separate, smaller, lighter remote controller specifically for channel changing and the like. Bush will address this in September with a £29 wireless keyboard.

Although this TV is far from a perfect browser and email client, it is not half bad. There's even a printer port, although only a few printers are officially supported. What struck us was how simple it was to set up and use – just plug it in to your phone line and you are off. For someone that does not own a PC and just wants basic browsing and email facilities, this could be the answer, but you'll probably want the wireless keyboard. You certainly would not get a PC and monitor worth switching on for this price, but its limitations probably mean we won't see hoards of people flocking to abandon their PCs. Watch this space, though – with a few improvements, this could be a force to contend with.

JASON JENKINS



stuff, forget it. The browser, developed by Ant, supports Javascripts, HTML 3.2 and has HTML 4.0 extensions together with SSL, so you'll be able to buy items over the Internet using your credit or debit card with confidence that the information is being encrypted. One thing that we found a bit cheeky was the fact that the Teletext facilities have been removed, on the basis that you don't need it with Internet access. We would still have liked to have seen it on the basis that Teletext is free and doesn't tie up your phone line.

Navigating web pages was slightly more difficult than with a PC and mouse, especially when it came to scrolling. Sometimes you can simply move your mouse pointer to the bottom of the page to see the rest of it, and sometimes you have to hold the select button and move the pointer. We found this a bit difficult, as our pointer kept disappearing off the side of the screen. With a bit of practice,

## DETAILS

★★★★

**PRICE** £199 (£169.36)

**CONTACT** Bush 01923 859777

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

**PROS** Very easy to use, low-cost email and Internet solution

**CONS** Browser and email program have comparatively limited functionality; you'll need a wireless keyboard

**OVERALL** If £200 is all you have, then this would be a good way to get on the Internet quickly and easily, but it can't yet compete with a PC browser and email client

# Sony NW-MS7 Walkman

MP3 is so passé, especially when you're in possession of Sony's sleek new solid-state Walkman.

There's been a great deal of media debate about MP3 lately, especially with the legal proceedings against Napster bubbling away. It seems that what Diamond started over a year ago with its Rio portable MP3 player is coming of age.

The music on these units is stored on solid-state media, such as Smart Media, so it won't jump, no matter how active you are. Also, the lack of moving parts means the devices are both small and light.

It was only a matter of time before Sony threw its hat into the ring and turned its almost legendary design talents to this emerging market.

Before you think that Sony is just jumping on the bandwagon, there are a couple things that should be pointed out. First, the Memory Stick Walkman employs Sony's proprietary Memory Stick solid-state storage. Second, it is not an MP3 player.

Sony decided that the MP3 standard did not produce high enough quality results, so it opted for its own ATRAC (Adaptive Transform Acoustic Coding) system. ATRAC is extensively used as the compression algorithm for MiniDisc, so adapting it for the MS Walkman was not a problem. Differing amounts of compression can be applied to either increase capacity on the Memory Stick or improve the quality of the output. We were impressed by the output quality when coding a track from a CD. The depth and soundstage created were excellent and far superior to any MP3 player we had listened to. This doesn't mean you can't drop MP3 files onto the NW-MS7 - you can, although they do have to be converted to ATRAC first.

As with all things Sony, the design of the unit is superb. It's smaller and lighter than almost any other solid-state memory music device and is extremely desirable. The dimensions are only 37 x 96 x 19mm

(w x h x d) and it weighs an amazing 70g. The Memory Stick used with the device is different to the versions we've seen before. Besides the obvious difference in colour (it's white instead of purple), it is called MagicGate Memory Stick and has inbuilt copy protection to stop you pirating music from it. Subsequently, any other Memory Sticks you have can't be used

with the Walkman, although MagicGate sticks can be used in other devices.

The Memory Stick is a generous 64MB which will give you around two hours of playback at the lowest quality, one hour at the highest and 80 minutes at the middle setting. The middle setting of 105Kbits/sec is generally the best option, providing decent capacity while maintaining high audio quality.

The supplied software, OpenMG Jukebox, allows you to pull tracks from CD and convert them to ATRAC as well as converting

MP3 files. The files you convert are stored in albums from where songs can be dragged and dropped onto the Walkman. We were disappointed that you could not drag and drop MP3 files straight to the device and have them converted on the fly. Having to convert the audio first not only takes longer, but also uses up double the space on your hard disk. That said, conversion doesn't take long, and even ripping a track from CD is incredibly quick.

When a song is taken from a CD it can be checked out three times to an external device. If after the third time the song has not been checked back into the

computer, you will no longer be able to use it. This is an attempt to stop piracy, but is not very successful since, if you can no longer check a song out, the OpenMG Jukebox is happy to let you rip it from the CD again and have three more goes.

A small docking bar is supplied in the box which connects both to the PC via USB and to the mains via the supplied transformer. When the Walkman is connected to the docking bar it is ready to receive data from the PC while charging its battery at the same time. Download time is pretty speedy through the USB connection.

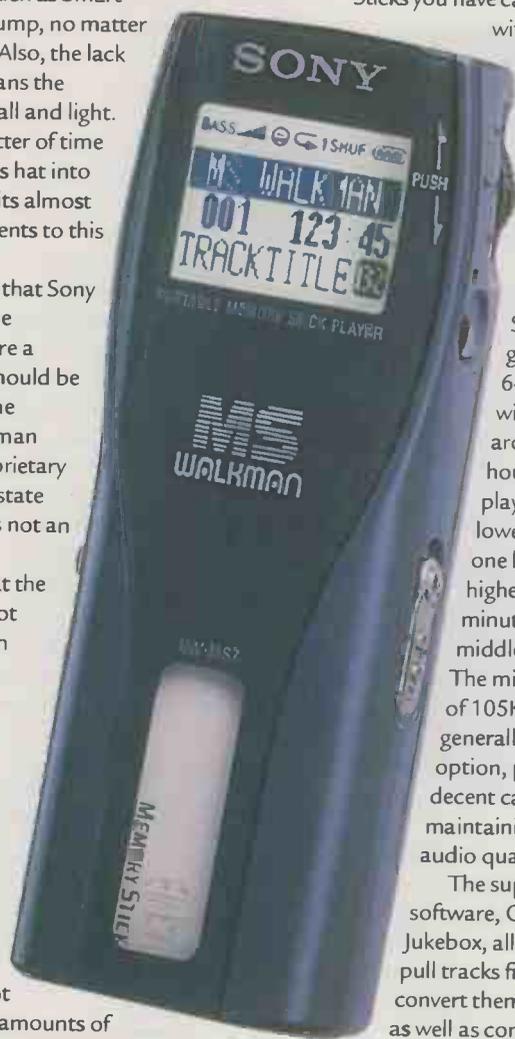
The device produces first-class music playback that is unaffected by what the user is doing. We ran and cycled on an exercise bike and playback was flawless.

There were, however, a couple of issues. First, was the lack of a remote control. Anyone who's used to listening to a Sony MiniDisc Walkman knows how invaluable this is. With the remote clipped to your shirt or jacket you don't have to dig around in your pocket to control the device. The second problem was the selection beep. Every time you enter the menu and select an option a beep is emitted, but the music stops momentarily when the beep is sounded. That said, the beep can be turned off.

On the whole, Sony has come up with a great product, but a couple of points stop it being the perfect solid-state music solution. The lack of a remote control is a big issue, although this was more than likely to keep costs down, but the inability to drag and drop MP3 files straight to the device is disappointing.

Ultimately, if you want a solid-state music player, then this is the best there is. It might seem pricey, but it is head and shoulders above the competition.

RIYAD EMERAN



## DETAILS

★★★★

PRICE £299 (£254.46 ex VAT)

CONTACT Sony 0990 111 999

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

PROS Very small; very light; very sexy; great sound

CONS No remote; no on-the-fly MP3 conversion

OVERALL A great product that's only a step away from being perfect. It's still the best in its class by a long way, though

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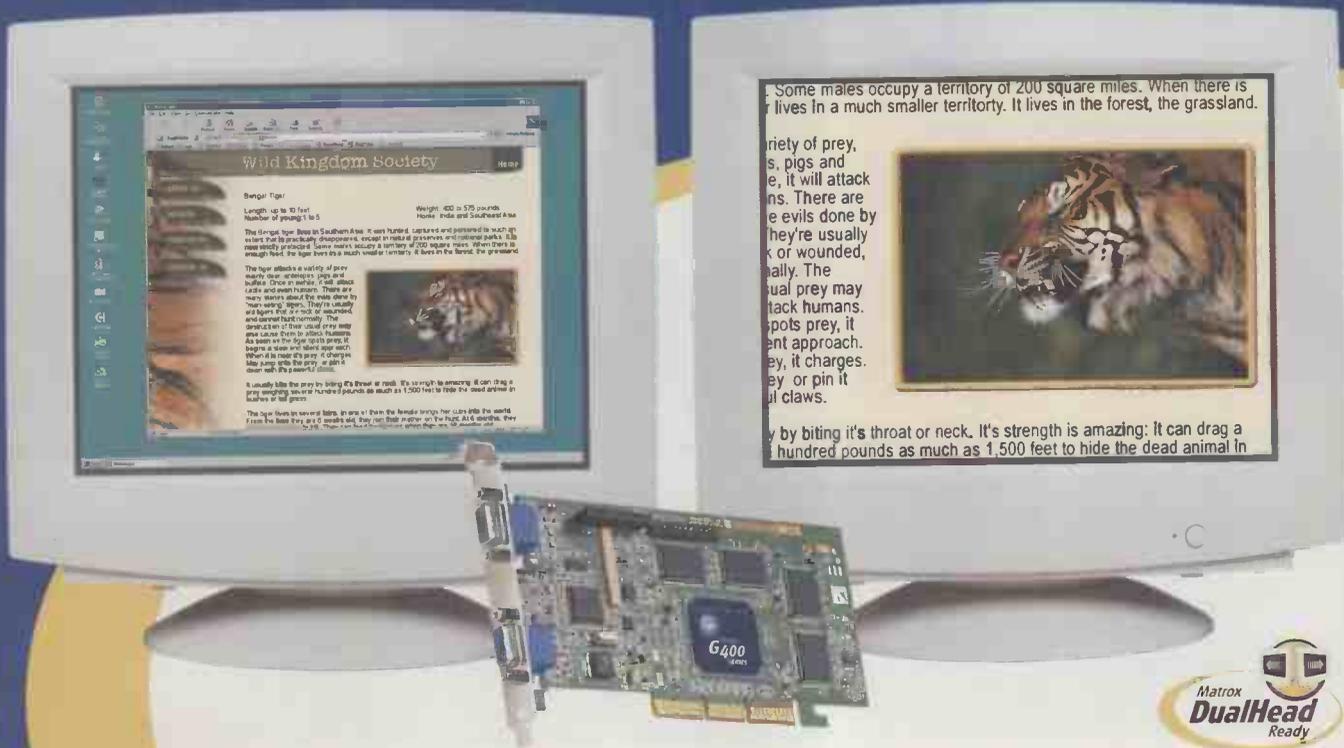


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- AGN Hardware US



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# Compaq iPAQ H3600

Pocket PC PDA with **astounding speed and good looks**, but no built-in Compact Flash or PC Card.

The first thing that hits you about the iPAQ H3600 is its stylish look. It's about time someone broke away from the angular lines and boxy looks of previous PDAs. The iPAQ really does look like it has been created by a designer rather than knocked up in a CAD package by a bored engineer. However, the style isn't to everyone's taste and, while Compaq should be praised for throwing away the boxy mould, you get the impression the unit just misses the mark slightly in the cool stakes. The PCW office was split on this one, with half really loving the stylish look and the other half thinking the machine looked like a naff prop from a bad sci-fi movie.

The second thing that hits you, or rather smacks you around the face like an English soccer thug on the rampage, is the sheer speed of the processor. We thought the Casio E-105 was speedy, but the iPAQ is like the Casio on steroids in comparison. This is not surprising as the iPAQ uses a StrongARM SA1110 running at a whopping 206MHz compared to the Casio's MIPS clocked at 131MHz.

We loaded a copy of PocketTV from [www.mpegtv.com](http://www.mpegtv.com) that allows you to play MPEG files on PDA devices. The iPAQ not only handled the video playback with ease, but could also play back an MP3 file at the same time - impressive.

The TFT screen is also worthy of praise. Measuring 240 x 320 pixels, it looks fantastic with the backlight on, but even without the backlight there is enough contrast to be able to read it reasonably easily in normal office light. Not only this, but the unit has an automatic brightness sensor, visible only as a tiny hole on the front of the fascia, that checks the light level in the room and adjusts the display's brightness accordingly.

Most of the usual buttons that have appeared on previous Windows CE devices are present on the iPAQ, with quick-launch buttons for the voice recorder, calendar, contacts, program menu and one assigned to Compaq's quick-launch utility. One omission, though, is the rocker switch that's present on the Aero models, but the new dpad (that also houses the speaker) more than makes up for its absence.

Compaq is making a big hullabaloo

about the expansion slot at the rear of the unit. This is a proprietary interface much like the Springboard slot on the



Handspring PDAs. Modules slot over the back of the iPAQ and grip its sides to stay in place. Unfortunately, Compaq didn't have any modules available at the time of writing, so we couldn't try out this feature. However, PC Card and Compact Flash modules should be available soon, and more interesting modules such as a GPS (Global Positioning System) unit and a combination Bluetooth/Compact Flash expansion pack should follow some time in the near future.

There is an open source initiative, backed by Compaq, to put Linux on the H3600. A version of Linux can be downloaded and run on the device, but once it is installed there is currently no way to reload the Pocket PC OS. This problem should be fixed soon. Check out [www.handhelds.org](http://www.handhelds.org) for more information. Despite all the plus points,

there are a number of issues we have with the device. While the iPAQ doesn't skimp on memory, having 32MB of RAM and, like all new Pocket PC devices, 16MB of ROM, there are no built-in Compact Flash or PC Card slots for additional storage. This is totally unforgivable and misses the point of Pocket PC being a multimedia OS. What's the use in having multimedia capabilities such as the WMA and MP3 playback facilities when you have to use a bulky add-on to give the device the storage space to hold the multimedia files?

Secondly, no matter how much better Pocket PC is than Windows CE as an OS - and it is way ahead of its older brother - it's still not as easy to use as Palm OS. It's a bit like Windows 3 in comparison to MacOS. It looks and feels similar, but it's just more fiddly to use and still has its annoying idiosyncrasies. That said, Pocket PC has a big edge when it comes to multimedia and Internet facilities.

Also, we did manage to repeatedly crash the device while trying to delete some MP3 files from memory. The crashes were so bad that the unit wouldn't even respond to the off button. We had to repeatedly reset the iPAQ before we finally managed to free the file from the grips of the Pocket PC media player. We're not sure if this is a fault with the iPAQ or with the Pocket PC OS, but it was extremely frustrating.

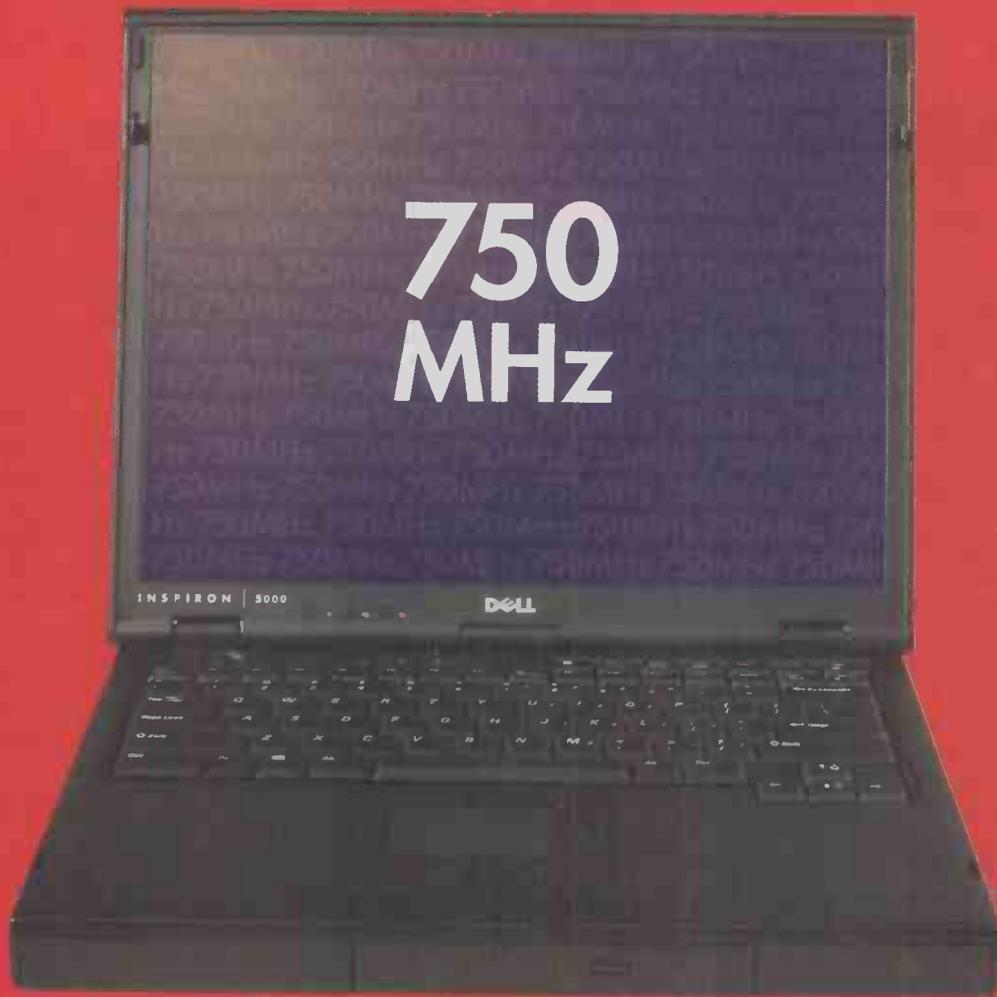
That said, the iPAQ is a very cute device. It's reasonably stylish, not too bulky and has a ferociously powerful CPU, but the lack of a built-in Compact Flash or PC Card slot brings it down a notch or two.

NIALL MAGENNIS

**DETAILS**  
★★★★

**PRICE** £399 (£339.60 ex VAT)  
**CONTACT** 0845 270 4000  
[www.compaq.co.uk](http://www.compaq.co.uk)

**PROS** Very fast processor; great screen; distinctive design  
**CONS** The lack of a built-in Compact Flash or PC Card slot is unforgivable  
**OVERALL** A stylish unit with a great screen and processor, but let down by the lack of built-in support for Compact Flash and PC Cards



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Dell recommends  
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Professional for business.

COMMON FEATURES: 256Kb L2 Cache, 3D positional sound with wavetable, Microsoft<sup>®</sup> Windows 98.

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- Integrated Floppy Drive
- ATI Mobility P 2X AGP High Performance Graphics with 8MB VRAM
- 9 Cell (52Whr) Lithium Ion Battery
- 56K/bs V90 Modem<sup>3</sup>
- Microsoft Works Suite 2000

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Prices and specifications are subject to change without notice. Prices correct at date of publication. Delivery is charged £49.00 (£57.58 inc VAT) per system. Dell's terms and conditions of sales and services apply and are available upon request. These systems are subject to availability. <sup>1</sup>Maximum data transfer rate is dependant on certain factors including telephone lines, communications software and communications protocol. Prices correct at time of going to press & are subject to change without notice. <sup>2</sup>The processor may be reduced to a lower operating speed and SpeedStep is a trademark of Intel Corporation. Microsoft, Windows and MS are registered trademarks of Microsoft Corporation. Other trademarks and trade names may be used in this document to refer to either the entities claiming the marks and names of their products. Dell <sup>3</sup>Finance is available from Dell Financial Services which is a trading style of Newcourt Credit Ltd, a company of The CIT Group, Inc., 66 Buckingham Gate, London SW1E 6AU. Finance will be subject to status and for U.K. business users only. Payments are based on a Technology Business Plan

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COMMON FEATURES: 256Kb L2 Cache, 3D Positional sound with wavetable, Microsoft Windows 98

### DELL INSPIRON 7500



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# Sony CMD-Z5

A well-designed phone with extras including WAP, email access and answerphone capabilities.

The Sony CMD-Z5 is quite simply a stunning mobile phone, resplendent in silver and small enough to fit even the tightest of pockets. The Z5 measures only 88 x 49 x 21.5mm (h x w x d) and weighs an incredible 82.5g. The styling is rounded and it actually looks like a toy phone rather than the real thing, but it does start to grow on you after a while. The only thing that really spoils the shape is the large antenna fixed to the top right corner, but then with a device this small there probably wasn't enough room for an internal aerial.

A large active flip covers all the buttons and half of the screen, so there's little chance of accidental key activation while it's in your pocket or bag.

The display is superb with multiple shades of grey for handling graphics and full resolution for improved detail. It's usually possible to view the whole of an SMS message on the screen at once without having to scroll through it. That said, even if you do need to scroll through anything, it's the simplest of manoeuvres with the Z5. Located at the top left corner of the phone is a jog dial, but not just any jog dial. Anyone who has used a device like this will be familiar with the ability to scroll up and down by turning the wheel and selecting by pressing the wheel inward, but Sony has taken this idea a step further. As well as being able to press the wheel inwards it can also be pressed towards or away from the user, making an already versatile tool even more so.

The one gripe that we did have about the jog dial was its position. We would have preferred to have seen it at the top right-hand corner to allow for easy thumb manipulation with the phone in your right hand, although we're sure that left-handed users will be grateful for the design.

Although the Z5's size is one of its key selling points, anyone with big hands may find it hard to press the keys without unwanted keystrokes appearing at random. But then any of the very small phones on the market suffer from the same problem.

Opening the phone and pressing the jog dial inwards brings up the menus. These are displayed beautifully as 3D tabs that can be scrolled through using the dial. Navigation is simple and intuitive with the extra jog dial functions coming in very handy. Pulling the dial towards you will jump back one menu level, while pushing it away from you will give you a brief explanation of the option that's currently highlighted.

There's a memo recording facility, which is nothing

new with a mobile phone, but what's interesting about this one is that you can use it as an answerphone.

You can record an answerphone message and then set the phone up to play that to incoming callers and then record their message for you to listen to later. This is a great idea because you avoid the costs incurred by retrieving voicemail from your service provider.

It's not just the design of this phone that's impressive though, it's also a very advanced mobile data communication

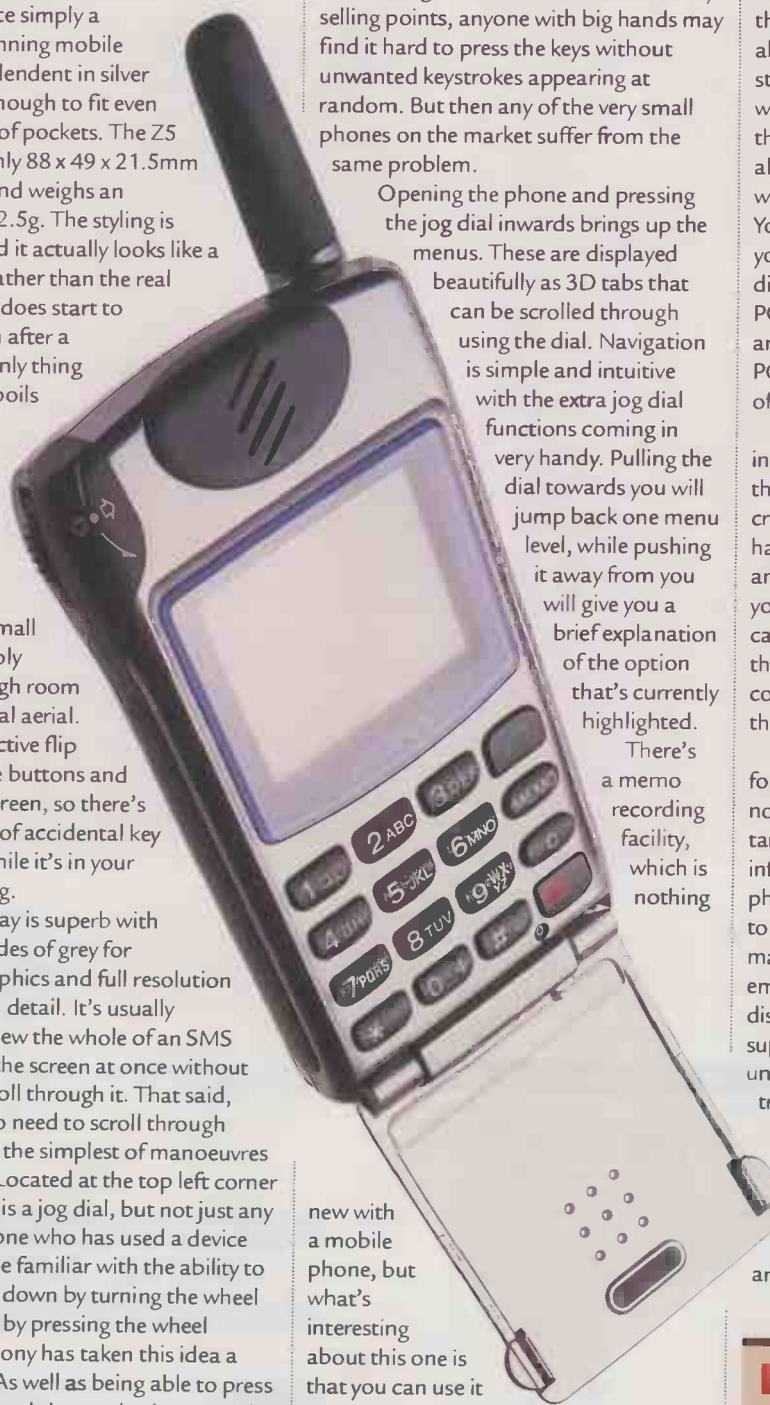
device. This is the first phone we've seen that uses the Microsoft browser that allows you to use both WAP and HTML standards. The results were impressive with faster download times than any of the other Internet phones we've seen, although setup wasn't easy and there was practically no help in the manual. You can also use the Z5 for accessing your POP3 email. Simply input the dialup and account details of your POP3 mail provider and you can read and send email from your standard POP3 account without the limitations of SMS email.

Another great design feature is the inclusion of a power cradle. This means that the phone can be placed in the cradle when you get to work where it will happily charge while you sit at your desk, and can then be simply picked up when you leave. Don't worry about having to carry the cradle with you when you travel though, since the power cable that connects to the cradle also connects to the phone.

So, is this the perfect mobile solution for the new millennium? Unfortunately, not quite; there are a couple of issues that tarnish the package. First is the lack of an infra-red modem. It may be said that a phone with features like this doesn't need to connect to a PDA or notebook, but many mobile users will still prefer to type emails on an external device. Another disappointment is the lack of GSM1900 support (it's a 900/1800 dual-band unit), rendering the phone useless if you travel to the US.

It's a shame that Sony chose to leave out two such useful mobile features that could have made the Z5 the ultimate mobile solution, although as it stands it's still a stylish and feature-packed product.

RIYAD EMERAN



## DETAILS

★★★★

**PRICE** Approx £149 with a contract (£126.80 ex VAT)

**CONTACT** Sony 0990 111 999

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

**PROS** Very small; feature packed; great design

**CONS** No IR modem or GSM1900 support

**OVERALL** This could have been the perfect phone for so many users but for a couple of omissions. It's still a great product though

**TINY**

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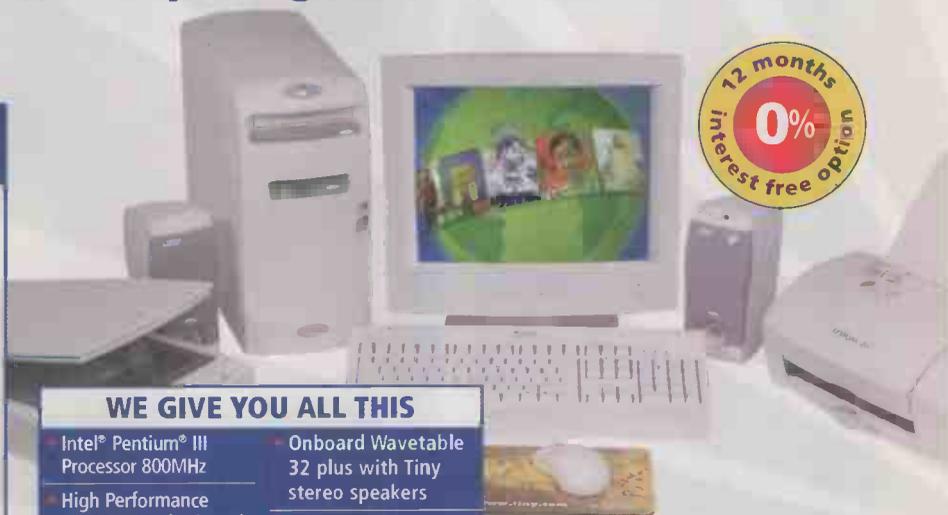
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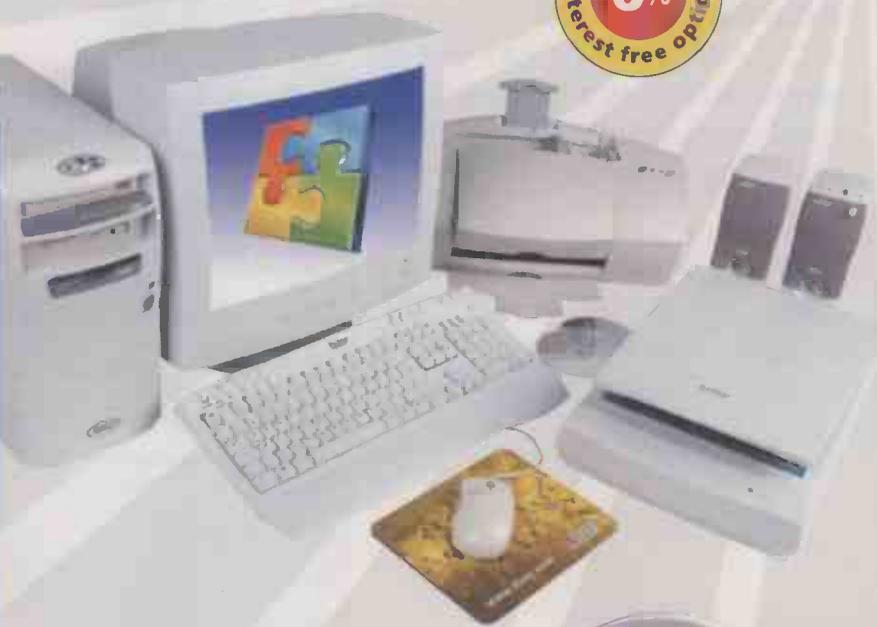
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- Creative Labs Soundblaster 128 Wavetable Sound
- Lexmark Z11 Color Jetprinter
- 600 dpi USB Flatbed Colour Scanner
- 56K Modem
- FREE Nokia 7110\*\* Mobile WAP Phone
- FREE Unlimited Internet Access with Tiny.Com – all you pay is the cost of a local call
- 12 Months Parts & Labour Support Package

Includes Windows® 98 Second Edition – the home version of the world's favourite software

## ★ SPECIAL FEATURES ★

- ★ Combined DVD/CD Re-writer\* Drive CD Re-writer\* - lets you copy images, text, sound and video DVD ROM - lets you watch the latest DVD movies, play games and music CDs
- ★ DigiCast™ System allows you to play DVDs on your PC whilst watching and listening to them on your TV in another room
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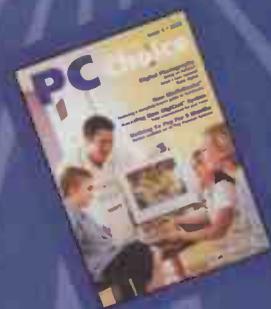
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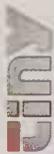
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# 3dfx Voodoo5 5500

The full production graphics card still has problems, but **FSAA is worth checking out** for games.

**W**e looked at a pre-production version of this board last month and the impression was of a somewhat lacklustre graphics solution when compared with the competition. However, after closer inspection of the full production board, 3dfx's new baby does show some potential, but retains many of the problems outlined last month.

The Voodoo5 5500 sports two VSA-100 graphics processors on the board running in SLI (Scan Line Interleave) mode. Unsurprisingly, this board draws a great deal of power and needs to be connected directly to the power supply. With this kind of raw power, we were expecting the fastest card around and were surprised last month when the reference board failed to blow us away in the performance stakes. We therefore had high hopes for this full retail card, but we were disappointed. Running the Quake III test at 1,280 x 1,024 with 32bit colour and textures resulted in a score of 40fps, which was comparable to last month's two GeForce2 cards that scored 41fps. The Voodoo didn't fare as well on Direct3D though. Running 3DMark in 1,280 x 1,024 with 32bit colour brought in a score of 2,277 compared with 3,084 on

the Asus V770 GeForce2 card. 3dfx has also ignored features such as an integrated transform and lighting (T&L) engine and hardware environment bump mapping, both of which will be supported by



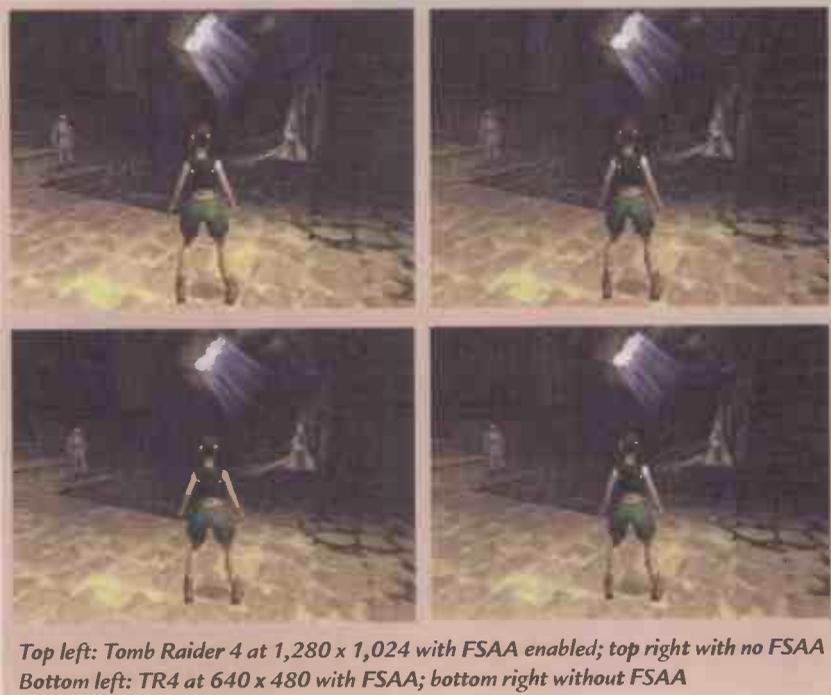
the forthcoming ATi Radeon card. Instead, 3dfx has pushed the full scene anti-aliasing (FSAA) feature. This improves the image quality of a scene by smoothing the edges and eliminating 'jaggies' that surround curved and diagonal surfaces. It works very well, but the performance hit is significant, to the extent that a 3DMark score of 3,418 at 1,280 x 1,024 in 16bit colour drops to 874

with four-sample FSAA enabled. But raw performance testing isn't a fair way of evaluating the benefits of FSAA since it is, intrinsically, subjective. To give the Voodoo a fair crack of the whip, we loaded up many games from differing genres to see what effect FSAA had and how much of a performance hit we ended up with. First-person shooter games like Quake III and Unreal Tournament didn't benefit too well from FSAA but other games showed a significant improvement. Racing games produced much smoother backgrounds and scenery, while flight simulators also benefited. The most impressive example was when we ran Tomb Raider games.

The difference in the image quality was astounding. The screenshots (left) show a scene from Tomb Raider 4 in both 640 x 480 and 1,280 x 1,024. The improvement with FSAA on the 640 x 480 screen is significant, but what surprised us was that even at 1,280 x 1,024 there was an improvement. That said, the game was unplayable at 1,280 x 1,024 with FSAA enabled. Games like Tomb Raider still look great even at lower resolutions with FSAA turned on, making it ideal for users with small monitors.

The Voodoo5 5500 doesn't perform as well as we'd hoped but FSAA can be applied to any game in your library without the need for native support.

RIYAD EMERAN



Top left: Tomb Raider 4 at 1,280 x 1,024 with FSAA enabled; top right with no FSAA  
Bottom left: TR4 at 640 x 480 with FSAA; bottom right without FSAA

## DETAILS

★★★★

**PRICE** £249 (£211.91 ex VAT)  
**CONTACT** 3dfx 01753 502 800  
[www.3dfx.com](http://www.3dfx.com)

**PROS** FSAA can be applied to any game with some stunning results  
**CONS** Lacks T&L, not as fast as a GeForce2  
**OVERALL** The lack of features and under par performance are disappointing, but the FSAA is great when used with the right game

### PERFORMANCE RESULTS

0	25	50	75	100 (fps)		
[Progress bar for Quake III]				40		
Quake III 1,280 x 1,024 32bit						
0	1,000	2,000	3,000	4,000	5,000	6,000
[Progress bar for 3DMark]						2,277
3DMark 2000 1,280 x 1,024 32bit						

# Seeing is Believing



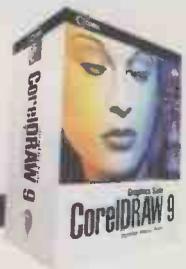
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# Hercules 3D Prophet II

If you need the extra frames per second **this 64MB graphics card** can offer this could be for you.

The GeForce II GTS is currently the force to be reckoned with in the 3D graphics cards arena, although as last month's preview of the ATI Radeon shows, the tide may be about to turn. We got hold of the 64MB version of the Hercules 3D Prophet II to see how it performs. Billed as '3D speed beyond imagination', the card has a lot to live up to, but is it worth shelling out for this when the 32MB version (*PCW* August, *Reviews* p114) is pretty fast already?

Apart from doubling the amount of DDR memory on this card, the 3D Prophet II has all the same functions as its sibling. The board does look different as all the memory chips on this model sit on the top of the card and instead of each RAM chip having individual heatsinks, two chips share a



larger heatsink between them. There is also a second PCB riser above the first to deal with the S-Video electronics as well as a DVI output.

The Prophet performed as expected, beating the scores of the 32MB variant in both 3DMark 2000 and the Quake III tests. The 64MB's 3DMark 2000 score at 1,280 x 1,024 with 32bit colour was 3,450, compared to the 32MB variant's 3,005 in the same test. As for the Quake III test, at 1,280 x 1,024 with 32bit colour and textures, the card achieved 49.9fps compared to the 32MB board's 41.1fps. So there is a marked improvement in performance.

The real issue is cost. With a street price of £319 inc VAT, it's a fair bit more expensive than the 32MB card, but if you are prepared to break the bank for slightly better performance, then at least

you can be sure you have one of the fastest graphics boards on the block.  
SCOTT MONTGOMERY

**DETAILS**  
★★★★★

**PRICE** £319 (£271.49 ex VAT)  
**CONTACT** Hercules 020 8686 5600  
[www.hercules.com](http://www.hercules.com)

**PROS** Even more speed from a GeForce II GTS-based card  
**CONS** Even more cash  
**OVERALL** If money is no object this is the one to buy. But for the less affluent, the 32MB version will be more than adequate

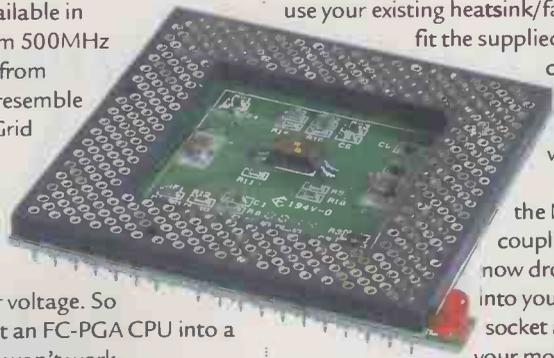
**PERFORMANCE RESULTS**

Test	Score
Quake III 1,280 x 1,024 32bit colour & textures	49.9
3DMark 2000 1,280 x 1,024 32bit colour & textures	3,450

# PowerLeap Neo-S370

A workaround for **chip compatibility problems** appears to have some difficulties of its own.

Upgrading your CPU is not straightforward. Intel's latest Flip Chip Pin Grid Array (FC-PGA) CPUs (available in Pentium IIIs from 500MHz and Celeron IIs from 566MHz) may resemble old Plastic Pin Grid Array (PPGA) models, but the pins are different and the CPU die requires a lower voltage. So while you can fit an FC-PGA CPU into a PPGA socket, it won't work.



Enter PowerLeap's Neo-S370, which promises to let new FC-PGA CPUs work on old PPGA motherboards, effectively letting you swap your sub-500MHz socketed Celeron for the fastest FC-PGA Pentium III on the market.

After setting two jumpers for the desired FSB (front-side bus), you must carefully insert the CPU into the adaptor - scary stuff, but not as bad as having to

slide a razor blade in between to separate them again. Since the chip is now twice as thick as before, you can't use your existing heatsink/fan and must fit the supplied PowerLeap combo, which is far from the best we've seen.

In theory, the Neo/FC-PGA coupling should now drop straight into your PPGA socket and work, but your motherboard must be able to support lower 1.65 core voltages. We tried an 866MHz PIII on an Abit BP6 and, while the system started up okay, it was too flaky to run any tests.

We had, in fact, bought a pair of adaptors in the hope of dual-PIII action, but now our BP6 didn't even wake up, so it was back to the dual 366 Celerons. At the [www.bp6.com](http://www.bp6.com) enthusiast site, they'd successfully got one PIII working, but no

joy with dual CPUs. Note that only FC-PGAs employing Intel's c80 'stepping' are certified for dual operation.

Despite costing only \$25 each, our pair came to £70 after postage and import tax, which is not far off a new motherboard. We're expecting to see several genuine dual-FC-PGA motherboards launched this summer which, to be honest, is a better buy.

GORDON LAING

**DETAILS**  
★★

**PRICE** \$25 plus postage and import tax (approx £35)  
**CONTACT** PowerLeap  
[www.powerleap.com](http://www.powerleap.com)

**PROS** FC-PGA compatibility on legacy PPGA motherboards  
**CONS** Ours were flaky and expensive to import  
**OVERALL** You may be better off buying a new motherboard

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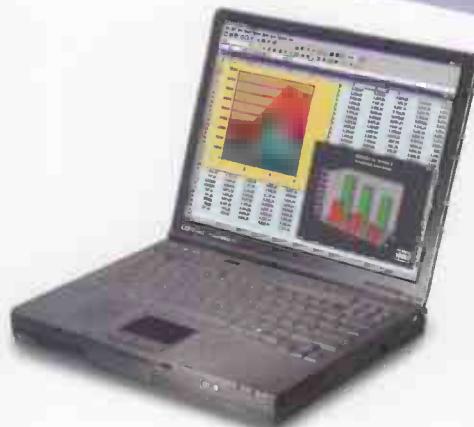
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### See inside for full range

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# COMPAQ

# Pioneer DVR-S201

DVD authors and companies that need to **back up a lot of data** will love this piece of kit.

A few years ago a DVD-R drive would have set you back over £13,000. Things have moved on since then, but these devices are still not cheap at £3,000 ex VAT. That said, it wasn't just the cost of DVD-R that put off potential buyers, it was also the capacity. The problem with DVD-R is that the capacity is only 3.95GB, which means that DVD discs cannot be mastered from them. Well, that's not exactly true, you could press a DVD 5 from a DVD-R disc, but you'd be wasting 800MB of capacity. However, the solution to this

problem is close at hand, with the 4.7GB DVD-R standard due for implementation in September.

it usually is with SCSI peripherals. There is no SCSI cable supplied, but since there's no way of knowing what SCSI card it will be connected to this makes sense. The discs are not particularly cheap, considering they can only be written to once, but any company that needs this kind of device isn't likely to be put off by the media cost. A 3.95GB disc will set you back between £20 and £24 while a 4.7GB disc will cost between £25 and £28.

Companies that need to archive a lot

of data on a regular basis will benefit greatly from a DVD-R drive, especially since only records stored on write-once media are admissible in court. That said, the main use of a drive like this will be for video. MPEG2 encoding has dropped in price so much that anyone dealing with multimedia or video is likely to want to code their output using it. Of course, anyone with a DVD player will already have experienced the high-quality video of MPEG2 when watching movies, so distributing video and multimedia on a DVD-R disc seems like the natural choice.

drive at under £400, but they really are entirely different products. The DVD-RAM discs may be rewritable, but you can only squeeze 2.6GB on each side, although the 4.7GB per side discs have been just around the corner for several months now. Also, DVD-RAM discs can only be read by another DVD-RAM drive, whereas DVD-R discs can be read by any DVD drive.

There is some serious competition on the horizon for DVD-R, however. DVD+RW is the rewritable standard supported by Philips, Sony and HP. This alternative to DVD-RAM is due for release early next year with a 4.7GB capacity and the ability to read the discs in any DVD drive, just like

DVD-R. However, whether we see DVD+RW next year remains to be seen, and in the meantime DVD-R is definitely the best solution for pre-mastering DVD discs.

The company that supplied the drive, Map 2000, is offering a bundle with the drive which includes Pioneer Crosswriter pre-mastering software as well as DVD-REP from Prassi (best known for its packet-writing CD-RW software). Rounding off the package is a box of 10 blank 3.95GB DVD-R discs to get you started.

This is a very expensive device that you either need or you don't. But if you do need it, it's well worth the money.

RIYAD EMERAN



Using the DVR-S201 was simple and intuitive with the drive operating like a high-capacity CD-R drive. We connected the drive to a 733MHz Intel Pentium III system with 128MB of RAM and a standard Adaptec PCI Narrow SCSI card. The burn times were long, but that's hardly surprising considering the amount of data that's being written. We wrote 3.5GB of data directly from a DVD-ROM disc to a blank 3.95GB DVD-R disc. The operation took 45 minutes and 30 seconds.

It's easy to dismiss DVD-R as being too expensive compared to a DVD-RAM

problem is close at hand, with the 4.7GB DVD-R standard due for implementation in September.

With 4.7GB recordable DVDs available, the process of creating DVDs for distribution has just got a lot easier. As things stand, if you want to create a DVD you'll probably have to send your data off on DLT tape and hope that the disc comes out as you want it. However, if you could create a DVD exactly the way you want it yourself, you'd know that when your distribution discs are pressed there will be no mistakes.

Connecting up the device is simple, as

## DETAILS

★★★★

PRICE £3,525 (£3,000 ex VAT)

CONTACT Map 2000 01344 845 626

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

PROS Great for pre-mastering DVDs; easy to use

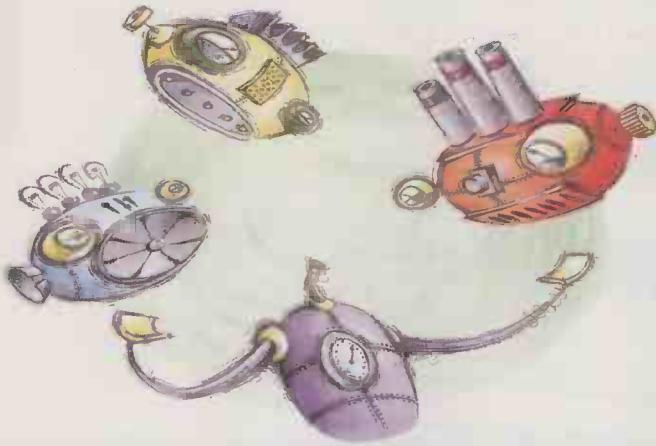
CONS Expensive

OVERALL A great unit if you're in the business of creating DVD discs. If you're not a DVD author, DVD-RAM may be a better option

# Let us do the juggling

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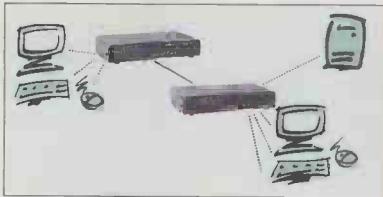
with excess keyboards, monitors and mice taking up too much desk space and generating excess heat? Well, let Dakota help find your solution. We're in business to meet all your computer switching and sharing needs with award-winning products, accurate information and a highly trained, expert staff.



Keyboard, monitor and mouse extender

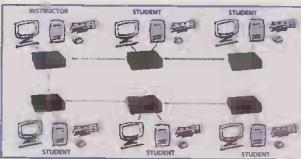
## Voyager UTP™ Extender

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™



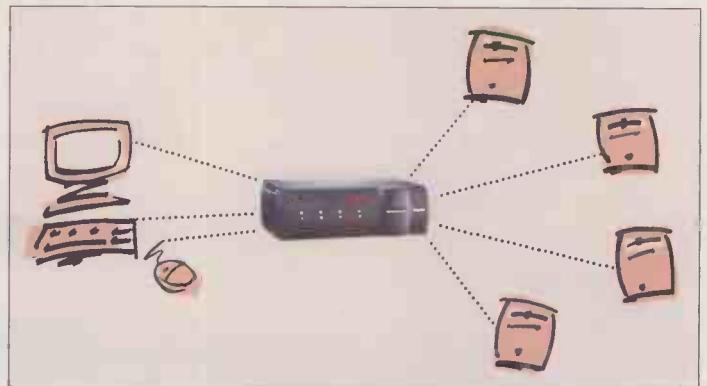
The TeachView system allows an instructor to display his monitor image to up to 50 students, allowing the students to see what the instructor does on his PC. The TeachView Plus version also allows the students to control

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™



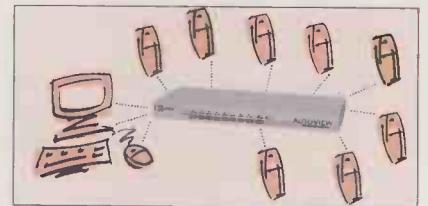
The Dakota Scout kvm switch has been specifically designed as an inexpensive and extremely compact keyboard, monitor and mouse switch. Ideal for users who need access to two or more different computers on a regular basis. Available with both two port and four port options, the switch is PC compatible 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.



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# Canon Digital Ixus

A digital camera, so compact and stylish, that the snap-happy will want to take it everywhere.

The one rule for any portable equipment is that if it's too big and heavy, you simply won't use it. This particularly applies to cameras – a big one may offer better facilities or quality, but if you can't be bothered to take it out, then you're better off buying a cardboard disposable, as at least you'll come home with some pictures.

Canon understands this philosophy perfectly and complements its higher-end SLRs with increasingly smaller compact cameras. The evolution peaked a couple of years ago with the tiny but perfectly formed Ixus camera, designed to use the new smaller APS film format. Sure, it couldn't match the quality of even some larger compacts in many circumstances, but its small size ensured it never stayed at home and missed an event. Now Canon has done what many thought would be

buying the more expensive S20. Instead Canon has fitted a 2.1 megapixel chip, operating at 1,600 x 1,200 pixels. With most colour inkjets liking to be fed around 200 pixels per printed inch, the Digital Ixus will easily deliver 8 x 6in prints, although even at 10 x 8in, image quality was acceptable (especially with subsequent software interpolation to smooth the jaggies).

You'd be forgiven for thinking Canon had employed built-in memory but, remarkably, the company has found room for a Type I Compact Flash slot and supplied an 8MB card as standard. Understandably, the slot won't accommodate IBM's MicroDrive. Like earlier Canon Digital cameras, the Digital Ixus employs relatively light compression at its best quality setting, resulting in files measuring around 1.6MB each. You'll get

around four or five of these on the 8MB card, 12 using higher compression, or 46 in 640 x 480 pixel mode. There's no uncompressed TIFF mode.

The supplied lithium-ion battery fully recharges in

around 120 minutes and is good for an average day's shooting – Canon reckons it's good for around 85 shots using the LCD monitor. Speaking of which, the Digital Ixus has a 1.5in TFT display, in addition to an optical viewfinder. The 1.5in may look small alongside the 1.8 and 2in displays on other digital cameras, but it works well. About the only downside is that you have to use it to check battery life, shooting mode and number of shots left, as there's no room for the traditional mono LCD status panel on the top.

Like the S10 and S20 before it, the Digital Ixus is almost entirely automatic, with a couple of overrides thrown in for good measure. Shutter speeds range from one second to 1/500, but there's no manual control over these, the aperture or the focus beyond a basic lock.

You can however, choose a black and

white mode, set the white balance and adjust exposure compensation from +/-2EV in 1/3 EV steps, which is considerably more than on

an average film compact. The flash can also be forced on or off, you can reduce red-eye, or use slow-syncro to complement long exposures. There's also TV output, but no video capture mode. Finally, a neat stitch-assist mode helps you align multiple frames to create panoramic effects.

Connection is across USB only, and Canon's supplied ImageBrowser software lets you browse, manage and download images – best-quality JPEGs take around six seconds to transfer.

Image quality was pretty good, but there was a little electronic noise apparent on smooth coloured graduations such as blue skies. So saying, in our tests, the Digital Ixus panned the original film Ixus in terms of image quality, along with boasting more control.

The bottom line is that while there are certainly better quality cameras around, none are as small as the Digital Ixus and its results are more than acceptable for the environments in which it will be used. It's so small you'll take it everywhere and, because it's digital, you'll keep snapping without a care. There's even a waterproof case available, at £149, that's good to five metres. In many ways, this makes the Digital Ixus the perfect compact camera – so long as you're never more than a day away from mains electricity or additional storage, of course.

GORDON LAING



impossible: meet the Digital Ixus.

Measuring a mere 57 x 87 x 27mm and weighing only 190g (without battery), the Digital Ixus really is the same size as the original 24-48mm zoom Ixus; suddenly Canon's earlier S10/S20 at 69 x 105 x 34mm and 270g doesn't seem so compact any more. When powered down, the only thing to protrude from the silver case is the slim zoom lever that surrounds the shutter release button on the top.

As with the S10/S20 and original Ixus, there's only room in such a small space to accommodate a 2x optical zoom lens, equivalent in focal length to 35-70mm on a 35mm camera; the actual specification is 5.4-10.8mm, f2.8-4.0 and the closest macro focusing distance is 10cm.

Before you get too excited, the Digital Ixus does not boast a 3.3 megapixel CCD – after all, if it did, there'd be no point

## DETAILS

★★★★★

PRICE £599 (£509.79 ex VAT)

CONTACT Canon 0121 666 6262

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

**PROS** Tiny, gorgeous and more than good enough for snappy situations

**CONS** Not 3.3 megapixel; slight noise on images; need to use main display to check status

**OVERALL** Small and of sufficiently good quality to replace many compacts





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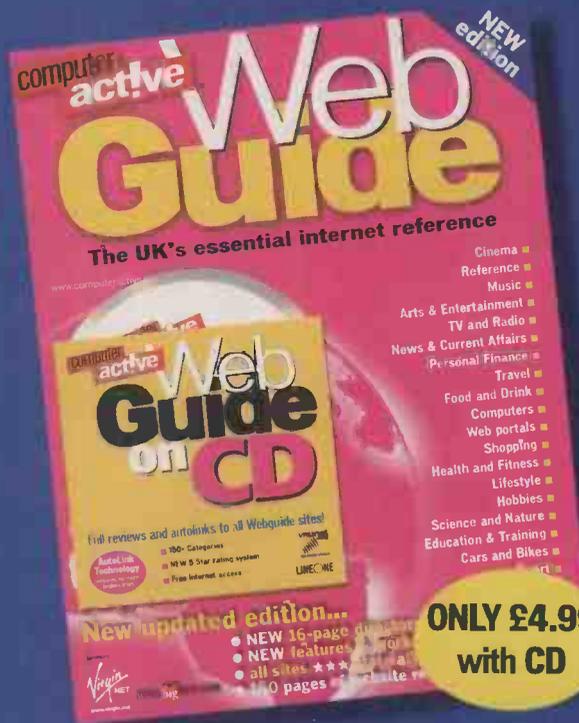
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# Epson PhotoPC 3000Z

A chunky, high-quality 3.3megapixel camera that promises to rival its competitors.

Now it's Epson's turn to join the 3.3megapixel fray with its PhotoPC 3000Z; a camera that, like its four major competitors from Canon, Sony, Olympus and Nikon, seems to have been carefully researched.

The 3000Z is a fairly chunky camera, measuring 89 x 108 x 65mm and weighing a relatively heavy 368g without batteries. Like Nikon and Olympus, Epson is sticking with four AA batteries and supplies a set of rechargeables and a charger. AAs are cheap and readily available, but they take around half a day to fully charge and rarely match the lifespan of the best lithium-ion rechargeables.

Like the earlier 850Z model, Epson has fitted the 3000Z with a 'HyPict' mode. This interpolates the standard 3.3megapixel resolution of 2,048 x 1,536 up to 2,544 x 1,904 pixels. Interpolation is where intermediate values are created by software to increase the apparent resolution of an image. It won't reveal any additional detail that wasn't originally captured, but can be quite effective at smoothing edges and hiding jaggies in big enlargements – but why build it in the camera when you can do it in software later?

We presume the answer is for situations where there's no PC, such as popping the memory card directly into a suitable photo printer. In-camera interpolation also allows you to work with raw data before it has been compressed. So saying, we took several identical compositions in both normal and HyPict modes, but when printed at A4 on Epson's Stylus Photo 1270, both looked virtually identical. At A3 there's a slight visible difference, but no-one yet produces an A3 printer with a memory card slot. Consequently we recommend you stick with the normal mode and

fit more images on the memory card.

Epson supplies the 3000Z with a 16MB Compact Flash card, although the slot is not certified



for the IBM MicroDrive CF hard disk. Interestingly, Epson has used the most severe standard compression out of all the 3.3megapixel cameras tested, resulting in files typically measuring only 780KB at best quality (compared to between 1 and 2MB on the others); even the interpolated HyPict mode only produces files around 1MB. There's the option of an uncompressed 9MB TIFF mode, along with a 640 x 480 and cropped 2,048 x 768 panoramic setting.

The 3x optical zoom lens is equivalent to 34-102mm on a 35mm film camera; the specification is 7-21mm, f2.0-2.5 and the closest macro focusing distance a reasonable 6cm. There's a manual focus option, but only three steps to choose from compared to seven on the Sony S70 and an impressive 50 on the Nikon 990.

Round the back is the choice of an optical viewfinder or a clear, bright 1.8in TFT display – out of all the 3.3megapixel models only the Sony S70 has a 2in screen. Seven buttons surrounding Epson's screen activate or confirm options displayed alongside, and you can zoom in by a factor of two during playback.

Flash options are particularly good, with an external hotshoe and a welcome rear-curtain mode that fires the flash at

the end of a long exposure to trail the action behind. An aperture priority mode offers six steps from f2.0 to f8.0, while fully manual offers 42 shutter speeds between eight seconds and 1/750. A time lapse function can automatically snap at intervals between 10 seconds and 24 hours. Exposure compensation is available from +/-2EV in 1/3 or impressively fine 1/5 EV steps.

The now common movie mode can capture up to 25 seconds of 320 x 240 video with mono audio in the QuickTime M-JPEG format, and play back full-screen on your TV; you can also record descriptive audio clips with each picture. Epson's software lets you view and transfer images (standard JPEGs in approx three seconds), and even configure and control the camera over the USB connection.

Image quality is excellent, with sufficient pixels to make a great looking A4 inkjet print. The high level of compression even on the best-quality JPEG setting slightly softened ultimate detail, but it's nothing you'd worry about.

On the downside, the 3000Z takes 55 or 15 seconds to save a TIFF or HyPict image, and 30 or five seconds respectively to open them. A 15-second video clip takes over 20 seconds to save and the same again to buffer before playing.

The 3000Z is most comparable to Sony's S70 and Olympus' 3030. Our favourite 3.3megapixel camera remains the S70 for being slightly smaller and lighter while boasting a much longer battery life, but it's an extremely close run thing – all will do you proud.

GORDON LAING

## DETAILS

★★★★★

PRICE £799 (£680 ex VAT)

CONTACT Epson 0800 220546

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

**PROS** Good quality; PC remote control of camera; time lapse function

**CONS** HyPict appears to be a white elephant; slightly high compression

**OVERALL** Another great 3.3megapixel camera where the choice between it, the Sony S70 and Olympus 3030 is entirely personal

# Umax Powerlook 1100

A FireWire scanner that will give you good results if you work with transparencies.

The Powerlook 1100 is a FireWire scanner, so data transfer to your PC will occur faster than over most SCSI links. There are two FireWire ports, so you can daisy-chain devices, but you'll need a FireWire card or integrated port for your PC.

Three film holders are supplied for 35mm, 120 and 5 x 4 film. The 35mm slide tray holds 12 mounted transparencies at once so you can scan lots of trannies in a short time.

The optical resolution of 1,200 horizontal x 2,400 vertical provides good sharp results and, with reflective originals, resolves detail such as text at small point sizes cleanly, though at resolutions above this the interpolation introduces a noticeable softening of edges.

The quality of scans from 35mm trannies is reasonable, with vibrant

colours, but falls well short of the standard required for most print reproduction purposes. The 1100 fared better with large format trannies, though.

The batch and auto scanning features make light work of many originals and are put to effective use in combination with the 35mm slide tray.

The preview scans the entire tray and selects the image areas, adding them as numbered 'frames' in the scan job list. You can then edit individual frames – changing the selection area in the preview window and editing scan settings. You can batch scan – using the same resolution and scan settings for each slide, or multiple scan with different settings. Batch scanning of a half-loaded tray with seven images all at 1,200dpi output resolution took a little over one minute, multiple scanning

the same set with resolutions from 150 to 2,400dpi took just two minutes.

At this price the Powerlook is a good option for small design businesses that deal primarily with reflective originals, but occasionally need to deal with trannies in quantity, at moderate output sizes, resolution and quality.

KEN MCMAHON



## DETAILS

★★★

PRICE £938.82 (£799 ex VAT)

CONTACT IMC 01344 871329

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

PROS Batch and multiple scanning; good-quality optics

CONS 35mm scan quality; poor documentation

OVERALL For almost four times the price of the Canon (below) you get a slightly bigger scan area, FireWire, noticeably higher quality, colour management and batch and multiple scanning features. Is that worth £600 to you?

# CanoScan FB1210U

Sleek, simple-to-use scanner that offers one-touch processing and speedy action.

Small, light, and sleek, this is the design antithesis of the Umax Powerlook 1100 reviewed above. The emphasis is on simplicity of use and from the USB port on the rear to the one-touch scan button on the front this is a good looking, functional piece of kit.

The optional transparency adaptor is so slim and lightweight you could easily mistake it for the document cover it replaces. Removal of the protective cover, however, reveals a 5 x 4in diffuser light that illuminates the slides from above.

Scangear CS-U, a TWAIN plug-in, provides access to the scanner from your image editor.

The TWAIN module has two modes, simple and advanced. With the first you choose from a selection of document

types – colour photo, line art and so on, set the paper size and image source, preview, crop and scan. Advanced mode allows you to set

the colour mode, output resolution and scaling, as well as providing image preprocessing options.

At its maximum optical resolution of 1,200 x 2,400, fine detail looked good but, as you'd expect from a scanner costing a quarter of the price, it was inferior to the Umax (above). Quality of transparency scans was terrific at the larger sizes, but really quite poor from 35mm originals. This might be something to do with the holder, which is fiddly to say the least.

The bundled Scangear toolbox app provides a desktop button bar that gives

one-touch processing for a variety of destinations. You can set colour mode, resolution and so on in each button's preferences and nominate one to activate when the start button is pressed.

Despite the bandwidth limitations of USB, even big scans are completed fairly quickly – a slightly undersized A4 RGB page at 300dpi, producing a 22MB file, took one minute and 10 seconds.

KEN MCMAHON



## DETAILS

★★★

PRICE £292.57 (£249 ex VAT) with transparency unit

CONTACT Canon 0121 666 6262

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

PROS Stylish; simple

CONS Poor-quality 35mm transparency scans; fiddly

OVERALL Good option for automated front-panel control, for 35mm transparencies in volume look elsewhere

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## Piranha Pro

The Piranha Pro is a revolution in mobile computing, bringing together mobility, an ultra slim design and desktop replacement power. The Piranha was developed as an alternative to standard desktop replacement notebooks. Surrounded by an elegant and thin profile design, the Piranha became one of the most popular Elonex mobile products. Now, the next generation ultra slim mobile computer has been launched – the Piranha Pro. Again the ultra slim design and good looks are there to be seen, but further enhancements are now included. The screen size has been increased to a more comfortable 13.3" TFT panel. Concurrent support for both integrated 56K modem and 10/100 LAN has been extended, offering even more savings on the need for PC-Card communication devices.

### Example configuration:

- Mobile Intel® Pentium® III Processor 700MHz
- 128MB SDRAM (Maximum 320MB SDRAM)
- 12.0GB Ultra DMA Hard Drive
- ATI RAGE Mobility-M1 VGA AGP with 8MB SDRAM
- 13.3" TFT 1024x768 XGA Colour Screen
- External 1.44MB Floppy Drive,
- External 24x Speed CD-ROM
- Dual Independent display with DVD and MPEG 2 Decoding
- 1x Type II PCMCIA slot
- Dimensions: 308 x 241 x 25.3mm (WxDxH), 1.9Kg
- Integrated V.90 56K modem with Pan European support
- Integrated 10/100 Intel Network Card
- Free Elonex Direct Internet Access
- Microsoft Office 2000 SB
- Microsoft Windows 98 Second Edition

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- Internal Charger and DC-in jack
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- Dimensions: 308mm x 251mm x 21mm (WxDxH)
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**Practical IT**

# CTX EX1300

A 21in shadow-mask monitor that offers fine quality at a budget price, but the world is going flat.

Although CTX is going flat for the majority of CRT displays, the company is also still plugging away at the top end with 21in monitors based on shadow-mask tubes. The EX1300 is the latest in the line.

Short-necked the EX1300 is not: at 540mm deep, you need plenty of desk space. And, at 30kg, unpacking and positioning is a two-person job.

Styling and control layout conforms to the usual CTX standards – three buttons on the fascia provide access to three on-screen menus for picture, colour and status information, while four others provide for navigation within them. Not the most intuitive system, but there is at

least a dedicated OSD exit button, which also serves to switch between D-SUB and BNC inputs when the OSD isn't active.

The EX1300 has a USB hub, with one upstream and four downstream connectors, which are tucked away on the back panel.

Progress hasn't completely halted on improvements to shadow-mask displays: the picture is admirably sharp, although it's inevitably less beguiling than the richness and vibrancy of an aperture grille.

Power regulation is rock-steady, with better resolution characteristics than we'd expect, along with a fine performance in the video bandwidth tests, which indicates good electronics. Maximum claimed resolution is 1,800 x 1,440 at 76Hz, although that's not really

a practical resolution: 1,600 x 1,200 at 85Hz is the highest we'd attempt for normal use, at which it's very usable.

The EX1300 is a fine unit, but the world is moving toward flat screens, and going back to the curved surface of a shadow-mask display is a price most people upgrading from a smaller, flat-screen unit will be unwilling to pay. But, if you still prefer the look of a shadow mask, the price and quality of the EX1300 make it one to consider.

DAVID FEARON



## DETAILS

★★★★

PRICE £586 (£499 ex VAT)

CONTACT CTX 01923 810 800

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

PROS Fine quality for a shadow mask; comprehensive features

CONS Most don't go for curvy screens any more

OVERALL A good choice for those who need a lot of screen area on a budget

# Taxan Ergovision 985

Another entrant into the 19in monitor race, this is a fine product but can it beat the competition?

The Ergovision 985 TCO99 is Taxan's latest entrant into the hotly-contested 19in monitor

fray. There are no surprises as far as the tube goes: it sports a flat-screen aperture-grille unit in the form of a Mitsubishi-made Diamondtron NF, with 18in viewable diagonal

The look of the 985 is also what we've come to expect from Taxan – functional rather than flash, with no over-the-top styling. In common with most other flat-screen CRTs, the unit is fairly deep, but not unmanageable at around 475mm. The OSD menu system is the biggest departure from previous models, and it's a huge improvement. The single button and digital rotary control make finding the adjustment you

want quick and simple: just twirl the knob and it'll scroll through the available adjustments page by page. As the name suggests, all the emissions, ergonomics and environmental bases are covered by the 985's TCO99 certification.

As usual, we tested the Taxan using a Matrox G400 graphics card. In terms of image quality, it's a good performer, with next to flawless image geometry and very good power regulation. At a resolution of 1,024 x 768 and a vertical refresh of 75Hz, focus and sharpness are adequate, but it doesn't possess the superb clarity and contrast of CTX's excellent, and cheaper, PR960F (PCW April 2000). This may be down to the variable 0.25-0.27mm aperture-grille pitch of the Diamondtron NF, compared to the constant 0.24mm pitch of the



CTX's Sony FD Trinitron tube. There's no USB facility, which the CTX has as standard. Quality is good enough for the display to remain usable if you want to switch up to 1,280 x 1,024, but go over 75Hz refresh at this resolution and the drop-off in clarity becomes obvious.

We have no major complaints about the 985 – it's a fine monitor with good controls and image quality. But at this price, the competition from CTX and Mitsubishi is a little too stiff.

DAVID FEARON

## DETAILS

★★★★

PRICE £390 (£331 ex VAT)

CONTACT Taxan 01344 484 646

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

PROS Great OSD; good quality

CONS Not as sharp or as cheap as some of the competition; no USB

OVERALL It's good, but not good enough to break clear of the pack

# Kodak V600 Zoom

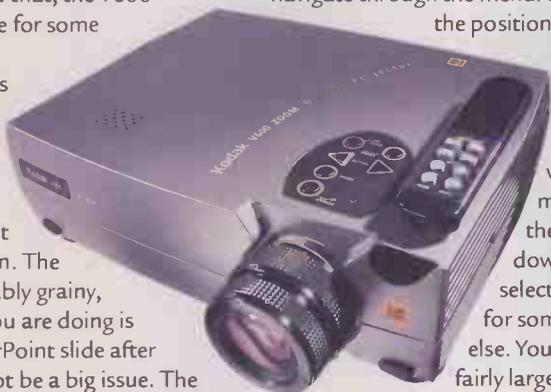
Mobile presenters on a budget should **focus in on this LCD projector** for its vivid reproduction.

**T**his LCD projector from the imaging giant Kodak is a lot more affordable than Infocus' DLP-based LP335 we reviewed last issue, but to a certain extent you get what you pay for. Having said that, the V600 Zoom would suffice for some mobile presenters.

This 800-lumens model displays an acceptable picture at 800 x 600 with, typically of LCD models, very vibrant colour reproduction. The picture was noticeably grainy, though, but if all you are doing is showing one PowerPoint slide after another, this will not be a big issue. The image can be viewed with the lights on, although not quite to the same degree as a 1,000-lumens version. For the best performance, though, keep the lights off.

Inside the case is a healthy supply of connectors: British, European and US plugs, S-Video, Composite, D-SUB,

audio and even a Mac adaptor. The projector has the appropriate ports for these cables. The control system is adequate, but could be improved slightly. Five buttons allow you to navigate through the menu. However, the positioning of the buttons is a bit confusing, and we kept mistaking the up, down and select buttons for something else. You have a fairly large degree of control over the picture, and there are a few pre-sets in Kodak's Image Manager that make the picture look a little better for photos, rich colours, spreadsheets and graphics. A remote is also provided with the same buttons as the top of the projector.



Turning the lens adjusts the focus, and there's also a manual 1.3x zoom on this model, although if you don't need this, a cheaper version comes without it. You can't adjust the keystone correction manually, which is a big minus. Overall, this projector is not as feature rich and does not have such a high-quality image as more expensive models, but it is light (3.4kg) and would suit the mobile professional on a budget.

JASON JENKINS

## DETAILS

★★★★

**PRICE** £1,996.33 (£1,699 ex VAT)

**CONTACT** Kodak 0870 6061031

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

**PROS** Inexpensive; light; lots of ports; vivid colour reproduction

**CONS** No remote mouse; menu could be better; no manual keystone correction

**OVERALL** Not suitable for a home cinema enthusiast, but presenters could check it out

# IBM Deskstar 75GXP

For IDE fans, this hard drive is **full of features** and can store 75GB in its high-capacity body.

**T**he grass was always greener on the SCSI owner's side of the fence, but IBM is about to change this for IDE owners with the Deskstar 75GXP.

It's a drive that manages to squeeze 75GB into a 1in high form factor. Despite this, though, it doesn't skimp on features.

First, and most important, is a change in the material the disks are made from. The standard aluminium substrate has been replaced with a more rigid glass version. Combined with fifth-generation GMR (Giant Magneto Resistive) heads, higher areal densities can be reached. This gives the 75GXP a density with a very impressive 11GB/sq in. This means that the 75GB capacity is spread across five disks, and 10 sides.



The glass substrate also undergoes a manufacturing process to create a smoother disk. The subsequent reduction in surface defects gives a more reliable storage medium. On top of this, the disk's additional rigidity allows the drive heads to fly closer to the surface, cutting down the number of read/write errors.

To increase data security when the drive is powered down, the load/unload technology is built in. Previously only seen in IBM's mobile drives, it moves the heads off the surface of the disk, and onto a safe area, when the drive powers down.

From the technical specs - a spindle speed of 7,200rpm, a 2MB data buffer, a UltraDMA100 interface, and an average

seek time of 8.5ms - everything looks good in terms of performance.

We put the drive to the test with a 1GB file copy, and a random file read/write test using Iometer version 1998.10.01. It took 73 seconds to do the file copy, while the read/write test gave a result of 0.78Mbytes/second. The seek time was slightly slower than the 36GB IBM hard drive featured in our April group test. So, it's not the fastest drive, but for the price you get an awful lot of storage.

DAVID LUDLOW

## DETAILS

★★★★

**PRICE** £499.38 (£425 ex VAT)

**CONTACT** IBM 01475 898125

[www.storage.ibm.com](http://www.storage.ibm.com)

**PROS** Massive capacity; reliability should be better

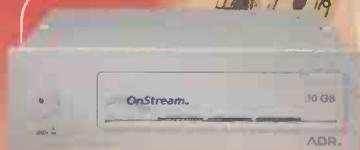
**CONS** Average seek time is a little slow

**OVERALL** If you're looking for a lot of storage at a reasonable price then this is a great drive

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- External Design

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Install the ultra-reliable OnStream Echo30 software and then simply forget about it! You'll be completely protected against dangerous computer viruses, computer crashes and other potential disasters. So, there really is no excuse not to back up your data.

On installation a full back up is completed which automatically backs up any new or changed data files. The OnStream Echo30 drive maintains multiple versions of the files – just in case you need to recover an earlier version!

Echo30 is available in internal (DI30-Internal IDE) and external models (30GB External USB) and both come with Echo's catalogue feature allowing access to your files through Windows Explorer.

**For more information on the exceptional value Echo30 tape drive from OnStream, call your reseller today.**

To find out more about the Internal IDE or External USB please visit us at: [www.onstream.com/echo30/PCWorld](http://www.onstream.com/echo30/PCWorld)

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# Western Digital 1394

An external FireWire drive that performs well – even when the cable was removed!

External FireWire drives are now becoming more commonplace and the market is approaching the level at which there is a real choice. For portable video storage and indeed any other activity that requires unfussy large-capacity drives these units are ideal.

This drive is an unremarkable looking black box with rounded edges. It's much larger than the LaCie PocketDrive (PCW July 2000), or the popular VST drives. It's available in 20, 30 and 45GB sizes – we've reviewed the entry-level option.

The drive is supplied with a six-pin FireWire cable and power supply that we didn't expect to have to use. The unit was connected to an ADS pyro 1394 card – a space previously happily occupied by a 16GB VST drive that took its power from the card. The WD drive, however, would

not function without the power cable. If you don't already have a 1394 card Western Digital sells one for £69 inc VAT.

Setup software for Windows and MacOS, which installs 1394 driver updates and formats the disk, is provided on CD, but refused to acknowledge the presence of the



drive. Windows 2000 knew it was there though – as evidenced by the unplug hardware icon in the system tray. We resorted to the

Windows 2000 disk management utility to format the disk, providing 19.1GB of formatted space.

In use the drive operated reliably. Given the much-vaunted hot plugability of FireWire devices it's irresistible, if a little foolhardy, to see what will happen if you pull the cable during a read

operation and the drive's performance in this respect was impressive. Playback of an AVI file in Windows Media Player stopped when the cable was removed – and resumed when plugged back in!

Despite the ease with which you can plug and unplug these products, manufacturers seem to be cagey about their resilience and Western Digital is no exception. All the same, the case is robust and should easily stand up to transit in a well-padded computer bag.

KEN MCMAHON

## DETAILS

★★★★

PRICE £299 (£254.47 ex VAT)

CONTACT Western Digital 01372 360 055

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

PROS Reliable; quiet; good value

CONS Needs a power cable; difficult setup

OVERALL There are smaller, better looking FireWire drives on the market, but this does the job and is competitively priced

# HP DeskJet 350C Series

If you need to print on the move, this mobile printer could be just what you're looking for.

The first thing you notice about the new DeskJet 350C Series is its size – small enough to be called 'mobile'. The basic 350C comes with high-volume mono and colour cartridges while the 350Cbi also includes a rechargeable battery pack and infra-red adaptor. The battery charges in a little over an hour and will then go on to print up to 130 pages of standard-quality black text.

As with all things mobile, though, there's a payoff. With the 350C it's the print quality. Mono graphics aren't too bad, graininess aside. Detailed colour graphics, though, even on HP's own

photo paper and at the highest quality



setting are extremely grainy.

To be fair, though, if you're buying a portable printer you can't really expect photo quality output, and at least transitions and general levels of detail were good. The printer weighs in at 5.4lb with the portable sheet feeder attached, so is quite heavy for a mobile device. It is, however, robust and well made. HP claims to have drop tested it from 2.5 feet.

Text printing is sharp, with very little feathering. Holding only one cartridge at

a time, though, you have to make a choice between colour or black and with the colour cartridge installed, composite text is slightly grey. That said, spot colour content is vibrant, if grainy. The print speed is good, and it managed a steady five pages a minute when we switched to draft quality. Standard quality printing of a single page of text took 38 seconds.

The 350C is an adequate mobile printer. Text quality is sharp and graphics, although not first class, are acceptable.

SCOTT MONTGOMERY

## DETAILS

★★★★

PRICE £179 (£152.34 ex VAT)

CONTACT Hewlett-Packard 0990 474 747

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

PROS Good text printing at reasonable speed; vibrant colours

CONS Graphics are very grainy; unit is heavy

OVERALL A mobile printer that adequately covers all on-the-move printing needs

# HP OfficeJet G85

The multifunction device returns and this does a good job as a printer, fax and photocopier.

It may not be the most attractive printer around but it is versatile, combining four of the most common business products in one unit with a footprint about the size of the average desktop PC. Its functions are printing, scanning, copying and colour faxing.

We got off to a good start with the G85. Its driver, like all of them from HP, is well written and extensive, and when you're printing it offers an impressive range of options. There are three print qualities to choose from and the G85 deals easily with banner printing, 23 media types and 18 paper sizes, including a set of user-defined dimensions.

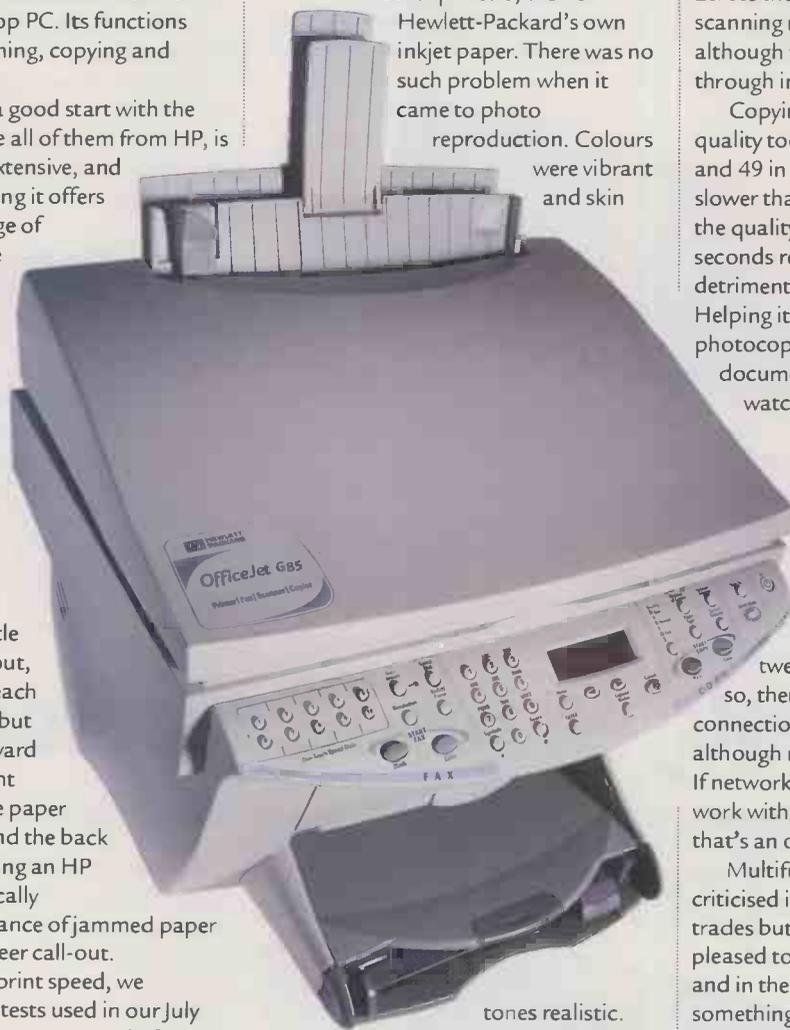
Cartridge installation is a little less well thought out, requiring you to reach well into the unit, but this is not as awkward as at first you might think. We liked the paper release door around the back that is fast becoming an HP trademark, practically eliminating the chance of jammed paper requiring an engineer call-out.

To test its raw print speed, we subjected it to the tests used in our July issue printers group test. A total of 50 'normal' quality pages of plain text arrived in 13 minutes 27 seconds, putting it ahead of even the fastest printer tested back then, the HP PhotoSmart P1100, and a full 20 minutes faster than Canon's ponderous BJC-8200 Photo. This impressive speed was not achieved by compromising on quality. On photocopy paper the characters were dark and firm with only minimal feathering.

A good driver feature is the ability to vary the amount of ink laid down on each pass, so if, like most of us, you use this sort of low-grade paper regardless of the printing technology, you can avoid saturation. If you're a stats junkie, black text is printed at 600 x 600dpi while colour printing achieves a respectable 2,400 x 1,200dpi.

Our vector graphic test image was well rendered with smooth curves and transitions, although the colours were slightly less vibrant than those seen from

other printers, even on Hewlett-Packard's own inkjet paper. There was no such problem when it came to photo reproduction. Colours were vibrant and skin



tones realistic.

Two things caught our eye here, though. In one complex area there was a rather high contrast between dark and light areas, so much so that you could be forgiven for thinking we'd enabled trapping on a publishing document, and in several other parts of the image there was visible stepping where we would have expected smooth curves. From hitting print to holding the finished photo took eight minutes 10 seconds, which would have put it somewhere around the middle of the pack in our group test.

The G85's scanning performance was fair, although it demonstrated some loss of definition in areas of shadow, recognising only 19 distinct tones of grey from a range of 22 on a test target. That said, when we used it to produce a copy

of the same target using HP's proprietary photo paper we were pleased with the results. It was still easy to tell the two apart but the colours were close right across the spectrum. Maximum optical scanning resolution is 600 x 3,600dpi, although this can be upped to 9,600dpi through interpolation trickery.

Copying a full A4 page at 'normal' quality took 21 seconds in monochrome and 49 in colour, which makes it far slower than a photocopier, but dropping the quality a notch cut this to 17 and 21 seconds respectively without having too detrimental an effect on the results. Helping it more closely mimic a high-end photocopier, there's an automatic document feeder, so you'll not have to watch over it on long jobs.

Of course, you shouldn't feel compelled to plug the G85 into your PC. Its fascia has more than enough buttons to brag about, providing for fax speed dialling, direct copying, magnification adjustment and even manually tweaking the print margins. Even so, there are USB and parallel connection points around the back, although no inbuilt networking features. If networking is your thing it'll happily work with an external Jet Direct unit, but that's an optional extra.

Multifunction devices have been criticised in the past for being jacks of all trades but masters of none. We're pleased to see HP has borne this in mind and in the G85 has come up with something well suited to the jobs at hand. It's keenly priced but you'll need to take into consideration that running an inkjet is a little more pricey than a laser, especially if you mainly print black text.

NIK RAWLINSON

## DETAILS

★★★★

PRICE £499 (£424.68 ex VAT)

CONTACT Hewlett-Packard 0990 474 747

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

**PROS** All-in-one unit, so good for the home office; fast text printing

**CONS** Photo printing could be slightly better, but it's nothing serious

**OVERALL** The multifunction device has been reborn and the G85 should do much to give the family a good name

# Notebook

## Buyer™

### THE UK'S BEST NOTEBOOK RANGE

Notebooks now account for over 30% of all PCs sold and provide desktop performance in a mobile package which can be used anywhere.

### Features to consider before you buy...

#### Screens

Popular sizes are 12.1", 13.3", 14.1" and 15.1". In terms of use a 15.1" display is better than a 17" CRT monitor. TFT screens provide the sharpest picture but the new High Performance (HPA) screens are almost as good quality. Resolution is normally SVGA (800 x 600) on 12.1" screens and XGA (1024 x 768) on all others. Go for the biggest screen you can afford. Ultra thin and light models may include 10.4" or 8.4" touchscreens.

#### Twin Displays

Some notebooks can have simultaneous displays on screen and external monitor. This is useful for presentations.

#### Processor

Mobile processors consume lower power and extend battery life. SpeedStep processors can also slow down to extend battery life. Mobile AMD 500MHz processors represent the best value at present. For power users we recommend Intel® Pentium® III 700MHz models.

#### RAM

Most notebooks include 2 DIMM slots which can take mobile 32Mb, 64Mb or 128Mb SDRAM modules with maximum RAM of 256Mb. We recommend 128Mb for most users.

#### Floppy Drive

A built-in 1.44Mb floppy drive is valuable as you don't need to carry an external drive with you.

#### Keyboard/Mouse

The best pointing device is the touchpad or fingerpad which is normally fitted as standard, but a PS/2 mouse can normally be added.

#### PC Slots

Most Notebooks contain two PC (PCMCIA) type II slots which are stacked to form one Type III slot. Look for Zoomed Video ready ports as these can be used for any PC card.

#### Battery Life

Battery life is normally around 2-3 hours depending on use and processor power consumption. Li-Ion batteries are normally standard on all TFT models and provide a longer life than Ni MH batteries. A notebook will come with an AC power adaptor/battery charger as standard.

#### Graphics

AGPx2 graphics using system RAM or ATI 8Mb graphics are normally standard. External resolution can be up to 1280 x 1024 or higher.

#### Multimedia

3D wavetable sound with built-in speakers and microphone with options for external ones, make notebooks fully multimedia ready.

#### Modem

Look for a built-in 56K modem and Internet access as standard because this is now a popular use. A built-in modem leaves the PC slots free for other upgrades.

#### Hard Drive

2.5" mobile hard drives are lightweight and have low power consumption. Popular sizes are 6Gb, 12Gb and 18Gb. We recommend 12Gb or larger.

#### CD-ROM/DVD

Consider notebooks with a CD-ROM drive (Mobile 24x CD) or a DVD drive. DVD with MPEG-II playback allows you to watch movies on your notebook.

#### Physical Size

Check the physical size and weight. Most are approx A4 size, weighing about 3Kg.

#### Special Ports

Some notebooks may include Ethernet ports for built-in Ethernet and TV-out ports.



#### Other Ports (covered for protection)

All standard ports including printer, serial, fast Infra-red, USB etc are included normally at the rear, giving your notebook full desktop functionality.

#### Expansion Bus (covered for protection)

This allows your notebook to be easily connected to a port replicator at your base at home and/or office. The port replicator remains connected to a larger screen, printer and larger keyboard, external mouse etc; giving full desktop functionality.

Whatever your notebook requirements, the Time Traveller range will include a model to fulfil your needs

#### Time Traveller 'E' Series

Our best selling range of Internet ready multimedia notebooks. A wide range of screens from 12.1" to 14.1" with Mobile AMD K6-2 3D processors. The Best Buy for Home and Business.

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14.1" screen models with Intel® Celeron™ and Pentium® III Processors – Incredible Power at Unbeatable Prices! Ideal for the Power User.

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15.1" screen models with built-in Ethernet and Intel® mobile Pentium® III processors with Intel® SpeedStep™ Technology. Ideal for Professionals and Corporates.

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Ultra thin and light notebooks for professionals on the move featuring Intel® mobile Pentium® III processors.

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# The Versatile

## Internet Ready Multimedia Notebooks

This range of notebooks delivers incredible notebook performance and functionality without compromising on size, weight or battery life. With high performance mobile AMD 3D processors these notebooks deliver desktop performance at truly incredible prices.

Our Best Buy model includes 13.3" TFT Suga Colour Screen, 128Mb RAM, 12Gb hard drive, full CD multimedia, 56K Internet ready modem and Microsoft Power Pack software for just **£899+VAT and Delivery!**

Buy any Exec model and get 12 months Interest Free Credit!

### Detailed Specification

**Screen:** Choice of 12.1" HPA, 12.1" TFT, 13.3" TFT, 14.1" TFT screens with resolution of XGA 1024 x 768 (13.3" and 14.1") and SVGA 800 x 600 on 12.1"

**Processors:** Choice of 400MHz, 450MHz or 500MHz Mobile AMD K6-2 with 3D Now!™ and low power consumption. 512K pipeline burst cache fitted.

**RAM Memory:** 32Mb, 64Mb or 128Mb SDRAM expandable to 256Mb.

**Hard Drives:** 4Gb, 6Gb or 12Gb high performance Ultra-ATA 33 with low power consumption.

**CD-ROM or DVD:** Mobile 24x CD-ROM or a DVD drive with MPEG-II movie playback built-in.

**Floppy Drive:** Built-in 3.5" 1.44Mb floppy drive.

**Modem:** Built-in 56K V90 modem and Free supanet Classic Internet Access.

**Multimedia:** 3D wavetable sound with built-in speakers and microphone with options for external speakers and microphone (stereo/line-in, headphones/line-out and microphone ports).

**Battery:** Li-Ion battery on TFT models. Ni MH battery provided on 12.1" HPA models. Battery life approx 2 to 3 hours depending on configuration and use.

**Full Power Management:** Standby, suspend to disk and suspend to RAM.

**Keyboard/Mouse:** Advanced notebook keyboard with built-in touchpad/fingerpad and buttons for Internet and e-mail. Options for external PS/2 mouse/keyboard.

**PC Slots:** Zoomed Video enabled two PC (PCMCIA) type II slots stacked (= one Type III) slot.

**Twin Displays:** SVGA port with simultaneous display on screen and external monitor.

**Graphics:** 8Mb AGP2 graphics using system RAM with external screen resolution of 1280 x 1024.

**Other Ports:** All standard ports including parallel printer, serial, two USB and fast Infra-Red.

**Expansion Bus:** 80 pin bus for port replicator.

**Physical Size:** Dimensions 305 x 251mm x 39mm to 42mm high. Weight 3Kg approx. Mains adaptor included.

**Operating Software:** Windows 98, Norton AntiVirus, Laplink 2000, IBM ViaVoice Millennium, Free supanet Classic Internet Access.

**Microsoft Power Pack:** Over £1000 of Microsoft and other application software. Plus Free SmartSuite Millennium Office pack.

**Exec Models:** Include Laplink cable, headset microphone, Joypad, Microsoft Encarta 2000 Encyclopaedia, 5 top games and 22 extra CD titles for just £99+VAT = £116.33 extra.

### Notebook Deal 1a E400-3D 12.1" CD

HPA Screen

HPA 12.1" SVGA Colour Screen

400 MHz

400MHz AMD K6-2 3D Mobile Processor

32 Mb

SDRAM Memory

4 Gb

Hard Disk

CD-ROM

CD-ROM Drive



£699

Plus VAT & Del.

£861.28

Total Price Inc. VAT & Del.

See detailed specification left

Product codes 394, Exec 395

### Notebook Deal 1b E450-3D 12.1" CD

HPA Screen

HPA 12.1" SVGA Colour Screen

450 MHz

450MHz AMD K6-2 3D Mobile Processor

64 Mb

SDRAM Memory

6 Gb

Hard Disk

CD-ROM

CD-ROM Drive



£799

Plus VAT & Del.

£978.78

Total Price Inc. VAT & Del.

See detailed specification left

Product codes 396, Exec 397

### Notebook Deal 1c E500-3D 12.1" CD

TFT Screen

TFT 12.1" SVGA Colour Screen

500 MHz

500MHz AMD K6-2 3D Mobile Processor

64 Mb

SDRAM Memory

6 Gb

Hard Disk

CD-ROM

CD-ROM Drive



£929

Plus VAT & Del.

£1131.53

Total Price Inc. VAT & Del.

See detailed specification left

Product codes 519, Exec 520

### Notebook Deal 1d E500-3D 12.1" CD

HPA Screen

HPA 12.1" SVGA Colour Screen

500 MHz

500MHz AMD K6-2 3D Mobile Processor

128 Mb

SDRAM Memory

12 Gb

Hard Disk

CD-ROM

24xCD-ROM Drive



£899

Plus VAT & Del.

£1096.28

Total Price Inc. VAT & Del.

See detailed specification left

Product codes 525, Exec 526

### Notebook Deal 1e E500-3D 14.1" CD

TFT Screen

TFT 14.1" XGA Colour Screen

500 MHz

500MHz AMD K6-2 3D Mobile Processor

128 Mb

SDRAM Memory

12 Gb

Hard Disk

CD-ROM

CD-ROM Drive



£1199

Plus VAT & Del.

£1448.78

Total Price Inc. VAT & Del.

See detailed specification left

Product codes 521, Exec 522

### Notebook Deal 1f E500-3D 14.1" DVD

TFT Screen

TFT 14.1" XGA Colour Screen

500 MHz

500MHz AMD K6-2 3D Mobile Processor

128 Mb

SDRAM Memory

12 Gb

Hard Disk

DVD ROM

DVD-ROM Drive



£1299

Plus VAT & Del.

£1566.28

Total Price Inc. VAT & Del.

See detailed specification left

Product codes 523, Exec 524

### OPTIONS

- Time Style A carry case – £59+VAT = £69.33
- Time Style B carry case – £59+VAT = £69.33
- Car charger adaptor – £49+VAT = £57.58
- Extra NiMH battery – £49+VAT = £57.58
- Extra Li-Ion battery – £99+VAT = £116.33
- Port replicator – £95+VAT = £111.63
- Exec Models – £99+VAT = £116.33

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Sun 10am-4pm

TIME

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# Time Traveller 'E'

**NOTEBOOK DEAL 1**

**SPECIAL PRICE**

**£1099** Plus VAT & Del.

**£1331.28** Total Price inc VAT & Del.

## Time Traveller E500-3D 13.3" CD

- 500 MHz**  
500MHz AMD K6-2 3D Mobile Processor
- 12 Gb**  
Hard Disk
- 128 Mb**  
SDRAM Memory
- 56k Modem**  
56k Built-In Modem
- TFT Screen**  
TFT 13.3" XGA Colour Screen
- CD-ROM**  
24x CD-ROM Drive
- TWIN DISPLAYS**  
Simultaneous Displays for Presentations
- 1.44 Mb Floppy**  
3.5" built-in floppy

Designed for  
Microsoft  
Windows 98



### All models include:

**PLUS** Over £1000 of Software

Power Pack 2000 including

**Microsoft**  
software

Includes Microsoft Windows 98, Internet Explorer 5 and Works 2000. Also includes IBM speech recognition and many Home and Education software titles. Plus Free Lotus SmartSuite Millennium.

**PLUS** Free Internet Access



Free supanet  
Internet Access

**PLUS** All standard features

See detailed specification opposite

**PLUS** Interest free credit on Exec models only

**No Deposit** If ordered in-store

**0%**

**No Interest** if repaid in 12 months

**29.8%**  
APR 4 YRS

Typical Finance Example: Cash price £1000 inc VAT and delivery. Pay nil deposit and 11 payments of £33.92, 12th and final payment of £626.88. Total amount payable £1000 (APR 0%). If the final payment is not received then the monthly payments of £33.92 will continue for a total of 48 months (APR 29.8%). Total price £1628.16. No deposit only applicable when ordered in-store. Mail orders require a deposit of the delivery charge (£39.95) for finance clearance.

Product codes 398, Exec 399

Direct Orders

**0800 77 11 07**

Send no money now. Total prices include courier delivery charge which varies with destination: UK mainland (excluding Scottish Highlands) is £34 + VAT = £39.95. Prices, specifications and offers are subject to change, availability and to our conditions of sale, copies from Time Computers Ltd, Time Technology Park, Burnley, Lancashire, BB12 7TG. Fax Number: 01282 77 07 01. Licensed credit brokers. Finance is subject to status. Written details on request. Goods normally delivered within 5-7 days. All orders fulfilled within 28 days unless otherwise specified. Industry practice is to measure screen CRT size. Viewing area can be approx 1" less. Software pre-loaded and supplied on CD with on-line help. Photography/software packs shown for illustration only. Time and the Hourglass are registered trademarks. More than just a PC and Time Machine are Trademarks of Time Computers Ltd. Products and prices in Dublin may differ. E&OE.



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# The High Performance

## High Performance Internet Ready Multimedia Notebooks with 14.1" screens

This range of notebooks delivers incredible power at unbeatable prices. They all feature superb 14.1" XGA screens and the high performance is provided by the latest Intel® Pentium® III processors and ATI AGP2 graphics.

Our Best Buy model includes Intel® Pentium® III processor 700MHz, 128Mb RAM, 12Gb hard drive, full CD multimedia, 56K Internet ready modem and Microsoft Power Pack software for just **£1399 + VAT and Delivery!**

Buy any Exec model and get 12 months Interest Free Credit!

**Notebook Deal 2a**  
**M600-2 CD**

600 MHz  
Intel® Celeron™ Processor 600MHz

64 Mb  
SDRAM Memory

6 Gb  
Hard Disk

CD-ROM  
CD-ROM Drive

£1095 Plus VAT & Del.  
**£1326.58**  
Total Price Inc. VAT & Del.

See detailed specification opposite

Product codes 527, Exec 528

**Notebook Deal 2b**  
**M600-3 CD**

600 MHz  
Intel® Pentium® III Processor 600MHz

128 Mb  
SDRAM Memory

12 Gb  
Hard Disk

CD-ROM  
Multimedia

24xCD-ROM Drive

£1295 Plus VAT & Del.  
**£1561.58**  
Total Price Inc. VAT & Del.

See detailed specification opposite

Product codes 535, Exec 536

**Notebook Deal 2c**  
**M600-3 DVD**

600 MHz  
Intel® Pentium® III Processor 600MHz

128 Mb  
SDRAM Memory

12 Gb  
Hard Disk

DVD ROM  
DVD-ROM Drive

£1395 Plus VAT & Del.  
**£1679.00**  
Total Price Inc. VAT & Del.

See detailed specification opposite

Product codes 529, Exec 530

### Detailed Specification

**Screen:** 14.1" TFT screen with resolution of XGA 1024 x 768.

**Processors:** Choice of 600MHz Intel® Celeron™ with on-chip 128Kb level 2 cache or Pentium® III 600MHz and 700MHz with 256Kb on-chip cache.

**RAM Memory:** 64Mb, 128Mb or 256Mb SDRAM dependent on model. Maximum on any model 256Mb.

**Hard Drives:** 6Gb, 12Gb or 18Gb high performance Ultra-ATA 33 with low power consumption.

**CD-ROM or DVD:** Mobile 24x CD-ROM or a DVD drive with MPEG-II movie playback built-in.

**Floppy Drive:** Built-in 3.5" 1.44Mb floppy drive.

**Modem:** Built-in 56K V90 modem and Free supanet Classic Internet Access.

**Multimedia:** 3D wavetable sound with built-in speakers and microphone with options for external speakers and microphone (stereo/line-in, headphones/line-out and microphone ports).

**Battery:** Li-Ion Battery is standard with all models with approx 2 to 3 hours life depending on configuration and use. AC power adaptor included.

**Full Power Management:** Standby, suspend to disk and suspend to RAM.

**Keyboard/Mouse:** Advanced notebook keyboard with built-in touchpad/fingerpad and buttons for Internet and e-mail. Options for external PS/2 mouse/keyboard.

**PC Slots:** Zoomed Video enabled two PC (PCMCIA) type II slots stacked (= one Type III) slot.

**Twin Displays:** SVGA port with simultaneous display on screen and external monitor.

**Graphics:** ATI Mobility M series 3D/AGP graphic engine with 4Mb VRAM and external screen resolution of up to 1280 x 1024. Built-in TV out.

**Other Ports:** All standard ports including parallel printer, serial, two USB, fast Infra-Red and S-Video TV out.

**Expansion Bus:** 80 pin bus for port replicator.

**Physical Size:** Dimensions 305mm x 251mm x 39mm to 42mm high. Weight 3Kg Approx.

**Operating Software:** Windows 98, Norton AntiVirus, Laplink 2000, IBM ViaVoice Millennium, Free supanet Classic Internet Access.

**Microsoft Power Pack:** Over £1000 of Microsoft and other application software. Plus Free SmartSuite Millennium Office pack.

**Exec Models:** Include Laplink cable, headset microphone, Joypad, Microsoft Encarta 2000 Encyclopaedia. 5 top games and 22 extra CD titles for just £99+VAT = £116.33 extra.

**Notebook Deal 2d**  
**M700-3 DVD 128**

700 MHz  
Intel® Pentium® III Processor 700MHz

128 Mb  
SDRAM Memory

12 Gb  
Hard Disk

DVD ROM  
DVD-ROM Drive

£1495 Plus VAT & Del.  
**£1796.58**  
Total Price Inc. VAT & Del.

See detailed specification opposite

Product codes 531, Exec 532

**Notebook Deal 2e**  
**M700-3 DVD 256**

700 MHz  
Intel® Pentium® III Processor 700MHz

256 Mb  
SDRAM Memory

18 Gb  
Hard Disk

DVD ROM  
DVD-ROM Drive

£1695 Plus VAT & Del.  
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Total Price Inc. VAT & Del.

See detailed specification opposite

Product codes 533, Exec 534

### OPTIONS

- Time Style A carry case – £59+VAT = £69.33
- Time Style B carry case – £59+VAT = £69.33
- Car charger adaptor – £49+VAT = £57.58
- Extra Li-Ion battery – £99+VAT = £116.33
- Port replicator – £95+VAT = £111.63
- Exec Models – £99+VAT = £116.33

TMM1/01

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# Time Traveller 'M'

**NOTEBOOK DEAL 2**

**SPECIAL PRICE**

**£1399** Plus VAT & Del.

**£1683.78** Total Price inc VAT & Del.

## Time Traveller M700-3 CD

- 700 MHz**  
Intel® Pentium® III Processor 700MHz
- 14.1" TFT Screen**  
TFT 14.1" XGA Colour Screen
- 128 Mb**  
SDRAM Memory
- 12 Gb**  
Hard Disk
- 56k Modem**  
56k Built-In Modem
- CD-ROM Multimedia**  
24x CD-ROM Drive
- ATI AGP x2**  
ATI AGP x2 Graphics
- TV-out**  
TV-out facility

Designed for  
  
 Microsoft Windows® 98



**ALL MODELS INCLUDE**  
**14.1"**  
**TFT XGA**  
**screens**

**All models include:**

**PLUS Over £1000 of Software**

Power Pack 2000 including  
**Microsoft®**  
 software

Includes Microsoft Windows 98, Internet Explorer 5 and Works 2000. Also includes IBM speech recognition and many Home and Education software titles. Plus Free Lotus SmartSuite Millennium.

**PLUS Free Internet Access**

**FAST INTERNET ACCESS**  
 Free supanet Internet Access

**PLUS All standard features**

See detailed specification opposite.

**PLUS Interest free credit on Exec models only**

**No Deposit** if ordered in-store **0%**

**No Interest** if repaid in 12 months **29.8%**  
 APR 4 YRS

Typical Finance Example: Cash price £1000 inc VAT and delivery, Pay nil deposit and 11 payments of £33.92, 12th and final payment of £626.88. Total amount payable £1000 (APR 0%). If the final payment is not received then the monthly payments of £33.92 will continue for a total of 48 months (APR 29.8%). Total price £1628.16. No deposit only applicable when ordered in-store. Mail orders require a deposit of the delivery charge (£39.95) for finance clearance.

Product codes 535, Exec 536

**Direct Orders**  
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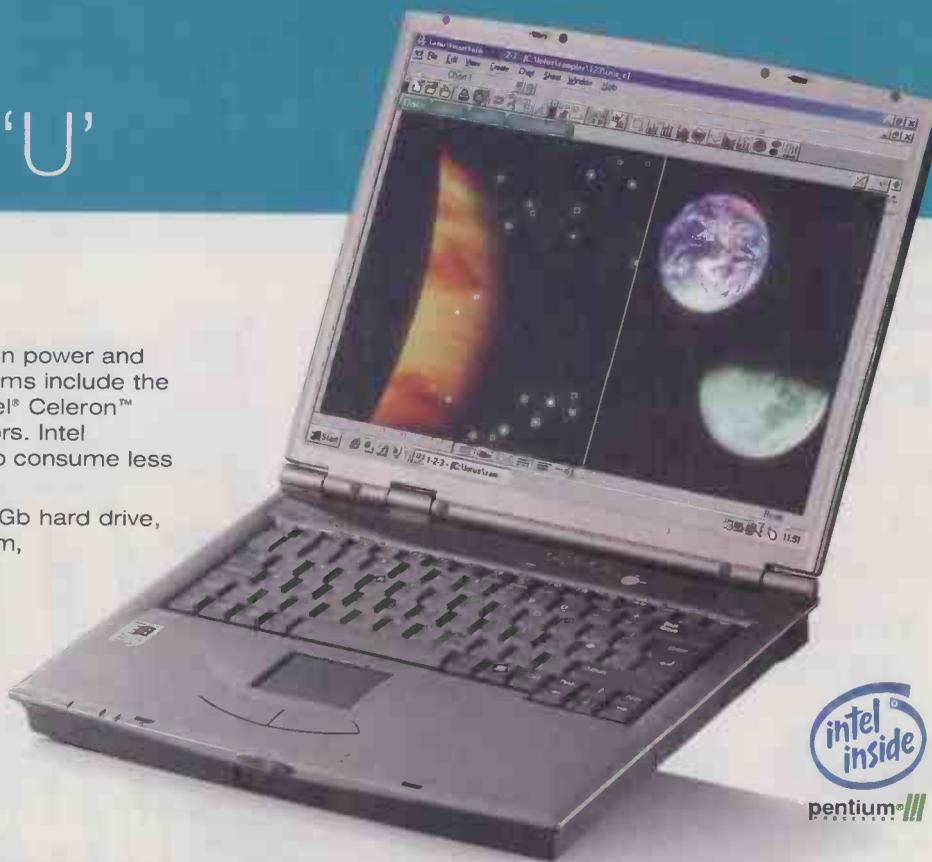
TMNOTD203

# The Ultimate Time Traveller 'U'

## 15.1" Notebooks with the Highest Specification and Performance

This range of notebooks delivers the ultimate in power and performance at affordable prices. These systems include the best 15.1" TFT XGA screens and the latest Intel® Celeron™ and Pentium® III SpeedStep™ mobile processors. Intel SpeedStep technology allows the processor to consume less power and thereby extend the battery life.

Our Best Buy model includes 128Mb RAM, 18Gb hard drive, full DVD multimedia, 56K Internet ready modem, Ethernet interface and Microsoft Power Pack software for just **£1898 +VAT and Delivery!**



**NOTEBOOK DEAL 3**

**SPECIAL PRICE**

**£1898** Plus VAT & Del.

**£2270.10** Total Price inc VAT & Del.

### Time Traveller U650-3 SS

<b>650</b> MHz	<b>15.1"</b> TFT Screen
Intel® mobile Pentium® III SpeedStep™ Processor 650MHz	TFT 15.1" XGA Colour Screen
<b>128</b> Mb	<b>18</b> Gb
SDRAM Memory	Hard Disk
<b>56k</b> Modem	<b>DVD</b> ROM
56k Built-in Modem	DVD-ROM Drive
<b>10/100</b> Base-TX	<b>TWIN</b> Displays
10/100 Base-TX built-in Ethernet interface	Simultaneous Displays for Presentations

Product codes 421, Exec 359

### ALL MODELS INCLUDE 15.1" TFT XGA screens

**PLUS** Over £1000 of Software

Power Pack 2000 including **Microsoft®** software

Includes Microsoft Windows 98, Internet Explorer 5 and Works 2000. Also includes IBM speech recognition and many Home and Education software titles. Plus Free Lotus SmartSuite Millennium.

**PLUS** All standard features

See detailed specification opposite.

**PLUS** Free Internet Access

FAST INTERNET ACCESS **supanet**™ Free supanet Internet Access

### Detailed Specification

**Screens:** 15.1" TFT screen with resolution of XGA 1024 x 768 on all models.

**Processors:** Choice of 600MHz Intel® Celeron™ mobile with on-chip 128Kb level 2 cache or Intel® mobile Pentium® III SpeedStep™ 600MHz to 700MHz with 256Kb on-chip cache.

**RAM Memory:** 64Mb, 128Mb or 256Mb SDRAM dependent on model. Maximum on any model 256Mb.

**Hard Drives:** 6Gb, 12Gb or 18Gb high performance Ultra-ATA 33 with low power consumption.

**CD-ROM or DVD:** Mobile 24x CD-ROM or a DVD drive with MPEG-II movie playback built-in.

**Floppy Drive:** Built-in 3.5" 1.44Mb floppy drive.

**Modem:** Built-in 56K V90 modem and Free supanet Classic Internet Access.

**Ethernet:** Built in 10/100 Base-TX network interface.

**Multimedia:** 3D wavetable sound with built-in speakers and microphone with options for external speakers and microphone (stereo/line-in, headphones/line-out and microphone ports).

**Battery:** Li-Ion Battery with approx 2 to 3 hours life depending on configuration and use.

**Full Power Management:** Standby, suspend to disk and suspend to RAM.

**Keyboard/Mouse:** Advanced notebook keyboard with built-in touchpad/fingerpad and buttons for Internet and e-mail. Options for external PS/2 mouse/keyboard.

**PC Slots:** One type II PCMCIA slot with Card Bus 2.1 interface and Zoomed Video support.

**Twin Displays:** SVGA port with simultaneous displays on screen and external monitor.

**Graphics:** 3D/AGPx2 ATI Rage LT-Pro with 8Mb SGRAM and external screen resolution of 1280 x 1024.

**Other Ports:** All standard ports including parallel printer, serial, two USB and fast Infra-Red.

**Physical Size:** Dimensions 326mm x 267mm x 37.5mm high. Weight 3.25Kg approx.

**Operating Software:** Windows 98, Norton AntiVirus, Laplink 2000, IBM ViaVoice Millennium, Free supanet Classic Internet Access.

**Microsoft Power Pack:** Over £1000 of Microsoft and other application software. Plus Free SmartSuite Millennium Office pack.

**Exec Models:** Include Laplink cable, headset microphone, Joypad, Microsoft Encarta 2000 Encyclopaedia, 5 top games and 22 extra CD titles for just £99+VAT = £116.33 extra.

### Notebook Deal 3a U600-2 M CD

<b>600</b> MHz	<b>600</b> MHz
Intel® mobile Celeron™ Processor 600MHz	
<b>64</b> Mb	<b>£1298</b> Plus VAT & Del.
SDRAM Memory	<b>£1565.10</b> Total Price inc VAT & Del.
<b>6</b> Gb	
Hard Disk	
<b>CD-ROM</b>	
CD-ROM Drive	

See detailed specification opposite  
Product codes 537, Exec 538

### Notebook Deal 3b U600-3 SS CD

<b>600</b> MHz	<b>600</b> MHz
Intel® mobile Pentium® III SpeedStep™ Processor 600MHz	
<b>128</b> Mb	<b>£1598</b> Plus VAT & Del.
SDRAM Memory	<b>£1917.60</b> Total Price inc VAT & Del.
<b>12</b> Gb	
Hard Disk	
<b>CD-ROM</b>	
CD-ROM Drive	

See detailed specification opposite  
Product codes 539, Exec 540

### Notebook Deal 3c U600-3 SS DVD

<b>600</b> MHz	<b>600</b> MHz
Intel® mobile Pentium® III SpeedStep™ Processor 600MHz	
<b>128</b> Mb	<b>£1698</b> Plus VAT & Del.
SDRAM Memory	<b>£2035.10</b> Total Price inc VAT & Del.
<b>12</b> Gb	
Hard Disk	
<b>DVD ROM</b>	
DVD-ROM Drive	

See detailed specification opposite  
Product codes 420, Exec 358

### Notebook Deal 3d M700-3 SS DVD

<b>700</b> MHz	<b>700</b> MHz
Intel® mobile Pentium® III SpeedStep™ Processor 700MHz	
<b>256</b> Mb	<b>£2098</b> Plus VAT & Del.
SDRAM Memory	<b>£2505.10</b> Total Price inc VAT & Del.
<b>18</b> Gb	
Hard Disk	
<b>DVD ROM</b>	
DVD-ROM Drive	

See detailed specification opposite  
Product codes 541, Exec 542

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TMN U11/02

# The Thin and Light Time Traveller 'L'

The Ultimate thin, slim and light Notebook

The Time Traveller 'Light' Is one of the first Intel® Pentium® III based thin and light Notebooks.

It provides full desktop power in an amazingly thin and light package that can be used anywhere.

This is a truly great Notebook!



**NOTEBOOK DEAL 4**  
SPECIAL PRICE  
**£1299** Plus VAT & Del.  
**£1566.28** Total Price inc VAT & Del.

## Time Traveller L500-3 10.4" CD A

- 500 MHz** Intel® mobile Pentium® III Processor 500MHz
- 10.4" TFT Screen** TFT 10.4" Colour Screen
- 128 Mb** SDRAM Memory
- 12 Gb** Hard Disk
- 56k Modem** 56k Built-in Modem
- CD ROM** External CD-ROM Drive
- TWIN Displays** Simultaneous Displays for Presentations
- 1.44Mb Floppy** 1.44Mb External Floppy Drive

Product codes 666, Exec 667

## 10.4" TFT or 8.4" TFT Touchscreen

**PLUS** Over £1000 of Software

Power Pack 2000 Including **Microsoft® software**  
Includes Microsoft Windows 98, Internet Explorer 5 and Works 2000. Also includes IBM speech recognition and many Home and Education software titles. Plus Free Lotus SmartSuite Millennium.

**PLUS** All standard features  
See detailed specification opposite.

**PLUS** Free Internet Access  
FAST INTERNET ACCESS **supanet.com** Free supanet Internet Access

### Detailed Specification

**Screens:** 8.4" TFT touchscreen or 10.4" TFT SVGA colour screen.  
**Processors:** Intel® mobile Pentium® III processor 500MHz.  
**RAM Memory:** 64Mb and 128Mb. Maximum on any model 256Mb.  
**Hard Drives:** 6Gb and 12Gb high performance Ultra-ATA 33 with low power consumption.  
**CD-ROM:** 24x external CD-ROM with dedicated connection port.  
**Floppy Drive:** External parallel port 3.5" 1.44Mb floppy drive.  
**Modem:** Built-in 56K V90 modem and Free supanet Classic Internet Access.  
**Multimedia:** SoundBlaster Pro compatible PCI sound with built-in speaker and microphone with jacks for external speaker and microphone.  
**Battery:** Li-Ion Battery with approx 2 hours life depending on configuration and use.

**Power Management:** Suspend to disk and suspend to RAM.  
**Keyboard/Mouse:** Advanced notebook keyboard with built-in touchpad/fingerpad.  
**PC Slots:** One type II PCMCIA slot with Card Bus 2.1 interface and Zoomed Video support.  
**Twin Displays:** SVGA port with simultaneous displays on screen and external monitor.  
**Graphics:** AGPx1 ATI SMI graphics accelerator with 4Mb embedded video DRAM.  
**Other Ports:** All standard ports including parallel printer, serial, USB and fast Infra-Red.  
**Physical Size:** Dimensions 254mm(w) x 192mm(d) x 30mm(h). Weight 1.39Kg approx.

**Notebook Deal 4a L500-3 8.4" CD**

- 500 MHz** Intel® Pentium® III Processor 500MHz
- 8.4" TFT TOUCH SCREEN**
- 64 Mb** SDRAM Memory
- 6 Gb** Hard Disk
- CD-ROM** CD-ROM Drive
- TOUCH SCREEN** Touchscreen Interface

**£1195** Plus VAT & Del. **£1444.08** Total Price inc VAT & Del.

See detailed specification above  
Product codes 654, Exec 655

**Notebook Deal 4b L500-3 8.4" CD A**

- 500 MHz** Intel® Pentium® III Processor 500MHz
- 8.4" TFT TOUCH SCREEN**
- 128 Mb** SDRAM Memory
- 12 Gb** Hard Disk
- CD-ROM** CD-ROM Drive
- TOUCH SCREEN** Touchscreen Interface

**£1295** Plus VAT & Del. **£1561.58** Total Price inc VAT & Del.

See detailed specification above  
Product codes 656, Exec 657

**Notebook Deal 4c L500-3 10.4" CD**

- 500 MHz** Intel® Pentium® III Processor 500MHz
- 10.4" TFT**
- 64 Mb** SDRAM Memory
- 6 Gb** Hard Disk
- CD-ROM** CD-ROM Drive

**£1199** Plus VAT & Del. **£1448.78** Total Price inc VAT & Del.

See detailed specification above  
Product codes 658, Exec 659

**Direct Orders**  
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- Supports a Virtual Private Network.



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Usually £210

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# BURN-Proof CD-RWs

Sanyo's technology boasts **more efficient CD burning**, so we put Plextor and Mirai drives to the test.

**H**ands up who's thrown away a CD-R because the CD writer suddenly stopped writing only part way through the operation? This is one of the most annoying problems with CD writers, and is caused by Buffer Underrun, which is where data cannot be delivered fast enough to the CD writer. The writer therefore uses a data buffer to ensure smooth and constant data is streamed onto the writing medium. This works in a similar manner to a water header tank in a house, which fills up, regulating in-house water flow, regardless of how many people on your street are running their taps. If the header tank were not in place, when all your neighbours ran their taps simultaneously, the water pressure would drop, affecting the flow of everyone's water. The header tank is in effect a water buffer for the regulation of constant water flow. But how does this relate to CD writers?

A similar problem exists with a PC. Each application and peripheral utilises the processor for operations; and, as one application is using it another cannot. So the processor shares its cycles between operations to keep everything moving. This is problematic for CD writing which needs constant data flow; so a CD writer uses the aforementioned buffer to smooth the data fluctuation, allowing constant rate writing. What is incredible is that if during the writing operation the buffer has less data in it than the writer requires for writing, the writer will stop and the disc being written will become unusable.

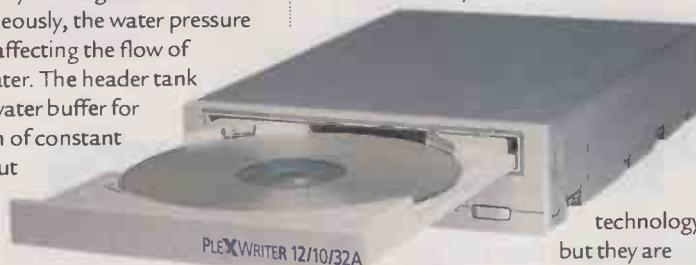
BURN-Proof drives stop the writing process before an underrun occurs. So when the buffer level drops to within 10 per cent of the point where an underrun will occur, writing stops until data becomes available, then writing resumes. You wonder why it's taken so long for this very obvious feature to appear.

We tested two CD-RWs that use Sanyo's BURN-Proof technology: the Mirai CRD-BP2-M, a 12-speed write, four-speed rewrite, 32-speed read SCSI drive, and the Plextor PX-W1210TA, a 12-speed write, 10-speed rewrite, 32-speed read EIDE unit. Not only do both drives use the

five minutes 33 seconds, compared to the Sony's six minutes 27 seconds and the AOpen's 10 minutes 21 seconds. As for drag and drop to a CD-RW, the Plextor managed to blow the competition out of the water with scores for copying a cover CD (490MB) in six minutes 59 seconds, and for the video CD (495MB), seven minutes nine seconds. The Mirai managed only 19 minutes 56 seconds and 17 minutes 41 seconds respectively, with the Sony and AOpen drives achieving times similar to the Mirai.

The performance is at least equal, and sometimes far better, than other fast CD-RW drives. But more importantly, the BURN-Proof technology makes CD burning more efficient and less prone to media destruction. It may finally be time to say goodbye to the bad old days, and hello to the joys of BURN-Proof.

SCOTT MONTGOMERY



technology, but they are also fast – the Plextor has one of the fastest rewrite speeds around. We compared the AOpen CRW-9624 (a six-speed write, four-speed rewrite, 24-speed read drive), and the Sony CRX 145E-RP (10-speed write, four-speed rewrite, 32-speed read) to the two BURN-Proof units.

Their performance was impressive, although the Sony unit is still champion of CD-RW formatting, which took a mere five minutes 49 seconds, compared to the Mirai's 20 minutes and two seconds, and the Plextor's more respectable eight minutes 13 seconds. Copying mixed files to a CD-R (490MB), both BURN-Proof drives managed to complete the task in

## DETAILS

★★★★★

MIRAI CDR-BP2-M

PRICE £269.08 (£229 ex VAT)

CONTACT Armari 020 8993 4111

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

PROS BURN-Proof technology

CONS Rewriting is not as fast as the Plextor

OVERALL A SCSI unit comparable in speed to others on the market, but the BURN-Proof technology means writing is easier than ever

★★★★★

PLEXTOR PX-W1210TA

PRICE £210.33 (£179 ex VAT)

CONTACT Dabs Direct 0800 674 467

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

PROS Fast rewriting with BURN-Proof

CONS The latest technology comes with a small price premium

OVERALL With the BURN-Proof technology, and the fast read and write times, CD burning has never been as much fun



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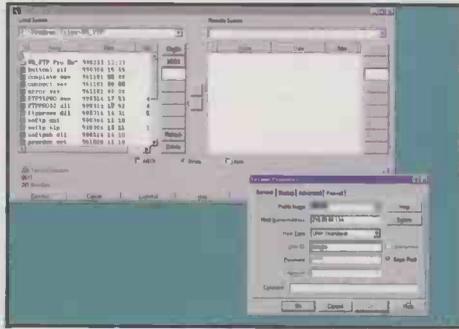
# Ipswitch WS\_FTP Pro 6.5

A suite offering greater flexibility and **Windows Explorer integration** to web authoring.

Ipswitch proudly proclaims its new suite to be the world's most popular FTP client for Windows, which is quite an assertion considering the easy availability of competitors such as Cute FTP through magazine cover discs and library downloads.

If your file transfer requirements run to nothing more than monthly changes to your website, then you'll probably not have a great need for a standalone product like WS\_FTP Pro. However, unlike the FTP capabilities of your authoring software, WS\_FTP Pro will integrate with Windows Explorer, making it possible to drag and drop files between the server and local PC.

As with previous releases, WS\_FTP will store your settings for a range of sites so logging on becomes a simple matter of selecting the appropriate server from a drop-down list and clicking to connect. If you regularly check a range of sites for



WS\_FTP Pro can be extensively customised

updates and patches this can quickly become a real time saver.

The Properties dialog is extensive, allowing you to customise virtually every aspect of the package, including file sorting order and how status information should be displayed. WS\_FTP Pro will intelligently switch between binary and ASCII transfer modes by referring to a user-defined list of ASCII file type extensions. It will also generate a log of all

transfers in either direction, although this tends to litter every directory you touch.

Most users will have little need for FTP software, being happy with that offered by their browser and web authoring software, but if you need something a little more flexible, WS\_FTP Pro remains one of the best.

NIK RAWLINSON

## DETAILS

★★★★★

PRICE £33 (£28.09 ex VAT)

CONTACT Unosoft 01483 888 150

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

SYSTEM REQUIREMENTS Windows 3.1/95/98/NT/2000, 16MB of RAM (32MB for Windows NT/2000), 3MB of hard drive space

PROS Flexible; good integration with Windows Explorer

CONS None to speak of

OVERALL Easy to use and customise; a good choice if you need standalone FTP utilities

# Hemera Photo Objects

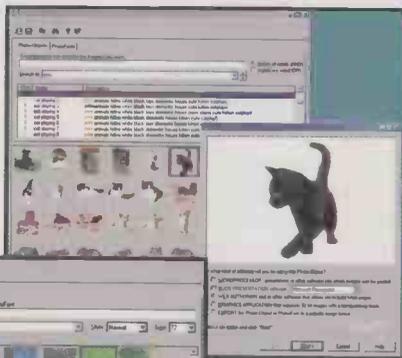
A library of 50,000 pictures with a simple approach to **give your web page a professional look.**

It's about a year since we took a look at Hemera's original image collection and we were impressed.

The company has released an expanded version, more than doubling the picture count of the original collection to a whopping 50,000 images, including 30,000 brand new ones.

Split into over 80 categories, the package uses a customised search tool. This includes an input box for entering keywords, but you'll probably find it just as easy to scroll through the categories and the images within each. There's also an accompanying book showing a thumbnail of each image so you can browse the collection without having to stare at the screen for hours.

This tool also takes care of retrieving the images from the library. It keeps track of which of the six CD-ROMs your chosen



Above: An album of thumbnails helps you find the image you're after  
Left: PhotoFonts allows you to fill text with an image

image calls home and prompts you to insert the appropriate disc. You then specify its use - web, word processing, on-screen presentation and so forth - and it gives you options for resizing and flipping the image before saving it to your

chosen destination. Image quality is first class, easily matching that found in 'professional' photo libraries.

A bonus is the added PhotoFonts function that will use photos as the fill texture of characters. It was once necessary to resort to Photoshop to achieve this sort of effect, but here it's simple, quick and cheap.

NIK RAWLINSON

## DETAILS

★★★★★

PRICE £59.99 (£51.06 ex VAT)

CONTACT Koch Distribution 01256 707 767

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

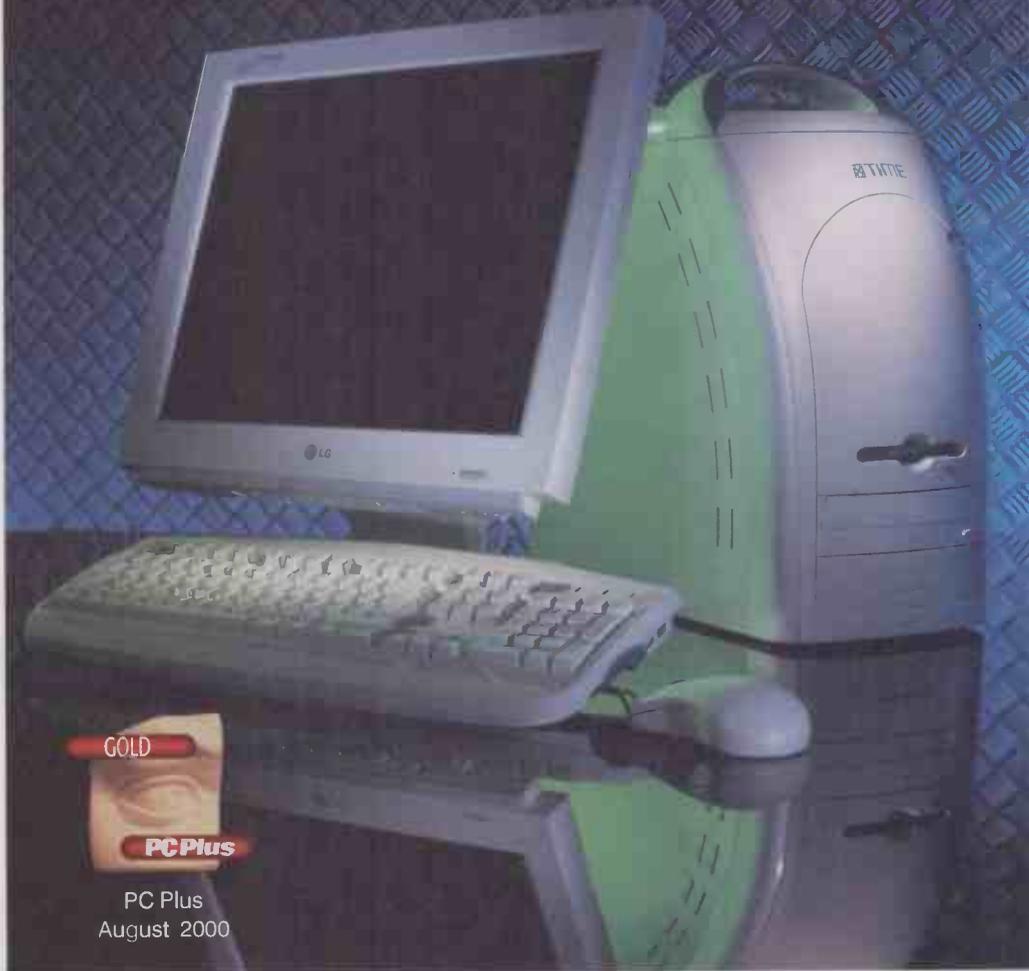
SYSTEM REQUIREMENTS 486 processor, 16MB of RAM, Windows 95 and above, 20MB of free hard drive space, CD-ROM drive, 256 colour display

PROS So many photos; high quality; affordable

CONS None

OVERALL A must-have product for the amateur web designer

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May 2000



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PC Plus  
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June 2000



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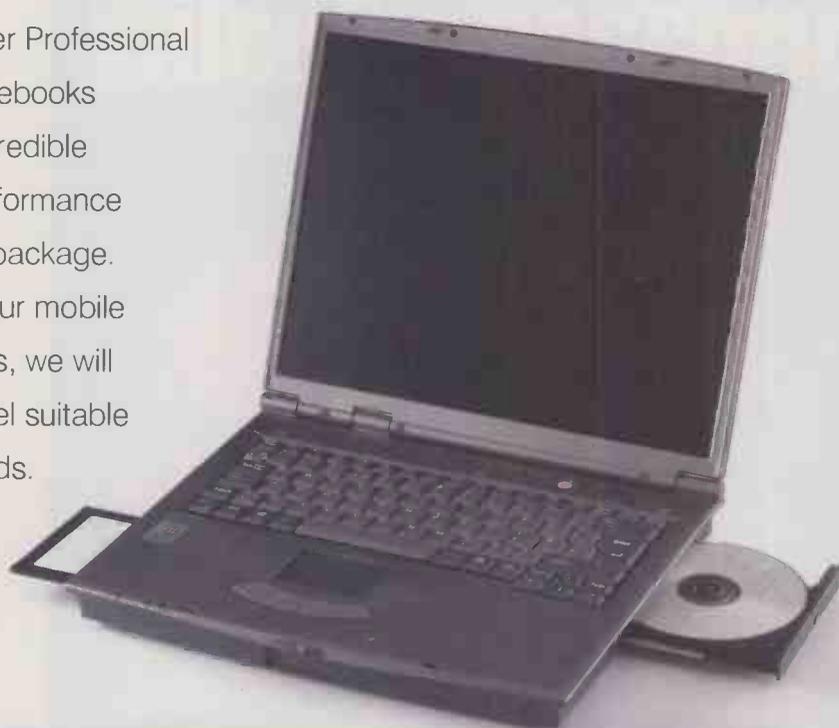


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**RAM Memory:** 32Mb, 64Mb or 128Mb SDRAM expandable to 256Mb.

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**Full Power Management:** Standby, suspend to disk and suspend to RAM.

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**Graphics:** 8Mb AGPx 2 graphics using system RAM with external screen resolution of 1280 x 1024.

**Other Ports:** All standard ports including parallel printer, serial, two USB and fast Infra-Red.

**Physical Size:** Dimensions 305 x 251mm x 39mm to 42mm high. Weight 3Kg approx. Mains adaptor included.

**Operating Software:** Windows 98, Free supanet Classic Internet access.

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- 400MHz mobile AMD K6-2 3D processor
- 32Mb SDRAM
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- 500MHz mobile AMD K6-2 3D processor
- 128Mb SDRAM
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- 128Mb SDRAM
- 12Gb hard disk
- 13.3" TFT XGA screen
- CD-ROM drive
- All standard features above

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Total price  
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**£1331.28**

### E500-3D 14.1" CD

- 500MHz mobile AMD K6-2 3D processor
- 128Mb SDRAM
- 12Gb hard disk
- 14.1" TFT XGA screen
- CD-ROM drive
- All standard features above

£1169  
Total price  
inc. VAT & Del.  
**£1413.53**

### E500-3D 14.1" DVD

- 500MHz mobile AMD K6-2 3D processor
- 128Mb SDRAM
- 12Gb hard disk
- 14.1" TFT XGA screen
- DVD-ROM drive
- All standard features above

£1269  
Total price  
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## Time Traveller 'M' Internet Ready Multimedia Notebooks

### M600-3 CD

- 600MHz Intel® Pentium® III processor
- 128Mb SDRAM
- 12Gb hard disk
- 14.1" TFT XGA screen
- CD-ROM drive
- All standard features above

£1265  
Total price  
inc. VAT & Del.  
**£1526.33**

### M600-3 DVD

- 600MHz Intel® Pentium® III processor
- 128Mb SDRAM
- 12Gb hard disk
- 14.1" TFT XGA screen
- DVD-ROM drive
- All standard features above

£1365  
Total price  
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**£1643.83**

### M700-3 CD 128

- 700MHz Intel® Pentium® III processor
- 128Mb SDRAM
- 12Gb hard disk
- 14.1" TFT XGA screen
- CD-ROM drive
- All standard features above

£1369  
Total price  
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**£1648.53**



### M700-3 DVD 128

- 700MHz Intel® Pentium® III processor
- 128Mb SDRAM
- 12Gb hard disk
- 14.1" TFT XGA screen
- DVD-ROM drive
- All standard features above

£1469  
Total price  
inc. VAT & Del.  
**£1766.03**

### M700-3 DVD 256

- 700MHz Intel® Pentium® III processor
- 256Mb SDRAM
- 18Gb hard disk
- 14.1" TFT XGA screen
- DVD-ROM drive
- All standard features above

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Total price  
inc. VAT & Del.  
**£1996.33**

Specification as 'E' models but with:

**Screens:** All 14.1" TFT XGA 1024 x 768

**Processors:** Mobile Intel® Celeron™ and Pentium® III upto 700MHz

**Plus** TV-out and 4Mb ATI SGRAM graphics

## Time Traveller 'U' Internet Ready Multimedia Notebooks

### U600-2 M CD

- 600MHz mobile Celeron™ processor
- 64Mb SDRAM
- 6Gb hard disk
- 15.1" TFT XGA screen
- CD-ROM drive
- All standard features above

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Total price  
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**£1529.85**

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- 600MHz Intel® mobile Pentium® III SpeedStep processor
- 128Mb SDRAM
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- 15.1" TFT XGA screen
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- All standard features above

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inc. VAT & Del.  
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### U600-3 SS DVD

- 600MHz Intel® mobile Pentium® III SpeedStep processor
- 128Mb SDRAM
- 12Gb hard disk
- 15.1" TFT XGA screen
- DVD-ROM drive
- All standard features above

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**£1999.85**

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- 650MHz Intel® mobile Pentium® III SpeedStep processor
- 128Mb SDRAM
- 18Gb hard disk
- 15.1" TFT XGA screen
- DVD-ROM drive
- All standard features above

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Total price  
inc. VAT & Del.  
**£2234.85**

### U700-3 SS DVD

- 700MHz Intel® mobile Pentium® III SpeedStep processor
- 256Mb SDRAM
- 25Gb hard disk
- 15.1" TFT XGA screen
- DVD-ROM drive
- All standard features above

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Total price  
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**£2469.85**



Specification as 'E' models but with:

**Screens:** All 15.1" TFT XGA 1024 x 768

**Processors:** Mobile Intel® Celeron™ and Pentium® III SpeedStep up to 700MHz

**Graphics:** 8Mb ATI AGPx2 graphics

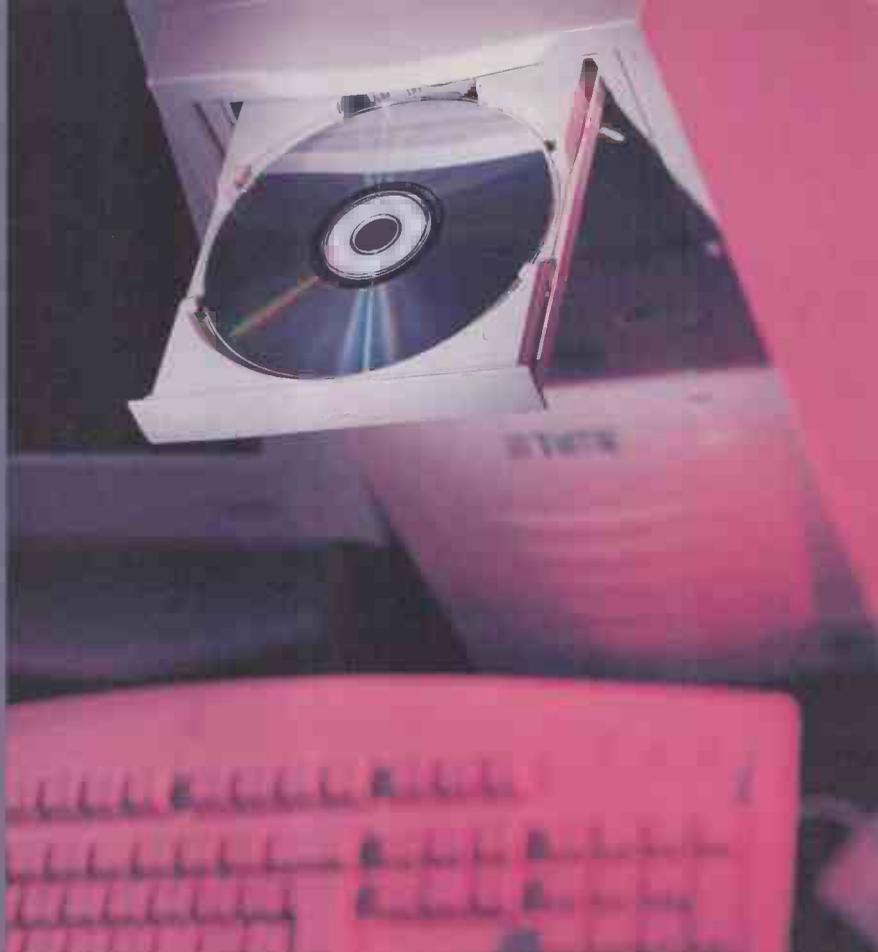
**Slots:** 1x PCMCIA with zoomed video

**Plus** built in Ethernet



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- 750MHz AMD Athlon processor
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**00-7 DVD** model with DVD drive instead of combo drive and 800 MHz processor  
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### 800-7 SP

- 800MHz AMD Athlon processor
- 512k pipeline burst mode cache
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- DVD-ROM drive with MPEG II playback
- CD-Rw rewritable drive for back-up and CD copying
- 3D Now!™ Technology for advanced graphics performance
- NVIDIA TNT-2 32Mb AGPx2 graphics
- Soundblaster 128 PCI sound
- 17" non-interlaced SVGA 0.28dp colour screen
- 56K PCI modem for fax/data and supanet Internet access
- Microsoft® Intellipoint mouse, keyboard and standard speakers
- Full ATX case and ATX motherboard
- All ports including 2 USB, serial, parallel and games
- Microsoft Windows 98 and SmartSuite Millennium

**£999** +VAT & Del

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### 800-7 SPS

- 800MHz AMD Athlon processor
- 512k pipeline burst mode cache
- 200MHz system bus
- 256Mb SDRAM
- 27Gb ATA-66 hard disk
- DVD-ROM drive with MPEG II playback
- CD-Rw rewritable drive for back-up and CD copying
- 3D Now!™ Technology for advanced graphics performance
- NVIDIA TNT-2 32Mb AGPx2 graphics
- Soundblaster Live PCI 1024 sound
- 17" non-interlaced SVGA 0.28dp colour screen
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- PC TV system with Teletext

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### 1000-7 SPS

- 1000MHz AMD Athlon processor
- 512k pipeline burst mode cache
- 200MHz system bus
- 256Mb SDRAM
- 30Gb ATA-66 hard disk
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- CD-Rw rewritable drive for back-up and CD copying
- 3D Now!™ Technology for advanced graphics performance
- NVIDIA TNT-2 32Mb AGPx2 graphics
- Soundblaster Live PCI 1024 sound
- 17" non-interlaced SVGA 0.28dp colour screen
- 56K PCI modem for fax/data and supanet Internet access
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# FileMaker Pro 5

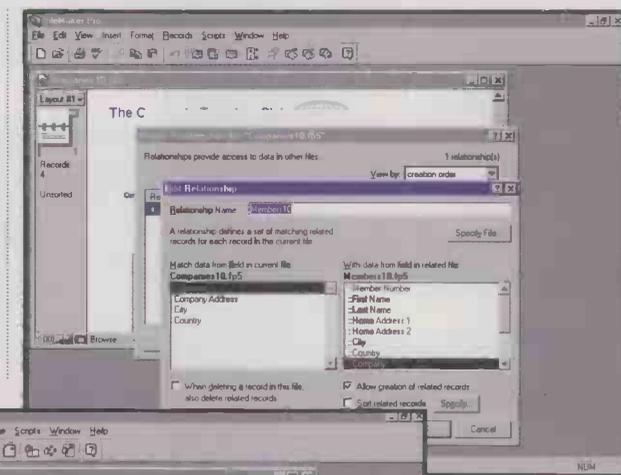
This user-friendly database management system bridges the Windows/Mac divide.

Over the years, FileMaker Pro has developed into a competent database management system (DBMS) with a good range of features. One of its greatest strengths is support for both Windows and Mac operating systems. It's one of those rare products with which you can develop cross-platform applications. This alone is reason enough to choose it if you work with both environments.

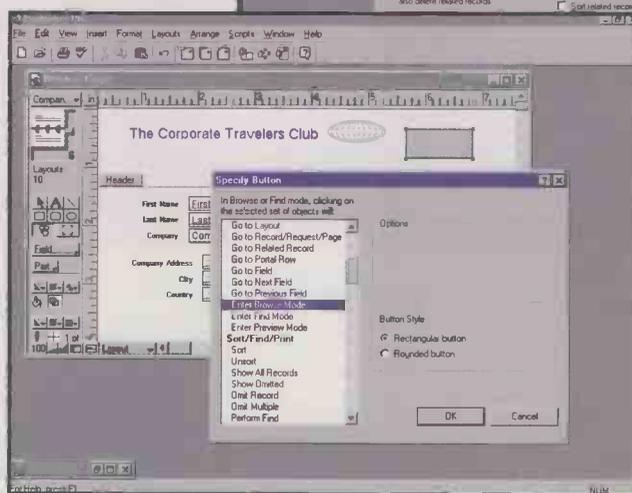
FileMaker has made great strides

towards being intuitive and user-friendly so that designing your first single-table database is a doddle. There are 16 predefined database templates to get both home and business users off to a quick start: for example, Recipes, Collections, Personnel Records and Purchase Orders. Alternatively, starting from a blank database is straightforward.

Each FileMaker Pro table inhabits a file with the .fp5 extension and once a table is defined, you work with various



Left: Editing a relationship between two tables in FileMaker Pro. Screen handling is not always as tidy as it could be: moving the dialog box chews away part of the text of the underlying layout



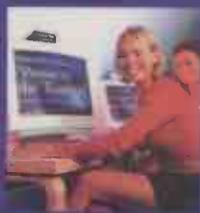
ScriptMaker scripts are built by making selections from a list of available actions

layouts to determine what appears on the screen. Layouts take the place of the objects often known as forms and reports in other DBMSs. FileMaker can run in one

of four modes: Browse, for inspecting existing records and adding new ones; Find, for locating a record or a subset thereof; Layout, for creating new views of your data; and Preview, for checking the appearance of printed output.

When creating a database, eight field types are at your disposal. Four of these are the familiar text, number, date and time types, and four are slightly more exotic. The container field type can hold image, audio or video files, OLE objects (such as spreadsheets or documents from other applications) and QuickTime file types are also supported. A calculation field holds values calculated from data in the current record or from other records, and a summary field holds summarised data from records in the current file. Finally, there's a global field for values to be used in all records in the current file, for example the rate of VAT to be used in price calculations.

## TRAINING & PRESENTATION SOLUTIONS



DisplayNet makes computer training easier than ever before. The instructor can demonstrate a program for the students on their own monitors in real time.

Displaynet is a modular monitor-share system for computer labs and training locations with 2 to 50+ student computers. Costing a fraction of the price of video projectors, DisplayNet allows an instructor to display his PC monitor image on

all the student monitors in the "DisplayNetwork"

The system does not affect CPU activity in any way on either the instructor or the student computers. Supporting resolutions of up to 1600 x 1280 in real time and compatible with all software, network and operating systems, DisplayNet is an optimal and in-expensive way to get more out of each classroom hour.

DisplayNet is a hardware based system.



## GRAND MAXVIEW

The Grand MaxView is a feature-packed portable scanner. The unit is ideal for business presentations, creating training tapes and

even playing games on a big screen TV. True Plug and Play with no software drivers makes this compact unit the most versatile in our extensive range of converters.

The Grand MaxView is bundled with an infra-red remote control mouse that can be used to control your presentation with additional functions such as Zoom, Freeze, laser pointer, etc.

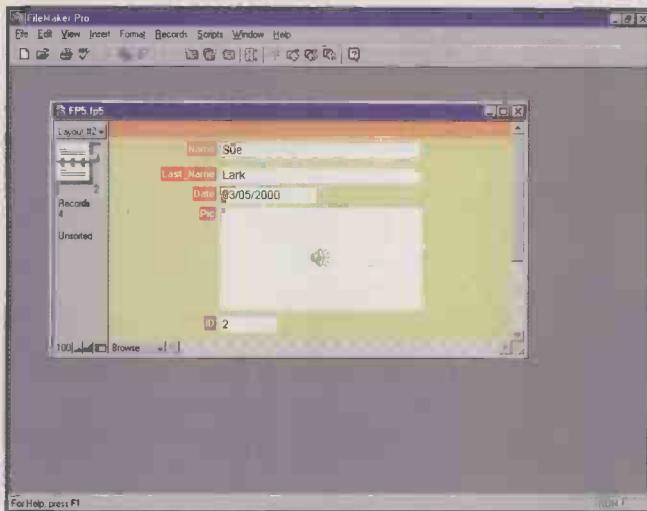
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Entering records requires only a click on the New Record button. Pasting .wav and .avi files into a container field is easy, and in Browse mode double clicking on the icon or thumbnail that's placed into the container field plays the sound bite or video. Container fields cannot be searched so you have to add a text field by which to identify them.



**A layout with an icon indicating that a sound bite is stored – double clicking will play it**

Once fields have been defined, a standard layout is generated automatically, showing all fields. The New Layout/Report assistant eases the production of further layouts for viewing data, for printing as a report and for 'mailmerge' form letters. Buttons can be added to layouts for application control; steps are selected from the ScriptMaker macro-writing tool to navigate between layouts, modes or fields and control structures such as If, Else and Loop are also available.

FileMaker Pro started life as a flat-file DBMS and has since acquired some degree of relational capabilities in response to the universal acceptance of the relational model as a means of storing all but the simplest sets of data. That's the good news. Unfortunately, instead of embracing the recognised RDBMS (relational DBMS) terminology,

for reasons never made clear, FileMaker has invented its own. Terms like 'master file', 'related file', 'related record' and 'related field' seem destined to cause confusion, and when introducing the 'match field', it's simply perverse for the manual to say 'sometimes called the key field or primary key'.

Lookups cause confusion too, because defining a lookup causes data to be copied into the 'master file' from a 'related file'. No link is maintained between the two, so if data is updated in the related file, these changes are not reflected in the master.

Apart from terminology and implementation idiosyncrasies, the adherence to the relational model is somewhat tenuous. There is no easy way of employing the checks and constraints for ensuring referential integrity of data nor of dealing with null values – incomplete records can be entered into

the sample database provided so that incomplete and mis-interpretable data can be retrieved.

FileMaker databases can be published on the web using the Web Companion plug-in that comes as part of version 5, though some features, notably scripts, are not available in a published database.

Existing users will find that version 5 arrives with widespread changes, especially to the interface that has been redesigned with Microsoft Office users in mind.

There's now a New Layout/Report assistant, a table view of your data, improved ODBC support for sharing data with other ODBC-enabled applications, improved conversion from Excel spreadsheets and a range of styles to apply to your web pages.

MARK WHITEHORN

**DETAILS**

★★★

**PRICE** £205.63 (£175 ex VAT)

**CONTACT** FileMaker 0845 603 9100

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

**SYSTEM REQUIREMENTS** 486 processor, 16MB of RAM, Windows 95, 98 or NT4 (SP3)

**PROS** Dual Mac/Windows support is invaluable to those in a mixed environment. Ease of use for simple databases and for handling media

**CONS** The product makes a poor fist of implementing the relational method of data handling

**OVERALL** Existing users will be delighted with this latest version and new users are likely to find it great for single-table databases. If you need multi-table data to be held securely with full use made of the data integrity constraints offered by an RDBMS, look elsewhere

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# Elsa AirLancer

Wireless LANs have come of age and this is simpler and cheaper to install than traditional wire.

Wireless LANs aren't new: the very first systems were proprietary and, at 1.5Mbits/sec, offered painfully slow network links. The new 802.11b IEEE standard and the Wireless Ethernet Compatibility Alliance (aka WECA), a manufacturing consortium, have created products that break the speed barrier, guarantee interoperability among vendors and carry lower prices. Wireless networking is now a practical way to extend the wired network. IEEE 802.11b is an extension to the original 802.11 standard that supported only 2Mbits/sec data rates. The 802.11b spec calls for a data rate of 11Mbits/sec, with fallback rates of 5.5Mbits/sec, 2Mbits/sec and 1Mbit/sec as distance from the access point increases. Kit supporting 22Mbits/sec is in the pipeline.

Multimedia specialist Elsa is one of a handful of vendors that have launched wireless LAN products on the back of the new 802.11b standard. The product consists of a LANCOM base station or 'access point' and the AirLancer client LAN adaptor. This is in fact a PC Card network transceiver, with a rubbery aerial that juts out about an inch from a PC Card slot. As well as plugging into notebooks, it also plugs in to the LANCOM access point or into a PCI adaptor for desktop PCs.

The access point is a device about the size of a largish modem that connects to the wired LAN and translates between the cabled Ethernet LAN and the radio link. It contains a 10BaseT port that connects to the LAN's hub, communications and encryption software and a radio transceiver. The front is adorned with a series of status LEDs indicating LAN and WLAN connectivity. We were supplied with the ISDN router version of the LANCOM, so there were two additional LEDs for each ISDN B channel.

The coverage afforded by the LANCOM access point varies with the type of building – if you want your wireless LAN to cover more than a few thousand square feet, you'll need more than one access point. As a rule of thumb, expect to

achieve transmission distances of 100m in fresh air but no more than 20m indoors.

As the client moves, its radio connection transfers to another access point, a process called roaming. A software utility monitors the broadcast quality and, as reception worsens, the bandwidth is progressively throttled back. Throughput at 11Mbits/sec is comparable to

However, the freedom brought about by wireless comes at a price: it has a high per-node cost, (between £250 to £300), while access points (the server's transmitters and receivers) are double this. And at a time when networks are shifting to 100Mbits/sec, the 11Mbits/sec offered by the latest WLANs looks a little meagre. There's also a risk of interference from other devices – it's even possible to disrupt transmissions by using a microwave oven or a cordless phone. Bluetooth devices share the same 2.4GHz waveband and this may cause problems – this band is limited to only 60 to 80 discrete channels at 1Mbit/sec, dropping to only three channels at 11Mbits/sec. Security is another issue since anyone with a scanner can eavesdrop. But most wireless LANs incorporate 128bit WEP encryption.

Installing the LANCOM and AirLancer ought to have been straightforward but turned out to be a bit fraught, with the complicated configuration software clearly being aimed at the technically competent network techie rather than a home user. Nevertheless once we'd swapped over the PC Cards and cold booted our notebook a couple of times, all the requisite LEDs lit up and we were able to surf away to our heart's content completely wire-less.

At long last wireless LANs have come of age. However, there remain some issues to be resolved, such as interoperability and security. But for the most part it worked very well. So long as you source all your wireless LAN kit from the same vendor you should be OK.

ROGER GANN



a conventionally cabled 10BaseT network.

Wireless LANs have several unique advantages. For a start, they allow roaming in a building, for example letting you take a notebook into a meeting while remaining logged onto your network. Wiring costs form a significant proportion of network installation costs and a wireless LAN needs very little. This makes networking feasible in many buildings that can't take a conventionally cabled LAN, such as historic or listed buildings, those with thick concrete floors or very large buildings. It's also easy to link buildings without recourse to ducting or wires. Wireless also makes it easy to set up *ad hoc* networks in schools or universities.

## DETAILS

★★★★

**PRICE** LANCOM base station £525 (£446.80 ex VAT), with ISDN router £625 (£531.91 ex VAT), PC Card £150 (£127.66 ex VAT)

**CONTACT** Elsa 08000 563445

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

**PROS** Cheaper and easier to install than traditional wire; secure

**CONS** Throughput varies; product is for Windows environments only; physical obstacles affect transmission; configuration software overly technical

**OVERALL** A good product with a few niggles, but a sound option for those that need it

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# GNAT Box GB100

If security is getting you hot under the collar, let this **firewall in a box** cool you down.

A network without a firewall is the digital equivalent of leaving your house unlocked; anybody can get in and do what they like. Installation of a firewall effectively helps put access control on the network. Firewalls work by sitting between the internal network and the outside world. Traffic flowing both ways gets inspected and, based on the security policy, accepted or denied. With high-speed permanent Internet connections in sight – ADSL and cable modems – there's a need to seriously consider security.

Global Technology Associates' GNAT Box GB100 is designed as a complete firewall-in-a-box – everything you need to get started. It comes in a tiny case that's far too small to be rack mounted, and so will have to find another home.

Internally there's nothing special, just an AMD K6 350MHz processor, 32MB of RAM, and three network cards for internal, external, and demilitarised zone (DMZ) networks. The DMZ is a special case that, while protected by the firewall, is also blocked from the internal network. Typically externally accessible machines, such as web servers, should sit on the DMZ. If they're breached the rest of the network remains protected.

The appliance runs a modified version of Linux, on top of which runs the GNAT Box software. Version 3.0, in addition to firewall facilities, offers Virtual Private Networking (VPN). This allows encrypted links to be made to the firewall, enabling secure remote access across the Internet to take place. This tends to be a better, cheaper, way of letting remote users gain access to the local network.

The GB100 has its roots in PC land, and so it is no surprise that the initial configuration is achieved by plugging in a mouse, keyboard – strangely the old five-pin DIN AT – and a monitor. After typing in one of the longest authorisation codes that we've ever seen, we were taken to a set of screens designed to get the GB100 onto the network. These included assigning IP addresses to each of the network cards, and deciding

which ones should act as the internal, external and DMZ.

This procedure should have been a lot easier than it was. None of the cards were labelled, and the on-screen notation didn't make a lot of sense. The setup screens suggested that IP addresses be assigned arbitrarily. GTA then expects the

deny all inbound traffic. However, this isn't likely to be suitable as it blocks incoming email. Unfortunately, the configuration software requires that you know on which TCP port that email – SMTP – works before a suitable filter can be written. This problem remains constant throughout the



administrator to swap cables and ping IP addresses until the correct configuration is found. Then the cards can be manually labelled in the correct way. This is a lot of hassle and really should not be done this way.

With installation completed we had to set up the firewall policy. Two methods can be used: direct control of the GB100, or a web-based management interface. We prefer the web management as it offers a better interface.

Connection through an ordinary web browser displays a tree structure of management tasks that allowed us to drill down to the task that we wanted to perform, for example changing network settings.

The main task is likely to be to define rules stating which traffic is allowed and denied. Rules operate in list order, so it's important to get it right. For example, creating a rule to deny all traffic, and then creating a rule to allow outbound web traffic, would mean that no traffic would be allowed to pass through. Annoyingly there's no way of moving a rule's position, although it's possible to choose positioning at creation.

By default the firewall is configured to allow all outbound traffic, but to

configuration with the GB100 always wanting, in our opinion, too much knowledge on the administrator's behalf.

There is a better system in the Gauntlet firewall from Axent. This has a configuration wizard that creates a policy for outgoing email, FTP, and web traffic, and for incoming email. This firewall does not rely on the administrator knowing port numbers.

Overall the GNAT Box GB100 is a fairly good device for the money. If the company sorted out the initial configuration and made the interface more user-friendly, this would be a top-notch product.

DAVID LUDLOW

## DETAILS

★★★

**PRICE** £2,344.13 (£1,995 ex VAT)

**CONTACT** Global Technology Associates  
01903 205 151 [www.globaltech.co.uk](http://www.globaltech.co.uk)

**PROS** VPN as well as firewall; large range of functions

**CONS** Annoying initial setup; can require too much information for defining rules

**OVERALL** A well-priced product with a large range of features, but beware that it can be tricky to use

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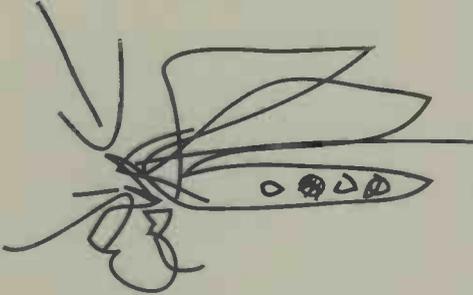
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  - A Aroused?
  - B Confused?
  - C Hot and bothered because you've been waiting for two days?
2. You dream you find a snake in your bed. You realise it has a human head. Whose face is on the snake?:
  - A Your angry bank manager?
  - B Your old boss?
  - C Your smirking IT supplier?
3. Look at the drawing below. What does it remind you of?:  

  - A An insect that is a valid representation of your id?
  - B A harmless scribble?
  - C A map of the journey you have to take to competitively source your IT?
4. You find yourself in Basildon. A crowd of competitors has formed around you laughing. Is it because:
  - A A strange tattoo has appeared on your left thigh?
  - B You just told a great joke?
  - C You've wasted all your budget because your IT quotes are too expensive?
5. You wake to find yourself in another world. The inhabitants are scornful that you cannot find something that to them is obvious. Do you:
  - A Feel foolish?
  - B Pretend that it's just not important?
  - C Turn the page and save time and money?
6. You have one year to live! What do you do in your final days?:
  - A Worry about the people you have let down because you lost the plot where IT sourcing was concerned, and how you will be judged in the so-called 'afterlife'?
  - B Seek revenge on all IT suppliers who gave you sleepless nights because their deals and service were so lousy?
  - C Relax because you think you are God?

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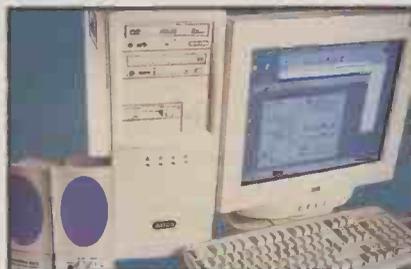
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Based around AMD's Socket A 750MHz processor, an MSI K7T Pro motherboard and 128MB of PC133 memory, this machine makes use of the latest technology. You get a 20.5GB IBM hard drive and a 32MB Hercules 3D Prophet DDR-DVI. Bonuses are the 17in CTX Trinitron monitor, eight-speed DVD and Mitsumi CD-RW. A killer price for a killer system.

Review August 2000, p78 Price £1,173.83 (£999 ex VAT)  
Contact Atlas 07000 285 275 [www.atlasplc.com](http://www.atlasplc.com)

### MID-RANGE PC

#### Mesh Matrix 850T



At the heart of the system beats AMD's Athlon 850MHz with on-die cache. You also get 128MB of PC100 memory and a large 30.7GB Maxtor DiamondMax hard drive. The excellent Hercules 3D Prophet II graphics card drives a 19in Mitsubishi Diamond Plus 91. Mesh has produced a fantastic package for any user after the latest technology at a bargain price.

Review August 2000, p76 Price £1,761.33 (£1,499 ex VAT)  
Contact Mesh 020 8208 4706 [www.meshcomputers.com](http://www.meshcomputers.com)

### HIGH-END PC

#### Dell Dimension XPS B1000 Special Edition

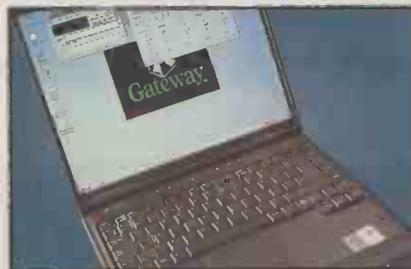


The first in the new wave of 1GHz Pentium III-equipped systems, the B1000 Special Edition, partners the power of the 1GHz PIII with 128MB of RAMBUS RDRAM and Dell's custom GeForce 256 graphics card with 64MB of DDR memory. You also get a spacious 30GB EIDE hard drive that can be backed up using the eight-speed CD-RW. A scorcher.

Review June 2000, p75 Price £2,348.83 (£1,999 ex VAT)  
Contact Dell 0870 152 4850 [www.dell.co.uk](http://www.dell.co.uk)

### FULLY-FEATURED NOTEBOOK

#### Gateway Solo 9300 LS



Making use of Intel's 650MHz SpeedStep processor this notebook has blistering performance. The screen and keyboard are both excellent, and the notebook enables you to do some basic video editing using the composite in and out ports at the back through the ATi mobility video card, or for digital video there's a FireWire port.

Review April 2000, p158 Price £2,113.82 (£1,799 ex VAT)  
Contact Gateway 0800 55 2000 [www.gateway.com/uk](http://www.gateway.com/uk)

### ULTRA-PORTABLE NOTEBOOK

#### Sony Vaio PCG-Z600RE



Sony has taken the ultra-portable genre a step further with this slim, sexy, Pentium III, 500MHz machine with 128MB of RAM and a 12GB hard disk. You also get a 56K PC Card modem and a built-in Ethernet adaptor. With a 12.1in TFT screen sporting a 1,024 x 768 resolution and a Memory Stick slot for Sony's own solid state media, this is the coolest notebook around.

Review June 2000, p76 Price £2,301.82 (£1,959 ex VAT)  
Contact Sony 08705 424 424 [www.sony.co.uk](http://www.sony.co.uk)

### PDA

#### Ericsson MC218



Based on the Psion Series 5mx, the MC218 has 16MB of memory and a processor speed of 37MHz. The email software is built into the ROM and supports UUEncoded attachments and MIME. Frames and Java 1.1.4 are supported by the web browser. Ericsson has even bundled an IrDA modem for connecting the device to its range of mobile phones.

Review May 2000, p204 Price £379 (£322 ex VAT)  
Contact Ericsson 0990 237 237 [www.ericsson.com](http://www.ericsson.com)

**DIGITAL CAMERA**Sony  
**Cyber-shot DSC-S70**

Sony's S70 uses the latest battery technology to provide around 120-150 minutes of usage and is Sony's first genuine 3.3megapixel camera. Image quality is superb. All in all, the S70 is the best all-round 3.3megapixel camera out there.

Review August 2000, p97 Price £750 (£638.30 ex VAT)  
Contact Sony 0990 111 999 [www.sony.co.uk](http://www.sony.co.uk)

**WEBCAM**Philips  
**Vesta Pro**

This is a very well designed unit with built-in USB microphone. The 640 x 480 pixel CCD can deliver up to 15fps at VGA resolution or smooth 30fps at lower resolutions down to 128 x 96. An excellent package at a remarkably cheap price.

Review July 2000, p224 Price £52.87 (£45 ex VAT)  
Contact Dabs Direct 0800 138 5240 [www.pcstuff.philips.com](http://www.pcstuff.philips.com)

**SOUND CARD**Creative Labs  
**SB Live! Platinum**

This is exactly what gamers and budding PC musicians have been asking for – great sound quality and excellent bundled software make it a winner. We think it's the best sound product ever.

Review February 2000, p83 Price £179 (£152 ex VAT)  
Contact Creative Labs 0800 973 069 [www.soundblaster.com](http://www.soundblaster.com)

**COLOUR INKJET**Hewlett-Packard  
**DeskJet 930C**

This uses the same engine as the higher spec P1100 and is a breeze to setup. Connection is via the parallel or USB interface and drivers allow you to adjust the printed page drying time.

Review July 2000, p201 Price £149 (£126.81 ex VAT)  
Contact HP 0990 47 47 47 [www.europe.hp.com](http://www.europe.hp.com)

**BUDGET LASER PRINTER**Brother  
**HL-1250**

This compact machine has everything you could reasonably ask for at the price, but Brother has gone one step further with the inclusion of both parallel and USB ports.

Review February 2000, p165 Price £245.58 (£209 ex VAT)  
Contact Simply 020 8523 4020 [www.brother.com](http://www.brother.com)

**COLOUR PHOTO PRINTER**Epson  
**Stylus Photo 870**

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.

Review July 2000, p206 Price £207.98 (£177 ex VAT)  
Contact Simply 020 8523 4020 [www.simply.co.uk](http://www.simply.co.uk)

**BUSINESS LASER PRINTER**Hewlett-Packard  
**LaserJet 4050TN**

The 4050TN's 1,200dpi resolution is outstanding, and with a 133MHz NEC processor and 16MB of RAM it can turn out 16ppm. It also comes network-ready as standard.

Review September 1999, p96 Price £1,580.38 (£1,345 ex VAT)  
Contact HP 0990 474747 [www.europe.hp.com](http://www.europe.hp.com)

**MULTI-FUNCTION DEVICE**Hewlett-Packard  
**Office Jet G85**

A scanner, photocopier and colour printer in one, that produces vibrant colours and realistic skin tones. Well suited to home or office work – and it's keenly priced.

Review September 2000, p112 Price £499 (£424.68 ex VAT)  
Contact Hewlett-Packard 0990 474747 [www.europe.hp.com](http://www.europe.hp.com)

**GRAPHICS CARD**Asus  
**V7700**

The Asus V7700 uses nVidia's GeForce 2 chip. The core clock speed has been increased to 200MHz and memory frequency boosted to 333MHz, making this card great for gaming.

Review August 2000, p114 Price £269.07 (£229 ex VAT)  
Contact Dabs Direct [www.asus.com](http://www.asus.com)

**EXTERNAL STORAGE**LaCie  
**PocketDrive**

This tiny external 6GB hard drive has two FireWire ports and a single USB connector. The FireWire ports mean the drive can be daisy chained to other FireWire peripherals.

Review July 2000, p108 Price £351.33 (£299 ex VAT)  
Contact LaCie 020 7872 8000 [www.elac.com](http://www.elac.com)

**EIDE HARD DRIVE**Seagate  
**Barracuda ATA 28GB**

This 28GB beast's spin speed of 7,200rpm helped it achieve 0.89Mbytes/sec in our random read and write test. It's a breeze to install and the £5.10 cost per GB makes it a bargain.

Review April 2000, p197 Price £157.45 (£134 ex VAT)  
Contact Simply 020 8523 4020 [www.seagate.com](http://www.seagate.com)

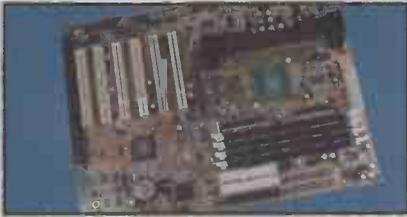
**SCSI HARD DRIVE**Quantum  
**Adas V**

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.

Review July 2000, p100 Price £399.50 (£340 ex VAT)  
Contact Quantum 01344 353 500 [www.quantum.com](http://www.quantum.com)

**SLOT A MOTHERBOARD**

**Abit  
KA7**



This uses VIA's Apollo KX133 chipset with the capability to run the memory at 133MHz plus support for AGP 4x. There are two Ultra DMA 66 channels plus the standard floppy connector and four DIMM banks.

Review July 2000, p108 Price £111 (£95 ex VAT)  
Contact Dabs Direct 0800 138 5240 www.dabs.com

**FC-PGA MOTHERBOARD**

**Gigabyte  
GA-6BX7**



If you are going to use one of the latest Pentium IIIs you're going to need a FC-PGA (Flip Chip Pin Grid Array) compatible board. The GA-6BX7 uses the 440BX chipset and has one AGP, four PCI and one ISA slot. It also uses cheap SDRAM.

Review June 2000, p98 Price £97.40 (£82.90 ex VAT)  
Contact Watford 0870 729 5600 www.gbt-tech.co.uk

**PROJECTOR**

**InFocus  
LP335**



A fantastic unit that uses the latest DLP chip. It even allows you to view slides with the lights on. It is expensive, but if you need something this small and light then the LP335 gives an extremely sharp, crisp image.

Review August 2000, p118 Price £4,876.23 (£4,150 ex VAT)  
Contact InFocus 0800 028 6470 www.infocus.com

**17IN MONITOR**

**CTX  
PR711F**



Using a Sony FD Trinitron tube, this monitor's slim casing somehow makes the display seem larger. Image quality is superb and a USB hub is built in to the base as standard.

Review January 2000, p79 Price £222 (£189 ex VAT)  
Contact Simply 0800 035 2100 www.ctxmonitors.com

**19IN MONITOR**

**CTX  
PR960F**



Equipped with an FD Trinitron tube this has a constant 0.24mm pitch across the screen. It also has an additional BNC input and a built-in USB hub as standard.

Review June 2000, p91 Price £363.08 (£309 ex VAT)  
Contact Simply 0800 035 2100 www.ctxmonitors.com

**21IN MONITOR**

**Sony  
Multiscan G500**



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.

Review May 2000, p226 Price £911 (£775 ex VAT)  
Contact Sony 0990 424 424 www.sony-cp.com

**LCD MONITOR**

**Sony  
SDM-N50**



This TFT display is a svelte 1.3cm thick and the screen is easy to position with its multi-pivoted stand. The display quality is first rate and it even has built-in speakers and a headphone socket.

Review April 2000, p96 Price £1,291.32 (£1,099 ex VAT)  
Contact Sony 0990 424 424 www.sony.co.uk

**SOUND SYSTEM**

**VideoLogic  
DigiTheatre**



This set includes five speakers, a subwoofer and an integrated six-channel amplifier plus a decoder. Excellent sound quality at a fair price make the DigiTheatre a must-have.

Review January 2000, p81 Price £249 (£211.91 ex VAT)  
Contact Videologic 01923 277 488 www.videologic.co.uk

**CD-RW**

**Creative  
CD-RW Blaster  
CD-Studio**



This 8 x 4 x 32 EIDE CDRW package has everything you need to get started. Not only is there an EIDE cable and screws to mount the drive, but also a CD-RW disc and 10 CD-R discs.

Review June 2000, p192 Price £164 (£140 ex VAT)  
Contact Dabs Direct 0800 138 5114 www.europe.creative.com

**ISDN TA**

**Eicon  
DIVA USB**

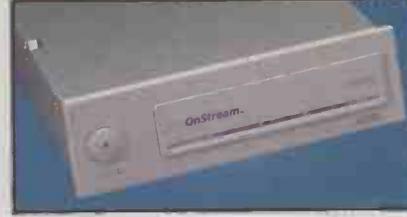


Weighing in at 70g and no larger than a mouse, this USB ISDN TA opens up 128Kbits/sec bandwidth and supports G3 and G4 faxing as well as a variety of voicemail and file transfer facilities.

Review March 2000, p87 Price £99 (£84.35 ex VAT)  
Contact Eicon Technology 020 8967 8000 www.eicon.com

**BACKUP**

**OnStream  
SC30**



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.

Review September 1999, p102 Price £386.58 (£329 ex VAT)  
Contact Simply 020 8523 4020 www.onstream.com

**DVD DRIVE**

**Pioneer  
DVD-115**



This 16-speed Pioneer drive is one of a few drives available at this speed. The unit uses a traditional tray loading design and also has a headphone jack and volume wheel on the front.

Review August 2000, p197 Price £141 (£120 ex VAT)  
Contact Dabs.com 0800 129 3120 www.pioneer.co.uk



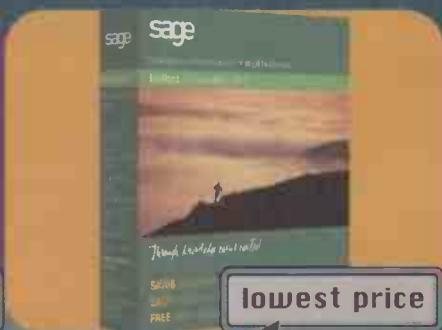
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► for the latest low prices visit our website or call 0800 376 5959.



**lowest price**

**Epson Stylus Photo 875 DC** - For digital camera enthusiasts who want the best print quality from their photos with the flexibility of an all round home printer.



**lowest price**

**Sage Instant Accounting 2000** - This easy to use package allows you to manage all your accounting requirements.



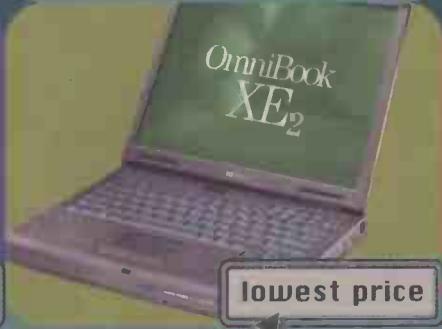
**lowest price**

**Microsoft Autoroute 2001** - Own the road wherever you go! AutoRoute 2001 is all you need to travel, across town or even across Europe.



**lowest price**

**Norton AntiVirus & Utilities 2000 Bundle** - A special package at a special price - save £££'s on these two great products by buying them together!



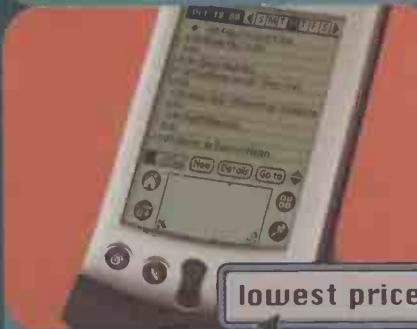
**lowest price**

**HP OmniBook XE2 Notebook** - A reliable, state-of-the-art notebook PC backed by superior service and support, and all at a great price.



**lowest price**

**Video7 15" LCD Monitor** - This top quality LCD display features resolutions as high as 1024 x 768 pixels with up to 16 million colours.



**lowest price**

**Palm Vx**  
The ultimate in personal organisers at a great price!



**lowest price**

**HP LaserJet 2100**  
Delivers 10 pages per minute with no compromise in quality - for those who demand high quality in everything they do!



**lowest price**

**Canon BJC-3000 InkJet Printer** - Another fantastic inkjet from Canon suitable for home or office use.

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# Art

THEY SAY A LITTLE KNOWLEDGE IS A DANGEROUS THING, BUT IN THE CASE OF IMAGE EDITING IT CAN HELP YOU TO CREATE GREAT PICTURES AND STUNNING GRAPHICS, ACCORDING TO KEN McMAHON. OUR WORKSHOPS SHOW YOU HOW.

## for the people



It's no secret that photography has come a long way in the past few years. In fact it's probably no exaggeration to say that the past decade has produced more technological change than since WH Fox Talbot discovered the amazing things you could accomplish with silver-coated paper. Evidence of the impact of digital technology on photography is all around you. On the advertising hoardings you pass on your way to work, the pictures in your daily newspaper, the images on the websites you browse and the graphics displayed behind the presenter on the early evening news.

Digital image editing makes it possible for professionals to quickly produce effects that previously would have taken a lot of time and cost a great deal of money. It also makes possible things that would never have been achieved, regardless of the time and money available.

Images frequently undergo all kinds of digital processing. The art of montage - producing a new image from bits of

several others - has blossomed in the digital age and we now take for granted unlikely photographic images of elephants on roller skates, cars driving on water, and mythical beasts. Not to mention less noticeable digital tweaking that gives us blemish-free models with startling eyes, sleek cars with reflection-free bodywork and holiday resorts with emerald seas, azure skies and beaches digitally denuded of their occupants.

The software tools used to accomplish all this are available to anyone with a modest PC. Adobe Photoshop is the industry standard application responsible for most of it. But even the most basic of packages aimed at the home user is now capable of many of Photoshop's tricks. Photoshop 5 LE and Paint Shop Pro 5.1, on which the following workshops are based, both have advanced features like layers, alpha channels, layer masks, sophisticated colour balancing and web-optimised output.

Plug-in filters provide image-enhancing tools like unsharp masking or other special effects and a vast range of third-party plug-ins provide additional effects and features.



ILLUSTRATION DANIEL MACKIE

## Take a trip to plug-in city



If there is something your image-editing application can't do, the chances are there's a plug-in that will fill the gap. Plug-ins will work with Photoshop and any other application that conforms to Photoshop's plug-in architecture. Paint Shop Pro, for example, seems happy with most third-party plug-ins. While there were compatibility problems with early plug-ins, nowadays if application developers say their products are plug-in compatible they are probably telling the truth.

Of course, the only way to be 100 per cent sure is to try it, and many plug-ins are shareware or available as demos or trials.

Plug-ins come in two flavours. Most commonly they add one or a suite of special effects to your filters menu. Good examples include Human Software's Squizz, Xaos Tools Terrazzo and Alien Skin's Xenoflex.

Squizz, is a Goo-style filter which offers brush-based, grid-based and envelope distortion effects. Terrazzo is useful for generating kaleidoscope-style tessellated background patterns and Xenoflex is the latest product from alien Skin – producers of the Black Box and Eye Candy effects suites.

Less fun, but perhaps more useful are the production tools which offer everything from image-enhancement tools to database facilities for keeping track of all your digital camera pictures. This category includes packages like Intellihance, Corel Knockout (not really a plug-in, but a standalone app), Imagebook, and Pantone's Hexwrench.

If it's productivity tools you want, an upgrade to Photoshop 5.5 might be a better option. Version 5.5 includes many of the advanced masking features that used to only

be available via plug-ins; it also provides good-quality text effects.

Plug-in suites like Extensis Phototools and Kai's Power Tools (KPT) provide lots of functionality and a stunning array of effects that it would be difficult and less fun to produce in any other way. If you want to try out plug-ins online, including Intellihance and Photoframe, go to [www.creativepro.com](http://www.creativepro.com).

There's a lot of shareware and demos just waiting to be experimented with. So there's no excuse not to take a few plug-ins for a test run.

Here are some sites with worthwhile downloads: [www.andromeda.com](http://www.andromeda.com); [www.alienskin.com](http://www.alienskin.com); [www.altamira-group.com](http://www.altamira-group.com); [www.gamutimaging.com](http://www.gamutimaging.com); [www.autofx.com](http://www.autofx.com); [www.creativepro.com](http://www.creativepro.com); [www.vertigo3d.com](http://www.vertigo3d.com); [www.corel.com](http://www.corel.com); <http://shareware.cnet.com>.

As our workshops show, you don't have to be a professional to achieve professional results. A little knowledge can go a long way to improving your pictures and helping you create stunning graphics. An understanding of the workings of certain features, together with a basic operational knowledge of a few key tools will enable you to get great results quickly.

All these workshops were all produced on a 350MHz PII machine with 64MB of RAM and a 10GB hard drive. No matter what your system, a quick check of your hardware configuration will speed your work up and avoid crashes.

Image-editing applications eat memory and hard disk space. Generally, the image you are working on is stored in RAM. Memory is also required for layers, alpha channels, undos and the clipboard, in addition to the operating system and any other applications you might be running. When your application runs out of RAM it turns to the hard disk for help, making use of it as virtual memory to store image data.

So, the first rule of fast working is to install as much RAM as you can afford, because once you start to make use of virtual memory, things will start to slow down appreciably. Typically you'll need five times the size of your image file, so if

your pictures are 1,024 x 768 resolution – just under 4MB, 24MB of spare RAM would be adequate. But if you are working on A4 300ppi (pixels per inch) scans, you'll need 10 times that amount. It's not essential, it just speeds things up.

If you do have to make use of virtual memory, it helps if you have one contiguous block – either allocate a partition on your hard drive exclusively for you image-editing application, or optimise your drive frequently.

While you are working you can help to keep memory and disk usage down by frequently purging the undo buffer and deleting unused layers and channels. After copying large amounts of data to the clipboard, once you have pasted, purge the clipboard by selecting a few pixels from the current layer and performing another copy.

### Layer upon layer

One of the biggest advances in image editing, layers, first appeared in vector graphics applications like Freehand and Illustrator and made the crossover when they were introduced in version 3 of Photoshop.

Like many new features of bitmap image-editing packages, the primary function of layers is to overcome the destructive nature of pixel

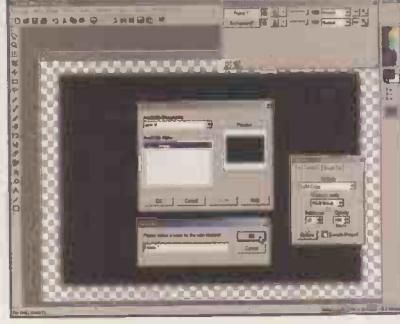
# Picture framing in Paint Shop Pro 5



Straight edges can be a bit, well, straight, and photos often look more interesting with a less exacting border. In this walkthrough we'll produce an art border that you can use to give your photos a more attractive edge. We're going to make use of alpha channels and layer masks to create borders so they'll be non-destructive - your original image will still be intact, viewed through the frame mask. So, if you change your mind you can choose a different frame, or remove it.



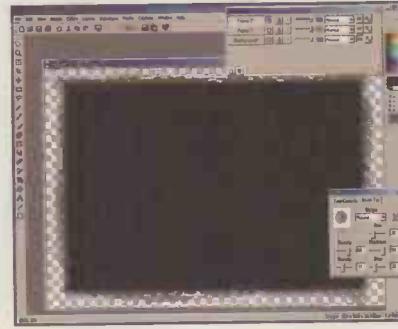
**1** Open up your image and make sure the layer and controls palettes are visible. Add a new layer and call it Frame 1. Don't worry about the mask options at this stage. Select Image/Canvas size and add about 10 per cent to the image dimensions to give a white border, then, in the background layer, select the border using the magic wand, invert it (Shift & Ctrl & I) and switch to the Frame 1 layer.



**2** Modify/Contract by about 12 pixels then Press Ctrl & H and feather the selection by 12 pixels to get a soft edge, then switch to the Frame 1 layer, flood-fill the selection with black. This is our basic frame. Select Mask/New/From image and check Create mask from source opacity, then click OK. Next select Masks/Save to alpha channel, click OK in the Save to Alpha dialog and call the channel Frame 1.



**3** Make the Frame 1 layer invisible and activate the background layer. Select Mask/Load from alpha channel and choose the Frame 1 alpha. Toggle the Enable layer mask button on the background layer to see what it looks like with and without the frame. Now we're going to create new frame masks using the paintbrush and spraycan.



**4** Duplicate the Frame 1 layer and call it Frame 2, make the other layers invisible so you can see what you're doing. Select the paintbrush tool and in the controls palette set the paper texture and choose a brush tip. Paint around the edges of the black rectangle until you're happy with the result.



**5** As in step 2, create a new mask from the image and save it as an alpha channel (call it Frame 2), then make the background layer active and load the new mask. You can continue making as many frames as you like in this way. Several of the paper textures including canvas, dark weave and asphalt produce good results. Experiment with brush tip settings and combinations. You can use the same settings with the eraser tool to remove mask as well as add it.

processing. Once you do something to the pixels in your image it's done for good - almost. You get one chance to undo it if it doesn't turn out right. These days, there are sophisticated history features that provide multiple undos, but even these work in a linear fashion; you can undo any number of actions, but only in reverse order. Layers provide the opportunity to carry out non-destructive editing that you can undo without affecting work you did after the original edit. One way this can be used to good effect is in

combination with the clone tool, much favoured for taking out unwanted image details like lampposts, trees, washing lines and ex-partners. Cloning requires careful setting of the tool options and repeated strokes with the right brush settings to achieve a seamless, invisible result. Often it's a question of trial and error, but it's not always obvious something's not right until way down the line, and if you clone on the background layer there's nothing to do but start again. You can avoid having to rework by duplicat-

### QUICK TIP

If you need more screen room in Photoshop, click on the centre button at the bottom of the tool palette to select Full screen mode with menubar, or press f to toggle between screen modes. Press tab to toggle all floating palettes.

# Making the most of digital pictures with Photoshop LE



You can download images from your digital camera and view or print them as they come. But with just a little effort you can transform them into pictures you can be proud of. How far you go is up to you. Here we've started with three simple steps – cropping, levels adjustment and unsharp masking – which all your pictures will benefit from, before graduating to some advanced tinkering with colour and tone.



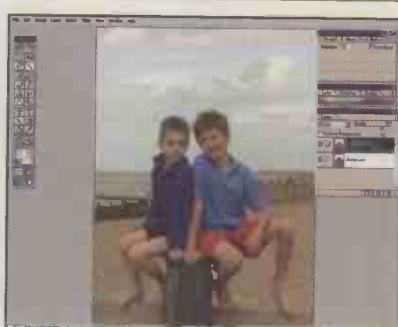
**1** Open your image and choose Save As, using a new filename and format. Most digital cameras store images as compressed JPEG s. Using the best-quality camera setting will save you effort. Don't resave images in JPEG format as the compression will reduce image quality. Choose Photoshop .psd format to preserve quality and keep all your layer and channel information. You can save to a flattened, compressed format when you're finished.



**2** To drastically improve the impact of your photos, click on the marquee tool and hold until the flyout appears, then select the crop tool. Drag a box around the area you want to keep, then press Return. Shoot at the highest resolution setting on your camera, because once you've cropped the picture, there are far fewer pixels in the image. But this also works to our advantage, speeding up all the work we've yet to do – which is why we cropped the image first.



**6** The variations default tends to ladle on the colour in bucketloads, so first adjust the slider to the fine end of the scale, that way you can add small increments. The radio buttons are set to add the colour in the midtones, which is on the beach where we want it, but depending on the image you might want to change this to add colour in the shadows or highlights. If you add too much of a colour, just add its complementary, or Alt-click on the cancel button to reset.



**7** Incidentally, the sharp eyed among you may have noticed that before altering the colour balance with variations we introduced a new layer by dragging the background layer onto the new layer button in the layers palette. Creating a new layer on which to make changes is always a good idea because, by adjusting the opacity slider you can blend the adjusted layer with the original one, varying the degree of the original effect.



**8** All this warming up hasn't done our sky any favours. It wasn't too blue to begin with and now the clouds have a creamy tinge. Select the magic wand tool and set a tolerance of about 32 in the tool options palette. Use Select/Grow to catch adjacent sky pixels you didn't get first time then press Ctrl & C followed by Ctrl & V to copy and paste the sky into a new layer. Click on the eye icon next to the existing layers to turn them off and you can see your sky layer in isolation.

## QUICK TIP

In Photoshop, click the preview checkbox on and off to see a before and after preview in the main editing window.

ing the background layer and cloning on a duplicate image above it. That way, you always have the untouched background layer to fall back on. You can simply copy the messed up bit from the background back into your retouching layer and start again, or make use of the opacity and blend modes to merge the two to better effect.

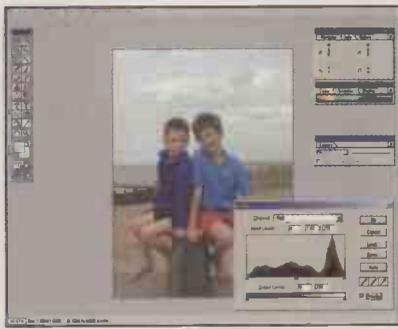
Once we had layers, the obvious thing to do was play around with how they interacted by varying the opacity – making topmost layers transparent, revealing layers underneath. You can

also get a lot of mileage out of blend modes that determine how pixels on the upper layer interact with those below. Lighten and darken can be used for subtle retouching and modes like multiply, dissolve and colour burn and colour dodge can be used to great effect.

From opacity and blend modes it was but a short step to adjustment layers. These are image adjustments that sit on a separate layer above the image layer and can be edited themselves in isolation from the layer to which they apply. For



**3** There aren't many images that don't benefit from unsharp masking, particularly if you're using a budget camera with a less than sparkling lens. The trick is not to overdo it. Choose an amount between 100 and 200 per cent, a radius between 0.5 and two pixels and a threshold of 0. Experiment with the sliders to see which settings give the best results and watch out for JPEG artifacts - blocky pixels and halos - which can be exaggerated by unsharp masking.



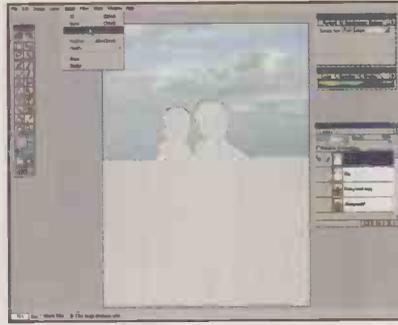
**4** Press Ctrl to bring up the levels dialog. The histogram shows the frequency of pixels across the tonal range from black (0) to white (255). You'll often find this clipped at either end where there are no or few areas of highlight or shadow detail. Our photo has a pretty good tonal range, but there are no whites and the contrast can be improved by dragging the input level slider down to 240. Or you can click the Auto button to map the darkest pixel to black and the lightest to white.



**5** For a seaside shot, our image looks a little cool, so we'll make a colour adjustment to warm things up. From the Image menu select Adjust/Variations to add red, green and blue (Additive Primaries) and yellow, magenta and cyan (Subtractive Primaries). Yellow and blue are complementary; adding one has the opposite effect to adding the other, so if you add equal amounts of each you get back to where you started. Magenta is the complementary of green and cyan of red.



**9** Select Rename Layer from the layer palette menu and call the new layer sky, then select Image/Adjust/Colour balance. Trial and error will help you achieve a realistic looking sky, but you will need plenty of cyan and a little magenta, all in the highlight area. If you check Preserve Luminosity the tonal values in the sky won't get darker, even though you're adding colour, though this can give an unrealistic day-glo effect. If your sky is over the top use the opacity slider to tone it down.



**10** Better, but still a bit gloomy. Why not replace the cloudy sky with something altogether more summery. Let's face it, on an English beach this is about the only way you're going to get the desired effect! Duplicate the sky layer by dragging it onto the new layer icon. Using the magic wand click in the transparent area below the sky (turn the other layers of if you like) and then Select/Inverse.



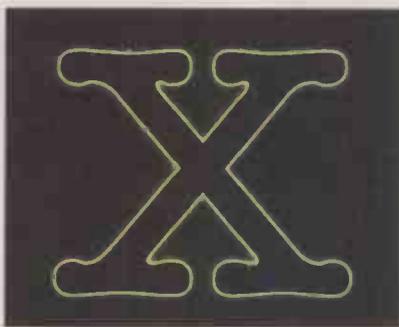
**11** Using the eyedropper select an area of the sky close to the horizon then click the background colour swatch and pick a deeper sky blue. Using the gradient tool, drag from the bottom to the top of the sky selection. This looks thoroughly strange because there's a clear blue sky, but no shadows. However, by experimenting with opacity and layer modes (overlay works particularly well) you can achieve a natural-looking compromise.

example, you can colour balance an image using an adjustment layer and then later reduce the opacity of the layer to lessen the degree of adjustment, or remove it altogether. Again, the underlying pixels are untouched. If you want to work quickly and efficiently, two features of image-editing applications you should get to know well are alpha channels and layer masks. RGB colour images are made up of three channels: one stores the pixels for the red image data, another the green, and the third the

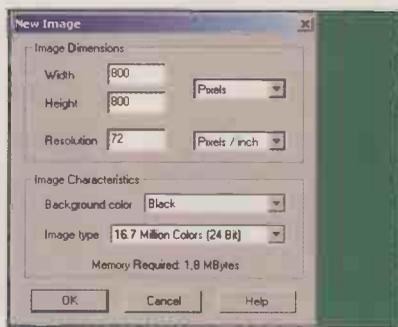
blue. You can view the separate channels in Photoshop LE by pressing Ctrl & 1, 2, or 3 (press Ctrl & ~ to get all three back together again). Additional channels can be used to save selections. Once you have saved a selection to an alpha channel it's available for you to load back in at any time, so you don't have to bother making the same selection over and over. What's more, you can edit the alpha channel, filling areas, applying effects filters and transformations to alter the way it works.

**QUICK TIP**  
Unless you're actually making use of plug-ins, remove them from the plug-ins folder. Your image-editing application will launch more quickly and use less memory without them.

# Text effects and animations in Paint Shop Pro 5



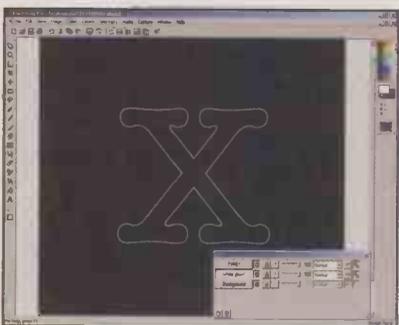
We're going to create some glowing text from scratch. It doesn't require any plug-ins, filters, complicated channel juggling or blend modes – the soft edge effect is achieved using the feather command. Our glow is made up of three colours, each of which occupies its own layer. A layer mask is used to define the shape of the glow. You can use this as a button, a navbar, or just for display type. We'll also show you how to use Animation Shop to give life to the image.



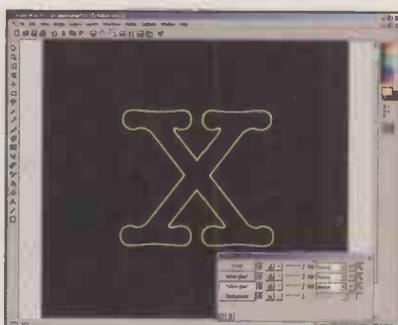
**1** Select File/New and enter the image dimensions in pixels. I've chosen 800 x 800 so you can see what's going on in the screenshots. You can always work big and sample down before creating a GIF file. Select 16.7 million colours (layers won't work in 8bit mode) and make the background colour black. Activate the layers palette by clicking the toggle layers palette button on the top toolbar.



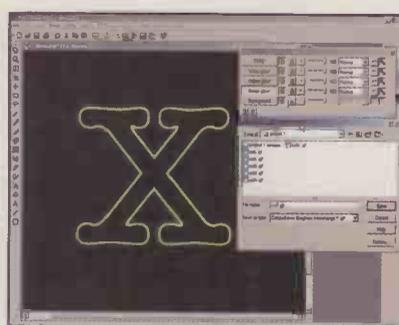
**2** Click the Add new layer button on the layer palette. In the layer properties dialog call the layer TYPE. Make sure the 'Mask is enabled for this layer' and 'Mask is locked with layer' checkboxes are checked and click OK. Click the Layer visibility toggle on the background layer to turn it off. Select the text tool and click in the centre of the layer. Enter your text (experiment to get the size right), but leave edge room for the glow. Make sure the antialias and floating boxes are checked.



**6** Incidentally, as we are not making use of the layer masks, other than to save selections, you can turn them off (last button from the right in the layers palette). Interestingly, if you leave them on, they will dim your glow slightly because the feather command works both sides of the selection border, so your flood fill will be two pixels wider than the selection. We may be able to make use of this 'accident' when it comes to animating the graphic.



**7** Now for the yellow glow. Duplicate the White glow layer, rename it Yellow glow and reposition it below the White glow layer. Create a selection from the layer mask, expand and feather it in the same way as for the White glow layer. Remake the layer mask from the expanded and feathered selection. Double click on the foreground colour swatch, select a yellow from the basic colours, and use flood fill. Select a green and repeat this step to produce a Green glow layer.



**8** We are going to save seven cells to import into Animation Shop. First make only the background layer visible and save a copy as cell1.gif. Next make the TYPE and White glow layers visible, with the layer mask turned on and save a copy as cell2.gif. Turn the layer mask off to increase the White glow and save a copy as cell3.gif. Save two GIF cells for each of the Yellow and Green glow layers (the first with mask on, the second with it off) and you will have seven animation cells.

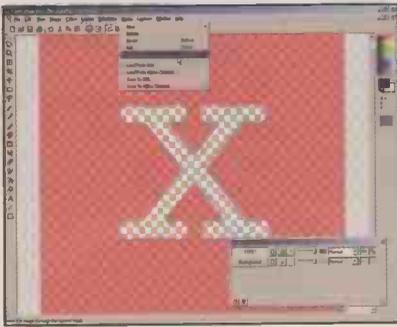
## QUICK TIP

Use the arrow keys to shift selections one pixel at a time. In Paint Shop Pro you need to press Shift too, in Photoshop this moves 10 pixels at a time.

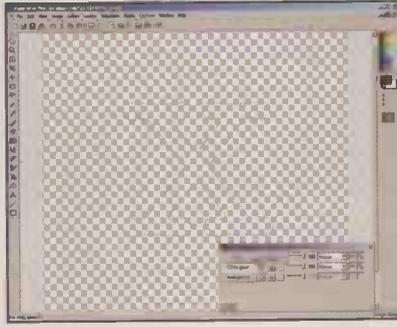
Layer masks are a lot like alpha channels, only they are linked to a particular layer. Masks control which parts of an image are displayed and which are hidden. In Paint Shop Pro the solid black areas show 100 per cent of the layer and the white areas nothing, in Photoshop it's the other way around, though you can invert the default setting. For example, if you used the gradient fill tool to fill a layer mask from solid black at the bottom to white at the top, the layer would show solid at the bottom, fading to transparent at the top.

Layer masking is used a lot in photomontage work to blend images together with a soft edge. It gives absolute control over which parts of the image are revealed and hidden and it's non-destructive – the original image is unaltered.

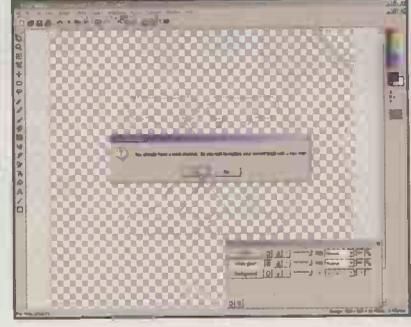
Next come selection tools, which have become increasingly effective in recent years and now any image editor worth its salt provides a number of ways to sort the pixels you want from those you don't. As ever, Photoshop has the best selection, though even the most budget packages will offer



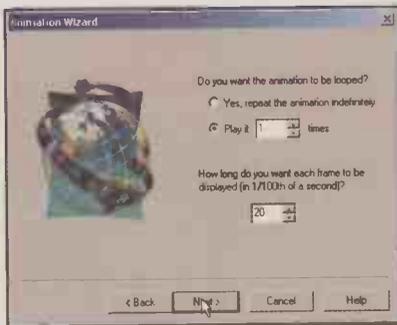
**3** Right click on the topmost 'Floating Selection' layer and select Defloat from the pop up menu. Then create a layer mask from the current selection using Masks/New/Show selection. To view the mask select Masks/View Mask (if you turn off the TYPE layer you can see it more clearly). Now you can select none (Ctrl & D) - you can get back your selection at any time with Shift & Ctrl & S.



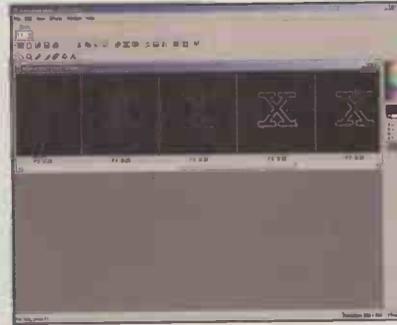
**4** We now have a black X on a black background! Don't worry, it's the backlit glow that will make the type visible. Duplicate the TYPE layer by dragging it onto the new layer button in the layers palette. Double click on Copy of TYPE and rename it White glow, then close the layer properties dialog box and drag the new layer below the TYPE layer. Press Ctrl & A, followed by del to clear the layer, then Shift & Ctrl & S to make a selection from the layer mask.



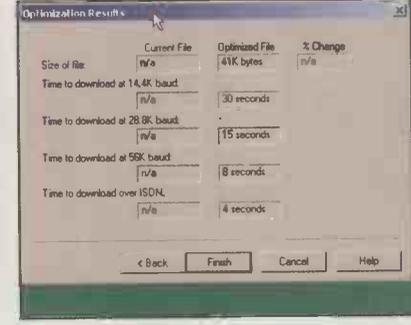
**5** We need to expand and feather the selection. From the Selections menu select Modify/Expand and enter a value in the number of pixels box. I've chosen two, but the effect will depend on the size of your image. Next Modify/Feather, this time we've gone for four. Remake the layer mask from this new selection - click yes to replace the existing mask. Fill the selection with white by clicking the background/foreground toggle and using the flood-fill tool, then select None.



**9** Open Animation Shop (File/Run Animation Shop) and run the animation wizard from the file menu. The wizard is fairly self-explanatory. The default frame delay is one-tenth of a second, so unless you have lots of frames you will need to lengthen this or your animation will be over in the blink of an eye. As I don't want the animation to loop I've unchecked this option.



**10** Click Add Image to include all of your cell files and use the move up and move down buttons to put them in the correct order. Click Finish to build the animation and you can now see each of the frames in a filmstrip format. Select View/Animation to see how it looks in motion.



**11** Lastly, you need to ensure that your animation is optimised for the web. The optimisation wizard does this for you, making appropriate colour depth and palette decisions, removing redundant frames and compressing the file so it will download quicker. You have to be careful with this and some tweaking may be necessary to achieve the best results. The optimisation wizard also provides a handy report that tells you how long your file will take to download.

some variation of the magic wand tool that picks up pixels of similar value based on an initial sample and a tolerance value.

Recent new additions to Photoshop 5.5's selection box include a magnetic lasso and pen tools, magic and background eraser tools (see this issue's *Hands On Graphics & DTP*) and an extract command. All these are designed to make the job of removing the main subject of a photograph from its background much easier. To do this kind of thing manually

requires tricky tedious, time-consuming tracing.

Whether you want to produce complex multi-image montages, sophisticated titles for a home video, or graphics for your website, today's image-editing applications provide all the tools you're likely to need. Improvement of your digital photos is within quick and easy reach. Basic knowledge of the way image-editing tools work can make the difference between a professional-looking result and a dog's breakfast. So, what are you waiting for?

## QUICK TIP

Use websafe colour palettes if producing images for the web. In Paint Shop Pro choose Colors/Load palette and safety.pal in palettes folder. In Photoshop 5 LE select replace swatches from swatches palette menu and use Web Safe Colors.aco.

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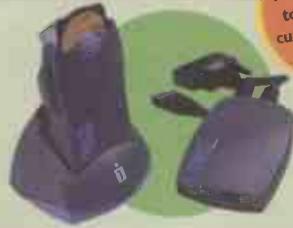
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# 50 hardware tips

KEEPING YOUR PC IN TIP TOP CONDITION OFTEN COSTS MONEY, BUT GORDON LAING HAS COME UP WITH A MULTITUDE OF SUGGESTIONS, MOST OF WHICH YOU CAN IMPLEMENT WITHOUT DIPPING INTO YOUR WALLET.

**M**AYBE YOUR PC ISN'T working as well as it used to. Perhaps you can't help thinking that a little tweak here and there will have your system once again firing on all thrusters. The truth is that a PC is just like any other piece of machinery, and requires regular maintenance to keep it in the best of health. But where do you start?

The answer is right here! Over the following pages we've got no fewer than 50 top tips to keep your PC hardware happy, and possibly running better than ever. Better yet, the vast majority of them are absolutely free! That's right, the best performance from your PC with no costly upgrades. So don't grind your PC into the ground. With our tips you'll have the smoothest system on the block!

ILLUSTRATION ANDY BAKER



## Let's get physical

**1** **Screwed up**  
Before you start digging into the innards of your PC, you should note that the hardware enthusiast's best friend is the Philips-head screwdriver.

Virtually everything in a PC can be loosened or tightened

using this. So get hold of a good one that preferably has a magnetic head to prevent those pesky screws from falling into your case and becoming forever lost. If you find yourself regularly crawling under desks to perform PC surgery, then a small Maglite torch can also prove invaluable.

## 2 Static electricity

The hardware enthusiast's worst enemy is static electricity, which can destroy a precious internal component in a flash. The particularly wary (or sparky) should always use an anti-static wrist strap, while the carefree may be content by regularly grounding themselves with a tap of the internal power supply. Certainly upgrading components on a highly charged carpet, or after rubbing a balloon against a furry jumper is not recommended (Although we're not sure why you would want to do that in the first place!).

## 3 Motherboard installation

When fitting a new motherboard, there's no need to lean into your case and struggle with screws. The side panel of most PC cases can be unscrewed and removed from the main chassis, allowing you to mount your motherboard in comfort. Make sure you use all the motherboard's mounting holes to prevent it from flexing when you insert cards.

## 4 Jumper settings

It's a good idea to set the jumpers on the back of drives before you screw them into your case. Believe us, it's a lot less fiddly than trying to do it when they're properly mounted. And speaking of which, don't skimp on screws when mounting drives, as otherwise you could experience irritating vibrations.

## 5 More power

Most PC cases are supplied with 230w power supplies. While this is adequate for a basic system, once you start adding more and more drives, fans to keep them cool, not to mention power-hungry CPUs and graphics cards, then perhaps it's time for an upgrade. Consider swapping your power supply for a higher-rated 300w version.

## Brave BIOS

**6** **Quick warning!**  
Almost every PC user will have to enter their BIOS at some time, but you should always act with caution, as an incorrect setting could render your system unstartable. While

enthusiasts may tweak BIOS settings for the best performance, less experienced users should only go in when they absolutely have to.

## 7 Easy OS install

In the old days, we installed everything from a floppy disk - indeed, most operating system installations still require a start-up floppy disk to load CD-ROM drivers in order to continue any further. A modern BIOS, however, may have the option to boot directly from an appropriate 'bootable' CD. If your BIOS supports this option, it's well worth activating, as a bootable OS CD makes installation a breeze, particularly for Windows 2000, which, like NT, otherwise requires three floppies before it'll talk to your CD-ROM drive.

## 8 Parallel peripheral problems?

Before the advent of USB, the PC's venerable parallel printer port won many new friends, including numerous scanners and even a handful of MP3 players. However, almost every new device demanded that the parallel port was working in the enhanced EPP or ECP modes. Sadly it's not enough that your parallel port is EPP- and ECP-compliant - it has to be set as EPP or ECP in the BIOS, so if you're experiencing trouble with a parallel port scanner, your BIOS is the place to look.

## 9 Don't interrupt me!

The BIOS is responsible for snatching most of your PC's precious resources, such as IRQ interrupts. If you've run out of IRQs and are experiencing device conflicts, consider disabling unused devices or ports in your BIOS. Exclusively SCSI users could disable their onboard IDE controller, while anyone with a USB keyboard or mouse could disable their PS/2 ports. Make sure the BIOS is set up for supporting a USB keyboard at boot, though.

## 10 BIOS updates

Sometimes an update to your BIOS is necessary to support new CPUs, bigger hard disks, or even modern OSs - Windows 2000, for instance, requires BIOS updates on many systems. Updating or 'flashing' your BIOS normally entails downloading the required data image file and a suitable flashing utility from your motherboard maker's website, copying it onto a bootable floppy, and starting your system with it. The updating process takes about a minute. If everything's working fine on your system there's no need to update your BIOS.

**11** SCSI BIOS updates

There's also a BIOS in decent SCSI cards, such as most of those supplied by Adaptec. Believe it or not, this BIOS, too, can sometimes need updating, as advised on Adaptec's website. For example, the popular 2940U2W card may require a BIOS update to work with several Intel 820 and 840 chipset motherboards.

**12** Load default settings

It can be easy to change a setting in your BIOS that will render your PC unstartable. Sometimes you can re-enter the BIOS, and change the offending setting, or if in doubt, just load the default BIOS settings and start again. However, you may not be able to get into the BIOS to change the settings back. But as the BIOS uses a battery to remember its new settings, removing it should return it to its default state (it's usually the flat circular battery on the motherboard). The BIOS can remain quite faithful to its user settings, though, so you may have to remove the battery for a good few minutes, or even longer to be sure.

**Full recovery**

**13** Okay, so the battery trick didn't work. Or perhaps your system lost power half-way through the BIOS flashing process. Either way, it's time to get really serious. Modern motherboards have a boot-block BIOS that doesn't get overwritten during flashing. This tiny amount of non-corruptible data has support for a floppy drive only, allowing you to boot and attempt to reflash the BIOS again. Sadly, there's no support for PCI graphics cards, so you'll either need to find an old ISA card, or instruct the Autoexec.bat file to fire up the flash utility and keep your fingers crossed. If this doesn't work, you're looking at physically swapping your BIOS chip for one that works. However, some boards have two BIOS chipsets to protect against this problem.

**14** Updates and installers  
Driver updates

Manufacturers of peripherals and devices are rarely satisfied with their drivers and usually work on improving their compatibility and performance. It's always worth checking for driver updates, particularly if you own a graphics card or Windows 2000. Amazing as it seems, we even saw improved games performance after updating a driver for a sound card. So saying, don't take the manufacturer's word as gospel. If you're experiencing problems or reduced performance with a new driver, then revert to an older one.

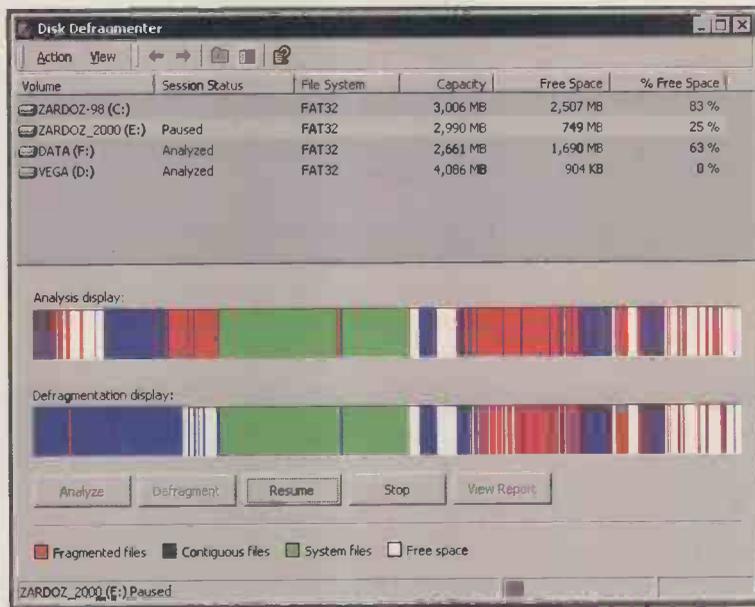
**15** Order a CAB

Recent versions of Windows store their installation files and standard drivers as compressed files with a CAB extension. When you're asked to insert the Windows CD, you're

in fact being prompted to supply the appropriate CAB files. If your hard disk has plenty of free space, consider copying the CAB files from the Windows CD and pointing the request at this location instead - very convenient if you don't always have your Windows CD to hand. There's no need to copy the entire CD though: for Windows 98, just copy the 173MB Win98 folder from the CD.

**16** Already installed?

Often a newly installed device will ask for the Windows CD to be inserted for some extra files. You may, however, find that you've already got the required files present in your system. If the Windows CD is not to hand and you've not copied the CAB files across, then browse the following folders: Windows/system, Windows/system/iosubsys, and Windows/system32/drivers. In many cases the installer will find the files it's looking for in these locations.



**Drive tips**

**17** Defrag your disk

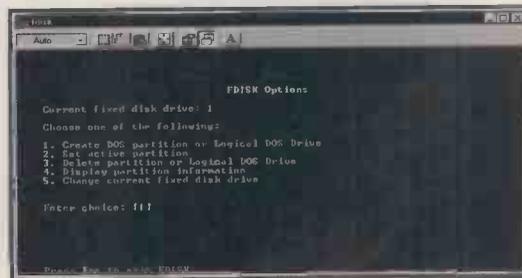
As you spring clean your hard disk, files are removed from all over the place, leaving lots of little gaps. To group them back together into one big useful area, use Windows' defrag tool. Simply bring up the properties of a drive in My Computer and choose Defragment from the Tools tab.

*Bring all your files back together again with Windows' defrag tool*

**18** Formatting is not enough

It's well worth reinstalling your entire operating system and applications at least every year, especially if you install and remove lots of software and

*Exorcise the ghosts and create new partitions with Fdisk*



devices. While the classic Format C: command may seem to get rid of everything, many OSs still leave bits behind. The only way to really exorcise the ghost is to restart in DOS, use Fdisk to delete your pesky partition and create a new active partition. You'll still need to format it afterwards of course.

### 19 Keep up with the IDE

The IDE interface that's standard on almost every PC motherboard typically features two connectors: one for the Primary channel and the other for the Secondary. Each channel can support two devices as Master and Slave, but it's not advisable to mix drives of very different performance. A CD or DVD-ROM drive will slow a hard disk if placed on the same channel, so keep them apart. Put hard disks on your Primary, and CD/DVD/Zip/LS-120 drives on your Secondary.

### 20 Choices, choices: 66 and 33

Following on from the point above, try not to mix UltraDMA66 drives with UltraDMA33 drives on the same channel, or the bandwidth on that channel will be fixed at 33Mbytes/sec. While this is still sufficient for most pairs of drives, disks are getting steadily faster. A new IBM model already delivers 35Mbytes/sec.

### 21 LVD, yeah, you know me!

The latest two SCSI interfaces, U2W and U160 use a Low Voltage Differential (LVD) connection. U2W and U160 SCSI cards normally feature at least two channel

## Pushing components to the limit

Overclocking is the process of forcing something to go faster than it was originally intended to go. While this is most commonly performed on CPUs, overclocking is now popular with some chipsets and even graphics cards. Remember, however, that if you artificially run a component beyond specification, you may damage it and probably invalidate your warranty.

A CPU's speed is dictated by two numbers multiplied together: the clock

multiplier and the front-side bus (FSB), so a PIII 750 is 7.5 times 100MHz. In recent years, Intel has locked the clock multiplier on its CPUs, which means overclockers have been forced to increase the FSB instead.

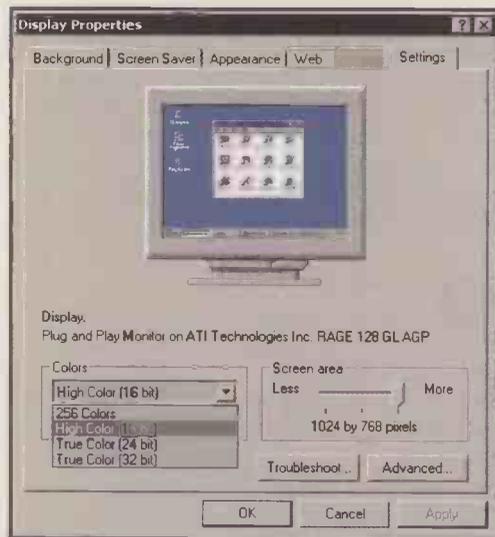
Apart from ensuring the resulting speed is still within the CPU's manufacturing tolerances, increasing the FSB has many other impacts.

First is that the PCI and AGP buses are only guaranteed to work at 33 and 66MHz respectively and these

speeds are calculated as a fraction of the FSB. Consequently, you'll have to ensure your motherboard offers appropriate dividers, or you may be running these often sensitive buses beyond their specification.

In BX chipset systems, the memory is also driven at the same speed as the FSB, so a 133MHz FSB will require PC133 memory.

For more details on the practicalities of overclocking, check out *Hands On Hardware* in PCW every month.



Try 16bit colour mode if you're looking for speed

connectors: one labelled LVD and the other as SE. In order not to compromise the performance of high-speed LVD hard disks, you should keep them on the LVD channel and all other non-LVD peripherals on the SE channel.

### 22 The terminator

SCSI offers great performance and flexibility so long as you obey some simple rules. One of the most important is to terminate each end of the SCSI chain, be it on an internal drive, an external scanner, or even on the SCSI card itself. Incorrect or missing termination can cause all sorts of problems.

### 23 Stay on the same bus

SCSI and IDE each have their pros and cons, but for the best performance, try to stick to just one or the other in your PC. Data transfer is much faster if it doesn't have to cross from IDE to SCSI or vice versa.

## Graphics and display

### 24 Free of flicker

A flickering display will give you eye fatigue and headaches. To avoid this, make sure your graphics card refresh rate is at least 70Hz, and ideally nearer 85Hz. If you change your refresh rate and your monitor can't handle it, wait for a few seconds and Windows will switch it back to your old setting. Note LCD monitors can get away with lower refresh rates as they have their pixels illuminated at all times.

### 25 Crop top?

If you don't like the black borders around your picture, then use the monitor controls to stretch or reposition the image on screen. Similarly, if it's cropped, then shrink the picture or shift it back again. Adjustments are frequently necessary when you switch resolutions or refresh rates.

**26 Go for 16bit: the ideal compromise!**  
While 24 and 32bit colour modes may reproduce photographic images the best, 16bit looks pretty good, and is a lot quicker for your system to handle.

**27 Quick games boost**  
To immediately improve your frame rate in games, consider playing them at a lower resolution. A setting of 640 x 480 may not be anywhere as detailed as 1,024 x 768, but it's a darned sight faster, and cheaper than buying a new graphics card.

**28 Save the environment**  
Power-saving modes will reduce electricity use and prolong the life of your display. Don't forget to switch off your display at the end of the day, though, as most PC power supplies will no longer do it for you.

**Sound advice**

**29 Magnetic shielding**  
Loudspeakers use big magnets to drive those cones and produce the sound. There's nothing wrong with that, of course, unless they're placed too close to your monitor. The magnets will interfere and produce undesirable coloured interference and distortion on screen. The solution is to move them further away or, better still, to buy a magnetically shielded pair.

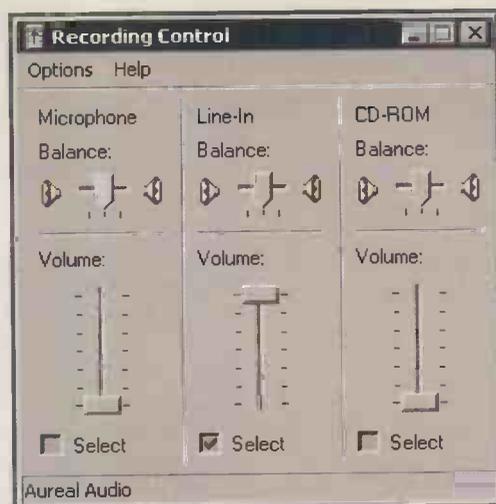
**30 Boo, hiss!**  
To minimise background hiss when recording audio on your sound card's line or CD inputs, make sure you mute the microphone input. If you have a pre-amp option, known as 'boost' on Creative cards, then mute this too.

**31 Digital dream**  
Most modern sound cards feature SPDIF ports, which squirt out digital audio through either an optical or coaxial phono connection. If your hi-fi pre-amp or processor features a spare SPDIF input, consider connecting it to your PC for the best quality. Note that many software DVD players can now redirect the raw Dolby Digital or DTS bitstream out of your sound card's SPDIF port, allowing you to connect it to an external Dolby Digital/DTS decoder.

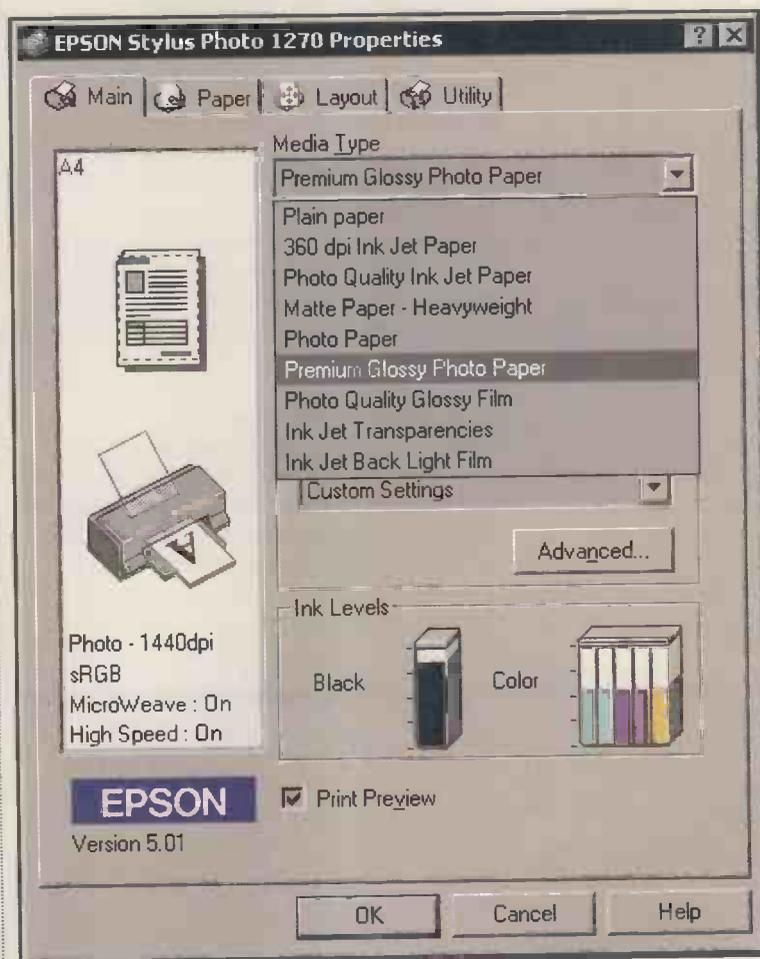
**Imaging and printing**

**32 Blocky digital camera photos?**  
The general rule for printing photos on colour inkjets is to supply them with 200-300 dots per printed inch. If you've got a 2.1 megapixel digital camera, that means you'll begin to see the blocky pixels on prints larger than 6 x 8in. To eliminate these jaggies, consider interpolating your image by two times in a package like Photoshop. This won't reveal any new detail in the picture, but will let you print to A3 without seeing any nasty blocks.

**33 Matched paper**  
Colour inkjet printers have an enormously wide range of different papers available - some are matt, some are glossy, some are thick and some are thin. The crucial thing is to know which paper you're using, and to instruct your printer driver. It will then know how much or how little ink to put on the page, striking the right balance between a soggy print and one which is lacking in the vibrancy department.



*Cut down that background hiss*



*Tell your printer driver what sort of paper you are using*

**34 Soft scans?**  
When scanning photographs, the results can sometimes look a little soft. Consider sharpening them using software, either from the TWAIN driver if available, or from an image manipulation package. The sharpener of choice is the curiously titled Unsharp Mask, which normally lets you adjust settings and preview their effect before applying.

**35 SCSI scanner not talking?**

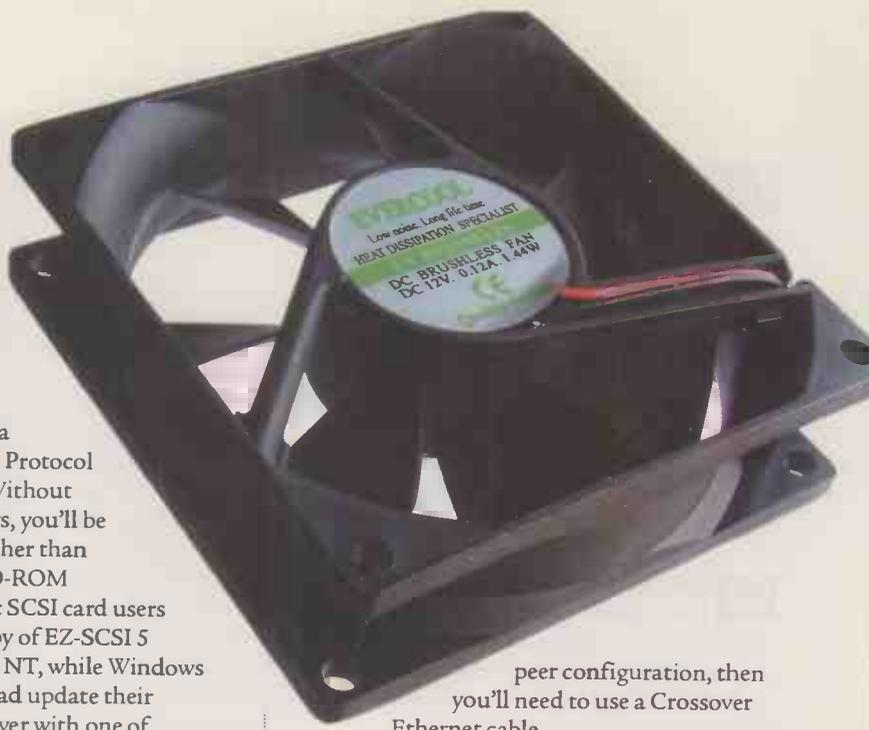
SCSI can be a superb interface for connecting drives and peripherals, but sometimes devices other than hard disks can give you trouble. The culprit is normally a missing Advanced SCSI Protocol Interface (ASPI) layer. Without ASPI loaded in Windows, you'll be lucky to get anything other than SCSI hard disks and CD-ROM drives working. Adaptec SCSI card users should get hold of a copy of EZ-SCSI 5 for Windows 95, 98 and NT, while Windows 2000 users should instead update their Microsoft SCSI card driver with one of Adaptec's own. This seems to do the trick for talking to SCSI scanners and other moody devices.

**36 Cabling and cleaning Cable compromise**

Most of us use extension cables and splitters to get our phone points to our modems, but these may be deteriorating the line quality and compromising your Internet performance. Remember that a 56K modem will rarely achieve its theoretical limit, but if you're consistently getting below 30K, then it may be time to check your cabling.

**37 Simple networking**

While LapLink's special USB cable is a neat way of quickly transferring files between two PCs at up to 12Mbps/sec, you can't beat the flexibility of a proper network. You'll need to fit a 10/100 PCI Ethernet card into each PC, and use CAT-5 quality cabling to support the faster 100Mbit speeds. If both PCs are connected directly to each other in a peer-to-



peer configuration, then you'll need to use a Crossover Ethernet cable.

**38 Clean living**

It's remarkable how much dust and dirt your PC accumulates over time. Try turning your keyboard upside down and shaking out all the sandwich crumbs. If your mouse has become unresponsive, remove the ball and brush any dirt and fluff from the rollers - cotton wool buds and compressed air can prove invaluable. Also check for fluff in your fan intake round the back of your PC case.

**Keeping your cool****39 Biggest fan**

Fast graphics cards, high-speed hard disks and quick CPUs all generate a lot of undesirable heat, and it's a good idea to get rid of it if you want to prolong their life. Most PC cases feature mountings for one or two additional fans to pull clean air in and suck it back out the other end - costing less than £10 each, additional case fans will help your PC keep its cool.

**40 Thermal paste**

Heatsinks may keep processors cool, but will only work at their best if there's decent contact between them. Help them by removing the heatsink, getting rid of any redundant pads, and applying a very thin layer of heat transfer compound instead (£1.99 from Maplins, [www.maplins.co.uk](http://www.maplins.co.uk)).

**41 CPU heatsinks**

Overclockers often have to pump higher voltages through their CPUs in order to get them to work reliably at faster speeds. This in turn generates more heat, so bigger heatsinks and fans are a must. Remember that PPGA processors need different heatsinks to FC-PGA processors, as they're slightly different heights. Hills Components ([www.hillscomponents.co.uk](http://www.hillscomponents.co.uk)) has a good range of Titan fans.

## Chipsets under the spotlight

In recent months, the chipset (which co-ordinates activities on your motherboard) has come to the forefront of attention. Intel's issues with its RDRAM-to-SDRAM protocol converters on 820 and 840-based motherboards have forced many users to look more closely at chipsets when they are looking

to buy a new system.

Intel's old BX chipset still cuts the mustard, particularly when overclocked from 100 to 133MHz, but this pushes the AGP bus beyond spec, and supplies of the chipset are now almost non-existent.

Natively supporting PC133 memory, Intel's brand new 815 and 815E chipsets are

set to do good business in mainstream products.

Many enthusiasts are, however, waiting for VIA's forthcoming chipsets that will support new DDR SDRAM, effectively running at 266MHz. We hope to see DDR motherboards for both Intel and AMD CPUs before Christmas.

**42 Monitor temperatures**

Wary users or overclockers should always keep an eye on the various temperatures in their systems, especially when they've been on for the best part of a day. Most BIOSs will indicate the CPU temperature, and some motherboards come with utilities to check this from Windows. Intel lists thermal guidelines in the developer sections of its website, but if your CPU is approaching 70 degrees Celsius, it's definitely time to cool down.

**43 Do your research**

If you want to check out overclocking or upgrade options, then the bible is your motherboard manual. If you've mislaid yours, identify your board and download a copy from the manufacturer's website - it's essential.

**Media care****44 Fragile CDs**

*Tomorrow's World* may have introduced compact discs as indestructible, but they're more fragile than we first thought. CD-R discs are particularly sensitive to scrapes and scratches, so keep them in their cases when not in use.

**45 Uncertain backup?**

When is a backup not a backup? When it's not been verified. It's no good studiously backing up your data if you don't check to see it was stored without a problem. All backup software offers a verification option, which simply checks to make sure everything went to plan - make sure you use it!

**46 Backup for backup**

You may be happily backing up and even verifying, but then one day your backup media fails, or is lost, burnt or nicked. If you really care about your data, back up twice each time, onto different media, and cycle it from time to time. Where possible, try to keep your backup media separate from your PC in case your system is stolen or damaged. A fireproof safe or off-site location could end up being the securest place for your precious backup media.

**47 Scary magnets**

Tapes and floppy disks store and identify their data using magnet properties of the media. Clever stuff, but easily distracted by a bigger magnet, like the ones they use inside your monitor and in loudspeakers. To avoid the chance of accidentally erasing your tape or floppy, do not leave it on top of your monitor or speaker.

**It's dead Jim!****48 New drive won't appear?**

A new hard drive may be connected up correctly, but if your BIOS hasn't been informed, then it may as well be in Timbuktu. If

it's an IDE drive, ensure the first page in your BIOS has the appropriate channel set to AUTO, and that the channel itself is enabled. If you want to boot from a SCSI drive, make sure your BIOS knows to boot from SCSI and not IDE.

**49 Machine won't start up?**

There's a reason most technical support people ask you to check your cables and connections - they're often at fault in a system which mysteriously won't start up. If your PC fans are whirring, but there's no beeping, nothing on your display or anything else at start-up, then switch off and make sure your CPU, memory and cards are correctly seated in their respective slots. It's often worth removing them and re-inserting to be sure. AGP graphics cards are notoriously troublesome, and often pop out from their slots almost invisibly, but sufficiently to halt a system. After much cursing and head scratching, we've discovered most mysterious non-boots are due to a badly seated component.

**Hills Components Limited - Microsoft Internet Explorer**

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Back Forward Stop Search Favorites History

Address <http://www.hillscomponents.co.uk/titanpage.htm> Go Links

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**Titan Fans**

Our range of Titan CPU coolers.  
We have a selected range featured on this page, however any Titan product may be sourced direct from Hills. Contact our Sales team with the Titan model number you require on (01923) 424344 or email [sales@hillscomponents.co.uk](mailto:sales@hillscomponents.co.uk).

**Majesty Cooler for Coppermine (FC-PGA) and AMD K6-3**  
Model No.: TTC-MIAB  
Size : 69.5 x 69.5 x 45.5 mm approx.  
Fan Size : 50 x 50 x 25 mm approx.  
Type : Single Fan with Ball Bearing  
This fan is suitable for CPU's up to 1GHz

Order Part Number: 57-9370

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**Majesty Cooler for PIII**  
Model No.: TTC-MA2B  
Type : Single Fan with Ball Bearing  
Total dimensions : 128 x 46.5 x 44 mm  
Majesty cooler , only for INTEL Pentium III SECC2 CPU UP TO 1GHz  
Heat sink dimensions : ø 70 x 45mm  
Thermal resistance : 0.49°C/W  
This fan is suitable for CPU's up to 1GHz

Order Part Number: 57-9412

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**Majesty Cooler for AMD K7**  
Model No.: TTC-MA4B  
Type : Single Fan with Ball Bearing  
Majesty cooler, only for AMD K7 CPU up to 1GHz  
Heat sink dimensions : 125 x 57 x 52mm  
Thermal resistance : 0.32°C/W  
Total dimensions : 125 x 57 x 52 mm

Done Internet

**50 Machine won't switch off?**

The power button on PC systems with ATX power supplies isn't simply an on/off affair; instead it works in states. If your machine won't physically switch off when you press the button, try holding it in for a few seconds. Also remember to enable ACPI in your BIOS so that Windows can switch off your PC when you shut down.

*Clash of the Titans: try Hills Components for a wide range of fans*

THE DAY IS COMING WHEN ROBOTS WILL BUILD, DESIGN AND REPRODUCE THEMSELVES.

# Mating robots

**I**T ALWAYS USED TO BE THAT robots were the fruit of human imagination. Now researchers are promising a new generation of robots that can design themselves, build themselves and program themselves. Not to mention reproduce.

Richard Watson and Sevan Ficici of Brandeis University in Massachusetts are working on what they call 'Embodied Evolution' (<http://demo.cs.brandeis.edu/pr/ee/>). Their idea is to set up a population of robots in some environment and – wait for it – let them mate with each other.

For their experiments they've been using little home-made robots they call 'tupperbots'. Each robot is about the size of an ashtray, and inside the plastic casing are two light sensors, a



*Snap happy: some of Khepera's robots with cameras*

simple microprocessor, a motor, and an infra-red comms link. The robots draw power directly from a floor ruled with stainless steel power strips, engaging with contacts in the base of the robot between the wheels. Each robot's task is to move towards a light at the centre of the environment, finding its way around all the other robots who are trying to do the same thing.

Each robot starts off pre-programmed with a simple behaviour algorithm – its 'genetic code' – and when two robots come within flirting distance, they transmit their genes to each other, via their infra-red links. A random mutation is introduced into the sets of transmitted genes, and each robot incorporates the genes it receives into its own genome. The effect after several generations of evolution is that the robots gradually get better at finding

the light and, surprisingly, their performance even beats that of a behaviour program hand-crafted by the researchers. You can try a Java simulation of the tupperbot experiments at [www.demo.cs.brandeis.edu/~miguel/cgi-bin/Bots/](http://www.demo.cs.brandeis.edu/~miguel/cgi-bin/Bots/).

Hod Lipson, also at Brandeis University, is taking the idea of robot evolution one stage further, and wants to build robots that change their shape on the fly, according to their given task ([www.demo.cs.brandeis.edu/golem/](http://www.demo.cs.brandeis.edu/golem/)). Currently Lipson and his colleagues are running evolutionary algorithms on a computer connected to a '3D printer', which deposits layers of thermoplastic to build up a 3D structure – and out pops a simple robot. In the future, miniaturised 3D printers could be incorporated directly in a robot's body, so it could sprout extra limbs on demand, and even give birth to new robots.

At the other end of the evolutionary scale, Mark Tildon of Solarbotics ([www.solarbotics.com](http://www.solarbotics.com)) builds bug-like robots he calls 'junkbots', that are cobbled together from whatever spare parts he has lying around. His prototype junkbots are made from old Walkman mechanisms, bits of printers, and solar cells that once powered calculators. One of Tildon's creations is a junkbot built from disk-eject motors that wriggles like the primitive, fish-like lamprey. Strangely, a team based at the University of Genoa, led by Vittorio Sanguineti, is also interested in lampreys and robots, but in a quite different, not to say chilling, way.

They've dissected out the brainstem and spinal cord from a living lamprey (presumably living no longer) and wired it to a standard Khepera lab robot – rather like a jam jar on wheels (<http://diwww.epfl.ch/Khepera/>). In the lamprey's brain are some large neurons whose function is to process signals from its sensory organs and relay them to its motor cells. Sanguineti and his colleagues have attached the Khepera's light sensors to the lamprey's neurons, and connected their outputs to the servo motors used to steer the robot. As grotesque as it may sound, it works – the fish's brain steers the robot to the light.

As Isaac Asimov once said: the robots are coming – but some of them are likely to be beyond even his imagination.

TOBY HOWARD



“Rex or my new Taxan...  
I'm not sure which  
one I like best.”

Charlie Warner aged 6, Dog owner and Taxan enthusiast.



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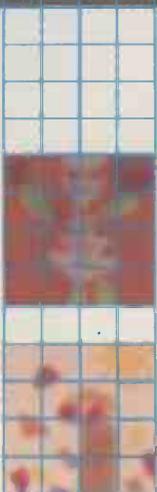
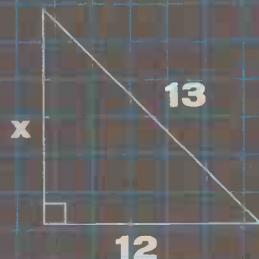
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$$\begin{aligned} a^2 + b^2 &= h^2 \\ x^2 + 122 &= 132 \\ x^2 + 144 &= 169 \\ x^2 &= 169 - 144 \\ x &= \sqrt{25} \\ x &= 5 \end{aligned}$$



**For those making the most of their university years, or last-minute crammers with exams at stake, your own PC can be a godsend. We asked 16 manufacturers to put together a system within a student budget of £999 and with a student's needs (academic, not alcoholic) in mind.**

**A**s summer draws to a close, the school and university terms will soon be upon us once again. For some, this will mark a return to the freedom of living away from their parents, while for others it will be the first step towards the bigger life of university socialising, with its drinking, end of term starvation and a workload that few really understand until the night before their first-term exams. It is a traumatic, but strangely wonderful time.

For those of us who have travelled

$$a^2 + b^2 = h^2$$

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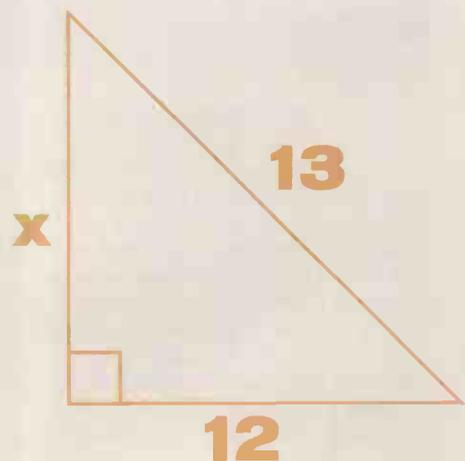
# Education systems

this path, there was one thing we envied others for – their own computer. The benefits of having one are many and varied. You no longer have to book yourself time on a university computer; you don't have to stop writing when the library closes; and perhaps most relevant, you can involve your flatmates in alarming minesweeper competitions, the enthusiasm for which can quickly grow out of control. The especially lucky students even have a printer, which allows them to print out their flatmates' names and stick them on their doors.

This month we asked 16

manufacturers to meet the challenge of putting together a competitive system that would suit school/university study. The guidelines we gave were: at least 128MB of RAM, a minimum 10GB hard drive, 17in monitor, modem, sound card and speakers, some form of removable storage, Windows 98 Second Edition, three-year warranty and software suitable for producing illustrated reports. The system should cost no more than £999 ex VAT, but including delivery and any credit card surcharges.

Read on to see what the manufacturers recommend you use in today's education system.



## Carrera Octan M750



**CARRERA HAS SUPPLIED** a machine that boasts the largest monitor – a 19in LG CS990DC. With a tube that isn't flat in any direction, this shadow-mask unit doesn't stand up to some of the vibrant and sharper aperture-grille models on test here. It may also be on the bulky side, if your desk is small. However, if image manipulation is a priority in your studies, you'll like the extra screen space.

Hooked up to the monitor is a 32MB TNT2 M64-based graphics card occupying the AGP slot of the Biostar

motherboard. This graphics solution is nothing to write home about, with the card underperforming in both of our 3DMark and Quake III tests.

At the Octan's heart, we find a 750MHz AMD Athlon processor, supported by a single module of 128MB PC100 SDRAM in one of three DIMM slots. The innards are tidy

with the cables neatly clamped to the side of the case. There's also an extra case fan to keep everything cool.

Storage is catered for by a 20.5GB Quantum Fireball hard drive which should provide more than enough room for most users, although media students capturing their video projects may find it fills up at an alarming rate. However, you can also burn data to CD using the Ricoh MP9060A CD-RW drive – winner of our Highly Commended award in June's group test – which doubles up as

a four-speed DVD-ROM drive. This has allowed Carrera to forego a separate DVD or CD drive, but at the expense of on-the-fly CD copying. A blank CD-R and a CD-RW disc are included. If you want to watch DVD movies, playback is reasonable but the audio suffers from background noise. A SoundBlaster PCI 128 sound card powers the budget Altec Lansing ACS22 speakers.

Lotus SmartSuite Millennium is included for producing illustrated reports, together with IBM ViaVoice, and a basic entertainment pack. On the whole, the Carrera offers little to make it really stand out. Performance is below par while other manufacturers have submitted more tailored bundles.

### DETAILS

**PRICE** £1,173.83 (£999 ex VAT)

**CONTACT** Carrera 020 8307 2800

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

**PROS** 19in monitor; combo drive

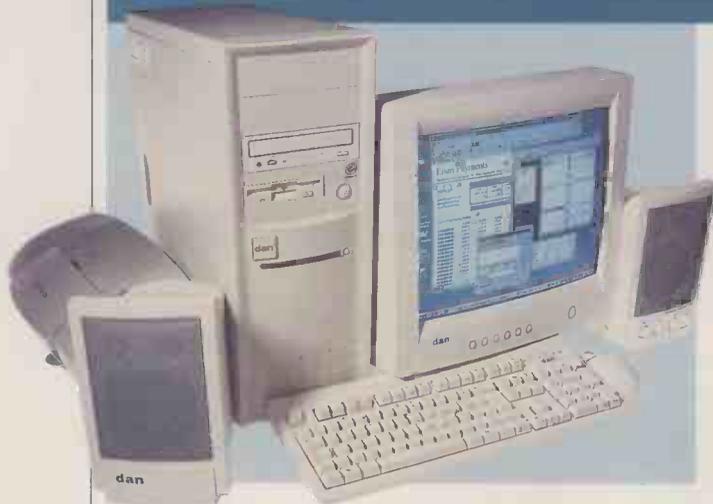
**CONS** No separate CD/DVD-ROM; poor sound on DVD playback

**OVERALL** A basic PC, without enough focus on the educational theme to make an impact

#### FEATURES

PERFORMANCE ★★  
VALUE FOR MONEY ★★★  
OVERALL RATING ★★★

## Dan Home Plus S



**ABSENT FROM OUR** group tests for seven issues, Dan Technology returns with a machine that features Intel's Flip Chip. This FC-PGA (Flip Chip Pin Grid Array) Pentium III is clocked at a respectable 700MHz, with 256KB of full-speed Level 2 cache squeezed on the die. With 128MB of PC100 memory leaving two DIMM slots free, the Dan is a mid-range performer sitting in the middle of the SYSmark 2000 results.

Lifting the lid off the large tower reveals an orderly layout that allows

easy access to the motherboard for upgrades. DVD playback is smooth, while sound is handled capably by a retail Creative SoundBlaster Live! 1024 connected to two large speakers. A DualHead 16MB Matrox Millennium G400 graphics card resides in the AGP slot. The card's reputation for great 2D performance should be welcomed

in an environment where writing illustrated reports is a priority. As for 3D performance, it failed the Quake III test, causing the machine to hang.

Showing off the Matrox graphics card is a Dan-badged 17in CTX VL700. This is a budget shadow-mask monitor producing a flicker-free vertical refresh rate of 75Hz at a resolution of 1,152 x 864 pixels. However, focus is far from perfect at the corners of the tube.

The backup device comes in the form of a Panasonic LS-120 that replaces the

standard floppy drive. Although handy as a storage medium, an LS120 disk is far more expensive than a CD-R, making this a costly solution for backing up files. We would have rather seen a Zip or CD-RW, as both have gained a wider acceptance in academic institutions.

Lotus SmartSuite Millennium is the office suite of choice, bundled with a selection of games. Unlike Carrera, Dan has also included a Lexmark Z32 printer, together with a cable to get you up and spooling straight away.

The Dan Home Plus S is a standard machine that makes use of Intel's latest chip technology. Problems with 3D applications and expensive backup media keep it from achieving an award.

### DETAILS

**PRICE** £1,168 (£994 ex VAT)

**CONTACT** Dan Technology 020 8830 1100

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

**PROS** Printer; good DVD playback and sound

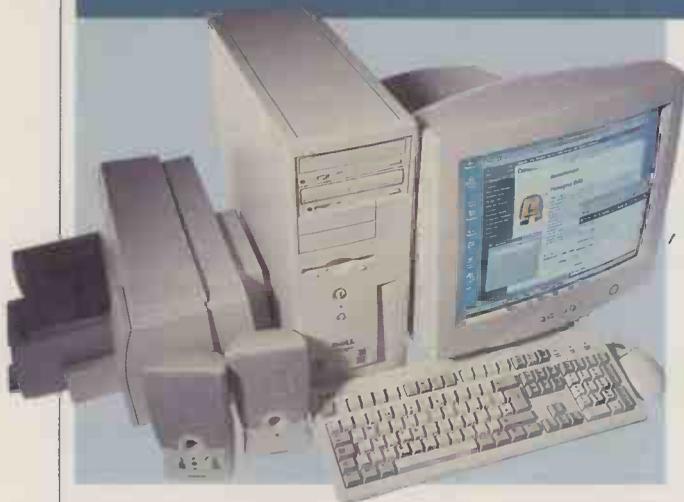
**CONS** Below-par monitor; no CD-RW capability; 3D graphics problems

**OVERALL** A fair attempt at an educational PC, but backing up costs could mount up

#### FEATURES

PERFORMANCE ★★  
VALUE FOR MONEY ★★★  
OVERALL RATING ★★★

## Dell Dimension XPS T700r



**WITH THE DIMENSION XPS T700r**, Dell has opted for a well-rounded system and has provided us with a machine that includes an HP 610C printer and a Sony CRX 140E CD-RW with CD-R and CD-RW discs bundled.

As for software, Dell has chosen Microsoft Works Suite 2000. This usefully includes Word 2000, a program that is common in many schools and universities.

The rest of the setup is based on the tried and tested Intel 440BX chipset,

ensuring long-term stability. The motherboard is a Dell/Intel effort featuring a Slot 1 Intel Pentium III clocked at 700MHz. Over this is a fan duct ensuring that it remains cool. The Maxtor hard drive isn't the biggest on test but you would be hard pushed to fill all 15GB. This is housed vertically at the front of the sturdy case.

The 16MB ATI Rage Pro 128 may not be at the high end of the graphics card scale but, for the task, it doesn't have to be. It will still handle most 3D games comfortably. Connected to this is a 17in Samtron monitor from Samsung. Although this is a shadow-mask unit with a curved screen, the geometry and focus is commendable. It also benefits from a splendid OSD menu system that is both clear and intuitive. The same company also makes the 12-speed DVD-ROM drive that

performed admirably in last month's DVD-ROM drive bonanza. Working well with the Pro 128's ATI chipset, DVD playback was good and audio was clearly reproduced through the older SoundBlaster 64V. The separate drive also brings with it the option of CD-to-CD burning. The only thing that irritated us was the untidy cabling.

Overall, Dell has hit the right blend of components, being the only manufacturer to bundle a printer, an economical CD-RW and an appropriate office suite, all topped off with decent DVD playback and audio. A worthy winner of the Editor's Choice accolade.

### DETAILS

**PRICE** £1,173.83

(£999 ex VAT)

**CONTACT** Dell Computers 0870 907 5664

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

**PROS** A printer together with a good office suite and robust case

**CONS** Untidy cable routing

**OVERALL** Dell has gathered together a range of components that work well together and best fit the criteria set for this group test

**FEATURES**

**PERFORMANCE**

**VALUE FOR MONEY**

**OVERALL RATING**



★★★★★

★★★

★★★★★

★★★★★

## evesham.com Athlon E-Special



**EVESHAM.COM'S** entry this month is built around the popular 700MHz Athlon processor, mounted on an MSI K7 Pro motherboard. The MSI board is based on AMD's own 750 chipset and backed up by 128MB of PC100 SDRAM in the form of a single DIMM module, with two DIMM slots free. A Diamond 56i Pro modem and SoundBlaster 128 sound card occupy two of the PCI slots, leaving two. Access to these is unhindered, as evesham.com's engineers have neatly routed all cabling.

Storage is taken care of with a roomy 20.5GB Maxtor hard disk and the Samsung SM-304B DVD/CD-RW combo drive, but no blank discs are provided. Although the inclusion of this drive leaves two 5.25in bays unoccupied, we would have favoured a separate ROM drive as well, so that you can copy CDs directly.

In terms of performance, the TNT M64-based graphics card lets down the rest of the system. The E-Special scored badly in our 3D tests, only managing 28.8fps and a score of 2,113 in Quake III and 3DMark respectively.

The graphics card is linked up to a Mitsubishi V70 monitor, a standard 17in shadow-mask model that suffered from a focusing problem, especially at the screen's centre and corners. This gave text an uncomfortably blurry appearance. Regarding input devices,

the keyboard felt a bit lifeless and the evesham.com-badged wheel-mouse just doesn't feel as good as Microsoft's.

evesham.com has supplied the functional Lotus SmartSuite Millennium office suite, which means you can be productive from your first day. However, the Lotus package is not as popular as the Microsoft Works Suite 2000 software supplied with other machines.

Although the E-Special is £50 cheaper than the best of this month's group, the money could have been spent on other areas – such as better graphics or a printer. Despite the three-year on-site warranty, the poor performance and lack of peripherals make the Athlon E-Special difficult to recommend.

### DETAILS

**PRICE** £1,115.08 (£949 ex VAT)

**CONTACT** evesham.com 0800 038 0800

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

**PROS** 700MHz processor; decent-sized hard disk

**CONS** Poor graphics, short on features

**OVERALL** A rather uninspiring machine.

Better value can be found elsewhere

**FEATURES**

**PERFORMANCE**

**VALUE FOR MONEY**

**OVERALL RATING**

★★★

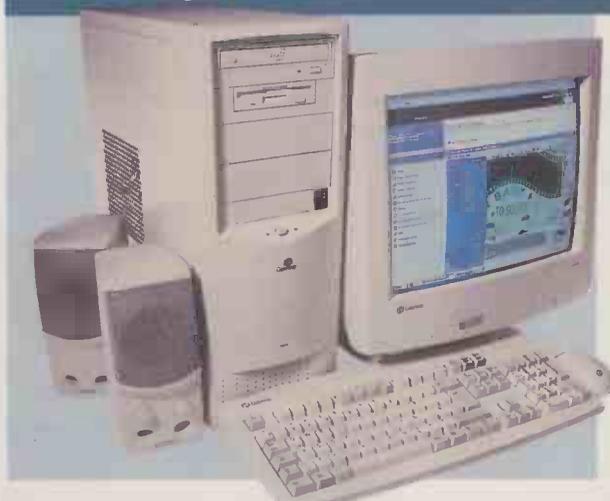
★★

★★★

★★★



## Gateway Select 750



**AT £940 EX VAT**, the Gateway Select 750 is the cheapest system in this month's group test. Having said that, the specification is comparable with most of the other machines we tested, so you're not losing out on features.

The motherboard is one of Gateway's own brand Kodoka AMD 750 chipset-based boards. Beating at the heart of the motherboard is an Athlon running at 750MHz. Memory is covered by a single 128MB SDRAM module, leaving two slots free for upgrade.

Storage is taken care of by a 14.7GB Western Digital hard disk, giving adequate space for essays, projects and presentations. For removable storage, Gateway has opted for a Panasonic LS-120. The 120MB size of this removable storage makes it ideal for the student's needs. However, the media is expensive at over £10 per disk, and the performance is slower than a Zip drive.

Dealing with sound, the Gateway has a SoundBlaster PCI 128 and Cambridge Soundworks GCS 200 speakers. A 32MB nVidia TNT2-based card from Creative deals with graphics and, although it is not a cutting-edge graphics solution, it performs adequately. Completing the display set is a Gateway EV700 monitor, producing a quality image, with a rotary selector allowing easy navigation of the OSD.

The Select 750's SYSmark results

placed it in the lower half of the group, with an overall score of 118. Compared to the other 750MHz processors in the test, the Gateway's performance was somewhat disappointing. DVD playback was also troubled, with decompression artefacts visible on plain coloured backgrounds.

The software bundle supplied was Microsoft Works Suite 2000, which includes Word 2000.

Overall, the Select 750 is not the best system in this month's test, but it's the cheapest. The inclusion of Word 2000 is a good choice and the saving of £60 can be put towards a budget printer.

### DETAILS

**PRICE** £1,104.50 (£940 ex VAT)

**CONTACT** Gateway, 0800 55 2000

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

**PROS** Lower cost helps for printer purchase; good software

**CONS** There are better performing PCs out there

**OVERALL** The price makes this an attractive system, but this doesn't quite offset the disappointing performance

<b>FEATURES</b>	★★★★
<b>PERFORMANCE</b>	★★
<b>VALUE FOR MONEY</b>	★★★★
<b>OVERALL RATING</b>	★★★

## Hi-Grade Ultis PV3733



**HI-GRADE'S SYSTEM** employs one of the first motherboards with the new 815E chipset: the Asus CUSL 2. Apart from system performance improvements, the most noticeable aspect of this motherboard is the multitude of USB sockets it can support. In the configuration Hi-Grade will ship, five USB connectors come as standard. However, the board can support a massive seven USB ports in total.

The board runs with a 133MHz FSB, which the Ultis PV3 uses to run its

733MHz Pentium III processor. Filling one of the memory slots is a 128MB of PC133 SDRAM, with two slots free.

Performance on the Hi-Grade was good in the SYSmark 2000 benchmarks, scoring 134. This shows the 815E chipset is capable of showing off the Pentium III to its full potential without the need for expensive RAMBUS

memory. It was in the SYSmark Internet content creation scores that it shone most, with a score of 155.

Storage on the Hi-Grade is covered by a spacious 13.5GB hard drive from Fujitsu. Removable storage comes in the form of a Mitsumi CD-RW, although no blank CD-RW media is bundled.

Dealing with the issue of graphics, a Hercules 3D Prophet is installed, based on nVidia's GeForce 256 chipset. The card has 32MB of SDR memory. However, as the results show, the

Hi-Grade's performance in both 2D and 3D is not to be sniffed at. The monitor is an excellent CTX PR705F aperture-grille model, while a SoundBlaster Live! 1024 with Diamond Promedia 2010 speakers cover sound. DVD playback on the Ultis fared no better than most, suffering from poor-quality sound.

As for software, Hi-Grade has gone with Lotus SmartSuite Millennium. This will provide for the student's word processing needs, as well as providing a spreadsheet package in 1-2-3 plus an organiser. Overall this is a good system with cutting-edge motherboard that can cater for the needs of today's student.

### DETAILS

**PRICE** £1,173.83 (£999 ex VAT)

**CONTACT** Hi-Grade 020 8532 6100

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

**PROS** Lots of USB sockets; strong system performance; good monitor

**CONS** Stronger software packages are available

**OVERALL** A very up-to-date machine that will deal with the student workload with no problems

<b>FEATURES</b>	★★★★
<b>PERFORMANCE</b>	★★★★
<b>VALUE FOR MONEY</b>	★★★★
<b>OVERALL RATING</b>	★★★★

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- ATX Mini Desktop Chassis
- 2 Year On-Site Maintenance Warranty

**£519** (£609.83 inc. VAT)

**Recommended Upgrades:**  
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**£39** (£45.83 inc. VAT)  
 17" Digital Colour FST Monitor (from 15")  
**£49** (£57.58 inc. VAT)

## Carrera Gemini 667

- Intel® Pentium® III Processor 667MHz
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- 13Gb ATA-66 Hard Drive
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- 48x Max CD-ROM Drive
- ATX Mini Desktop Chassis
- 2 Year On-Site Maintenance Warranty

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**Recommended Upgrades:**  
 Add 64Mb 100MHz SDRAM  
**Please Call!**  
 20Gb ATA-66 Hard Drive (from 13Gb)  
**£19** (£22.33 inc. VAT)

## Carrera Cygnus 733

- Intel® Pentium® III Processor 733MHz
- 128Mb 100MHz SDRAM
- 20Gb ATA-66 Hard Drive
- Guillemot nVIDIA TNT2 M64 32Mb AGP Video
- 17" Digital Colour FST Monitor
- 48x Max CD-ROM Drive
- ATX Mid-Sized Tower Chassis
- 2 Year On-Site Maintenance Warranty

**£849** (£997.58 inc. VAT)

**Recommended Upgrades:**  
 19" Digital Colour FST Monitor (from 17")  
**£99** (£116.33 inc. VAT)  
 MS Windows 2000 Professional (from 98)  
**£29** (£34.08 inc. VAT)

## Carrera Multimedia

A range of custom-built systems equipped with the performance, features and value demanded by the multimedia user.



**Standard Features include:** ATX Tower or Desktop Chassis, 2 USB Ports, 1.44Mb 3.5" Floppy Disk Drive, Microsoft Windows 98 (Second Edition), DVD Software Decoder, Premium Keyboard, MSCompatible Mouse and Mat

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- Intel® Integrated 810E 3D AGP Video
- 15" Digital Colour FST Monitor
- 8x DVD-ROM Drive (40x CD-ROM Drive)
- 56Kb/s V90 Fax Modem
- FREE Internet Access with PowerGen.net
- Integrated 128 Voice PCI Sound
- Stereo Amplified Speakers
- Lotus SmartSuite Millennium Edition
- Rage Software 3 Game Bundle
- 2 Year On-Site Maintenance Warranty

**£599** (£703.83 inc. VAT)

**Recommended Upgrade:**  
 17" Digital Colour FST Monitor (from 15")  
**£49** (£57.58 inc. VAT)

## Carrera Cygnus M700

- Intel® Pentium® III Processor 700MHz
- 128Mb 100MHz SDRAM
- 20Gb ATA-66 Hard Drive
- Guillemot nVIDIA TNT2 M64 32Mb AGP Video
- 17" Digital Colour FST Monitor
- 10x DVD-ROM Drive (40x CD-ROM Drive)
- 56Kb/s V90 Fax Modem
- FREE Internet Access with PowerGen.net
- Creative Labs 128 Value PCI Sound
- Stereo Amplified Speakers
- Lotus SmartSuite Millennium Edition
- Rage Software 3 Game Bundle
- 2 Year On-Site Maintenance Warranty

**£899** (£1,056.33 inc. VAT)

**Recommended Upgrade:**  
 Add Internal IDE CD-RW Drive (4x4x32)  
**£99** (£116.33 inc. VAT)

## Carrera Cygnus M800

- Intel® Pentium® III Processor 800MHz
- 128Mb 100MHz SDRAM
- 30Gb ATA-66 (7200rpm) Hard Drive
- Guillemot nVIDIA Geforce 256 32Mb AGP Video
- 17" Digital Colour FST Monitor
- 16x DVD-ROM Drive (40x CD-ROM Drive)
- 56Kb/s V90 Fax Modem
- FREE Internet Access with PowerGen.net
- Creative Labs SB LIVE! 1024 PCI Sound
- Stereo Amplified Speakers
- Lotus SmartSuite Millennium Edition
- Rage Software 3 Game Bundle
- 2 Year On-Site Maintenance Warranty

**£1,149** (£1,350.08 inc. VAT)

**Recommended Upgrade:**  
 Guillemot nVIDIA Geforce 2 GTS 32Mb AGP Video  
**£89** (£104.58 inc. VAT)

## Carrera Networking

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## Carrera Lightspeed XP

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- 9Gb U2 Wide IVD SCA SCSI Hard Drive
- Integrated Adaptec AIC7892 SCSI Controller
- ATI 3D Charger 4Mb Video
- 15" Digital Colour FST Monitor
- 48x Max CD-ROM Drive
- 1.44Mb 3.5" Floppy Disk Drive
- ATX Full Tower Chassis
- Carrera Premium Keyboard
- MSCompatible Mouse
- 2 Year On-Site Maintenance Warranty

**£1,499** (£1,761.33 inc. VAT)

## Networking Services

Carrera's networking division offers a range of bespoke server solutions to suit all budgets and requirements. A comprehensive service is provided, addressing all business needs, including:

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- Installation
- Cabling
- Testing

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## Mesh Matrix Duron 700T



**MESH IS THE ONLY** manufacturer to opt for the newly released AMD Duron processor to power its offering. This processor has 64KB of on-die Level 2 cache running at full processor speed, which makes it a relatively fast machine coming in at fifth place in the overall SYSmark results.

The Duron is plugged into the Gigabyte GA7ZM motherboard, based on VIA's KT133 chipset. This means that the Duron not only has a 200MHz front-side bus to the chipset, but can

a quality 17in aperture-grille monitor and one of the best found here. It has excellent image sharpness and colours. The only gripe is the fiddly OSD and poor power regulation.

Under the hood, the build quality is solid, with all the cables carefully secured around the case. This allows easy access for future upgrades or additions. There is also a decent-sized 20.5GB Seagate Barracuda hard drive, occupying a 3.5in bay. This should provide plenty of data storage

also take PC133 SDRAM. Mesh has opted for 128MB of PC100 SDRAM.

Located in the 4X AGP slot is the Guillemot 3D Prophet GeForce with 32MB of SDRAM. nVidia's Graphics Processing Unit helps the Mesh yield impressive figures in both the 3DMark and Quake III tests. Attached to this is Mitsubishi's Diamond Pro 720 -

for several years of study. For backing up and transporting those important assignments, a Teac CD-RW is present, but no free CD-RW discs are bundled. Nevertheless, the Teac is complemented by a Pioneer 10-speed DVD-ROM. Thoughtfully, Mesh has also fitted an ATi TV tuner for added versatility.

In terms of software, the student is provided with a full copy of Works Suite 2000 offering all the programs they're likely to need.

Overall, the Mesh is a quality machine that fulfils most of the criteria we set for the group test. Only the lack of a printer lets the package down.

### DETAILS

**PRICE** £1,173.83  
(£999 ex VAT)

**CONTACT** Mesh Computers 020 8208 4706

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

**PROS** Good monitor; TV option; powerful graphics

**CONS** No printer

**OVERALL** A good performer with a solid set of components

#### FEATURES

**PERFORMANCE** ★★★★★  
**VALUE FOR MONEY** ★★★★★  
**OVERALL RATING** ★★★★★



## Multivision Vision Education A700



**THE VISION EDUCATION A700** is the first machine we've seen from Multivision and, as the name suggests, its Athlon processor is running at 700MHz. The motherboard is a K7 Pro from MSI. The modem and the SoundBlaster PCI 128 fill two of the five available PCI slots on the board (with the sound being pumped out to Labtec speakers), which leaves three free PCI slots for upgrading. Memory comes in the form of a single 128MB PC133 memory module, fitted into one of the

three available slots.

A 20GB Seagate hard disk deals with storage, providing plenty of room for saving your work and storing applications. Addressing removable storage is a Samsung SM-304B CD-RW/DVD combo drive. This is a good solution providing versatility to the package.

The performance of the Multivision

wasn't spectacular, coming fourth from last in the overall SYSmark scores with 116. That said, the average student probably wouldn't notice this in real-world use. As for DVD playback performance, the A700 had sound quality that at best would make DVD viewing a little irritating.

A 3D Prophet from Guillemot tackles the graphics, although it's the 16MB version with SDR memory instead of DDR. That said, the 3D performance results show this card still performs well.

The LG 775FT Flatron monitor supplied with the Multivision was one of the best in the test, giving a sharp image on the flat screen.

As for software, the Multivision comes with Lotus SmartSuite Millennium, which includes Word Pro for word processing, 1-2-3 for spreadsheet work and Lotus organiser. The bundle also includes an Epson 670 and printer cable.

Overall, the Multivision is a well-balanced machine for study, meeting all the software and hardware requirements the student will require. The performance wasn't the best in the group, but would be adequate for most students.

### DETAILS

**PRICE** £1,173.83 (£999 ex VAT)

**CONTACT** Multivision 0121 550 8000

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

**PROS** Package includes a printer; good monitor

**CONS** Poor sound quality in DVD playback

**OVERALL** A good all-round package for production of student work

#### FEATURES

**PERFORMANCE** ★★★★★  
**VALUE FOR MONEY** ★★★★★  
**OVERALL RATING** ★★★★★

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## Carrera Octan D600

- AMD Duron™ Processor 600MHz
- 64Mb 100MHz SDRAM
- 8.4Gb ATA-66 Hard Drive
- Guillemot nVIDIA TNT2 M64 32Mb AGP Video
- 15" Digital Colour FST Monitor
- 48x Max CD-ROM Drive
- Integrated 128 Voice PCI Sound
- ATX Mini Desktop Chassis
- 2 Year On-Site Maintenance Warranty

**£579** (£680.33 inc. VAT)

**Recommended Upgrades:**  
 3Com 3C905C 10/100MB PCI Network Card  
**£39** (£45.83 inc. VAT)  
 17" Digital Colour FST Monitor (from 15")  
**£49** (£57.58 inc. VAT)

## Carrera Octan B750

- AMD Athlon™ Processor 750MHz
- 64Mb 100MHz SDRAM
- 15Gb ATA-66 Hard Drive
- Guillemot nVIDIA TNT2 M64 32Mb AGP Video
- 17" Digital Colour FST Monitor
- 48x Max CD-ROM Drive
- Integrated 128 Voice PCI Sound
- ATX Workstation Tower Chassis
- 2 Year On-Site Maintenance Warranty

**£739** (£868.33 inc. VAT)

**Recommended Upgrades:**  
 Add 64Mb 100MHz SDRAM  
**Please Call!**  
 20Gb ATA-66 Hard Drive  
**£29** (£34.08 inc. VAT)

## Carrera Octan B850

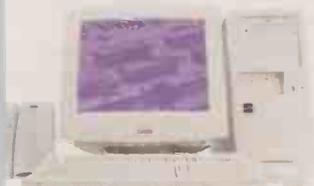
- AMD Athlon™ Processor 850MHz
- 128Mb 100MHz SDRAM
- 20Gb ATA-66 Hard Drive
- Guillemot nVIDIA TNT2 M64 32Mb AGP Video
- 17" Digital Colour FST Monitor
- 48x Max CD-ROM Drive
- ATX Workstation Tower Chassis
- 2 Year On-Site Maintenance Warranty

**£929** (£1,091.58 inc. VAT)

**Recommended Upgrades:**  
 19" Digital Colour FST Monitor (from 17")  
**£99** (£116.33 inc. VAT)  
 MS Windows 2000 Professional (from 98)  
**£39** (£45.83 inc. VAT)

## Carrera Multimedia

A range of custom-built multimedia systems enhanced by the performance advantages of AMD Duron™ and Athlon™ Processors.



**Standard Features include:** ATX Tower or Desktop Chassis, 1.44Mb 3.5" Floppy Disk Drive, Microsoft Windows 98 (Second Edition), DVD Software Decoder, Premium Keyboard, MS-Compatible Mouse and Mat

## Carrera Octan DM650

- AMD Duron™ Processor 650MHz
- 64Mb 100MHz SDRAM
- 10Gb ATA-66 Hard Drive
- Guillemot nVIDIA TNT2 M64 32Mb AGP Video
- 15" Digital Colour FST Monitor
- 8x DVD-ROM Drive (40x CD-ROM Drive)
- 56Kb/s V90 Fax Modem
- FREE Internet Access with PowerGen.net
- Integrated 128 Voice PCI Sound
- Stereo Amplified Speakers
- Lotus SmartSuite Millennium Edition
- 2 Year On-Site Maintenance Warranty

**£679** (£797.83 inc. VAT)

**Recommended Upgrade:**  
 17" Digital Colour FST Monitor (from 15")  
**£49** (£57.58 inc. VAT)

## Carrera Octan M750

- AMD Athlon™ Processor 750MHz
- 128Mb 100MHz SDRAM
- 20Gb ATA-66 Hard Drive
- Guillemot nVIDIA TNT2 M64 32Mb AGP Video
- 17" Digital Colour FST Monitor
- 10x DVD-ROM Drive (40x CD-ROM Drive)
- 56Kb/s V90 Fax Modem
- FREE Internet Access with PowerGen.net
- Creative Labs SB 128 Value PCI Sound
- Stereo Amplified Speakers
- Lotus SmartSuite Millennium Edition
- 2 Year On-Site Maintenance Warranty

**£899** (£1,056.33 inc. VAT)

**Recommended Upgrade:**  
 Add Internal IDE CD-RW Drive (4x4x32)  
**£99** (£116.33 inc. VAT)

## Carrera Octan M850

- AMD Athlon™ Processor 850MHz
- 128Mb 100MHz SDRAM
- 30Gb ATA-66 (7200rpm) Hard Drive
- Guillemot nVIDIA Geforce 256 32Mb AGP Video
- 17" Digital Colour FST Monitor
- 16x DVD-ROM Drive (40x CD-ROM Drive)
- 56Kb/s V90 Fax Modem
- FREE Internet Access with PowerGen.net
- Creative Labs SB LIVE! 1024 PCI Sound
- Stereo Amplified Speakers
- Lotus SmartSuite Millennium Edition
- 2 Year On-Site Maintenance Warranty

**£1,199** (£1,408.33 inc. VAT)

**Recommended Upgrade:**  
 Guillemot nVIDIA Geforce 2 GTS 32Mb AGP Video  
**£89** (£104.58 inc. VAT)

## Carrera Studio Systems

A range of systems, designed to meet the needs of home recording enthusiasts through to studio professionals.



**Standard Features include:** ATX Tower Chassis, 1.44Mb 3.5" Floppy Disk Drive, MS Windows 98 (SE), DVD Software Decoder, Premium Keyboard, MS-Compatible Mouse

## Carrera Academy Pro

- AMD Athlon™ Processor 750MHz
- 128Mb 100MHz SDRAM
- 2 x 20Gb ATA-66 Hard Drives
- Matrox RT2000 Digital Video Editing Solution Realtime Native DV and MPEG-2 with 3D Effects
- 17" Digital Colour FST Monitor
- 10x DVD-ROM Drive (40x CD-ROM Drive)
- Internal CD-RW IDE Drive (4x4x32)
- 56Kb/s V90 Fax Modem
- FREE Internet Access with PowerGen.net
- Creative Labs SB128 Value Sound
- Stereo Amplified Speakers
- 2 Year On-Site Maintenance Warranty

**£1,999** (£2,398.83 inc. VAT)

## Carrera Studio Pro

- AMD Athlon™ Processor 750MHz
- 128Mb 100MHz SDRAM
- 15Gb ATA-66 Hard Drive
- 20Gb ATA-66 Hard Drive
- Matrox Millennium G400 32Mb AGP Video - Dual Head
- 19" Digital Colour FST Monitor
- 10x DVD-ROM Drive (40x CD-ROM Drive)
- 56Kb/s V90 Fax Modem
- FREE Internet Access with PowerGen.net
- Yamaha CDRWV Internal SCSI Drive (8x8x24)
- Yamaha SW1000XG Sound
- Yamaha PLG1.50 - ANX1 Daughter Board
- 2 Year On-Site Maintenance Warranty

**£1,899** (£2,278.83 inc. VAT)

## The Carrera Difference

### Support

All Carrera systems are covered by a comprehensive **2 year On-site Warranty**, plus free **Lifetime Technical Support**.

### Finance Solutions

Carrera offer a comprehensive range of payment options, including interest free **credit**, personal and corporate **finance** and **account facilities**.

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# "Best Notebook of the Year", from one of

As was declared by PC Advisor\*  
FEB 99

LCD: 15.1"



"The most compact corporate system yet seen in PC PRO" - Aug 99



## AJP Neo-PC (Intel® Pentium® III)

### New Generation Desktop

- 15.1" TFT XGA (1024x768) Colour Screen
- Intel® Pentium® III Processor
- Intel® 440BX AGP Set, 100MHz FSB
- 128MB SDRAM (upgradeable to 256MB)
- 20GB HDD ATA-33 EIDE (upgradeable to 30GB)
- 10/100 Base-TX PCNET Ethernet Adapter
- 8MB SG VRAMATI 3D Rage LT PRO with AGP 2X
- 512KB Level II Cache
- 24X CD ROM (optional 6x DVD)
- 3.5" FDD
- 2x PCMCIA Type II slots, supports Zoomed Video
- 3-D stereo sound with internal speakers (Sound Blaster PRO™ compatible)
- Ports: 2x USB, IrDA, Serial, Parallel, Monitor, 2x PS/2, Games,
- 1x PCI Slot
- Keyboard and Mouse
- Dimensions: 351mm (W) x 170mm (D) x 353mm (H)
- Weight: 7Kg
- Windows 98 preloaded with CD and manual

15.1" TFT Intel® Pentium® III Processor - 650MHz	Exc. VAT	Inc. VAT
	£1349.00	£1585.08

Other Configurations	Exc. VAT	Inc. VAT
With Intel® Pentium® III Processor 700MHz	Add	49.00.....57.58
With Intel® Pentium® III Processor 750MHz	Add	125.00.....146.86
With Intel® Pentium® III Processor 800MHz	Add	175.00.....205.63

\*Upgrade CDROM to DVD Drive with MPEG II s/w Add 89.00.....104.58

### Buy with Confidence



AJP specialise in the manufacture of notebooks and New Generation desktop computers. With over 14 years experience, our philosophy is to produce advanced specification computers incorporating the latest standards in mobile and desktop technology. All our systems are very competitively priced, and offer quality, reliability, upgradeability and flexibility. To ensure the quality of our work AJP is ISO9002 registered. This ensures that we work to an international quality standard set out by NQA an approved government body. AJP were among the first to introduce "The Notebook Computer" and also "The New Generation Desktop" with TFT LCD screens. In 1997 AJP received "The Special Achievement Award for Business" from PC Direct who recognised and acknowledged AJP's consistent positive input to the notebook market. This is reflected by awards won by AJP through the years. Last year AJP received "The Best Notebook of the year award 1999" by PC Advisor and won an award for "Notebooks" at the PC Direct Hits Awards 1999 and year 2000. AJP notebooks consistently win reviews in the magazines and are highly praised and awarded "Best Buys" for their high quality build, unparalleled technical specifications and excellent value for money. AJP has steadily risen to a position of strength, achieving plc status in June 1998, which ensures continued growth and a secure financial status. A Dunn and Bradstreet comprehensive report carried out in July 1998 showed that AJP ranks among the top 15% of the computer companies in the UK. At the 1999 Deloitte & Touche Technology Fast 50 awards where the fastest fifty IT companies were shortlisted, AJP was selected and won an award. With all the above facts AJP invites you to buy with confidence.

LCD: 12.1"



## AJP 5100C (Intel® Mobile Pentium® III & Celeron™)

### Entry Level System

- 12.1" TFT SVGA (800x600) colour screen
- Intel® Mobile Pentium® III Processor or Celeron™ Processor
- Intel® 440ZX AGP Set
- 64MB SDRAM (upgradeable to 256MB)
- 6GB HDD ATA-33 EIDE (upgradeable to 12GB)
- 56K PCMCIA fax/modem
- 4MB SG VRAM S3 VIRGE with AGP
- 256KB On Die Level II Cache (128KB for Celeron™)
- 24X CD ROM (optional 6x DVD)
- 3.5" FDD
- 2x PCMCIA Type II slot, supports Zoomed Video
- 3-D Stereo sound with internal speakers and microphone (Sound Blaster PRO™ compatible)
- Ports: USB, IrDA, TV-out Serial, Parallel, Monitor, PS/2
- NiMH Battery\*\*
- Carry case, AC/DC PSU, 12 months RTB Warranty
- Dimensions: 280mm(W) x 240mm(D) x 39.5mm (H)
- Weight: 2.8Kg
- Windows 98 preloaded with CD and manual

12.1" TFT Intel® Celeron™ Processor 500MHz	Exc. VAT	Inc. VAT
	£999.00	£1173.83

Other Configurations

With Intel® Celeron™ Processor 500MHz	Add	Exc. Vat £	Inc. Vat £
With Intel® Celeron™ Processor 600MHz	Add	25.00.....29.38	
With Intel® Pentium® III Processor 600MHz	Add	49.00.....57.58	
With Intel® Pentium® III Processor 650MHz	Add	99.00.....116.33	
With Intel® Pentium® III Processor 650MHz	Add	175.00.....205.63	
With Intel® Pentium® III Processor 700MHz	Add	249.00.....292.58	
With Intel® Pentium® III Processor 750MHz	Add	399.00.....468.83	
*Upgrade to 5100CDF	Add	89.00.....104.58	

5100CDF comes with DVD/MPEG II software instead of CD ROM

### Options and Upgrades

* Additional 64MB RAM module	Exc. Vat £	Inc. Vat £
	79.00.....92.83	
* Additional 128MB RAM module	149.00.....175.08	
* Upgrade from 6GB to 12GB HDD	49.00.....57.58	
* Upgrade from 6GB to 17GB HDD	125.00.....146.88	
Additional 6GB HDD	99.00.....116.33	
Additional 12GB HDD	149.00.....175.08	
Additional 17GB HDD	225.00.....264.38	
HDD Housing Kit	39.00.....45.83	
* 1100P/1200/3100C Upgrade from NiMH to Li-Ion Battery**	49.00.....57.58	
1100P/1200/2100P/3100C Additional Li-Ion Battery**	99.00.....116.33	
8500P Additional Li-Ion Battery**	125.00.....146.88	
PCMCIA Ethernet Card 10 Mbps (BNC & 10BT)	69.00.....81.08	
PCMCIA Ethernet Card 10/100 Mbps (10BT)	99.00.....116.33	
PCMCIA Fax/Modem (56K)	79.00.....92.83	
PCMCIA Combo Fax 56K/Ethernet 10Mbps	125.00.....146.88	
PCMCIA Combo Fax 56K/Ethernet 10/100Mbps	149.00.....175.08	
Car Adapter	45.00.....52.88	
Imega Zip Drive (100MB)	175.00.....205.63	
LS-120 Drive (120MB)	125.00.....146.88	
DVD Drive	175.00.....205.63	
Port Replicator	99.00.....116.33	
* Upgrade to Windows NT Workstation.....	79.00.....92.83	

\*\* Initial sale only  
\*\* Please note, the batteries are consumable items and are not covered by the warranty

LCD: 12.1"-13.3"



## AJP 3420 (Intel® Mobile Pentium® III & Celeron™)

### Mid Range System (Slim & Light)

- 12.1" TFT SVGA (800x600) or 13.3" TFT XGA (1024x768) colour screen
- Intel® Mobile Pentium® III Processor with SpeedStep™ Technology or Intel® Mobile Celeron™ Processor
- Intel® 440BX Mobile AGP Set
- 64MB SDRAM (upgradeable to 256MB)
- 6GB HDD ATA-33 EIDE (upgradeable to 12GB)
- Built in 56K fax/modem
- 8MB SG VRAM ATI 3D Rage LT PRO with AGP 2X
- 256KB On Die Level II Cache (128KB for Celeron™)
- 24X CD ROM (Optional Hot-swappable with CD-RW\* ReadWriter/6x DVD/FDD/LS-120)
- 1x PCMCIA Type II slot, supports Zoomed Video
- 3-D stereo sound with internal speakers and microphone (SoundBlaster Pro™ compatible)
- Ports: USB, IrDA, TV-Out, Serial, Parallel, Monitor, PS/2
- Intelligent Li-Ion Battery\*\*
- Carry case, AC/DC PSU, 12 months RTB Warranty
- Dimensions: 306mm (W) x 232mm (D) x 29.8mm (H)
- Weight: 2.2Kg
- Windows 98 preloaded with CD and manual

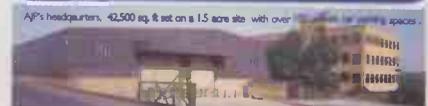
12.1" TFT Intel® Celeron™ Processor 500MHz	Exc. VAT	Inc. VAT
	£1049.00	£1232.58

13.3" TFT Intel® Celeron™ Processor 500MHz	Exc. VAT	Inc. VAT
	£1149.00	£1350.08

Other Configurations

With Intel® Celeron™ Processor 500MHz	Add	Exc. Vat £	Inc. Vat £
With Intel® Celeron™ Processor 600MHz	Add	25.00.....29.38	
With Intel® Pentium® III Processor 600MHz	Add	49.00.....57.58	
With Intel® Pentium® III Processor 650MHz	Add	99.00.....116.33	
With Intel® Pentium® III Processor 700MHz	Add	175.00.....205.63	
With Intel® Pentium® III Processor 750MHz	Add	249.00.....292.58	
Upgrade CD ROM to 6x DVD	Add	399.00.....468.83	
Upgrade CD ROM to CD-RW4	Add	89.00.....104.58	
Additional CD RW4	Add	175.00.....205.63	
	Add	195.00.....229.13	

### Upgrade any notebook to 128MB RAM and 12GB HDD £ 99 + VAT



**PC Advisor** "THE BEST NOTEBOOK OF THE YEAR 1999" The list of winning features on this high class budget option is long and impressive. Equipped with an unusually large 15.1" TFT Screen, it also boasts 64MB RAM, 5GB Hard Disk... puts in a super fast performance, outclassing many of the more expensive power notebooks we saw in our charts in 1998. Though priced as a budget notebook this is a highly - specced and versatile machine which will happily run your business applications." Awarded "Best Notebook of the year 1999" and given the "Best Buy" for 7 consecutive months AUG 98 - FEB 99



In 1999 AJP won an award for "Notebooks" at the PC Direct Hits Awards 99.

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# the fastest growing IT Companies

As was declared by Deloitte & Touche, AJP won an award as one of the fastest fifty growing IT Companies in London and South East.  
Nov 99



LCD: 15.1"



LCD: 13.3 - 14.1"



LCD: 13.3 - 14.1"



## AJP 8500P (Intel® Mobile Pentium® III & Celeron™)

### High End System

- 15.1" TFT XGA (1024x768) colour screen
- Intel® Mobile Pentium® III Processor with SpeedStep™ Technology or Intel® Celeron™ Processor
- Intel® 440BX Mobile AGP Set
- 64MB SDRAM (upgradeable to 256MB)
- 6GB HDD ATA-33 EIDE (upgradeable to 17GB)
- 56K PCMCIA fax/modem
- 8MB SG VRAM ATI 3D Rage LT PRO with AGP 2X
- 256KB On-Die Level II Cache, (128KB for Celeron™)
- 24X CD ROM (Optional 6x DVD)
- 3.5" FDD (Optional LS-120, Iomega ZIP, 2nd HDD)
- 2x PCMCIA Type II slots, supports Zoomed Video
- 3-D stereo sound with internal speakers and microphone (Sound Blaster PRO™ compatible)
- IEEE 1394 Firewire 400Mbps (for digital video)
- Ports: 2xUSB, IrDA, Port Replicator, Video-In, TV-Out, Serial, Parallel, Monitor, 2x PS/2
- Full size keyboard with separate numeric keypad
- Intelligent Li-Ion Battery \*\*
- Carry case, AC/DC PSU, 12 months RTB Warranty
- Dimensions: 358mm (W) x 280mm (D) x 50mm (H)
- Weight: 4.6Kg
- Windows 98 preloaded with CD and manual

## AJP 3100B (Intel® Mobile Pentium® III & Celeron™)

### High End System

- 13.3"/14.1" TFT XGA (1024x768) colour screen
- Intel® Mobile Pentium® III Processor with SpeedStep™ Technology or Intel® Mobile Celeron™ Processor
- Intel® 440BX/ZX Mobile AGP Set
- 64MB SDRAM (upgradeable to 256MB)
- 6GB HDD ATA-33 EIDE (upgradeable to 17GB)
- 56K PCMCIA fax/modem
- 8MB SG VRAM ATI 3D Rage LT PRO with AGP 2X
- 256KB On-Die Level II Cache, (128KB for Celeron™)
- 24X CD ROM (Optional 6x DVD)
- 3.5" FDD (Optional LS-120, 2nd HDD)
- 2x PCMCIA Type II slots, supports Zoomed Video
- 3-D stereo sound with internal speakers and microphone (Sound Blaster PRO™ compatible)
- IEEE 1394 Firewire 400Mbps (PIII models only)
- Ports: 2xUSB, IrDA, Port Replicator, TV-Out, Serial, Parallel, Monitor, PS/2
- Intelligent Li-Ion Battery \*\*
- Carry case, AC/DC PSU, 12 months RTB Warranty
- Dimensions: 316mm (W) x 256mm (D) x 39mm (H)
- Weight: 3Kg
- Windows 98 preloaded with CD and manual

## AJP 3300C (Intel® Pentium® III & Celeron™)

### High End System

- 13.3"/14.1" TFT XGA (1024x768) colour screen
- Intel® Pentium® III Processor or Celeron™ Processor
- Intel® 440BX Mobile AGP Set
- 128MB SDRAM (upgradeable to 256MB)
- 12GB HDD ATA-33 EIDE (upgradeable to 17GB)
- 56K PCMCIA fax/modem
- 8MB SG VRAM ATI 3D Rage LT PRO with AGP 2X
- 256KB On-Die Level II Cache, (128KB for Celeron™)
- 24X CD ROM (Optional 6x DVD)
- 3.5" FDD (Optional LS-120, 2nd HDD)
- 2x PCMCIA Type II slots, supports Zoomed Video
- 3-D stereo sound with internal speakers and microphone (Sound Blaster PRO™ compatible)
- Ports: 2xUSB, IrDA, Port Replicator, TV-Out, Serial, Parallel, Monitor, PS/2
- Intelligent Li-Ion Battery \*\*
- Carry case, AC/DC PSU, 12 months RTB Warranty
- Dimensions: 316mm (W) x 256mm (D) x 39mm (H)
- Weight: 3Kg
- Windows 98 preloaded with CD and manual

	Exc.VAT	Inc.VAT
15.1" TFT Intel® Celeron™ Processor 500MHz	£1399.00	£1643.83

Other Configurations

	Add	Exc. Vat. £	Inc. Vat. £
With Intel® Pentium® Processor III 600MHz		175.00	205.63
With Intel® Pentium® Processor III 650MHz		249.00	292.58
With Intel® Pentium® Processor III 700MHz		325.00	381.88
With Intel® Pentium® Processor III 750MHz		475.00	558.13
*Upgrade to 8500PDF		89.00	104.58
*Upgrade to 8500PDL		149.00	175.08

8500PDF comes with DVD/MPEG II software instead of CD ROM

8500PDL comes with DVD/LS-120/MPEG II software instead of CD ROM/FDD

	Exc.VAT	Inc.VAT
13.3" TFT Intel® Celeron™ Processor 500MHz	£1199.00	£1408.58
14.1" TFT Intel® Celeron™ Processor 500MHz	£1249.00	£1467.53

Other Configurations

	Add	Exc. Vat. £	Inc. Vat. £
With Intel® Celeron™ Processor 550MHz		25.00	29.38
With Intel® Celeron™ Processor 600MHz		49.00	57.58
With Intel® Pentium® III Processor 600MHz		99.00	116.33
With Intel® Pentium® III Processor 650MHz		175.00	205.63
With Intel® Pentium® III Processor 700MHz		249.00	292.58
With Intel® Pentium® III Processor 750MHz		399.00	468.83
*Upgrade to 3100BDF		89.00	104.58

3100BDF comes with DVD/MPEG II software instead of CD ROM

	Exc.VAT	Inc.VAT
13.3" TFT Intel® Celeron™ Processor 533MHz	£1275.00	£1498.13
14.1" TFT Intel® Celeron™ Processor 533MHz	£1325.00	£1556.88

Other Configurations

	Add	Exc. Vat. £	Inc. Vat. £
With Intel® Celeron™ Processor 566MHz		25.00	29.38
With Intel® Celeron™ Processor 600MHz		49.00	57.58
With Intel® Pentium® III Processor 650MHz		99.00	116.33
With Intel® Pentium® III Processor 700MHz		149.00	175.08
With Intel® Pentium® III Processor 750MHz		225.00	264.38
*Upgrade to 3300CDF		89.00	104.58

3300CDF comes with DVD/MPEG II software instead of CD ROM

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### NEC Direction SM-667VP



**NEC'S MACHINE COVERS** all the software requirements that the student needs, including Microsoft Word 2000. Corel Draw 7 is also included for artistic users. Parents will also be glad to see Money 2000 included.

Performance-wise, the Direction hovers around the middle to bottom of the SYSmark 2000 tables although it still copes with most applications. Handling the graphics on the NEC is a 32MB card based on the nVidia GeForce 256 chipset. Unfortunately, the memory is

SDR rather than DDR, although the results in both the graphics-intensive benchmarks show this doesn't have much effect on the overall performance. It scored 68.2fps in Quake III and a 3DMark of 4,009.

As a means of watching movies, the Direction didn't perform as well as some of the other entrants. When playing DVD movies,

the picture was fine but the sound quality wasn't wonderful, with a lot of background noise. Watching DVDs could quickly become tiresome; so bear this in mind if it is important to you.

The motherboard is an MSI 6309 based on the VIA 694X chipset and the processor, although having one of the lowest clock frequencies in the test at 667MHz, is a Pentium III with the full-speed on-die cache. This lets it compete with, and beat in many operations, faster processors. The system also

includes 128MB of PC133 SDRAM. The sound card is an Aureal advantage connected to Labtec speakers.

NEC's own 17in monitor, was adequate, although the image quality was a little fuzzy and couldn't maintain an adequate refresh rate at 1,280 x 1,024. The 20.5GB Maxtor hard drive will more than suffice for fixed storage, and a CED-8080B CD-RW from LG covers the issue of removable storage.

NEC has got the balance right, making sure the correct software for studying is included, while still making the machine capable of gaming.

#### DETAILS

**PRICE** £1,173.83 (£999 ex VAT)

**CONTACT** NEC 0870 010 6322

[www.nec-online.co.uk](http://www.nec-online.co.uk)

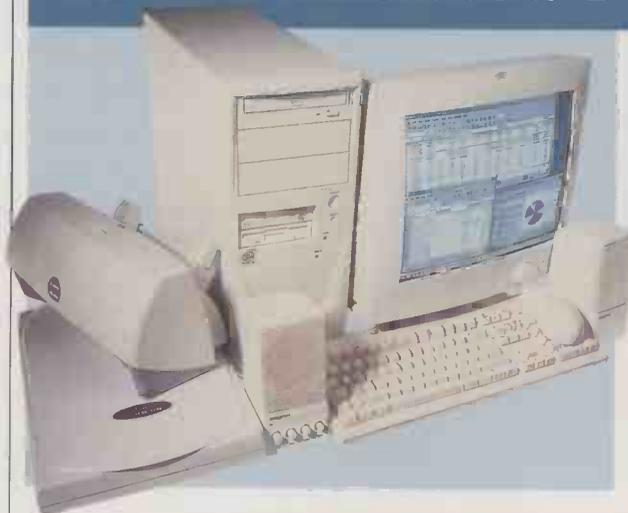
**PROS** Good software package; good graphics performance

**CONS** Background noise in DVD playback; disappointing monitor

**OVERALL** A good all-round PC, only let down by the sound in DVD playback and the quality of the monitor

<b>FEATURES</b>	★★★★
<b>PERFORMANCE</b>	★★★
<b>VALUE FOR MONEY</b>	★★★
<b>OVERALL RATING</b>	★★★

### PC World Advent 3047 BTO



**AT THE HEART** of the Advent system from retailer PC World beats a Pentium III 650MHz mounted on a Gigabyte GA6 BX7 motherboard. The system also comes with a single 128MB PC100 SDRAM module residing in one of the three available DIMM slots.

The hard disk is a 10.2GB model from Seagate, which will be able to handle all the information a student is likely to produce. Dealing with removable storage, the Advent has an internal Iomega 100MB Zip drive. First

impressions are that this is not as good as a CD-RW.

However, the size of the disks and the Zip drive's ease of use make it an ideal storage device for a student PC.

A Creative SoundBlaster PCI 128 deals with the sound, with SBS20 speakers from Creative to pump it out. As for the display, an nVidia TNT2 Model 64-

based card drives a Proview PK-770 17in monitor. The image quality on the monitor was poor, with streaking occurring across the screen. This was especially noticeable in any application displaying text where the streak lines were most pronounced - which is unfortunate in a student PC, where text display will be paramount.

A Toshiba SD-M1402 DVD-ROM drive is included, so a bit of after-hours movie watching is an option.

In terms of performance, the Advent

produced a SYSmark 2000 score of 118, which was just below average. As for 3DMark and Quake III, the results show that the Advent is not a gaming machine, due to the graphics card.

The peripherals bundled with the machine include a Mustek 1200UB scanner and a Canon BJC-2100 colour printer. The software productivity pack includes Microsoft Works 2000, Excel 2000, Money 2000 and Home Publisher 2000.

The Advent is a well-rounded student computer, with all the peripherals needed to produce and print a student's work. It's a pity the monitor is so poor.

#### DETAILS

**PRICE** £1,173.83 (£999 ex VAT)

**CONTACT** PC World 08705 464 464

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

**PROS** Printer and scanner included; good DVD playback

**CONS** Poor-quality monitor and graphics card

**OVERALL** Great peripherals allow the student to do everything. However, the monitor quality has been sacrificed to achieve this end

<b>FEATURES</b>	★★★★★
<b>PERFORMANCE</b>	★★★
<b>VALUE FOR MONEY</b>	★★★
<b>OVERALL RATING</b>	★★★

## Polar Technology Phoenix



**THE PROCESSOR DRIVING** Polar Technology's entry for this group test is a 700MHz Athlon. This, along with 128MB of PC100 SDRAM and the MSI K7 Pro motherboard, saw the machine lodge itself in the performance tables as an all-round good performer, with the Phoenix placing third or fourth in nearly all of the categories.

The software bundled with the system is Microsoft's Works Suite 2000, which includes Word 2000, as well as Money 2000 to help tackle the inevitable

student financial problems, and a copy of the Encarta Encyclopaedia.

The graphics duties are dealt with by a Creative 3D Blaster Annihilator Pro. This nVidia GeForce 256-based card has 32MB of DDR memory and its performance is highlighted by the Phoenix's position in the top five in both the Quake III test where it

achieved 64.9fps, and the 3DMark test where it scored a respectable 3,728, sitting fifth on the table. The sound card is a Creative PCI128, which feeds Labtec speakers.

The Mitsubishi Diamond Pro 720 monitor performed well, achieving a maximum resolution of 1,600 x 1,200 at 75Hz, with a crisp, clear image. DVD playback performance was similar to many of the machines, with a clear and smooth picture, but unfortunately with background hiss affecting the sound.

To meet storage requirements, a 25GB IBM hard drive is installed giving plenty of space; and to address the requirement for removable storage, there's a Creative CD-RW.

One point to note is that Polar is one of the only machines on test to ship with a blank CD-RW disc to go with the drive. It's a small point, but inclusion of the disc means you are ready to go as soon as you plug it in, rather than having to run to the shops to get some media.

The Polar Phoenix is a fine all-round machine that admirably handles office tasks needed for study, yet still offers reasonable gaming performance. As with many of the machines, though, DVD playback wasn't up to scratch.

### DETAILS

**PRICE** £1,173.83 (£999 ex VAT)

**CONTACT** Polar Technology 0161 482 7000

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

**PROS** CD-RW included; good-quality monitor

**CONS** Background noise in DVD playback

**OVERALL** A versatile machine for work and play, but let down by poor DVD performance

#### FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★★★

★★★★

★★★★

★★★★

## Quantex Microsystems M677SX



**THE QUANTEX M677SX** comes with more software on it than any other system in this month's group test, but you only get the most important original software discs with it: namely Windows 98SE, Corel WordPerfect Office 2000 and the Grolier Encyclopaedia (on DVD). Quantex has opted for a solution where the bulk of the software installed on the system is stored on a drive image on a D:\ partition on the hard drive. If your system becomes unstable you restore the stable system from the image

to return your PC to its former glory.

Included with the Quantex is a Canon FB630P scanner along with a Canon BJC-2100 colour Bubble Jet printer, complete with cable. This and the addition of the scanner makes the Quantex an attractive system.

The performance of the Quantex wasn't as good as machines of similar

specifications, languishing in last place in the SYSmark table and placed in the middle in the Quake III and 3DMark 2000 tests. The processor, complemented by the Biostar motherboard, is a 667MHz Pentium III, supported by 128MB of PC133 SDRAM. The graphics card is a 3dfx Voodoo 3 3000 with TV out, which is long in the tooth and doesn't support 32bit colour in 3D. A Creative PCI 128 and Altec Lansing ACS22 speakers cover sound.

Optical storage is well catered for

with a Toshiba 12-speed DVD-ROM drive and a Sony CD-RW drive. There are also 10 blank CD-R discs supplied to get you started.

Considering the performance issues, the Quantex's DVD playback exhibited surprisingly good audio and video quality. The 17in Quantex-badged monitor was not up to the level of some of the competition, however.

Ultimately, the Quantex fits a niche. It has all the peripherals the student will need and, although the overall performance isn't earth shattering, its DVD playback is one of the best.

### DETAILS

**PRICE** £1,173.83 (£999 ex VAT)

**CONTACT** Quantex Microsystems

01438 224 444 [www.qtx.co.uk](http://www.qtx.co.uk)

**PROS** Printer and scanner included; good

DVD playback; CD-RW with 10 discs

**CONS** General performance wasn't

wonderful; some software discs aren't included

**OVERALL** This system has everything the student will need to prepare and print all of their work and the impressive DVD playback is a bonus

#### FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★★★★

★★

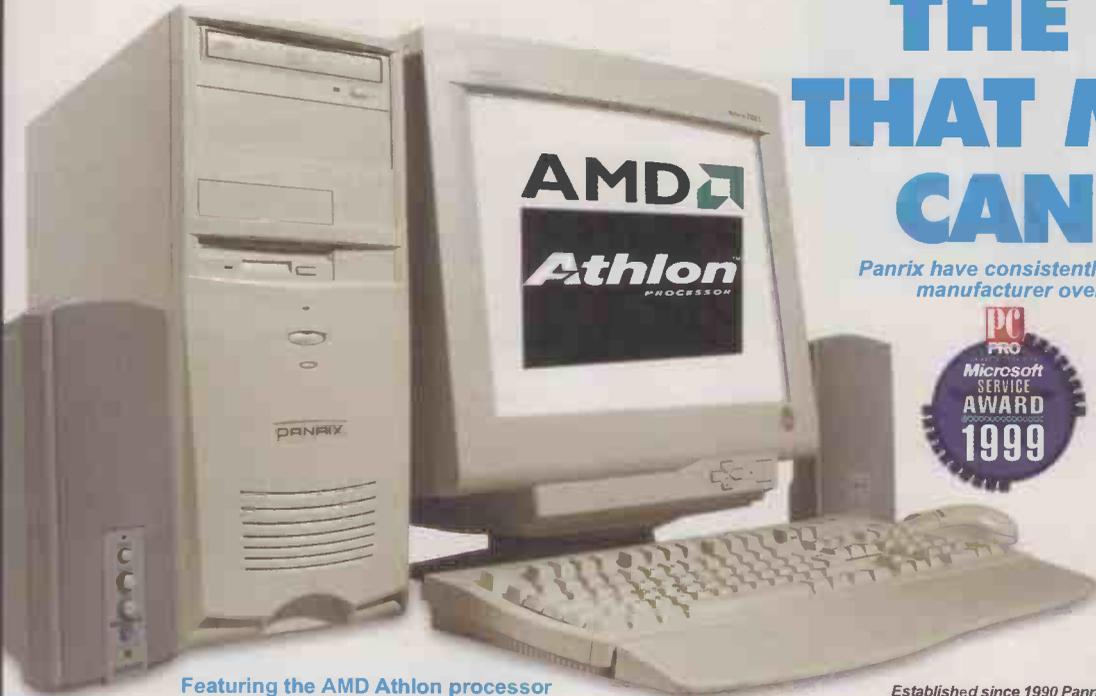
★★★★

★★★★

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ATX Mini Tower  
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On-board 56.6 Modem  
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MS Windows '98

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24 x CD ROM, Built in Touch Pad  
1.44Mb 3.5" Floppy  
16 bit Stereo Sound  
On-board 56.6 Modem  
Internal Speakers & Microphone  
86 Key Full-Size UK Layout Keyboard  
MS Windows '98

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**£1,643.83 inc. VAT**  
Quote Ref 67267



#### Nitro

AMD K6-2 500MHz  
64Mb SDRAM  
10Gb Ultra-DMA Hard Drive  
AGP On-board Graphics  
1.44Mb 3.5" Floppy  
48 x CD-ROM  
15" Hansol .28dp Monitor  
Integrated Audio  
Micro ATX Tower  
Win '98 Keyboard, MS Trekker PS2 Mouse  
MS Windows '98

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**3 Years Warranty (1st year on-site)**  
**£586.33 inc. VAT**  
Quote Ref 64173



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**3 Years Warranty** (1st year on-site)

**£703.83** inc. VAT

Quote Ref 67282

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MS Windows '98 & MS Works 2000 CD

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## Simply Systemax A750 RV Pro



**SIMPLY'S ENTRY** easily topped both the Quake III and 3DMark tables. Bearing in mind that the system employs the same Creative 3D Blaster Annihilator Pro with 32MB of DDR memory as some of the other machines, the results cannot be ascribed purely to the graphics card. Although in combination with the Athlon 750MHz, the AOpen AK72 motherboard and the 128MB of PC133 SDRAM, the system performs extremely well. For the student with a gaming interest, Simply has also

bundled its standard games pack, which includes Driver and Unreal Tournament.

Taking care of optical storage is a Ricoh DVD/CD-RW combo drive. The hard disk is a Maxtor 20GB unit and the system employs a Creative V128 sound card in combination with SBS52 speakers. Included is an ATi TV tuner card, turning the PC into a television,

ideal when you're living in one room.

High scoring in the SYSmark tests shows the Systemax to be an all-round good performer. Only in the Internet content creation, where it came fifth, did it slip outside its position as one of the top two scorers. In contrast to its generally outstanding performance, the DVD playback was the poorest of all this month's systems, with the picture occasionally jerky and the sound quality unacceptably low.

Included with the system is an Epson

Stylus 460 inkjet colour printer for printing essays and diagrams. The CTX monitor performs adequately, exhibiting sharp image quality.

As for application software, Corel WordPerfect Suite 8 is included, catering for the word processing and spreadsheet needs of the student. For the younger students there is also an educational software pack, which deals with various subjects to GCSE level.

The Simply Systemax will be more suited to the gamer than the serious scholar. Inclusion of games will appeal to some, but for others, bundling of Word 2000 may have appealed more.

### DETAILS

**PRICE** £1,173.83 (£999 ex VAT)

**CONTACT** Simply Computers 08707 297 366  
[www.simply.co.uk](http://www.simply.co.uk)

**PROS** Comes with a printer; exceptional gaming performance

**CONS** Software could be better; awful DVD playback

**OVERALL** A system more in tune with the gamer than the scholar, although the printer is a good addition

#### FEATURES

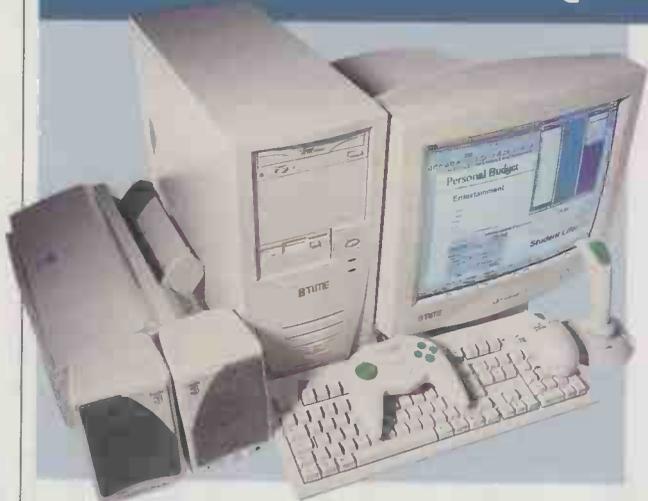
PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★★★  
★★★★★  
★★★★  
★★★★

## Time Machine 750-7 QV Pro



**TIME'S ENTRY** boasts a 750MHz Athlon processor. Although other manufacturers employed a similar processor, it was the Time system that bludgeoned its way to the top of the SYSmark 2000 overall table. For the student who is looking for a powerful work machine, the Time may well be worth a look. Although the raw power may not make such a difference in real-world application use, it does make the machine more versatile and the extra power increases the longevity.

Built around an MSI K7 Pro motherboard, the Time Machine sports a SoundBlaster Live! 1024 that is piped to Screenbeat Pro 50 speakers. A 16MB Voodoo 3 3000 that also supports TV in/out feeds a Samtron monitor, which is not wonderfully sharp. A 20GB Fujitsu hard disk deals with storage and should

be adequate for saving essays and dissertations, while still leaving enough room for any other applications that may be required.

The system comes complete with an Epson 460 colour printer to print essays, along with a microphone, gamepad and joystick. The inclusion of the latter peripherals gives gamers their necessary hardware – although, as the 3DMark and Quake III results show, the Time Machine isn't the best gamer's choice.

A Samsung DVD/CD-RW combo

drive caters for both removable storage (through the combo's CD-RW capabilities) and reading of CD-ROM and DVD media. As for DVD playback, the Time Machine suffered, as so many of the systems did, with poor sound quality that curtails the use of this machine for enjoyable DVD viewing.

Software includes Microsoft Works and Time's standard software pack, which includes Lotus Millennium. Through both of these packages all the software needs of the student are adequately met.

The Time system would suit the serious student, although inclusion of gaming peripherals gives versatility.

### DETAILS

**PRICE** £1,173.83 (£999 ex VAT)

**CONTACT** Time Computers 01282 777 555  
[www.timecomputers.com](http://www.timecomputers.com)

**PROS** Printer included; excellent performance with office applications

**CONS** Bundled software could have been better; DVD sound was poor

**OVERALL** A good system for the serious scholar, complete with a printer

#### FEATURES

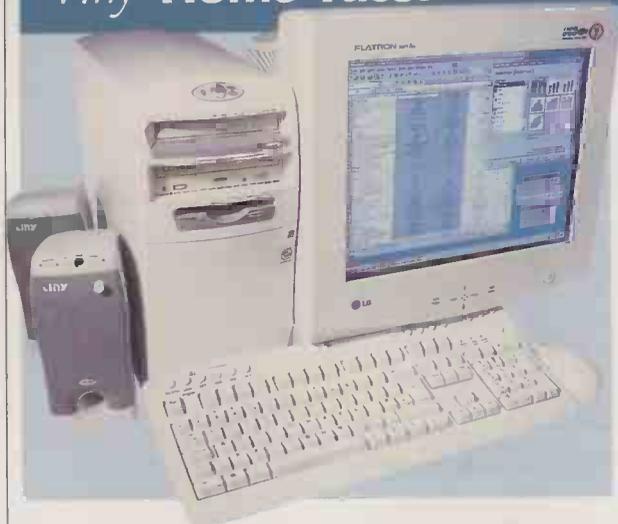
PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★★★  
★★★★  
★★★★  
★★★★

## Tiny Home Tutor



**THE TINY HOME Tutor** gears itself more to school level than university. It ships with an educational software bundle of various study aids for students at GCSE level. For students in higher education, Tiny has opted for Microsoft Office Professional 2000 with a student licence. This is therefore one of the best software bundles in this month's test, as it is directly aimed at our target audience and gives them access to one of the best office packages.

Driven by a 733MHz Pentium III

processor, the Tiny has an MSI 6154 motherboard, supplied with one of the three RAM slots filled by a 128MB PC133 SDRAM module. The hard disk is a Western Digital 20GB unit, giving adequate storage space, and for removable storage a CD-RW drive is included. A single CD-R is bundled with the system, although a

CD-RW would have been more useful.

An onboard Creative PCI 128 deals with sound requirements, with the sound piped to CPR50 speakers. For graphics and display, a TNT2 Model 64 card is included and a 17in LG Flatron monitor completes the ensemble. The screen image is sharp, with the monitor achieving an astounding maximum resolution of 1,600 x 1,200 at 75Hz. A Matshita SR 8585 deals with DVD.

The Home Tutor is near the bottom of all of the tables, highlighting the poor

performance of this machine. Considering the power of the processor, we expected higher scores, but the Home Tutor fails to deliver. DVD playback was no worse than the others, with good visuals, but poor sound.

One problem overshadows the Tiny system, and that is the case. All the drives are recessed into the machine, which, for the DVD means the tray catches on part of the casing, stopping the tray ejecting. Inserting a floppy is also made difficult by the case design.

The Tiny performs poorly and, at least on the system we received, suffers from a questionable design. That said, the software bundle is excellent.

### DETAILS

**PRICE** £1,173.83 (£999 ex VAT)

**CONTACT** Tiny 01293 821 555

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

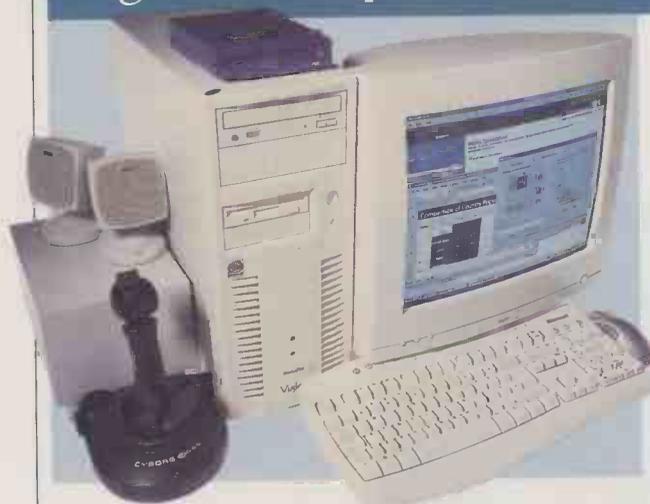
**PROS** Microsoft Office Professional (student licence) included; good monitor

**CONS** CD ejection jams on case; poor performance overall

**OVERALL** The system case is poorly designed. Other systems are better value

<b>FEATURES</b>	★★★★
<b>PERFORMANCE</b>	★★
<b>VALUE FOR MONEY</b>	★★
<b>OVERALL RATING</b>	★★

## Viglen Homepro P3 800 SWR



**FITTED ONTO AN MSI MS6119** motherboard is the most powerful processor in this month's group test: an 800MHz Pentium III. Using this raw power, the Viglen sits comfortably at the number one spot in the SYSmark Internet content creation table. The Homepro's weakest area was 3D, where it slipped towards the bottom end of the tables. But even taking this into account, its overall performance can only be considered to be impressive.

The Viglen was one of the few

systems that excelled in DVD playback. The image coming from the Pioneer DVD-ROM was smooth, with no decompression artefacts, and the sound was hiss-free. The 32MB ATI graphics card (with video in/out) may go some way to explaining this, due to its superior motion compensation, showing that Viglen

has got the combination just right. In the same vein, the system also includes cables to allow you to connect the PC to a television. S-Video, composite and SCART cables are all supplied. The bottom line: if DVD is important to you, this machine is well worth a look.

As for software, the Viglen system comes with Microsoft Works Suite 2000, which covers most student needs. The suite includes Word 2000, Money 2000, and the Encarta encyclopaedia.

The supplied 17in ADi E55 monitor

produces a decent image, although it's not as sharp as some seen elsewhere in the group. The hard disk is a 13.5GB Western Digital model, which should be more than ample for internal storage. As for removable storage, Viglen has opted for a 100MB Zip drive (an internal or external option is available). However, the cost of Zip disks should be considered (£5-£6 each).

Overall, the Viglen is a first-rate system that both performs well for work and has good DVD playback for movie watching. The software bundle covers all the bases and there's a Saitek Cyborg joystick! Shame there isn't a printer.

### DETAILS

**PRICE** £1,173.83 (£999 ex VAT)

**CONTACT** Viglen 020 8758 7000

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

**PROS** Generally good performance; excellent DVD playback; TV cabling included

**CONS** No printer; uninspiring monitor

**OVERALL** This is a good machine, powerful enough to cope with most applications, and with watchable DVD playback. Inclusion of a printer would have made it the overall winner

<b>FEATURES</b>	★★★★
<b>PERFORMANCE</b>	★★★★
<b>VALUE FOR MONEY</b>	★★★★
<b>OVERALL RATING</b>	★★★★





## How we did the tests

### SYSmark 2000

This comprises 12 application workloads and a management program. The workloads are divided into two categories: office productivity and Internet content creation. We run the benchmark at a resolution of 1,024 x 768 in 16bit colour. It loops three times, rebooting between each workload.

It then assigns the system a performance rating for each application, based on a comparison of workload runtimes between the system being tested and a fixed calibration platform. A rating of 100 indicates the test system has performance equal to that of the calibration platform, 200 indicates twice the performance and so on. The calibration platform is based on a Pentium III 450MHz processor, an Intel 440BX chipset motherboard, 128MB of SDRAM, a 32MB Diamond Viper V770 Ultra graphics card, an IBM DJNA 371800 and Windows 98 SE.

Each category rating is a geometric mean of the workload ratings in that category. The overall rating is a weighted geometric mean of the category ratings.

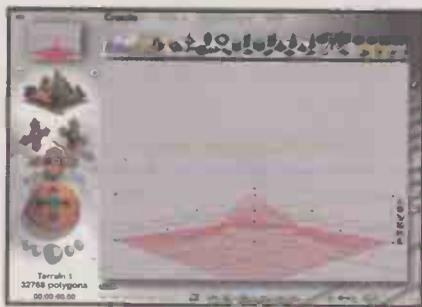
### Office productivity

#### Corel CorelDraw 9.0

This script first takes an abstract design, applies an Art Stroke to it and runs various filter effects. It creates and manipulates a scene composed of vector graphics. Next, it takes a raster image and applies effects. It creates several 3D objects and performs 3D manipulations.

#### Corel Paradox 9.0

This performs SQL-style queries on a database table and runs a 'find duplicates' query. It imports other text files, formatting and exporting each to HTML. Then it opens up query forms, enters



*Bryce 4 script manipulates a wire frame scene and renders it*

charts, applying graphics and sound effects, and adding movie files.

additional data and produces reports based on queries.

#### Microsoft Word 2000

This workload invokes word processing functions, including editing, spell checking, search and replace, font change, copy and paste, print preview, mail merge fields, insert hyperlinks, background and table formatting plus opening and viewing HTML pages.

#### Microsoft Excel 2000

Operations include closing and opening spreadsheets, HTML pages and data in text files, spell checks, formula calculation, plotting data, formatting charts and cells, analysing data in pivot tables, naming a cell and inserting hyperlinks.

#### Microsoft PowerPoint 2000

Operations include spell checks, editing, formatting and moving pictures, applying templates, formatting tables in slides, inserting hyperlinks, applying header and footer data formatting

*3DMark 2000 tests each system's DirectX performance (above) and OpenGL performance is tested via Quake III: Arena (below)*



#### Dragon NaturallySpeaking Preferred 4.0

The script plays a pre-recorded WAV file into NaturallySpeaking, which then converts the WAV file to text.

#### Netscape

##### Communicator 4.61

This opens a website of plays by Shakespeare and selects and loads the texts several times. Then it loads a page consisting of large tables, thumbnails and images and cycles through viewing the images.

#### Internet content creation

##### Adobe Premiere 5.1

This creates an animation of about 16 BMP files and other AVI clips and puts transitions between them. It superimposes two audio tracks and runs the audio through filters.

#### Adobe Photoshop 5.5

The script loads, resizes, zooms out of images, applies filters to the images, changes mode and colour settings, adjusts image brightness and contrast and saves the image to a JPEG file.

#### Avid Elastic Reality 3.1

The workload sets up and renders a morph between two MPEG2-sized images (720 x 480 pixels, roughly 750KB).

#### MetaCreations Bryce 4

This script opens an assembled wire frame scene and renders it to the final image. Then a new image is opened and saved in Metastream format. Another image is opened and saved in an HTML-compatible format.

#### Microsoft Windows Media Encoder 4.0

The input file is an AVI clip that is encoded using the MPEG-4 Video Codec.

#### 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 resolutions. We ran the benchmark at 1,024 x 768 in 16bit colour, with each game set to loop three times. The 3DMark is calculated by adding the frames per second for each game together and multiplying the result by 12.

#### Quake III

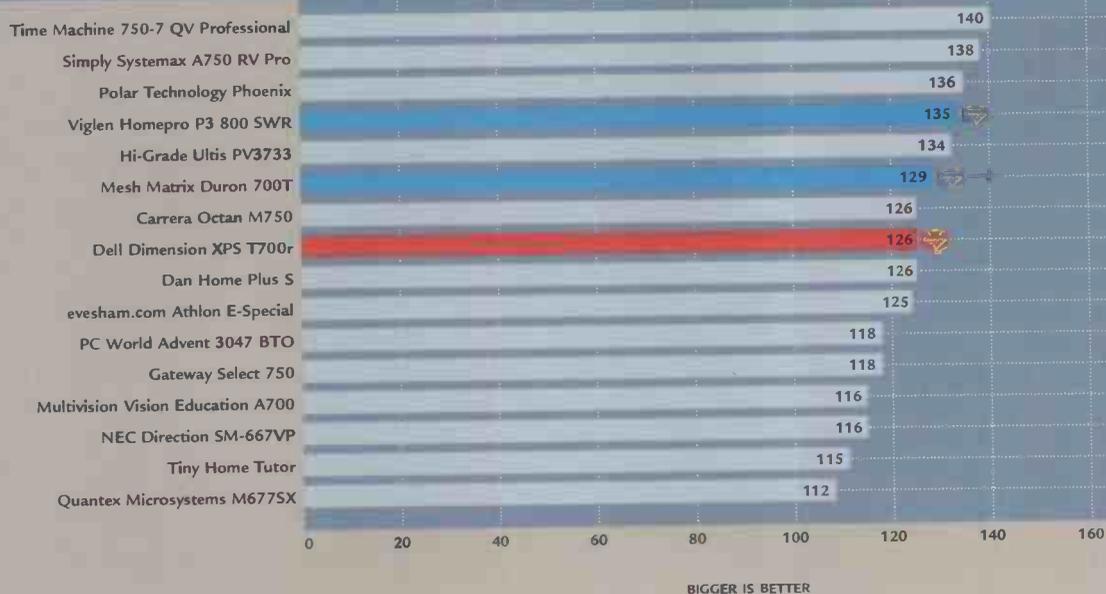
We tested each system's OpenGL performance with Quake III: Arena (1.11).

The settings were: video mode - 1,024 x 768, colour depth - 16bit, full screen, highest texture detail, texture quality - 16bit, texture filter - bilinear, lighting and lightmap.

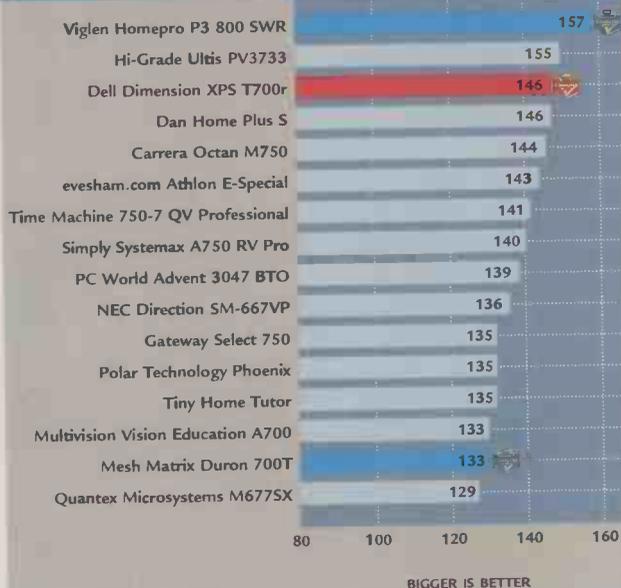
At command prompt we typed: `timedemo 1`  
`demo demo001`

This runs demo 1 and records the frames per second.

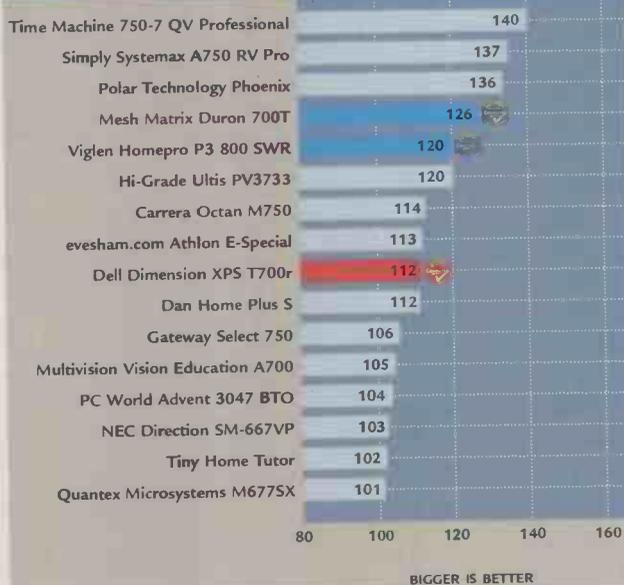
### SYSmark 2000 overall



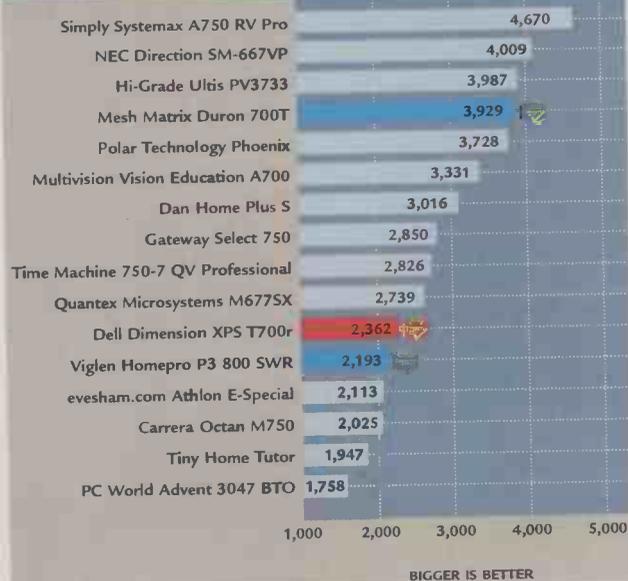
### SYSmark 2000 Internet content creation



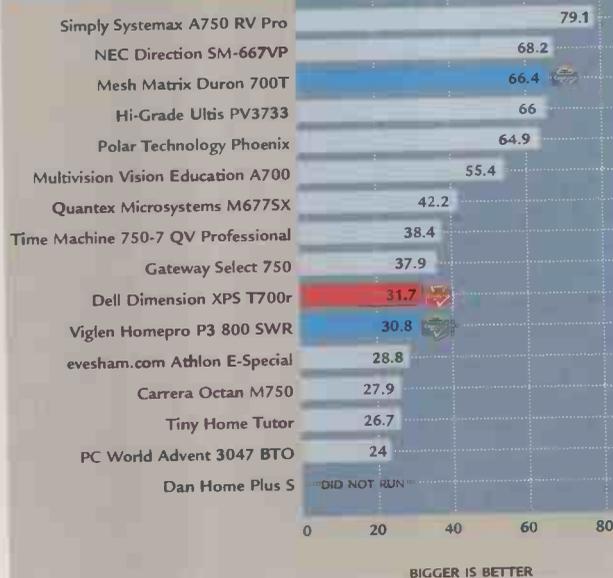
### SYSmark 2000 office productivity



### 3DMark 2000



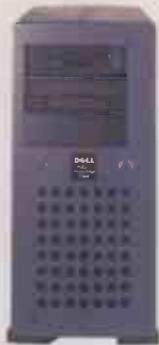
### Quake III (fps)



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- Dell 15" Monitor (13.7" VIS, 0.28 dot pitch)
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\*Source: International Data Corporation, Final Data, Q4 1999.

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### Table of features



MANUFACTURER	CARRERA	DAN TECHNOLOGY	DELL COMPUTERS	EVESHAM.COM	GATEWAY
MODEL NAME	OCTAN M750	HOME PLUS S	DIMENSION XPS T700R	ATHLON E-SPECIAL	SELECT 750
Price inc VAT (ex VAT)	£1,173.83 (£999)	£1,168 (£994)	£1,173.83 (£999)	£1,115.08 (£949)	£1,104.50 (£940)
Telephone	020 8307 2800	020 8830 1100	0870 907 5664	0800 038 0800	0800 55 2000
<b>HARDWARE SPECS</b>					
Processor	Athlon 750MHz	Pentium III 700MHz	Pentium III 700MHz	Athlon 700MHz	AMD 750MHz
RAM/type	128MB/PC100	128MB/PC100	128MB/PC100	128MB/PC100	128MB/PC100
Occupied/spare RAM slots	1/2	1/2	1/3	1/2	1/2
Max memory in this configuration	640MB	1.1GB	640MB	640MB	640MB
Maximum memory	768MB	1.5GB	768MB	768MB	768MB
Hard disk (manufacturer + model)	Quantum Fireball Plus LM	Maxtor 52049U4	Maxtor 51536U3	Maxtor 52049U4	Western Digital
HD size/interface	20.5GB/EIDE	20.5GB/EIDE	15GB/EIDE	20.5GB/EIDE	14.7GB/EIDE
Storage drive model and maker	Ricoh MP9060A	Panasonic LS120	Sony CRX 140E	Samsung SM-304B	Panasonic LS120
Size of storage drive media	650MB (1 CD-R and 1 CD-RW inc)	120MB (1 disk inc)	650MB (1 CD-R and 1 CD-RW inc)	650MB	120MB
Storage drive interface	EIDE	EIDE	EIDE	EIDE	EIDE
<b>MOTHERBOARD COMPONENTS</b>					
Motherboard manufacturer	Biostar	Gigabyte	Dell/Intel	MSI 6195	Gateway
Model/chipset	M7MKA/AMD 750	VIA GA-6VX7/694X	Northstar/440BX	K7 Pro/AMD 750	Kodoka/AMD 750
<b>EXPANSION AND I/O</b>					
No of 3.5/5.25in bays	3/4	4/3	5/2	2/3	5/3
No of free 3.5/5.25in bays	1/3	2/2	3/0	0/2	3/2
No of PCI/ISA/shared slots	4/1/1	4/0/1	4/0/1	5/0/1	5/0/0
No of free PCI/ISA/shared slots	2/1/1	2/0/1	2/0/1	3/0/1	3/0/0
No of USB/serial/parallel/PS2	2/2/1/2	2/2/1/2	2/1/1/2	2/2/1/2	3/2/1/2
<b>MULTIMEDIA</b>					
DVD manufacturer/model	Ricoh MP9060A	Panasonic SR8585B	Samsung SD-612	Samsung SM-304B	Toshiba SD-M1402
DVD speed/interface	4x/EIDE	8x/EIDE	12x/EIDE	4x/EIDE	12x/EIDE
Sound card manufacturer	Creative	Creative	Creative	Creative	Creative
Sound card model	SB PCI 128	SB Live! 1024	SB PCI 64V	SB PCI 128	SB PCI 128
Speakers (manufacturer + model)	Altec Lansing ACS22	Dan Hi-Fi Speakers	Harmon Kardon HK195	Cambridge Soundworks SBS52	Cambridge Soundworks GCS200
Graphics card maker and model	Generic TNT2 M64	Matrox Millennium G400 DualHead	ATI Rage Pro 128	Generic TNT2 M64	Creative TNT2
Chipset	nVidia TNT2 M64	Matrox G400	ATI Rage Pro 128	nVidia TNT2 M64	nVidia TNT2
RAM and type	32MB SDRAM	16MB SGRAM	16MB SGRAM	32MB SDRAM	32MB SDRAM
Graphics card interface	AGP	AGP	AGP	AGP	AGP
Monitor manufacturer/model	LG CS990DC	CTX VL700	Samtron 75E	Mitsubishi V70	Gateway EV700
Monitor size/ max viewable diagonal	19in/18in	17in/16in	17in/16in	17in/16in	17in/15.9in
Maximum resolution at 75Hz	1,600 x 1,200	1,152 x 864	1,152 x 864	1,280 x 720	1,024 x 768
<b>OTHER INFORMATION</b>					
Modem manufacturer and model	PCI internal 56K	PCI internal 56K	Aztech MDP 3900 V.90	Diamond SupraSST 56i Pro DFV	PCI internal 56K
Misc hardware		Lexmark Z32 printer	HP 610C printer		
Bundled software	Lotus SmartSuite Millennium, IBM ViaVoice, Entertainment bundle	Lotus SmartSuite Millennium, 3D games bundle	MS Works Suite 2000, Dell Home Advantage Software	Lotus SmartSuite Millennium	MS Works Suite 2000

HI-GRADE	MESH COMPUTERS	MULTIVISION COMPUTERS	NEC	PC WORLD	POLAR TECHNOLOGY
<b>ULTIS PV3733</b>	<b>MATRIX DURON 700T</b>	<b>VISION EDUCATION A700</b>	<b>DIRECTION SM-667VP</b>	<b>ADVENT 3047 BTO</b>	<b>PHOENIX</b>
£1,173.83 (£999)	£1,173.83 (£999)	£1,173.83 (£999)	£1,173.83 (£999)	£1,173.83 (£999)	£1,173.83 (£999)
020 8532 6100	020 8208 4706	0121 550 8000	0870 010 6322	08705 464 464	0161 482 7000
Pentium III 733MHz	AMD Duron 700MHz	Athlon 700MHz	Pentium III 667MHz	Pentium III 650MHz	Athlon 700MHz
128MB/PC133	128MB/PC100	128MB/PC133	128MB/PC133	128MB/PC100	128MB/PC100
1/2	1/2	1/2	1/2	1/2	1/2
512MB	1.1GB	640MB	1.1GB	640MB	640MB
512MB	1.5GB	768MB	1.5GB	768MB	768MB
Fujitsu 3136AH	Seagate Barracuda	Seagate Barracuda	Maxtor	Seagate U10	IBM
13.5GB/EIDE	20.5GB/EIDE	20.5GB/EIDE	20.5GB/EIDE	10.2GB/EIDE	25GB/EIDE
Mitsumi CR-4804JE	Teac CD-W 54E	Samsung SM-304B	LG CED8080B	Imega Internal Zip 100	Creative CD-RW
650MB	650MB	650MB	650MB	100MB	650MB (1 CD-RW inc)
EIDE	EIDE	EIDE	EIDE	EIDE	EIDE
Asus	Gigabyte	MSI 6195	MSI	Gigabyte	MSI
CUSL 2/Intel 815E	GA7ZM/VIA KT133	K7 Pro/AMD 750	6309/VIA 694X (133A)	GA6 BX7/Intel 440 BX	K7 Pro/AMD 750
4/3	3/3	4/3	5/2	4/3	5/2
2/1	1/1	2/2	3/0	1/2	3/0
6/0/0	3/0/0/1	5/0/1	5/0/0	4/1/1	5/0/1
4/0/0	0/0/0	3/0/1	3/0/0	2/1/1	3/0/1
5/1/1/2	2/2/1/2	2/2/1/2	3/2/1/2	2/2/1/2	2/2/1/2
Asus E608	Pioneer DVD-114	Samsung SM-304B	Pioneer 115	Toshiba SD-M1402	Pioneer DVD 104
8x/EIDE	10x/EIDE	4x/EIDE	16x/EIDE	12x/EIDE	10x/EIDE
Creative	Creative	Creative	Aureal	Creative	Creative
SB Live! 1024	SB Live! 1024	SB PCI 128	Advantage	SB PCI 128	SB PCI 128
Diamond Promedia 2010	Labtec 1070	Labtec LCS-2514	Labtec LCS 2414	Creative SB S20	Labtec LCS-2414
Guillemot 3D Prophet	Guillemot 3D Prophet GeForce SE	Guillemot 3D Prophet GeForce SE	nVidia GeForce	nVidia Riva TNT2 Model 64	Creative 3D Blaster Annihilator Pro
nVidia GeForce 256	nVidia GeForce 256	nVidia GeForce 256	nVidia GeForce 256	nVidia TNT2	nVidia GeForce 256
32MB SDRAM	32MB SDRAM	16MB SDRAM	32MB SDRAM	32MB SDRAM	32MB DDR
AGP	AGP	AGP	AGP	AGP	AGP
CTX PR705F	Mitsubishi Diamond Pro 720	LG Flatron 775FT	NEC VR17	Proview PK-770	Mitsubishi Diamond Pro 720
17in/16in	17in/16in	17in/16in	17in/16in	17in/15.7in	17in/16in
1,600 x 900	1,600 x 1,200	1,152 x 864	1,152 x 864	1,024 x 768	1,600 x 1,200
Diamond Supra SST 56i Pro DF	Diamond SupraSST 56i Pro DFV	PcTel HSP micromodem 56	3Com 56K V.90 PCI Win Modem	US Robotics PCI Win Modem 56K V.90	Diamond Supra SST 56i ProDF
	ATI TV Wonder	Epson 670		Mustek 1200UB scanner, Canon BJC-2100 printer	
Lotus SmartSuite 9.5	MS Works Suite 2000	Lotus SmartSuite Millennium IBM ViaVoice	MS Word 2000, Works 2000, Money 2000, Corel Draw 7, IBM ViaVoice, Encarta, Route Express	MS Works 2000, Excel 2000, Money 2000 Standard, Home Publisher 2000, MapPoint 2000 UK	Microsoft Works Suite 2000



### Table of features



MANUFACTURER	QUANTEX	SIMPLY	TIME	TINY	VIGLEN
MODEL NAME	M677SX	SYSTEMAX A750 RV PRO	TIME MACHINE 750-7 QV PRO	HOME TUTOR	HOMEPRO P3 800 SWR
Price inc VAT (ex VAT)	£1,173.83 (€999)	£1,173.83 (€999)	£1,173.83 (€999)	£1,173.83 (€999)	£1,173.83 (€999)
Telephone	01438 224 444	08707 297 366	01282 777 555	01293 821 555	020 8758 7000
<b>HARDWARE SPECS</b>					
Processor	Pentium III 667MHz	Athlon 750MHz	Athlon 750MHz	Pentium III 733MHz	Pentium III 800MHz
RAM/type	128MB/PC133	128MB/PC133	128MB/PC100	128MB/PC133	128MB/PC100
Occupied/spare RAM slots	1/2	1/2	1/2	1/2	1/2
Max memory in this configuration	1.1GB	1.1GB	640MB	1.1GB	640MB
Maximum memory	1.5GB	1.5GB	768MB	1.5GB	768MB
Hard disk (manufacturer + model)	Seagate ST328040A	Maxtor VL20	Fujitsu MDF3204AH	Western Digital	Western Digital
HD size/interface	28.5GB/EIDE	20GB/EIDE	20GB/EIDE	20GB/EIDE	20GB/EIDE
Storage drive model and maker	Sony CD-R 140E	Ricoh combo MP9060A	Samsung SM-304 combo	4 x 4 x 32 CD-writer	Imega Zip 100 (int or ext)
Size of storage drive media	650MB (10 CD-Rs inc)	650MB	650MB	650MB (1 CD-R inc)	100MB (1 Zip disk inc)
Storage drive interface	EIDE	EIDE	EIDE	EIDE	Parallel
<b>MOTHERBOARD COMPONENTS</b>					
Motherboard manufacturer	Biostar	AOpen	MSI	MSI	MSI
Model/chipset	M6VCG/VIA 694	AK72/KX133	K7 Pro/AMD 750	MS 6154/VIA 693A	MS6119/Intel 440 BX
<b>EXPANSION AND I/O</b>					
No of 3.5/5.25in bays	4/3	3/3	4/3	3/2	4/2
No of free 3.5/5.25in bays	2/1	1/1	2/2	1/0	2/1
No of PCI/ISA/shared slots	4/0/1	4/0/1	5/0/1	2/0/1	3/2/1
No of free PCI/ISA/shared slots	2/0/1	1/0/1	3/0/1	2/0/0	1/2/1
No of USB/serial/parallel/PS2	2/2/1/2	4/2/1/2	2/2/1/2	2/2/1/2	2/2/1/2
<b>MULTIMEDIA</b>					
DVD manufacturer/model	Toshiba DVD SD-M1402	Ricoh combo MP9060A	Samsung SM-304 combo	Matshita DVD-ROM SR 8585	Pioneer DVD-ROM DVD-115
DVD speed/interface	12x/EIDE	4x/EIDE	4x/EIDE	8x/EIDE	16x/EIDE
Sound card manufacturer	Creative	Creative	Creative	Creative	Creative
Sound card model	SB PCI 64V	SB V128	SB Live! 1024	SB PCI 128 (onboard)	SB PCI 128
Speakers (manufacturer + model)	Altec Lansing ACS 22	Creative SBS52	Screenbeat Pro 50	CPR50	Altec Lansing ACS33
Graphics card manufacturer and model	3dfx Voodoo 3 3000 TV out	Creative 3D Blaster Annihilator Pro	3dfx Voodoo 3 3000 TV out	nVidia Riva TNT2 Model 64	ATI Rage Fury Pro VIVO
Chipset	3dfx Voodoo 3	nVidia GeForce 256	3dfx Voodoo 3	nVidia TNT2	Rage 128 Pro
RAM and type	16MB SDRAM	32MB DDR	16MB SDRAM	32MB SDRAM	32MB SDRAM
Graphics card interface	AGP	AGP	AGP	AGP	AGP
Monitor manufacturer/model	Quantex XP1727DP	CTX PL7	Samtron 75e Plus	LG Flatron 795FT Plus	ADI E55
Monitor size/ max viewable diagonal	17in/16in	17in/16in	17in/16in	17in/16in	17in/16in
Maximum resolution at 75Hz	1,152 x 864	1,152 x 864	1,152 x 864	1,600 x 1,200	1,024 x 768
<b>OTHER INFORMATION</b>					
Modem manufacturer and model	Accord I56LVP	Systemax 56K V.90	Etech PCI 56K PVP+	HSP56 Micromodem	Diamond SupraSST 56K (software)
Misc hardware	Canon FB630P scanner and BJC-2100 printer	Epson Stylus 460, ATI TV tuner, MS Sidewinder GamePad	Gamepad, joystick, microphone, Epson 460 printer		Saitek Cyborg 2000 joystick
Bundled software	Corel WordPerfect Office 2000, Grolier Multimedia Encyclopedia, Email Voicelink, Drive Image SE, RingCentral, Cybersnoop 3.0 SE, Webferret, Enfish, Tracker Pro	MS Works 2000, Systemax games & education bundle, ACID Music Software (limited) WordPerfect Suite 8 (limited)	MS Works, Time standard software pack inc Lotus SmartSuite Millennium	MS Office Pro 2000 student licence, education software pack	Microsoft Works Suite 2000

# Editor's Choice

It's not easy to build a PC for a student and the manufacturers' varied approaches to the problem show how open to interpretation the possibilities can be. We considered that there are really three issues that a good student PC should be able to encompass: first, and most important, the PC must have the correct software and specification for doing work. It was therefore a necessity that the package should include a good word processor. We consider the preferred option to be Word 2000, although WordPerfect and Word Pro are products that are also up to the task.

The second criterion is that the machine should be versatile for entertainment purposes. Our thoughts on this were that a system with a DVD-ROM drive in one of its bays should be good enough to be able to watch DVD movies on – giving the student the option of watching films in their room. The performance of DVD playback was therefore a factor. Also falling into this category was the presence of a TV card to allow terrestrial TV to be tuned into the PC.

The final and least important aspect was the PC's ability to deal with games. So a system specification that was capable of handling games was noted, as were relevant peripherals.

One other aspect was considered to be of great value, and that was the inclusion of a printer, or money left out of the budget to buy one. The quality of the printer was not specified, although all the printers included were colour,

despite being entry-level products. The versatility of a printer saves untold amounts of time for a student. Trips to the university's printing facilities can become tedious, whereas with a printer tucked in the corner of a student's room, the odd page can be printed out as needed. That said, the lack of a printer didn't hold back two of our winners.

In general, the overall quality and performance of all the machines was impressively high, with few of them failing to be relevant at least at some level.

## The winners

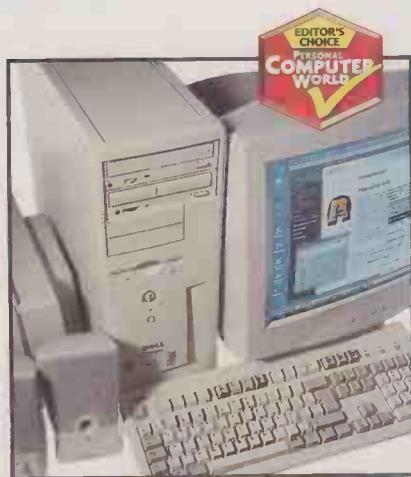
Considering all of the above, the **Editor's Choice** this month goes to the Dell Dimension XPS T700r. With its 700MHz Pentium III processor and 128MB of PC100 RAM, this machine is more than adequate for all the office applications that a student will need to produce essays and projects. The Maxtor hard drive, although not the largest in the test, is a decent-sized 15GB unit and considering the size of the average word processor document file size, it will still take the student some time to fill. Also included is a Sony CD-RW, which with the inclusion of both CD-R and CD-RW media, promotes good backup habits from day one.

On the entertainment front, the quality of the DVD sound and video playback means the Dimension will allow the student to watch movies on their PC when they are not working. As for software, the inclusion of Word 2000 in

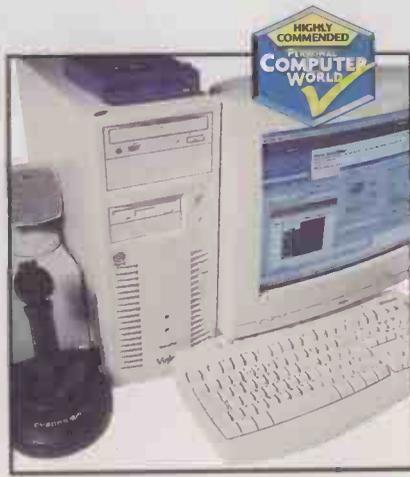
the Works Suite 2000 package is ideal for producing essays and reports. This, along with the inclusion of the HP printer (complete with cable), makes this an ideal work machine.

The competition was fierce, though, and the Viglen Homepro P3 800 SWR receives our first **Highly Commended** award, only failing to beat the Dell because the package didn't include a printer. The speed of the processor on the Viglen was not a factor in this decision, as the performance gained from it was not really significant. Instead the Viglen is commended because it has the right software in Works Suite 2000 (including Word 2000); it had the best DVD playback of all of the systems tested; and it included a Saitek Cyborg joystick for anyone interested in gaming. The balance was good all round and the cables for connecting the DVD to a TV make this a versatile entertainment PC as well as a good work system.

The final **Highly Commended** award goes to the Mesh Matrix Duron 700T. This machine may not have come with a bundled printer, but it offered a superb mix of components. Based on AMD's latest chip, the performance of this machine was impressive. The display setup was first rate, with a nVidia GeForce-based graphics card coupled with a Mitsubishi NF aperture-grille screen. Both a DVD-ROM drive and CD-RW drive are bundled so disc-to-disc copying can be performed. Rounding things off is a TV tuner card, to give students a bit of extra entertainment during their down time.



*Dell's system will be a positive boon to the student, with its printer and backup drive*



*The HomePro offers great performance, plus some decent entertainment options*



*Mesh's machine uses the latest chip from AMD and a good display set*

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- i.LINK (IEEE1394), 400 Mbps
- Memory Stick slot
- RJ-11 direct port - built-in modem V.90, K56flex
- Jog Dial
- PCG-SR1K runs best with Microsoft® Windows® 2000 Professional

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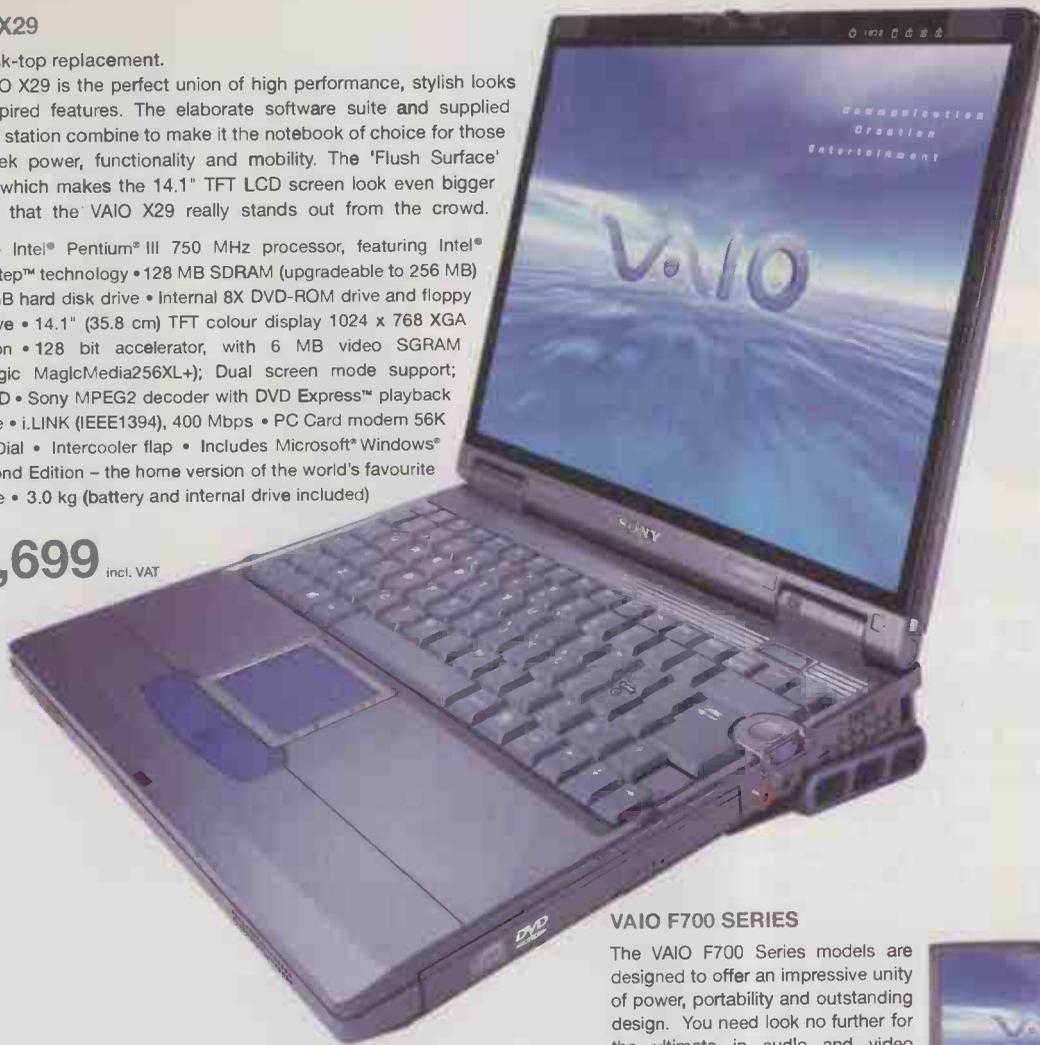
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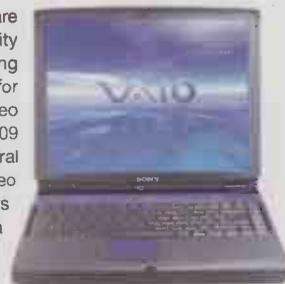
- Mobile Intel® Pentium® III 750 MHz processor, featuring Intel® SpeedStep™ technology
- 128 MB SDRAM (upgradeable to 256 MB)
- 18.1 GB hard disk drive
- Internal 8X DVD-ROM drive and floppy disk drive
- 14.1" (35.8 cm) TFT colour display 1024 x 768 XGA resolution
- 128 bit accelerator, with 6 MB video SGRAM (NeoMagic MagicMedia256XL+); Dual screen mode support; Direct 3D
- Sony MPEG2 decoder with DVD Express™ playback software
- i.LINK (IEEE1394), 400 Mbps
- PC Card modem 56K
- Jog Dial
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- Includes Microsoft® Windows® 98 Second Edition – the home version of the world's favourite software
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- 128 MB SDRAM (upgradeable to 256 MB)
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- Floppy disk drive
- Integral 8X DVD-ROM drive
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- Direct 3D
- i.LINK (IEEE1394), 400 Mbps
- RJ-11 direct port - built-in modem V.90, K56flex
- PCG-F709 includes Microsoft® Windows® 98 Second Edition – the home version of the world's favourite software
- PCG - F709K runs best with Microsoft® Windows® 2000 Professional

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### VAIO F707

- Mobile Intel® Pentium® III 600 MHz processor, featuring Intel® SpeedStep™ technology
- 64 MB SDRAM (upgradeable to 256 MB)
- 9.0 GB hard disk drive
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- Integral 8X DVD-ROM drive
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- Direct 3D
- i.LINK (IEEE1394), 400 Mbps
- RJ-11 direct port - built-in modem V.90, K56flex
- Includes Microsoft® Windows® 98 Second Edition – the home version of the world's favourite software

**£2,199** incl. VAT

### VAIO F701

- Intel® Celeron™ 500 MHz processor
- 64 MB SDRAM (upgradeable to 256 MB)
- 9.0 GB hard disk drive
- Floppy disk drive
- Integral 24X CD-ROM drive
- 13" (33cm) HPA colour display 800x600 SVGA resolution
- Direct 3D
- i.LINK (IEEE1394), 400 Mbps
- RJ-11 direct port - built-in modem V.90, K56flex
- Includes Microsoft® Windows® 98 Second Edition – the home version of the world's favourite software

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- 248 x 29 x 153 mm, 1 kg (incl. battery)
- External floppy disk drive
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- 128 bit accelerator with 2.5 MB video RAM
- Sony MPEG1 Digital Video with full screen playback
- Built-in microphone, stereo speakers and Jog Dial
- 1/6" 410 000 pixel CCD - f = 2.8 mm F 2.8 lens, automatic white balance, automatic exposure, manual focus
- i.LINK (IEEE1394), 400 Mbps
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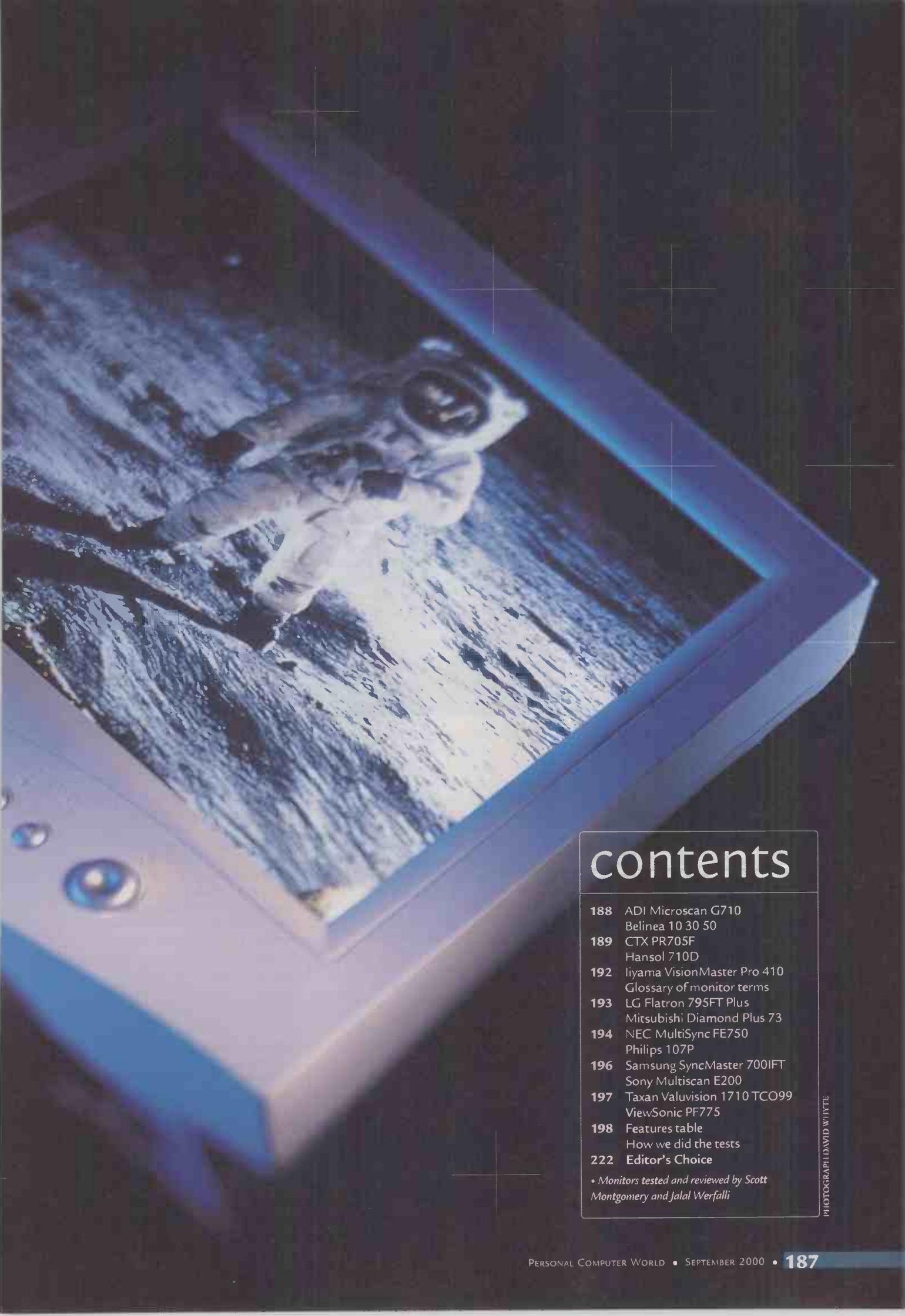
# big picture

**A good monitor is a vital ingredient of your PC system, so knowing the good from the bad is important. We invited 13 suppliers of 17in screens to let us test their mettle.**

**O**ne element of your computer is actively used more than any other: the monitor. Yet you rarely hear people boast about their monitor, it's always how fast their processor is or how much memory their graphics card has. The monitor, though, is the one part of your computer you interact with the most simply because the screen is where your PC interfaces with you. Yet how many of us are seduced by the magic numbers of the diagonal? That extra inch or two on the diagonal becomes the most important thing as we doggedly follow the 'bigger is better' maxim that applies to so many other aspects of computing.

But, and there is a but, should such an arbitrary method of monitor selection really be in force? Would you buy wallpaper for your living room based on how wide the roll was? Unlikely. The variation in monitors is as diverse as any other part of your PC, and considering you are actively looking at a monitor, rather than merely observing its performance, we thought it would be a good idea to test some 17in models that now represent the norm in PC use.

The monitor manufacturers that submitted screens for this group test were given only a couple of guidelines. The monitor was to be as flat as possible, while still being good value for money; and as the reviews on the following pages show, there is a great deal of variation within the 17in market.



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PHOTOGRAPH BY DAVID WUYTTE

## ADI Microscan G710



**LITTLE BROTHER TO** the model that featured in our May issue's 21in monitor group test, the ADI Microscan G710 has the same brightness and contrast wheels under the front fascia as its sibling. These wheels offer easier and more accurate manipulation of settings than the standard button-driven digital on-screen display (OSD) method.

This unit is one of the few in the test with a built-in microphone, situated in the fascia above the screen, with output

at the rear. The G710's bezel is quite big, making the screen appear slightly smaller than some of the competing units. The included USB hub has four downstream ports and plugs into the back of the unit, extending on a short cable for easy access to the ports.

Setting up this FD Trinitron screen was both simple and quick – although with the brightness set to give the correct black level, the contrast could not be driven up high enough to give the required white level. This made the screen appear slightly dimmer than we would have liked. The OSD

allows easy navigation for setup of the monitor's geometry, with the unit working at optimal levels within a couple of minutes.

On the DisplayMate image quality tests (see How we did the tests box later in the group test), the G710 performed well. The geometry was good, with no distortion or pincushioning. Power regulation was good, although focus at the corners of the image deteriorated noticeably. Colour was well represented, with regular colour purity across the

screen. There was no streaking or ghosting in the image and colour-fading consistency was excellent. However, the general dimness of the screen may have affected all the results because at lower contrast levels distortion is less likely to occur.

Overall, apart from the poor focus at the edges, this Trinitron screen performs well. However, the overall dimness of the display may cause a bit of eye strain with long-term use. The unit conforms to TCO99 standards, so emissions are not an issue, and at its mid-range price it's not a bad unit. Although for £20 more you could get the all-round better performing ViewSonic PF775 (see later).

### DETAILS

**PRICE** £260 (£229 ex VAT)

**CONTACT** ADI 020 8327 1900

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

**PROS** OSD easy to navigate

**CONS** Very dim screen

**OVERALL** The dimness of the screen pulls this unit down. Although performance appears good, this may be entirely due to low overall contrast. Eye strain may also pose a problem

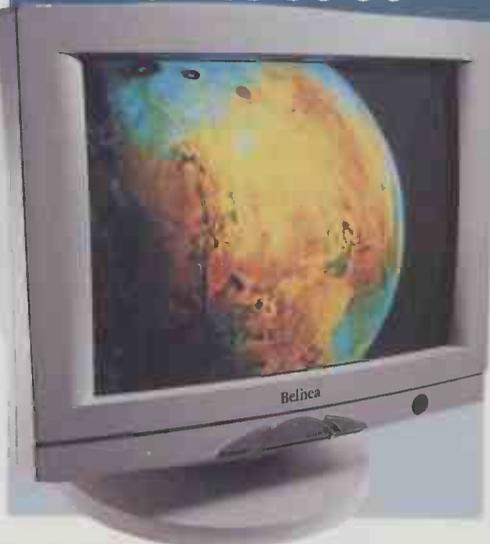
**IMAGE QUALITY** ★★

**CONTROLS** ★★

**VALUE FOR MONEY** ★★

**OVERALL RATING** ★★

## Belinea 10 30 50



**ONE OF FOUR** entrants in this month's test with a shadow-mask tube, the Belinea 10 30 50 had one of the best images based on initial impression at power-up. The colours were vibrant, and the image was sharp and focused – all-round, an excellent first impression.

The fascia surrounding the screen is narrow and gives the screen area a virtual boost. It also sports what at first appears to be three buttons and, tucked underneath, a wheel for adjustment.

After pressing the left and right buttons, though, we discovered they were merely adornment for the fascia. Using the centre button in combination with the wheel, the brightness, contrast and screen geometry can be set up. The OSD was simple to navigate: you just select the required option and then manipulate the settings by rotating the wheel.

Running the DisplayMate tests, the Belinea did not perform as well as we initially thought it would. This serves to highlight how an overall impression of a monitor can be just as valid a means of assess-

ment as a program like DisplayMate.

Focus on the Belinea was excellent, and fine focus testing further reinforced the quality of the tube, with minimal deterioration towards the edges. Screen regulation was impressive, while pincushion and barrel distortion, plus other geometric features were not as good as the flatter aperture-grille models. Video bandwidth was excellent, with lines of varying thickness appearing at consistent intensity. The image also

experienced very little streaking and ghosting, only suffering mildly from the former on grey backgrounds. The anti-glare coating wasn't particularly good and colour representation in the tests wasn't wonderful, with patchiness in pure colours and irregular fading. The Belinea is TCO99 certified, so ergonomics and emissions are assured.

Overall, the working image on this monitor is great, with its failings in DisplayMate by no means affecting this. For general Windows purposes it is a fine monitor, even if the screen is a little curvy. However, its £304.33 price tag means it's eclipsed by cheaper models.

### DETAILS

**PRICE** £304.33 (£260 ex VAT)

**CONTACT** Belinea 01344 788 920

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

**PROS** Excellent image quality for general use, with striking colour and focus

**CONS** One of the most expensive 17in monitors we tested

**OVERALL** Apart from the price, this is a good monitor. Unfortunately, similar quality can be bought for less

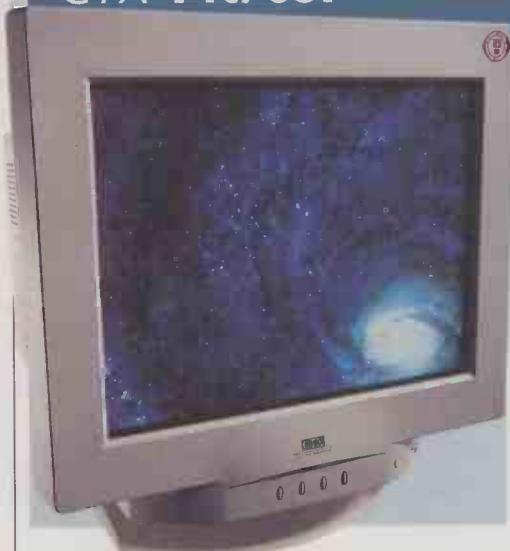
**IMAGE QUALITY** ★★

**CONTROLS** ★★

**VALUE FOR MONEY** ★★

**OVERALL RATING** ★★

## CTX PR705F



**THE PR705F IS A 17in** member of CTX's ProFlat series, all of which sport an 'absolutely flat screen'. Not only is it flat, but the fascia is constructed to highlight this, with sharp edges and barely a curved surface in sight. The only curves visible from the front are where the OSD control buttons are situated. At the back of the unit, along with the D-SUB input are BNC connectors for RGB input. The unit also conforms to the TCO99 standard.

Four buttons allow access to the OSD and navigation was clearly set out and easy to use. Unfortunately, the CTX proved to be one of the most difficult units to set up correctly. The main problem was getting the geometry correct. Every time one geometric aspect was changed, it seemed that another had to be reset or altered to compensate for a new error. The setup took a long time in comparison to other monitors.

There was one problem we were unable to resolve through the OSD: the top edge of the screen was not straight. As none of the OSD geometry controls

address top and bottom curvature on any monitor, this problem unfortunately had to stay, and the straight lines of the fascia only served to highlight the imperfection.

DisplayMate reinforced our thoughts on this monitor's good points and the performance showed it to be a quality unit. Text focus was fairly sharp across the image, although the ViewSonic was sharper in the corners. The flatness of the FD Trinitron screen

meant that distortion and curvature were minimal, except for the top edge problem, which obviously let it down. Screen regulation was overall very good, as was colour purity, although there was some minimal streaking from colours and greys. As for desktop resolution, it managed 81Hz at 1,280 x 1,024 while 85Hz would have been preferable.

Leaving the DisplayMate tests and looking at the CTX in normal use, the PR705F had a good overall image quality - assuming the curvature problem with the top edge was an idiosyncrasy of our test unit. You could do a lot worse for £222 inc VAT.

## DETAILS

**PRICE** £222 (£189 ex VAT)

**CONTACT** CTX 01923 810 800

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

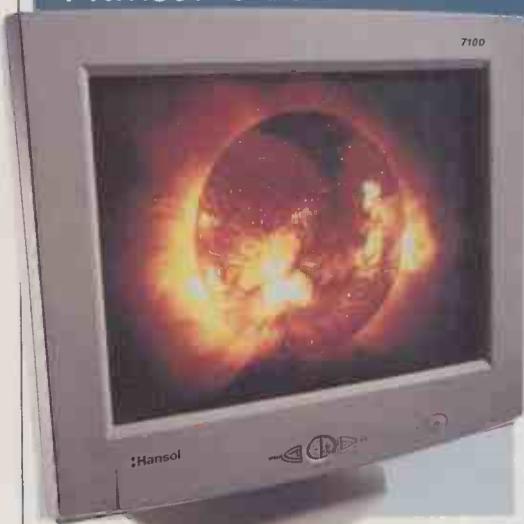
**PROS** BNC as well as D-SUB input gives some versatility

**CONS** The curve on the top edge of the screen; general setup difficulties

**OVERALL** Setup was lengthy, but image quality was OK apart from the curve at the top of the screen

IMAGE QUALITY	★★★★
CONTROLS	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

## Hansol 710D



**HANSOL ELECTRONICS** started manufacturing displays in 1995 with the introduction of its first 17in monitor, the Mazellan 700P. Since then, it has built up a reputation for monitors with good picture quality at equally attractive prices. The Hansol 710D, one of four monitors in Hansol's current professional series, is no exception. The unit encases a Samsung-designed DynaFlat shadow-mask tube that has a virtually flat screen.

The first thing that strikes you when you switch it on is the overall sharpness and liveliness of the screen. This is comparable to some high-end models on test here. Both the dot pitch and maximum resolution are decent at 0.25mm and 1,600 x 1,200 at 75Hz, respectively. However, using this resolution will leave you squinting. Nevertheless, it does comfortably handle 1,024 x 768 at 85Hz - the more appropriate screen resolution for a 17in monitor.

Starting up DisplayMate, the 710D showed little evidence of blooming, while text is finely resolved right across the screen

and into the corners. Moving on to power regulation, the Hansol performed better than the other two budget models from Mitsubishi and Taxan, but it's not perfect. When compared directly to other models it was obvious that a small displacement existed in the top left-hand corner, revealing that beam control needs fine-tuning.

Basic geometry is acceptable, although when the monitor arrived we needed to make some adjustment to

rectify a skewed tilt. The slightly awkward four-button OSD has most of the necessary options to set the picture squarely within the bezel. Vertical and horizontal convergence tests were passed with flying colours, but if the three beams decide to migrate off their factory settings then you're pretty much stuck, as no colour convergence controls exist. At the back of the unit is a captive D-SUB connection - something we expect to see on a lower-priced model.

All in all, the picture quality offered by the 710D is very respectable. If you're looking for a vibrant and bright picture but don't want to overstretch your budget, the 710D is ideal.

## DETAILS

**PRICE** £210 (£179 ex VAT)

**CONTACT** Hansol 01276 418 213

[www.hansol-uk.com](http://www.hansol-uk.com)

**PROS** Fine overall quality from the DynaFlat tube

**CONS** No horizontal or vertical convergence controls

**OVERALL** An excellent screen for an attractive price

IMAGE QUALITY	★★★★
CONTROLS	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★



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- Up to 14.1" TFT Technology
- Integrated 56K Modem

Model	CPU / Display / RAM / Hard Disk / CD-ROM	Ex-VAT	Inc-VAT
GT7650XV	PIII 650; 15.1" SXGA TFT; 128MB; 12GB; DVD	£2149	£2525.08
GT7600XT	PIII 600; 14.1" XGA TFT; 64MB; 6.4GB; DVD	£1649	£1937.58
VM7600cXT	Cel 600; 14.1" XGA TFT; 64MB; 6.0GB; 24 x CD; 56K	£1279	£1502.83
VM7600cT	Cel 600; 12.1" SVGA TFT; 64MB; 6.0GB; 24 x CD; 56K	£1029	£1209.08
VM7500cT	Cel 500; 12.1" SVGA TFT; 64MB; 6.0GB; 24 x CD; 56K	£ 949	£1115.08

NT OPTIONS AVAILABLE



SAMSUNG GT

**SAMSUNG GT SERIES**

- Up to PIII 650MHz
- Max RAM 256MB; 8MB VRAM
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- Integrated 56K Modem

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PORTEGE 3110CT



PORTEGE 7020CT



SATELLITE



TECRA 8100

**PORTEGE SERIES**

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- Max Ram 320MB (PIII)
- Up to 12GB HDD
- DVD Option

Model	CPU / Display / RAM / Hard Disk / CD-ROM	Ex-Vat	Inc Vat
Sat Pro 4270	Cel 500; 13" SVGA DS; 64MB; 5.6GB; 24 Speed CD	£ 958	£1125.65
Sat Pro 4270	Cel 500; 14.1" XGA TFT; 64MB; 5.6GB; 24 Speed CD	£1249	£1467.58
Sat Pro 4270	Cel 500; 15" XGA TFT; 64MB; 5.6GB; 24 Speed CD	£1330	£1562.75
Sat Pro 4290	Cel 550; 12.1" SVGA TFT; 64MB; 5.6GB; 24 Speed CD	£1079	£1267.83
Sat Pro 4290	Cel 550; 14.1" XGA TFT; 64MB; 5.6GB; 24 Speed CD	£1319	£1549.83
Sat Pro 4320	PIII 600; 14.1" XGA TFT; 64MB; 5.6GB; 24 Speed CD	£1625	£1909.38
Sat Pro 4360	PIII 700; 14.1" XGA TFT; 64MB; 12.0GB; DVD	£1919	£2254.83
Portege 3410CT	Cel 400; 10.4" SVGA TFT; 64MB; 5.6GB; Opt. CD	£1277	£1500.48

WINDOWS 2000 / NT OPTIONS AVAILABLE

**SATELLITE/PRO SERIES**

- Celeron 500MHz to PIII 700MHz
- 13" to 15" Displays
- Up to 576MB RAM
- 6GB to 12GB Drive
- Integrated CD-ROM

Model	CPU / Display / RAM / Hard Disk / CD-ROM	Ex-Vat	Inc Vat
Portege 3440CT	PIII 500; 11.3" XGA TFT; 64MB; 5.6GB; Opt. CD	£1519	£1784.83
Portege 7020CT	PIII 366; 13.3" XGA TFT; 64MB; 6GB; CD/DVD Dock Option	£1539	£1808.33
Portege 7140CT	PIII 500; 13.3" XGA TFT; 64MB; 6GB; CD/DVD Dock Option	£2129	£2501.58
Portege 7200CT	PIII 600; 13.3" XGA TFT; 64MB; 6GB; CD/DVD Dock Option	£2465	£2896.38
Tecra 8100	PIII 600; 13.3" XGA TFT; 64MB; 5.6GB; 24 Speed CD	£1819	£2137.33
Tecra 8100	PIII 600; 14.1" XGA TFT; 64MB; 5.6GB; 24 Speed CD	£2210	£2596.78
Tecra 8100	PIII 650; 14.1" XGA TFT; 64MB; 11.2GB; 6 x DVD	£2639	£3100.83
Tecra 8100	PIII 700; 14.1" XGA TFT; 128MB; 11.2GB; DV	£2675	£3143.10

WINDOWS 2000 / NT OPTIONS AVAILABLE

**TECRA 8000/8100 SERIES**

- Up to PIII 700MHz
- Up to 13GB HDD
- 24 Speed CD or DVD Drive

## SONY

**VAIO C1XD**

- PII 400MHz
- 8.9" Ultra Wide TFT Display
- Built-in CCD Camera
- Only 1Kg

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LB E6520	PIII 450; 14.1" XGA TFT; 64MB; 6.0GB; 24 Speed CD	£1749	£2055.08
LB E6530	PIII 500; 14.1" XGA TFT; 64MB; 12.0GB; 24 Speed CD	£1829	£2149.08
LB E6540	PIII 600; 14.1" XGA TFT; 64MB; 12.0GB; 24 Speed CD	£1899	£2231.33
LB X7550	PIII 650; 15.1" XGA TFT; 128MB; 12.0GB; DVD; LS-120	£2679	£3147.83

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## Iiyama VisionMaster Pro 410



**ANYONE WHO IS** familiar with the name Iiyama will know that this Japanese company has a reputation for producing high-quality display units. However, you may also know that its monitors have been criticised in the past for their power regulation. Thankfully, it would seem that Iiyama has addressed this problem as the VisionMaster Pro 410 put in a fine performance in our regulation tests.

The tube comes in the form of a

Mitsubishi 17in Natural Flat model, with a 0.25mm aperture-grille pitch. The viewable area is 15.9in and the screen reflectivity is thankfully low. As with all aperture-grille monitors this one exhibits the ubiquitous damping wires that some users may find distracting. This aside, the tube provides excellent image quality and its ability to display images with vibrant colours and in sharp focus is very commendable, only being eclipsed by Sony's Multiscan E200. The resolution specifications are decent too, managing a comfortable 1,280 x 1,024 at 85Hz, and an eye-

straining 1,600 x 1,200 at 75Hz.

The styling is characteristic of all Iiyama monitors, with clean lines and a fascia that bears its old three-button OSD controls. These are not the most intuitive and can only be navigated in a long-winded manner because the buttons have multiple functions. That said, the four menus do include geometry controls, horizontal convergence correction, moiré reduction and a colour control with three pre-set options and

one user-defined option where only the red and blue levels can be adjusted.

BNC inputs are provided at the rear, however, you'll have to use the clumsy OSD to switch between them. On the plus side, these connections along with the power lead are recessed and allow the unit to be pushed up against a wall.

Although the design is perhaps looking a little outdated now, it is difficult to fault the VisionMaster Pro 410 especially in terms of the overall visual result. With the added bonus of BNC connectivity and a non-captive D-SUB lead – which the Sony display lacks – the Iiyama VisionMaster Pro 410 is undoubtedly one of the best 17in monitors around.

## DETAILS

**PRICE** £276.12 (€235 ex VAT)

**CONTACT** Iiyama 01438 314 417

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

**PROS** Excellent image quality and colour vibrancy

**CONS** That awkward OSD

**OVERALL** The 17in CRT of choice at an attractive price

**IMAGE QUALITY** ★★★★★  
**CONTROLS** ★★★★★  
**VALUE FOR MONEY** ★★★★★  
**OVERALL RATING** ★★★★★



## Glossary of monitor terms

**Aperture grille** Instead of fine holes like a shadow mask, this display uses a mask of very fine vertical wires held in place by two just visible horizontal damping wires. No masking in the vertical direction leads to a brighter and more vivid picture.

**Barrel distortion** Defines the straightness of the sides of the image area – called barrel, because of the convex appearance of the image area.

**Bezel** The part of the monitor casing that surrounds the edges of the screen, effectively framing the picture.

**BNC connectors** The five separate connections around the back of some monitors. These are in place to separate the video signals into red, green, blue, and horizontal and vertical synchronisation signals. This decreases interference as the signals are shielded from each other.

**Cathode-Ray Tube (CRT)** A partially evacuated tube, whereby electrons striking an internal phosphorescent coating form a picture.

**Convergence** Describes how well the three colour guns (red, green and blue) intersect at each pixel. The better the guns converge, the more closely the colours overlap, creating a sharper image.

**Degaussing** The removal of magnetic fields that have built up within the display. These fields cause image or colour distortion and are either degaussed by an internal coil when the computer is turned on, or by manually selecting a degauss option.

**D-SUB connector** Standard video cable that may already be connected internally to the monitor (known as captive), or it may plug independently into the monitor's D-SUB port.

**OSD (on-screen display)** Graphical interface in which the user selects screen adjustment options usually using the buttons on the front of the monitor.

**Pincushion distortion** Inverse of barrel where the distortion resembles a pincushion, in that the sides of the image area have a concave appearance.

**Refresh rate** The rate at which the screen is redrawn, measured in cycles per second or Hertz (Hz). If the rate is not high enough the human eye will detect the decay in screen brightness between refresh cycles – known as flicker. Flicker is noticeable below a refresh rate of 75Hz.

**Screen regulation** How well the screen can control the electron beam between areas of high-beam intensity and low-beam intensity. Determined by flashing white

areas against a black background.

**Shadow mask** A sheet of alloy – usually the iron-nickel alloy invar, used because of its low thermal expansion properties – perforated with many small holes into which the beams from the three guns converge. This sits in front of the phosphor layer.

**Streaking and ghosting** Another indicator of the quality of the beam intensity electronics. When the beam is scanned from a high-intensity area (white) to a low-intensity area (black) the beam has to switch from on to off. If this is not precise then the white area will appear to streak or ghost into the black area.

**VESA (Video Electronics Standards Association)** An association of companies that co-operate in establishing common standards for video display systems.

## LG Flatron 795FT Plus



**CONVENTIONAL CRTS** are still based on a screen that is formed from part of a glass sphere – or a cylinder for Sony's Trinitron displays. However, some screens are designed with a completely flat front surface such as Mitsubishi's Diamondtron NF and FD Trinitrons. Although these tubes can produce wonderful results, the internal surface remains curved to compensate for beam diffraction. This is where the LG Flatron differs as both sides of its tube are flat.

This produces a screen that has excellent non-reflective properties.

The 795FT Plus borrows technology from both aperture-grille and shadow-mask designs, in that it uses a 'slot mask' whereby a mask with slots rather than holes is used in front of the phosphor. The stripe-pitch is rated at 0.24mm, equivalent to a 0.25mm dot-pitch tube. The Flatron 795FT has a 16in viewable diagonal and reaches an unusable maximum resolution of 1,600 x 1,200 at 77Hz. It handles all other VESA resolutions with ease.

Considering tube performance, the image is not as bright as other aperture grilles. Focus is slightly lost in the corners of the screen and vertical resolution is not the finest.

Geometry, however, cannot be faulted. The only area where the LG really trips up is in regulating the screen's power and electron beams. It was nevertheless a little more stable than the Mitsubishi and Taxan offerings.

The OSD is one of the simplest to navigate because the touch-sensitive

controls are a pleasure to use, as well as being laid out on the fascia in the same fashion as the icons in the OSD menus.

Colour convergence is adjustable in both planes, while there are settings for moiré correction and overall colour purity, together with a couple of extra pincushion geometry options.

Connectivity is dealt with by a non-captive D-SUB lead along with one upstream and four downstream ports at the expense of BNC connections. Two USB cables are included.

The LG Flatron 795FT Plus employs different technologies, but this comes at a price as this is the most expensive model in the group test.

### DETAILS

**PRICE** £340.75 (£290 ex VAT)

**CONTACT** LG Electronics  
01753 500 400

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

**PROS** Touch-sensitive controls; self-explanatory OSD; non-reflective screen

**CONS** Expensive; poor power regulation

**OVERALL** An innovative display but with a premium price to match

IMAGE QUALITY	★★★
CONTROLS	★★★★★
VALUE FOR MONEY	★★
OVERALL RATING	★★★★

## Mitsubishi Diamond Plus 73



**JOINING MITSUBISHI'S** expanding line-up of Diamondtron NF (Natural Flat) colour monitors, the Diamond Plus 73 sports a vibrant aperture-grille display, housed in a case that lacks some of the design *finesse* seen elsewhere. That said the bezel does frame the tube with enhancing narrow borders.

For this price the grille pitch is an admirable 0.25mm, and it does not vary from the screen's centre to the corners. Indeed the resolution was good in all

areas of the display, passing every sharpness and resolution test. As for maximum resolution, your graphics card need not worry as the Diamond Plus 73 can only handle 1,280 x 1,024 at a flickery 66Hz, but it comfortably achieves the standard 1,024 x 768 at 85Hz. Anti-glare was fine, while colour fading was constant and colour purity rich and even.

By far the worst results were obtained when testing the Diamond Plus 73's power regulation. This revealed a gun untamed by its electronics, failing all of DisplayMate's regulation tests with the entire screen expanding in bright areas and contracting in dim areas.

On the front are three buttons that give you simple access to the basic OSD. Most of the usual display controls are present but to keep costs down Mitsubishi has left out advanced controls such as moiré, and colour convergence – a shame because the colour registration was off in both directions. Nevertheless, the available settings can be adjusted very finely and

not in jerky steps as with other displays. Still, this didn't help us with geometry correction as we had difficulty centring the display within the bezel and removing an intrinsic vertical and horizontal curvature to the picture.

The only thing that's around the back is a captive D-SUB lead.

Even though the Mitsubishi Diamond Plus 73 uses a Diamondtron Natural Flat tube it didn't perform to the standards we are used to seeing from Mitsubishi. The best thing about this 17in is the price, but the Diamond Plus 73 will struggle to compete with the Hansol offering.

### DETAILS

**PRICE** £222.07 (£189 ex VAT)

**CONTACT** Mitsubishi 01707 278 684

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

**PROS** User-friendly OSD; vibrant flat screen; attractive price

**CONS** Basic controls; poor power regulation and colour convergence

**OVERALL** A budget monitor that suffers from flaws that will be noticeable to the discerning end user

IMAGE QUALITY	★★★
CONTROLS	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★

## NEC MultiSync FE750



**WITH ITS NATURAL FLAT** aperture-grille tube and a narrow fascia, this is a fine looking monitor. It does, however, have one unusual aesthetic feature. At the bottom of the screen where the OSD controls are situated is a small piece of clear plastic displaying the MultiSync logo. The orange/green LED signalling the monitor's standby/on status is behind this so the logo changes colour with the light. Whether you like this feature is a matter of personal taste, but

at least it looks different from the rest of the pack.

The OSD is menu driven and navigation is simple, with the monitor quick and easy to set up. The overall impression at this stage was that the image was reasonably focused across the screen, with well-represented vibrant colours.

As with the Belinea screen, the DisplayMate testing revealed a different side to NEC's entrant – again, both the testing and the general feel of the monitor should be borne in mind.

DisplayMate highlighted a degree of blooming and some defocusing towards the

periphery of the monitor. Screen regulation and general resolution across the image were also not up to the same standard as some of the other units. However, the anti-glare coating was excellent and colour fading was pretty much uniform across the spectrum, the geometry was outstanding, with no pincushion or barrel distortion and no evident horizontal or vertical curvature.

The MultiSync's lack of gun control was highlighted by the display being

prone to mid-range streaking. This weakness was further exemplified with problems in both a white-level and black-level shift. Basically this manifests itself in a slight change in what should be a uniform colour, due to the presence of other colours on the screen. Green colour purity was also not what it should have been, with the screen becoming slightly faded towards the corners.

At a price of £304.32 some of these performance issues should not have arisen. Having said that, for Windows use this is a perfectly adequate display, though you can get better quality for less cash.

### DETAILS

**PRICE** £304.32 (£259 ex VAT)

**CONTACT** NEC 0645 404 020

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

**PROS** Good colour representation and screen geometry

**CONS** Regulation and streaking proved to be a problem

**OVERALL** This display is adequate for general use, although there are monitors with better images for the money

**IMAGE QUALITY** ★★★

**CONTROLS** ★★★★★

**VALUE FOR MONEY** ★★★

**OVERALL RATING** ★★★

## Philips 107P



**ON PULLING THE** Philips 107P out of its box, the first thing that strikes you is the styling of the unit. With limited desk space in mind, the 107P is designed with a narrow back and sweeping flanks that curve to the front of the chassis. The bezel is also quite narrow making the screen look much bigger than it really is. On the front are some unusual silver OSD controls comprising four arrow keys and an 'OK' button. Even the flimsy on/off switch has had the silver paint

treatment. Around the back is an independent D-SUB socket and BNC connectors. No internal USB ports exist, although a USB base is available as an optional extra.

The tube is an aperture grille with a pitch of 0.25mm and a maximum resolution of 1,920 x 1,440 at a refresh of 60Hz – pointless considering that the only time you will ever use this setting would be out of curiosity. 1,280 x 1,024 at 85Hz is the highest practical resolution for this screen.

Our tests produced mediocre results pretty much across the board. Nowhere did the 107P

excel, but there are areas where it didn't do well, for example it faltered over blooming. This had a blurring effect on text and gave the whole screen a slightly soft feel. Geometry is another problem because the picture has an intrinsic curve to the left-hand side of the screen. The display was also sensitive to vibrations, wobbling when the bench was tapped. However, power regulation is adequate.

The OSD is intuitive, helping you

along with clear prompts, and the range of options is impressive with extra controls for precise purity adjustment. An 'Auto Calibrate' option regularly readjusts the luminance and black level with the colour settings to maintain their original relative values. The 107P is also the only monitor in this test to offer direct switching between the D-SUB and BNC inputs, albeit through a simultaneous press of the 'OK' and 'UP' buttons on the control panel.

On the whole, the Philips 107P isn't a bad monitor, but we expect better image quality from a company with a history in electron beam technology.

### DETAILS

**PRICE** £311.37 (£265 ex VAT)

**CONTACT** Philips 020 8665 6350

[www.pcstuff.philips.com](http://www.pcstuff.philips.com)

**PROS** Space-saving design; BNC/D-SUB direct switching; range of controls

**CONS** Blooming; geometrical imperfection; vibration-sensitive

**OVERALL** A monitor with an excellent set of controls, but a disappointingly average performance

**IMAGE QUALITY** ★★★

**CONTROLS** ★★★★★

**VALUE FOR MONEY** ★★★

**OVERALL RATING** ★★★

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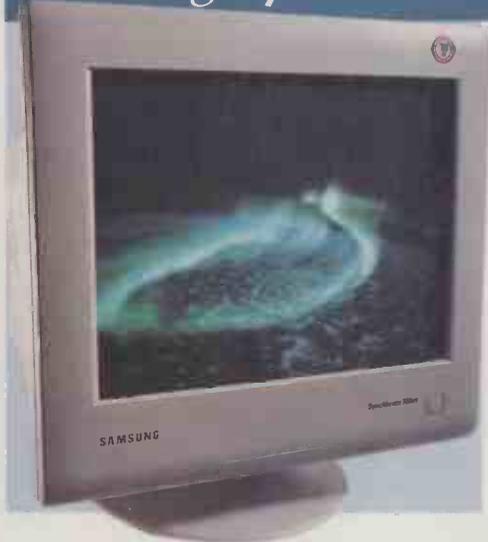
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## Samsung SyncMaster 700IFT



**ALTHOUGH APERTURE-**grille technology appears to be the preference in 17in monitors, with most of this month's entrants using it, the Samsung SyncMaster 700IFT has an Infinitely Flat Tube (IFT) shadow-mask screen.

The SyncMaster's fascia is quite plain and generally uninspiring. However, pressing the bottom of the fascia releases the OSD control buttons that swing out on a small block – a nifty feature indeed. The OSD is intuitive

and easy to navigate and covers all the usual geometry setup requirements, as well as allowing the input to be selected – so that two computers could be connected at the same time via the D-SUB and BNC connectors. Not included in this though are the contrast and brightness control wheels, which are situated under the front fascia. The accuracy of wheels for these settings is always preferable, despite the fact that they are no longer in vogue. Between the OSD and the wheels, the monitor was easily set up.

Putting the SyncMaster to the test with DisplayMate we found it was not too bad, but certainly not groundbreaking. The screen was fairly well in focus across the display and the anti-glare coating functioned adequately. As for geometry, although it passed all the tests, it excelled in none. There was minimal pincushion and barrel distortion, while vertical and horizontal curvature, although present, was minimal. Resolution was not the worst in the group, but a general focus

problem in the bottom left of the screen let the unit down. The Samsung did, however, pass the screen regulation tests with flying colours.

One of the biggest problems was colour. Colour scale fading consistency was fine, but there were general problems of colour streaking. This may have been partly due to the red gun's inability to give an even colour in the red colour purity test. There was also some black-level shifting, although it wasn't awful.

At £280.82 inc VAT, this monitor isn't too bad, but unfortunately other units of a very similar price outperform it and look better in general terms.

### DETAILS

**PRICE** £280.82 (£239 ex VAT)

**CONTACT** Samsung 020 8391 0168

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

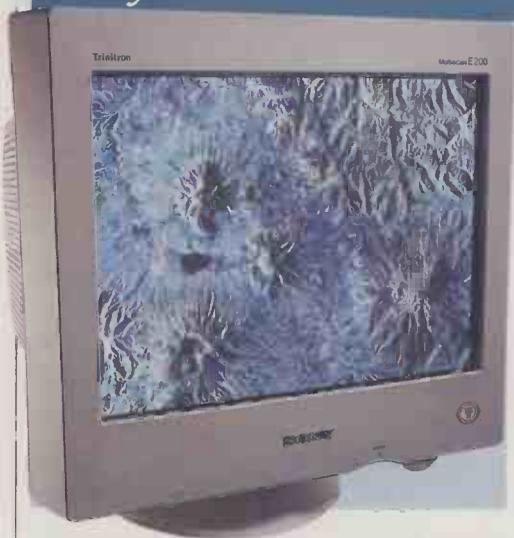
**PROS** BNC input, good screen regulation

**CONS** Mediocre performance

**OVERALL** The input options give this unit versatility. But for a similar fee, a better and equally versatile monitor is available from Iiyama

**IMAGE QUALITY** ★★  
**CONTROLS** ★★  
**VALUE FOR MONEY** ★★  
**OVERALL RATING** ★★

## Sony Multiscan E200



**SONY REQUIRES** little introduction when it comes to CRTs. Having invented the vertically flat Trinitron tube, it has also brought us a truly flat display in the form of the FD Trinitron. Built around this technology, the Sony Multiscan E200 is an entry-level model and, as such, its specifications are not the highest. Lacking any BNC inputs, the E200 also has a captive D-SUB lead so if this goes wrong, the whole unit will have to be returned. The maximum

supported resolution is also limited to 1,280 x 1,024 refreshing at 81Hz. However, a setting above this will rarely be needed on a monitor of this size.

As for image quality, the E200 delivers the wonderfully rich colours that we have come to expect from this type of aperture-grille tube. Colour fading is uniform while contrast is particularly good, covering a wide intensity range from the darkest black to a brilliant white. This gives rise to excellent greyscale performance attributable to a near perfect balance that Sony has struck between the E200's darkly tinted

glass and beam intensity. The E200 did show some evidence of streaking and ghosting, but this was minimal. Text appears very sharp in all corners of the screen, while reflections are hardly noticeable. Geometry is praiseworthy, but, surprisingly, vertical colour registration was not quite as spot on as the Iiyama screen. However, Sony does give you both horizontal and vertical convergence controls.

Styling is of a typical Sony standard

with the screen surrounded by a narrow and shallow bezel that enhances its apparent size. At first glance, the only control seems to be a power switch, but on closer inspection, you'll find a small four-way joystick facing downwards from the base of the bezel. Moving it will navigate you through the OSD and pressing it makes selections. This is a bit tricky at first due to its light operation, but you soon get used to it.

The Sony Multiscan E200 achieved a slightly higher score in our tests than the Iiyama VisionMaster Pro 410, but not by much. Restrictions to connectivity means that the Multiscan E200 just misses out on our Editor's Choice.

### DETAILS

**PRICE** £276.12 (£235 ex VAT)

**CONTACT** Sony 0990 424 424

[www.sony-cp.com](http://www.sony-cp.com)

**PROS** Image vibrancy and colour purity

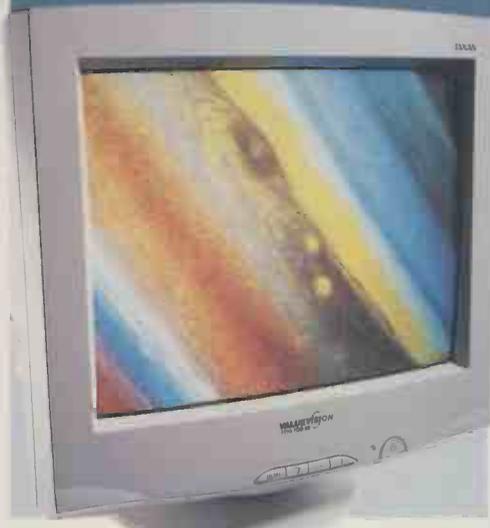
**CONS** Captive D-SUB lead and lack of BNC connectivity

**OVERALL** A very competent tube; with a vast heritage behind it. Although it's let down by limited connectivity it's still worth a look

**IMAGE QUALITY** ★★★★★  
**CONTROLS** ★★★★★  
**VALUE FOR MONEY** ★★★★★  
**OVERALL RATING** ★★★★★



## Taxan Valuevision 1710 TCO99



**THE TAXAN VALUEVISION** range of monitors, as the name suggests, target the value-oriented monitor buyer. However, having the word value in the name of a monitor makes one think that the quality isn't up to scratch even if that isn't the case. Unfortunately, in this instance the quality was disappointing. As the cheapest monitor in the group test, though, value is perhaps apt.

The unit is TCO99 certified, so there's no scrimping on emissions

issues. But apart from this, and the overall aesthetically pleasing shape of the fascia, there is little to recommend this monitor.

The first problem we encountered involved the setup. The OSD is accessed through four buttons unobtrusively situated on the front of the monitor, and proved easy to navigate. However, when the OSD is used there are problems: first, its presence on the screen causes the image to expand due to the intensity of the OSD; and second, when the brightness and contrast are set correctly and the OSD is switched off, the dynamic of the image (minus the

OSD) changes, making the brightness and contrast settings incorrect. In other words, setup can only be done by best guess rather than accurately.

DisplayMate only served to further prove the weaknesses of the Valuevision. The display was prone to defocus and blooming. The geometry was adequate, but not nearly as accurate as some of the other models. The biggest failure was, of course, regulation; its failings on all the regulation tests sheds some light

on the OSD setup problems. Also troubled was horizontal line and corner resolution. At 1,280 x 1,024, maximum refresh was 67Hz making the VESA maximum viewable screen resolution only 1,024 x 768.

There were things the Valuevision did well, namely a general lack of streaking and ghosting and relatively pure colour representation, but overall this unit did not represent good value for money. We were unable to set up the display correctly, so it's impossible to recommend the 1710, which is a shame when you consider Taxan's usually high-quality displays.

### DETAILS

**PRICE** £163.32 (£139 ex VAT)  
**CONTACT** Taxan 01344 484 646  
[www.taxan.co.uk](http://www.taxan.co.uk)

**PROS** Aesthetically pleasing fascia; and good OSD navigation

**CONS** Appalling regulation reduced setup to guesswork

**OVERALL** With an OSD that hindered an effective setup, there is little about this monitor to recommend it

IMAGE QUALITY	★★★
CONTROLS	★
VALUE FOR MONEY	★
OVERALL RATING	★★

## ViewSonic PF775



**EMPLOYING A SONICTRON** aperture-grille absolute flat tube, the ViewSonic PF775 image was pretty impressive from the moment it was turned on. The colours were bright, the image sharp and that was before we had even set it up optimally.

The minimal recessing of the screen from the fascia increases the overall flat look of the screen, although the bezel is quite big and square, giving the illusion of a smaller screen size than some units.

The OSD was not the most intuitive system, with two of the four buttons situated below the screen used to select features, rather than one. Frequent pressing of the wrong select button was a little irritating, but once this aspect was mastered, setting up this display was a simple operation. The OSD has all the necessary options for manipulation to an optimal image – although a curve existed on the top edge of the screen that could not be removed.

Intrigued by some of the results on other screens with DisplayMate, we found the ViewSonic to perform fairly well

across the tests. The anti-glare coating was good and text was in focus across the screen. The geometry was fine, with minimal pincushion and barrel distortion, although there was some horizontal curvature. The bane of the Taxan, screen regulation, was very good on the ViewSonic, with only minimal movement of the pixel-thick lines that were edging a white flashing image. Overall resolution was good, although horizontal lines were better resolved

than the vertical lines, which were also not wonderfully sharp in the corners. A high degree of gun control was evident in the video bandwidth test, as well as in colour registration tests. Colour purity was commendable, with regular colour across the whole display from each gun. But no monitor is perfect, and the ViewSonic suffered from slight streaking problems, specifically coming from pure white, which streaked in almost every instance.

Despite this, though, at £280.82 inc VAT, TCO99 certification, good colours and a fine image, the PF775 is a good-quality monitor.

### DETAILS

**PRICE** £280.82 (£239 ex VAT)  
**CONTACT** ViewSonic 01293 643 900  
[www.viewsonic.co.uk](http://www.viewsonic.co.uk)

**PROS** Good focus, regulation and colours  
**CONS** Square bezel gives the impression of a smaller screen

**OVERALL** A good-quality monitor, only a whisker behind this month's winners. Certainly worth checking out if you're in the market for a 17in monitor

IMAGE QUALITY	★★★★
CONTROLS	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

## Table of features

MANUFACTURER	ADI	BELINEA	CTX	HANSOL	IYAMA
MODEL	MICROSCAN G710	10 30 50	PR705F	710D	VISIONMASTER PRO 410
Price (ex VAT)	£229	£260	£189	£179	£235
Price (inc VAT)	£260	£304.33	£222	£210	£276.12
URL	<a href="http://www.adimicroscan.com">www.adimicroscan.com</a>	<a href="http://www.belinea.co.uk">www.belinea.co.uk</a>	<a href="http://www.cbmonitors.com">www.cbmonitors.com</a>	<a href="http://www.hansol-tik.com">www.hansol-tik.com</a>	<a href="http://www.iyama.co.uk">www.iyama.co.uk</a>
Tube type	FD Trinitron aperture grille	CRT shadow mask	FD Trinitron aperture grille	FST shadow mask	Diamondtron NF aperture grille
Nominal tube size	17in	17in	17in	17in	17in
Actual viewable diagonal	16in	16in	16in	16in	15.9in
Dot/grille pitch	0.24mm	0.26mm	0.24mm-0.25mm	0.25mm	0.25mm
<b>POWER CONSUMPTION</b>					
Power consumption (max)	130w	95w	125w	85w	110w
Power consumption (standby)	15w	Less than 15w	15w	Less than 65w	10w max
Power consumption (suspend)	5w	Less than 3w	5w	Less than 15w	10w max
Power consumption (off)	N/A	N/A	N/A	Less than 5w	5w max
<b>AVAILABLE CONNECTIONS</b>					
USB hub (upstream ports, downstream ports)	1 x U, 4 x D	X	X	X	X
Integrated microphone	✓	X	X	X	X
Video outputs	Captive D-SUB	Captive D-SUB	Captive D-SUB	Captive D-SUB	D-SUB, BNC
<b>REFRESH RATES</b>					
Maximum VESA refresh rate at 1,024 x 768 (Hz)	85	85	85	85	85
Maximum VESA refresh rate at 1,280 x 1,024 (Hz)	85	85	81	85	85
Maximum VESA refresh rate at 1,600 x 1,200 (Hz)	79	77	N/A	75	75
Manufacturer's proposed maximum resolution/refresh rate (Hz)	1,600 x 1,200/75	1,600 x 1,200/64	1,600 x 1,200/67	1,600 x 1,200/75	1,600 x 1,200/75
<b>OTHER INFORMATION</b>					
Dedicated front-panel input select	X	X	X	X	X
Highest emissions compliance	TCO99	TCO99	TCO99	TCO99	TCO99
Dimensions (mm) (w x h x d)	439 x 441 x 441	420 x 428 x 454	418 x 448 x 447	418 x 417 x 419	412 x 424 x 420
Net weight	21kg	18.1kg	20kg	17kg	21kg



## How we did the tests

Monitors need a carefully controlled environment for accurate and fair testing. For this group test we used a dual setup of two identical PCs, both equipped with Matrox Millennium G400 graphics cards as they are considered to give the best 2D display performance. The choice of graphics card is important,



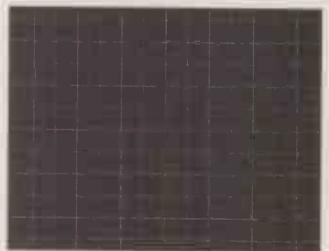
DisplayMate Master test

since if the monitor isn't being fed with a high-quality signal it can never give its best. We used two systems in testing so that we were able to make instant and accurate A-B comparisons without having to mess about with disconnecting and reconnecting cables, or using signal-degrading splitters.

As important as the graphics card driving a monitor, or the software used in testing, is the physical testing environment. A monitor relies on magnetic fields to steer its electron beams and produce a picture. Consequently, any monitor is susceptible to external magnetic fields, and these can both distort geometry and affect colour. Although this is more pronounced in larger screens, 17in

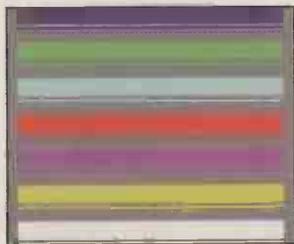


Colour fading consistency test

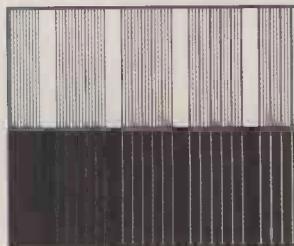


Geometric linearity test screen

LG	MITSUBISHI	NEC	PHILIPS	SAMSUNG	SONY	TAXAN	VIEWSONIC
FLATRON 795FT PLUS	DIAMOND PLUS 73	MULTISYNC FE750	107P	SYNCMaster 700IFT	MULTISCAN E200	VALUEVISION 1710 TCO 99	PF775
£290	£189	£259	£265	£239	£235	£139	£239
£340.75	£222.07	£304.32	£311.37	£280.82	£276.12	£163.32	£280.82
<a href="http://www.lge.com">www.lge.com</a>	<a href="http://www.mitsubishi.com">www.mitsubishi.com</a>	<a href="http://www.nec.co.uk">www.nec.co.uk</a>	<a href="http://www.pcstuff.philips.com">www.pcstuff.philips.com</a>	<a href="http://www.samsung.com">www.samsung.com</a>	<a href="http://www.sony-cp.com">www.sony-cp.com</a>	<a href="http://www.taxan.co.uk">www.taxan.co.uk</a>	<a href="http://www.viewsonic.com">www.viewsonic.com</a>
FST 'slot mask'	Diamondtron NF Aperture grille	NF aperture grille	Flat aperture grille	IFT shadow mask	FD Trinitron aperture grille	FST shadow mask	PerfectFlat aperture-grille
17in	17in	17in	17in	17in	17in	17in	17in
16in	16in	16in	16in	16in	16in	16in	16in
0.24mm	0.25mm	0.25mm	0.25mm	0.24mm (diag)	0.24-0.25mm	0.27mm	0.25mm
130w	100w	75w	92w	120w	120w	Less than 100w	130w
8w	N/A	N/A	Less than 11w	60w	15w	Less than 15w	N/A
8w	Less than 15w	Less than 15w	Less than 11w	Less than 15w	15w	Less than 5w	15w
3w	Less than 5w	Less than 5w	Less than 2.4w	Less than 3w	3w	Less than 5w	3w
1 x U, 4 x D	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X
D-SUB	Captive D-SUB	Captive D-SUB	D-SUB, BNC	D-SUB, BNC	Captive D-SUB	Captive D-SUB	D-SUB
85	85	85	85	85	85	85	85
85	N/A	85	85	85	81	N/A	85
77	N/A	77	79	79	N/A	N/A	77
1,600 x 1,200/75	1,280 x 1,024/66	1,600 x 1,200/65	1,920 x 1,440/60	1,600 x 1,200/75	1,280 x 1,024/81	1,280 x 1,024/65	1,600 x 1,200/77
X	X	X	✓	X	X	X	X
TCO99	TCO99	TCO95	TCO99	TCO99	TCO99	TCO99	TCO99
415 x 439 x 435	403 x 420 x 420	403 x 427 x 440	399 x 410 x 419	415 x 438 x 418	404 x 414 x 420	408 x 377 x 425	417 x 430 x 450
21kg	18.8kg	16.5kg	19kg	18.8kg	20kg	15.5kg	20kg



Colour streaking test screen

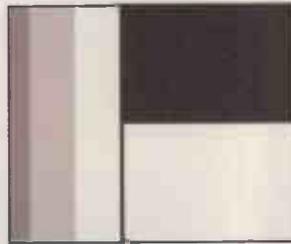


Video bandwidth test screen

monitors are also affected.

Even the earth's own magnetic field can have a subtle effect, so when testing, all the monitors were set up facing in exactly the same direction. We also made sure that each display on test was at least one metre away from any others, to avoid the possibility of any magnetic or electromagnetic interference (EMI): the same went for any other electrical equipment in the vicinity that might give off significant levels of EMI.

The units were all tested under constant, artificial light. Each monitor was given a warm-up period of one hour before we commenced testing, which is vitally important for



White-level shift test screen

any monitor, as both shadow masks and aperture grilles tend to expand as they are bombarded with electrons from the guns.

This variation is taken into account when monitors are factory-calibrated and image quality can be noticeably superior once a unit has properly warmed up.

Testing itself was done using the industry-standard DisplayMate utility by Sonera. Utilising a series of test screens (see examples left) each monitor undergoes an exhaustive set of tests and every aspect of image quality is examined, including geometry performance, focus, resolution, corner-to-corner consistency, power regulation, colour purity and linearity.

All the formal testing was performed at a resolution of 1,024 x 768 with a 75Hz refresh rate. As well as formal testing, however, we also looked at how subjectively usable the units were at higher resolutions where this was appropriate.

# Editor's Choice

As the previous pages show, not only are there a lot of monitors to choose from, but there are also a number of factors that will affect that choice. The monitors we tested ranged from the not-so-good to the excellent and the prices ranged from £163.32 to £340.75 inc VAT – a differential that we think you will agree is pretty big: meaning that the cheapest is less than half the price of the most expensive monitor.

The trap is to assume that, because all of the units are the same size, price is a convenient way to help you to choose the monitor you need. Unfortunately, it is not such a simple equation. If only it were the case that the most expensive was the best and the cheapest the worst – although in this case the cheapest definitely came off worst in the group.

What it ultimately comes down to is value for money. Some of the most interesting comparisons were between units of a similar price. Evaluating these was difficult, as we were aware that on a limited budget, performance and features would be the deciding factors.

There are four aspects to each monitor: image quality, controls, value for money, and an overall rating. Image quality was marked on test performance, image sharpness, colour representation, as well as overall impression of the display for general use. The controls score is based on the ease of use of the input method to access the OSD, as well as the navigation of the OSD and general ease of setup. Value for money reflects the price versus the performance,

while the overall score is based on all the criteria.

One thing to bear in mind when purchasing a monitor is that personal preference will obviously sway your choice. We had disagreements about a number of issues with the monitors in the group test: some of us preferred certain fascias and controls, and others were hated and found to be totally unintuitive. However, despite our personal tastes, the DisplayMate tests ensure that there is as much objectivity projected onto the scoring as is possible, with anything clearly failing a test being marked accordingly. Exemplary performance was a little harder to gauge, although we managed to thrash it out between ourselves to pick the winners.

One final thing should be borne in mind if you are looking to buy a monitor. Try to see it in the flesh so you know you are happy with it. After all, you'll be looking at it for a long time, so it's worth getting it right.

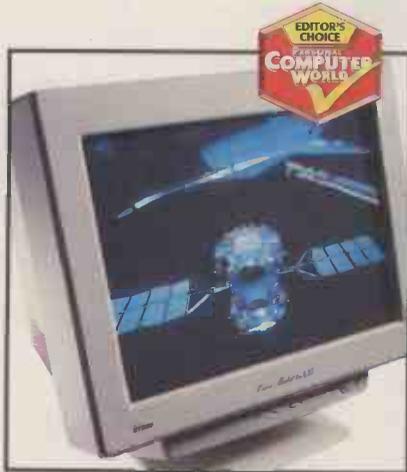
## The winners

For the ultimate prize of **Editor's Choice**, the eventual decision came right down to the wire. The final contenders battling it out were the Iiyama VisionMaster Pro 410 and the Sony Multiscan E200. Both units performed excellently, although the Sony did achieve a slightly higher overall DisplayMate score than the Iiyama. In addition to very similar ratings, both monitors occupy the same price bracket, which left us with no option other than to base our final decision upon features.

Both units employ aperture-grille screens, the Sony with its FD Trinitron screen and the Iiyama using a Mitsubishi Natural Flat screen; and both are excellent, with colour, focus and overall image quality first-rate.

Showing greater versatility than the Sony as regards input, the Iiyama entrant comes with BNC input as well as a non-captive D-SUB. The Sony, by comparison, only has a captive D-SUB cable for input from the PC. This may seem a small point to note, but in the event of a cable failure on a monitor with a captive D-SUB, the whole unit has to be returned to the manufacturer, with all the inconvenience that is likely to cause. In the end, therefore, the Iiyama VisionMaster Pro 410 is this month's Editor's Choice, with the Sony Multiscan E200 coming a close second, and winning this test's first **Highly Commended** award.

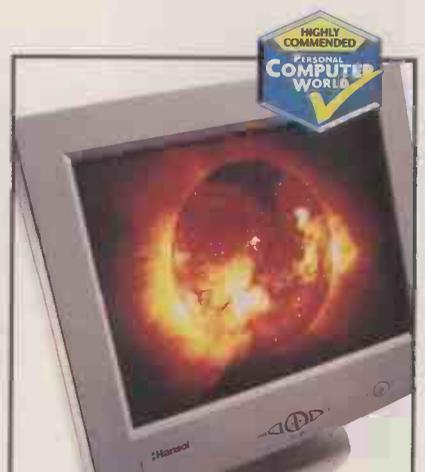
For the second **Highly Commended** award we looked to the budget end of the group. In general, we found the lowest-priced units did not represent good value for money, due to screen geometry issues, regulation problems and poor overall image quality. One monitor that did not suffer from these problems was the Hansol 710D, with its reasonable performance and sharp, lively screen image. The DynaFlat shadow-mask screen is virtually flat and geometry on the unit is overall quite good. It's certainly not as good a monitor as our first two winners, but at £210 inc VAT, this is the best value for money in the lower price bracket.



Iiyama's VisionMaster Pro 410 scoops Editor's Choice – an aperture-grille to thrill



Sony's Multiscan E200, with its excellent image quality, was pipped at the post



At the budget end, the Hansol 710D proved that the shadow mask isn't dead

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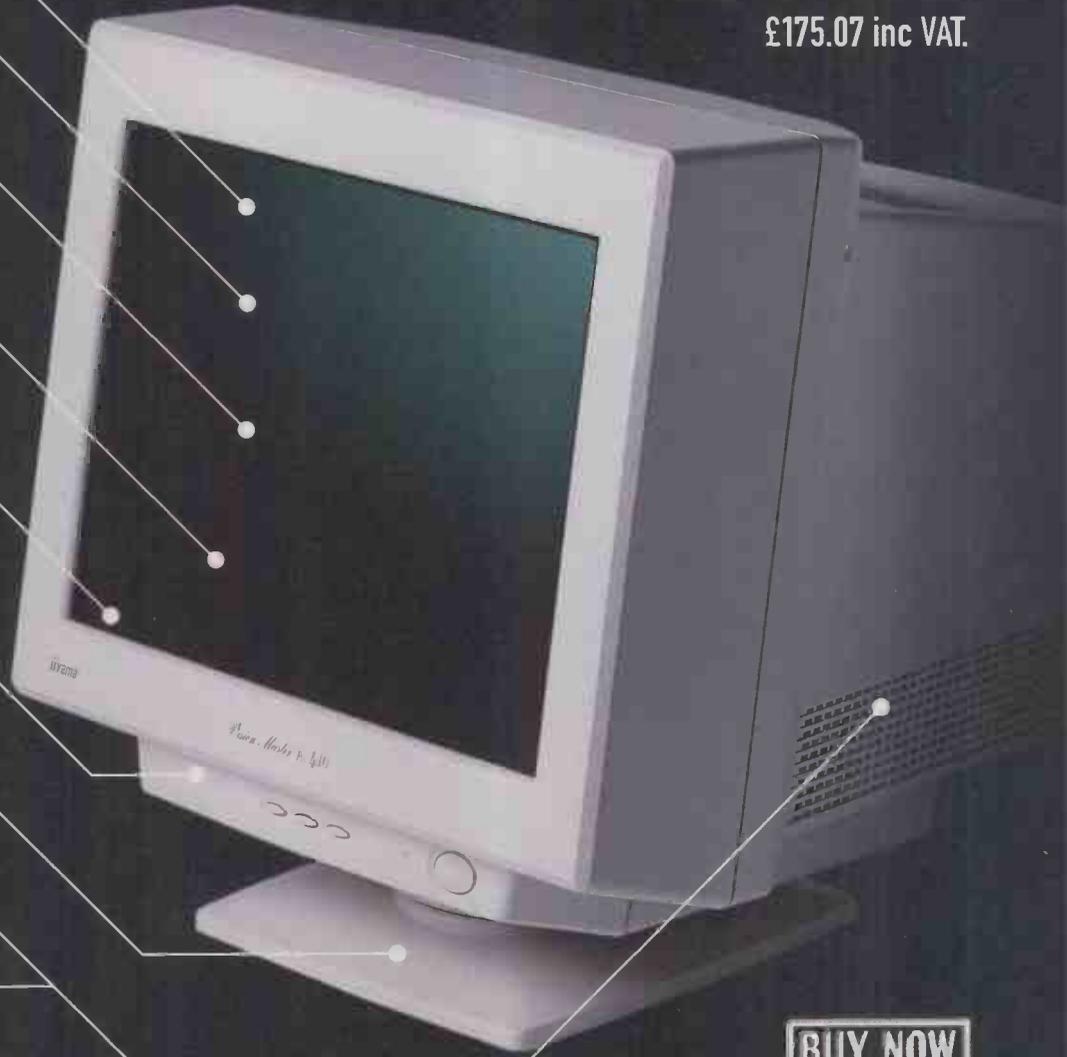
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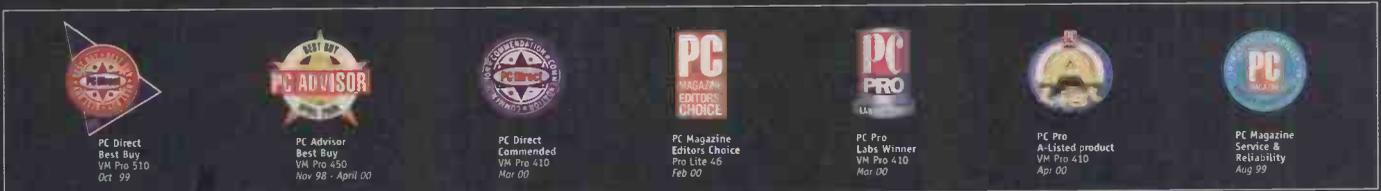
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PC World Bus. Direct - 01706 625411

Dabs Direct - 0800 138 5102  
Action Computer Supplies - 020 8843 4800  
Dan Technology - 0870 4447013

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\* Ziff Davis BrandTrak Wave 6  
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# Server

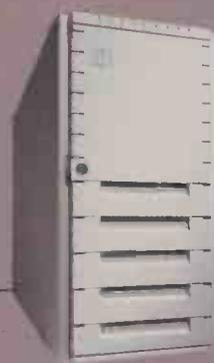
city

**M**any small businesses are now realising the benefits networking can bring to their productivity. SMEs (small to medium enterprises) represent a huge proportion of UK businesses and an extremely lucrative and rapidly growing market to manufacturers.

While some small businesses are still content with a simple peer-to-peer network, the majority are looking to the benefits of a client/server environment where they can centralise all their major applications such as email, databases or intranets. With all your shared resources now in one location, everyone suffers if the system fails, so it's no longer enough to be content with just using a PC as a server. Continued business operations depend on total reliability so nothing less than a purpose-built machine will do.

The small-business market will be split between those looking for their first server and companies wanting to upgrade to something more substantial. With this in mind we invited 10 manufacturers to submit a server that had the muscle to cope with up to 100 users and a maximum price limit of £2,000 ex VAT. To spice things up we made no requests for particular specifications, but left it entirely up to each vendor to decide what they thought would be suitable for the target market. The tight price restriction would require some juggling with components - would faster processors or more memory be a better bet than a RAID controller or more hard-disk storage? It was their call. Our challenge produced some interesting results, so turn the page to find out more.

**Many small businesses are looking to client/server environments to satisfy their networking needs, so we challenged 10 server manufacturers to come up with products to suit this growing market.**





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• PCs tested and reviewed by Dave Mitchell

## Compaq ML350



**FOR MANY YEARS** Compaq has been content to use the same chassis for its small-business and workgroup ProLiant servers that, although offering a unique modular assembly and excellent build quality, are looking somewhat dated. The ML350 is one of a new range of servers from Compaq that heralds a completely new design. Gone are the separate boards for processors and memory, replaced by a single main board, which produces a much tidier interior.

The ML350 on review came equipped with a single PIII 600EB processor but it does support dual processors up to 866MHz. The processor slots are located at the top of the motherboard with four DIMM sockets below them. The basic configuration comes with a single

128MB PC133 module that can be upgraded to 2GB. Compaq is yet another server vendor that has handed the job of core logic duties to ServerWorks. So the 'Intel inside' sticker literally only refers to the processors.

SCSI services plus network and graphics adaptors are all integrated, although the arrangement is most peculiar as Compaq has placed them all on a single, full-length daughterboard occupying the top PCI slot. Here, you have a Compaq NC3163 dual-speed network adaptor sitting alongside an ATi 3D Rage IIC PCI graphics chipset, so both monitor and network ports are on the same backplate. The hard disk subsystem is handled by a

Symbios 53C896 chipset that provides dual Wide-Ultra2 SCSI channels with support for up to 15 devices each and both connectors are located on the edge of the daughterboard. Coined a 'Server

Feature Board' by Compaq, it's not the most elegant solution, but this arrangement does have its advantages, as it would be a simple job to upgrade network, graphics and SCSI services in one fell swoop by installing new cards as Compaq makes them available.

Although the ML350 uses a similar internal design to HP's LC2000 it offers far fewer features. Cooling is limited to a single fan mounted on the rear panel, whereas the LC2000 uses no fewer than four in a single hot-swap assembly. Furthermore, the ML350 only comes with a single power unit, while many other vendors offer multiple redundant

supplies. Storage capabilities are more modest than most, with the ML350 using a small cage mounted at the front with room for four fixed hard disks. Two 9.1GB Compaq-branded Fujitsu hard disks were supplied but total storage can be increased to a healthy 72.8GB using four 18.2GB versions instead. Compaq also offers an optional hot-plug bay as well.

Operating system installation is helped along by Compaq's SmartStart utility, supplied on a bootable CD-ROM. The process kicks off by storing some basic configuration details on a server profile disk and then offers a choice of operating systems. We found this was fully up to date with options, not only for Windows 2000 Server and Advanced Server, but also for NetWare 5.1. A fair amount of CD-ROM swapping is required but we had the ML350 up and running inside a couple of hours.

Server management comes courtesy of Compaq's Insight Manager. This provides plenty of information about processors, memory and disk drives, as well as detailed information on operating temperatures and voltages. In addition, the XE version now supports web-based management. The information gathered can be linked to an alert log so that any error messages detected will cause the software to send out warnings to support staff by network broadcast, email or pager. Compaq's ASR2 (automatic server recovery) can also be called into play as it will automatically reboot the server and activate a pager number if a critical failure is detected.

With the review system costing a reasonable £1,724, the ML350 looks good value. The arrangement for gathering graphics, network and SCSI services on a separate board may not appeal to everyone, but this server impressed in the performance stakes taking fourth place in both Ethernet and Fast Ethernet tests.

## HARDWARE SPECIFICATIONS

Motherboard: Compaq  
Chipset: ServerWorks Entry ServerSet III LE  
FSB speed (MHz): 133  
Processor type/speed: Pentium III 600EB  
No of processors: 1  
Max processors: 2

## STORAGE

Hard disk: 2 x Fujitsu MAE3091LP  
Total capacity (unformatted): 18.2GB  
Controller type: Symbios 53C896  
Software: Compaq SmartStart, Insight Manager, ASR

## DETAILS

**PRICE** £2,026 (£1,724 ex VAT)

**CONTACT** Compaq 0845 270 4000

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

**PROS** Combines top performance and value with good management facilities and innovative design

**CONS** Minimal internal cooling and no support for redundant power supplies

**OVERALL** A fine specification for the price that delivers good performance. Quality management features, but look elsewhere if you want hot-swap power supplies and cooling fans

**BUILD QUALITY**  
**PERFORMANCE**  
**VALUE FOR MONEY**  
**OVERALL RATING**

★★★★  
★★★★  
★★★★  
★★★★

## Dan Dantum RAID/PP Server



**WITH THE DANTUM** RAID/PP Server, Dan has taken the same approach as Viglen by fitting a non-server-specific motherboard. However, the company has taken a bigger risk with the SuperMicro PIIIDME because this uses an Intel 840 chipset, which has had more than its fair share of troubles recently. Originally designed for expensive Rambus memory, the 840 was modified by Intel with a Memory Repeater Hub (MRH-S) allowing it to accept less costly SDRAM.

The PIIIDME offers a 133MHz FSB (front-side bus), but thanks to this modification it only has a 100MHz memory bus. Also, dual memory channels are designed to improve performance by interleaving, so memory modules must be installed in pairs. For the Dantum, Dan plumped for a pair of

128MB DIMMs leaving a couple of sockets spare for upgrades. Another point of note is that the MRH-S on 840 motherboards has had problems with ECC memory and a quick check in the Dantum's BIOS revealed this feature was disabled.

The PIIIDME is one of a family of four 840-based motherboards and, in terms of features, this is the weakest because it is the only one with no onboard SCSI. Instead you get two UltraDMA66 IDE channels that are not suited to server applications, purely because of the limited number of devices they can support. To overcome this, Dan has selected an Adaptec AAA-131U2 single-channel PCI RAID controller card.

This was linked to a triplet of 9.1GB Quantum Ultra160 hard disks and configured as RAID 1 mirror array with one of the drives standing in as a spare in case of failure. RAID 1 is designed for data protection, although with three drives up for grabs Dan could just as easily have configured them for RAID 5, which combines increased performance and fault tolerance.

Array creation requires the server to be booted from Adaptec's configuration floppy, after which

it can be managed and monitored from the operating system using the bundled CI/O software. We tested the array by cutting the power to one of the mirrored pair and, sure enough, the server started squawking loudly. The CI/O software then cut in and rebuilt the array in nine minutes using the spare drive, during which

time the server continued to function normally.

The Genie chassis looks a good choice as it's well built and offers plenty of room for expansion. Dan filled all four front 5.25in bays with three holding lockable UniStor hot-swap disk carriers, each with dedicated cooling fans and status indicators. A Toshiba IDE CD-ROM drive fills the fourth bay, but the Seagate TapeStor SCSI tape drive in the spare 3.5in bay looks more of a token gesture as its low backup speeds and native 4GB capacity are really only suited to PC backup.

The interior is reasonably tidy, with only the ribbon cables for the disk drives running across the motherboard. Up above is a massive internal disk cage with its own cooling fan and room for five more hard disks. Dual processors are supported and the Dantum is supplied with a single PIII 700MHz chip. Combining this with the healthy portion of memory undoubtedly gave Dan second place in both Ethernet benchtests (see performance results graphs later in the group test) although we would have expected it to be much closer on the heels of the Mesh 700L.

The only PCI slot in use is taken up by the RAID controller leaving two 64bit and three 32bit PCI slots free. One integrated component that has no place on a server is the sound chip linked to audio and MIDI ports on the rear panel. This is rather a waste but, as long as Dan is not charging you for the privilege, you can always ignore it.

The Dantum does offer a good specification for the price, but it comes in for the same criticisms as Viglen's system, mainly due to the choice of motherboard. The PIIIDME is not designed for servers, there are still issues surrounding the 840 chipset and general server management and monitoring tools are also particularly weak.

### HARDWARE SPECIFICATIONS

Motherboard: SuperMicro  
 Chipset: Intel 840  
 FSB speed (MHz): 133  
 Processor type/speed: Pentium III 700  
 No of processors: 1  
 Max processors: 2  
**STORAGE**  
 Hard disk: 3 x Quantum Atlas IV  
 Total capacity (unformatted): 9.1GB (mirror + spare)  
 Controller type: Adaptec AAA-130U2  
 Software: Veritas Backup Exec

### DETAILS

**PRICE** £2,148 (£1,828 ex VAT)

**CONTACT** Dan 0870 444 7020

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

**PROS** Quality Adaptec RAID controller with three hard disks and plenty of memory

**CONS** Motherboard not designed specifically for servers; lack of integrated SCSI controller; and tape drive has insufficient capacity and speed for server backup

**OVERALL** Although the RAID controller provides excellent levels of fault tolerance, this system would benefit hugely from a server-specific motherboard. The chassis offers good expansion potential, but management tools are almost non-existent

**BUILD QUALITY** ★  
**PERFORMANCE** ★★★  
**VALUE FOR MONEY** ★★  
**OVERALL RATING** ★★

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## Dell PowerEdge 2400



**THE POWEREDGE 2400** is Dell's top server product for small to medium-sized businesses and took over from the highly successful PowerEdge 2300 last year. The 2400 still uses the same large black chassis borne by its predecessor, but offers a greatly improved specification. Dell was one of the first server companies to drop Intel in favour of ServerWorks for core logic duties. The 2400 uses an Entry ServerSet III LE chipset that allowed Dell to claim it as the very first server on the market to offer a 133MHz front-side bus (FSB). This move was obviously a smart one as many other vendors including Hewlett-Packard and Compaq have followed suit. One of the main reasons for not implementing Intel's 840 chipset at the time was that it supported the more expensive Rambus memory that Dell

didn't think the server market was ready for. The ServerWorks chipset allows vendors to implement less costly PC133 SDRAM.

Dell also pioneered the tool-free design, so maintenance and upgrades can be carried out without needing a screwdriver. Thumbscrews are used throughout the 2400 and expansion cards are held in place using small plastic clips. With the side cover removed, you'll find a well-designed interior allowing upgrades to be carried out swiftly, so reducing server downtime. Dual-processor slots are mounted at the top of the motherboard and covered with a large plastic duct to direct the air flow where it's needed most. The

review model came fitted with a single 600MHz chip teamed up with 128MB of memory occupying one of the four DIMM slots alongside.

A unique feature is Dell's integrated

PERC/2i RAID controller built around an embedded 100MHz Intel 80960RX processor. A separate DIMM socket sits alongside for cache memory and the controller is activated by purchasing a special hardware key and inserting it in a slot

next to the memory modules. The RAID option was enabled on the review system and supported by 64MB of cache memory. For non-RAID operations, two SCSI chipsets are provided with an embedded Adaptec AIC-7880H servicing the 40-speed CD-ROM drive and two spare 5.25in bays. An AIC-7890 Ultra2 chipset looks

after storage and is placed in a large cage, accessible from the front, which supports six 1in or four 1.6in hard disks. Dell only offers active backplanes for the storage cage and these are fitted with their own Adaptec SCSI chipset and support hot-plug drives. Note that installing the RAID key will automatically disable the 7890 chipset. A pair of 9.1GB Quantum Atlas V drives were fitted and configured in a RAID 1 mirrored array, although these Ultra160 drives will be of limited value as the RAID controller cannot utilise the higher speeds.

The 2400 offers the best expansion slot options with no fewer than five 33MHz, 64bit PCI slots. A single ISA slot shares a mounting plate with one of them while an extra 32bit PCI slot is located at the base. Standard systems come with a single power supply but an optional distribution board can be fitted, allowing a pair of hot-swap supplies to be added to the recipe.

Dell offers a comprehensive range of server management and monitoring tools. A full array of sensors on the motherboard means administrators can keep in touch with operating voltages, temperatures and fan activity. An optional Dell Remote Assistant card equipped with its own processor and modem allows the server to be monitored and managed remotely. The RAID controller comes with its own array management utility that can also be used to look after remote systems. Local diagnostics are dealt with by Dell's OpenManage Resolution Assistant and a bootable Server Assistant CD-ROM ensures your chosen OS is installed without any problems.

Performance results for the 2400 were average, although faster processors and more memory would have remedied this. Even so, the 2400 does offer a lot of server for your money, and the integrated RAID controller is particularly impressive.

### HARDWARE SPECIFICATIONS

Motherboard: Dell  
Chipset: ServerWorks Entry ServerSet III LE  
FSB speed (MHz): 133  
Processor type/speed: Pentium III 600  
No of processors: 1  
Max processors: 2  
**STORAGE**  
Hard disk: 2 x Quantum Atlas V  
Total capacity (unformatted): 9.1GB (mirrored pair)  
Controller type: Dell PERC 2/Si  
Software: Server & Resolution Assistant

### DETAILS

**PRICE** £2,349 (£1,999 ex VAT)

**CONTACT** Dell 0870 152 4850

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

**PROS** Very well designed and built with plenty of management and monitoring tools. Good fault tolerance provided by integrated RAID controller and hot-swap drive bay

**CONS** Average performance and supplied Ultra160 drives of limited value

**OVERALL** Easy to install and manage with a fine specification for the price. Good levels of fault tolerance on offer and the high levels of component integration leave plenty of room for expansion

**BUILD QUALITY** ★★★★★  
**PERFORMANCE** ★★★★★  
**VALUE FOR MONEY** ★★★★★  
**OVERALL RATING** ★★★★★



evesham.com SE3200



**ALONG WITH TOSHIBA** and Mesh, evesham.com is sufficiently impressed with Intel's L440GX+ server motherboard that it has included it in its small-business server range. However, instead of using an Intel chassis as well it has opted to clothe the board in a box from Taiwanese-based In Win Developments. No, we haven't heard of this company either, but suffice to say that the IW-2000 chassis actually looks a better bet than the Intel

alternative that is used by Mesh.

Build quality is as good as the Astor II but the extra depth of the SE3200 allows it to offer a better designed and laid out interior. A large hot-swap disk cage at the front has room for up to six 1in hard disks and evesham.com generously supplied a pair of 18.2GB Fujitsu Ultra2 drives held in sturdy metal carriers. Up

above are three 5.25in bays with two home to an LG 40-speed IDE CD-ROM drive and a very useful OnStream ID30 tape drive. This is a better backup option than the HP T20 and DAT DDS-3 drives supplied elsewhere because, although it only offers a modest backup transfer rate of 60Mbytes/min, the sturdy cartridges have a high native capacity of 15GB, making the ID30 more suitable for high-capacity backup.

Physical security is better than on the Mesh server, since the front door can be locked to deny access to the hard disks, 5.25in bays and power and reset buttons. Dual power supplies provide limited fault tolerance as they are fitted in a special carrier that

uses a single plug socket so there's nothing to stop the server being unplugged and shut down accidentally.

There's more room to manoeuvre inside because the disk cage doesn't foul the motherboard, so all components are in the clear.

Normal SCSI services are looked after by an Adaptec AIC-7896N chipset, but evesham.com has fitted an Adaptec ARO-1130 RAID controller card. This uses the special RAIDport III slot and effectively upgrades the

embedded SCSI chipset to perform as a RAID controller.

A single slot supports up to 64MB of EDO cache memory, although evesham.com only supplied the minimum 2MB. With the RAID card linked to the disk cage backplane, the review system had the Fujitsu drives configured as a RAID 1 mirrored pair.

As they're perfect copies of each other, if one fails the system will continue uninterrupted using the other drive.

Monitoring is provided by Intel's Server Control, which gathers plenty of information about operating temperatures, cooling fan status and voltages from the motherboard sensors and displays it in an intuitive interface. Alert notification is extensive so you can configure Server Control to send a broadcast message if it spots a problem. In the event of a severe error or failure you can, for example, set it to close down the operating system and initiate a hardware reset or switch the server off completely.

Both the Adaptec RAID controller and embedded Intel network adaptor can be monitored and you can also keep an eye on other servers on the same network with the agent software installed. Adaptec provides a dedicated utility for managing the RAID controller as well, which offers an email option for notification of errors. The L440GX+ motherboard also offers a useful feature called PEP (Platform Event Paging) that is implemented in the BIOS. Should any significant system events occur frequently, the server can be configured to automatically call a pager using an external modem connected to one of the COM ports.

The SE3200 impressed in the benchtest stakes with SYSmark recording a respectable third place overall. Clearly, the L440GX+ motherboard is a speedy performer, although the differences between all the PIII 600MHz-endowed systems was relatively small. Even though the Mesh 700L stands out from the crowd for its higher specification, evesham.com's SE3200 looks a smarter long-term bet as the chassis is better designed and the RAID controller will pay dividends if you're running mission-critical applications.

#### HARDWARE SPECIFICATIONS

Motherboard: Intel  
Chipset: Intel 440GX  
FSB speed (MHz): 100  
Processor type/speed: Pentium III 600E  
No of processors: 1  
Max processors: 2

#### STORAGE

Hard disk: 2 x Fujitsu MAE3182LC  
Total capacity (unformatted): 18.2GB (mirrored pair)  
Controller type: Adaptec ARO-1130  
Software: Intel Server Control, OnStream Echo

## DETAILS

**PRICE** £2,349 (£1,999 ex VAT)

**CONTACT** evesham.com

0800 038 0800 [www.evesham.com](http://www.evesham.com)

**PROS** A solid server-specific Intel motherboard teamed up with a substantially better chassis than the Mesh's Astor. Good overall performance; tape drive included; and the Adaptec RAID controller is a worthy addition

**CONS** Local management and monitoring not as good as some

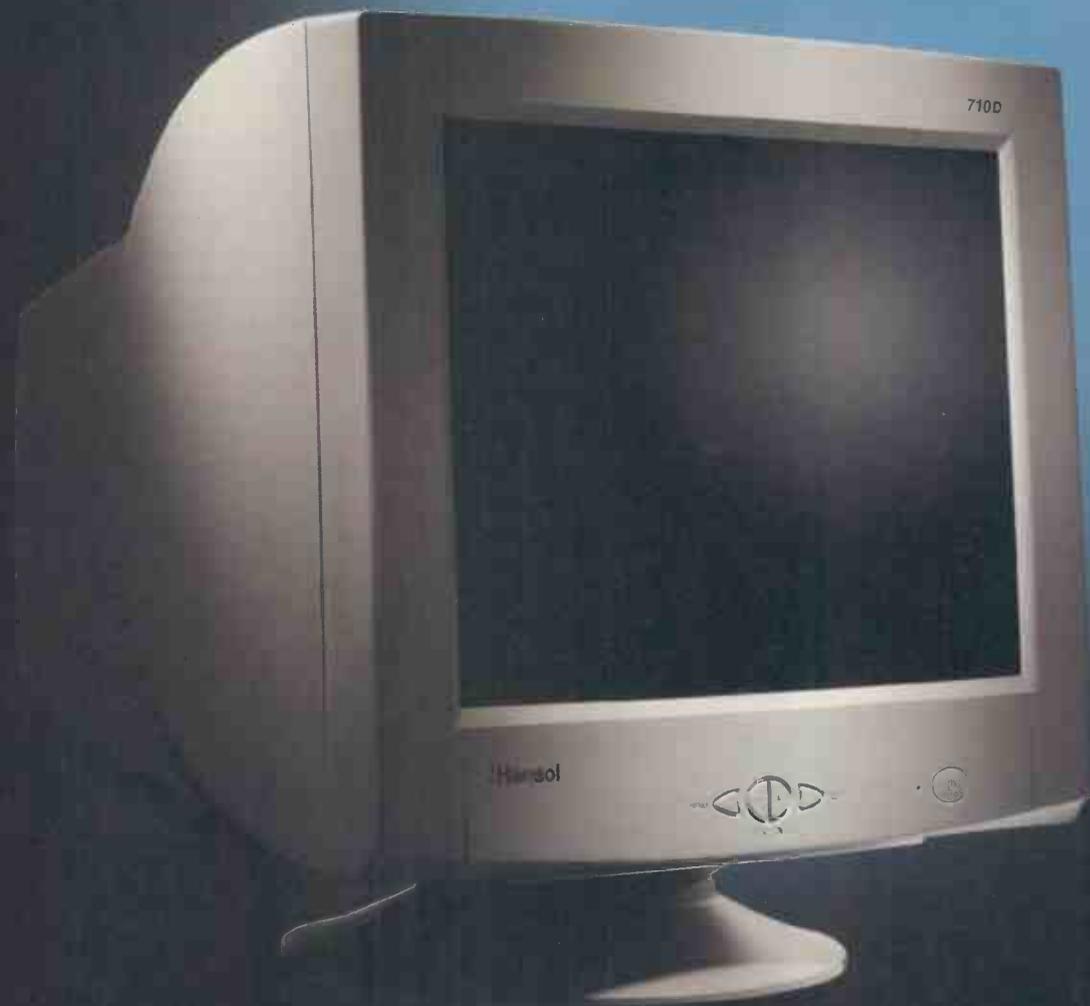
**OVERALL** A balanced specification that provides good performance and plenty of fault tolerance. Good choice of backup tape drive and all housed in a well-designed chassis

**BUILD QUALITY** ★★★★★  
**PERFORMANCE** ★★★★★  
**VALUE FOR MONEY** ★★★★★  
**OVERALL RATING** ★★★★★



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## Hewlett-Packard NetServer LC2000



**LAUNCHED AT THE** beginning of this year, the LC2000 is firmly aimed at small to medium-sized businesses, being as it is a replacement for HP's aging NetServer LC3. It's one of the largest servers on review and offers superb build quality and a completely revamped design. Dell may have pioneered the tool-free design, but HP caught on quickly as you can tell from this server. You don't need a screwdriver to remove or add any components because everything is secured using thumbscrews.

Three 5.25in bays sit behind the lockable front panel and are partnered by a large hot-swap disk cage beneath with room for up to six 1in hard disks. HP offers the least amount of storage for your money, though, as the review system only came supplied with a

single 9.1GB HP-branded Seagate hard disk.

Internally, the LC2000 displays some excellent design concepts. Behind the disk cage is a full-height assembly holding no fewer than four cooling fans. In the event of a failure the entire module can be released with a single thumbscrew and pulled out for swift replacement without having to power down the server. The only downside is the LC2000 is easily the noisiest server here.

HP's motherboard occupies the main part of the chassis and the processor slots are mounted next to the lower two fans for maximum cooling and are protected by a large metal cage. Both connectors for the Symbios Ultra2 SCSI

chipset, along with floppy and IDE channels, are located at the top of the board, so the ribbon cables can be routed underneath the top cover and kept well away from the motherboard.

One power supply comes as standard, but this can be teamed up with an optional second supply for increased fault tolerance, and the units are easily removed from the rear of the chassis.

Alas, the asking price for the review model we received only includes a

single PIII 533MHz processor but the LC2000 does support speeds up to 800MHz. The poorer processing power undoubtedly had an impact in the benchtest, as a glance at the performance charts later in this group test shows HP lurking down in the basement for both tests. However, the tests show clearly the effects different

components have on network performance, so a faster processor would undoubtedly have made an improvement. HP is another vendor that has dropped Intel in favour of ServerWorks with the LC2000 sporting the Entry ServerSet III LE core logic chipset which supports up to 4GB of PC133 SDRAM memory. Four DIMM sockets sit above the processors, with one holding a 128MB module.

Supplied on a bootable CD-ROM, HP's NetServer Navigator provides plenty of installation assistance while HP's Local TopTools for Servers offers a web-based interface for viewing server status and configuration. It provides a tidy row of tabbed folders so you can easily browse through CPU, memory and storage utilisation, view an event log and print reports on system status and configuration changes.

A new feature is Remote Administration (RA), which uses a dedicated serial port link for monitoring hardware on the motherboard. Local access to the server is via a null-modem cable or you can call in from a remote location using a modem link. RA allows the server to be controlled independently of the operating system and you can view statistics such as operating temperatures and voltages. If a fault is identified, RA can be configured to call a pager number from a predefined list.

Although Hewlett-Packard's LC2000 server offers less hardware for your money, in terms of build quality and design the machine is nothing less than a standard setter. Management tools are also particularly good, while redundancy and expansion potential are excellent. The performance issues mentioned in the review can easily be remedied with a higher specification so, if these features are important to you, then this system should definitely be on your shopping list.

**HARDWARE SPECIFICATIONS**

Motherboard: Hewlett-Packard  
Chipset: ServerWorks Entry ServerSet III LE  
FSB speed (MHz): 133  
Processor type/speed: Pentium III 533  
No of processors: 1  
Max processors: 2  
**STORAGE**  
Hard disk: Seagate ST39102LC  
Total capacity (unformatted): 9.1GB  
Controller type: Symbios 53C897  
Software: NetServer Navigator, HP TopTools

**DETAILS**

**PRICE** £2,089 (£1,777 ex VAT)

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

**PROS** Exemplary build quality and internal design; good expansion and fault tolerance, plus a host of remote management tools

**CONS** Weak specification resulting in low performance; very noisy cooling fans; only one year on-site warranty

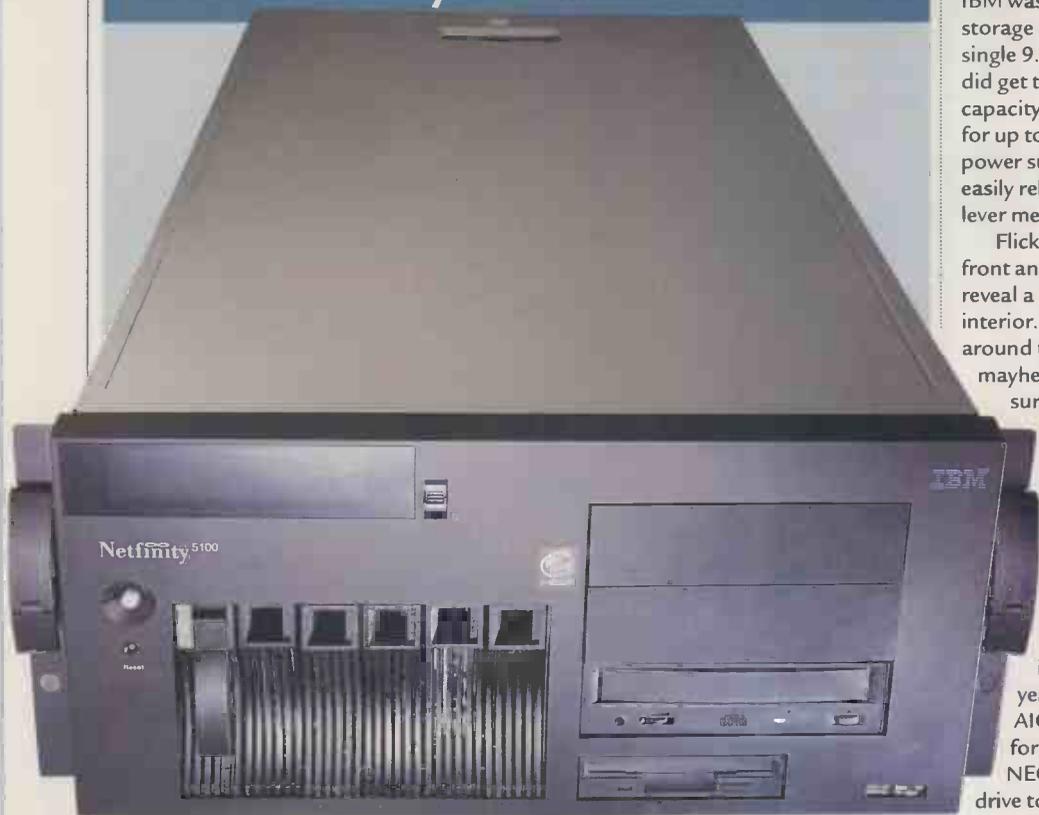
**OVERALL** A modest specification for the price but superb build and expansion potential makes the LC2000 a good choice as a long-term investment

**BUILD QUALITY**  
**PERFORMANCE**  
**VALUE FOR MONEY**  
**OVERALL RATING**

★★★★★  
★★  
★★★★  
★★★★



# IBM NetFinity 5100



IBM was the least generous in the storage stakes as it only supplied a single 9.1GB IBM Ultra2 hard disk. It did get top marks for power redundancy capacity, though, as the 5100 has room for up to three compact hot-swappable power supplies at the rear that are easily released with a simple clip and lever mechanism.

Flick down the small lever at the front and the top panel slides back to reveal a spacious and well-designed interior. All connectors are arranged around the edge keeping cable-related mayhem to a minimum. There are no surprises in the core logic department as ServerWorks (formerly Reliance Computer Corporation) gets the job with its Entry ServerSet III LE offering a 133MHz FSB and full support for PC133 SDRAM. IBM is a long-time supporter of the ServerWorks chipsets, having implemented it in its servers for a number of years now. An integrated Adaptec AIC-7899G chipset offers support for Ultra160 drives but, as with NEC, IBM chose to fit an Ultra2

drive to keep within our price limit. A single PIII 667MHz module fills one of the processor slots but Intel doesn't get the networking job as this is handled by an integrated AMD PCnet server adaptor. Add the 128MB of PC133 memory and you would expect a reasonable performance from the 5100. However, we were disappointed to see it lounging down in ninth place for the Ethernet test, although this did improve noticeably for the Fast Ethernet test. The network card can often be a bottleneck when under heavy load, so we added an Intel Pro100+ PCI server adaptor and reran the Fast Ethernet test. This clawed back only a few seconds but enough to raise the 5100 to fifth place.

**THE NETFINITY 5100** is one of a range of four servers from IBM that are aimed at budget-conscious businesses looking for a good combination of price and performance. Clothed in IBM's trademark black chassis, the 5100 is available in standard tower or rack-mount versions – we looked at the latter for this review. Standing at 5U, or 8.75in high, up to eight units can be placed in an industry-standard 42U high rack assembly. As

we've come to expect from IBM, build quality is among the best and its tool-free design enables swift upgrades and maintenance. For first-time installation, IBM provides its ServerGuide bootable CD-ROM. No operating system had been installed prior to delivery so we called upon this utility for assistance and found it very easy to use. It begins with a system scan and then loads the most appropriate drivers before installing your chosen network operating system. You also get plenty of other utilities including a driver disk and book factory, online help and a System Information Tool that gives you the lowdown on installed hardware. IBM's NetFinity Manager software links up with an

integrated Advanced System Management processor on the motherboard to provide detailed management and monitoring facilities. Although we found the Service Manager interface rather clunky, it does provide plenty of useful information. You can monitor system health, run hardware and software inventories and stay ahead of hard-disk failures with a Predictive Failure Analysis tool. Many of these features can be extended to remote systems running the NetFinity Client. Full alerting is provided, although this was complex to set up. However, if a problem is detected, the software can send a warning message, dial a pager or execute a program.

The front panel is endowed with a useful LED status display showing power and system status, the number of processors installed, network speed and activity, plus fault notification. The latter indicator ties in neatly with an LED panel on the motherboard called a 'light path indicator'. This shows any error conditions identified with the various system components, making it easy to locate the problem area. Below this is a large hot-swap disk cage with room for up to six 1in hard disks. Along with HP,

integrated Advanced System Management processor on the motherboard to provide detailed management and monitoring facilities. Although we found the Service Manager interface rather clunky, it does provide plenty of useful information. You can monitor system health, run hardware and software inventories and stay ahead of hard-disk failures with a Predictive Failure Analysis tool. Many of these features can be extended to remote systems running the NetFinity Client. Full alerting is provided, although this was complex to set up. However, if a problem is detected, the software can send a warning message, dial a pager or execute a program.

**HARDWARE SPECIFICATIONS**  
 Motherboard: IBM  
 Chipset: ServerWorks Entry ServerSet III LE  
 FSB speed (MHz): 133  
 Processor type/speed: Pentium III 667  
 No of processors: 1  
 Max processors: 2  
**STORAGE**  
 Hard disk: IBM DNES-309170Y  
 Total capacity (unformatted): 9.1GB  
 Controller type: Adaptec AIC-7899G  
 Software: ServerGuide, NetFinity Manager

## DETAILS

**PRICE** £2,290 (£1,949 ex VAT)  
**CONTACT** IBM 0990 727 272  
[www.ibm.com](http://www.ibm.com)

**PROS** Exemplary build quality and design. A wide array of management and monitoring software, plus a good specification that includes an Ultra 160 SCSI chipset

**CONS** Single 9.1GB Ultra2 hard disk; average performance. Management software is not the easiest to use and could do with updating

**OVERALL** A quality rack-mount server with good internal design and specification. Performance was not the best, but the 5100 can be easily upgraded with a wide range of options

**BUILD QUALITY** ★★★★★  
**PERFORMANCE** ★★  
**VALUE FOR MONEY** ★★★  
**OVERALL RATING** ★★★

## Mesh 700L



**INSTEAD OF** producing a server using a variety of off-the shelf components, Mesh has taken the simple expedient of sourcing not only the motherboard, but also the entire chassis from Intel.

The 700L comes clothed in Intel's Astor II server chassis, equipped with the same L440GX+ server motherboard as found in Toshiba's Magnia 3030. Since both components are specifically designed for servers, the 700L is very much up to the task at hand.

The Astor has a comparatively small chassis but offers plenty of room for expansion as it has a large hot-swap drive bay at the front, with room for five 1in high hard disks. One carrier was fitted with an 18.2GB Quantum Atlas Ultra2 drive and, once more drives are added, an LED status display alongside shows when they can be safely

removed without powering the server down.

As with the Magnia, one PCI slot supports a RAID controller, although in this case it'll be Adaptec's ARO range of PCI cards. Only two 5.25in. bays are provided and both were occupied by a Teac CD-ROM drive and an HP SureStore T20 tape drive. The latter offers transfer rates similar to the DAT DDS-3 tape drives supplied by NEC and Viglen, but the Travan TR-5 based cartridge's native capacity of 10GB is already being stretched by the supplied 18GB hard disk.

Chassis security is rudimentary. The side panel and hard-disk door need to be padlocked shut, although an intrusion switch can be fitted and

linked to the management software. If the chassis is breached for any reason, the software can be configured to lock the keyboard or even power the server down.

Internally, Mesh's 700L offers far less room than the Magnia 3030, mainly due to the depth the hard-disk cage extends into the chassis. A pair of large cooling fans are fitted to the rear and the entire assembly completely obscures access to the IDE

connectors. The single Ultra2 channel offered by the embedded Adaptec AIC-7896N chipset looks after the hard-disk cage while the Ultra Wide channel is linked to the tape drive.

Installation assistance is not provided by Mesh because the company's servers are generally configured with the required network

operating system before they are dispatched to the customer. However, benchtesting the 700L got off to a poor start as we were unable to network the server. The diagnostics tab on Intel's ProSet utility showed the adaptor drivers for the embedded Pro100+ chipset had failed to load and it was only after some extensive investigation that we found networking had been disabled in the Windows NT hardware profile. A bad slip-up on Mesh's part but, with this tick-box unchecked, the server proceeded to behave itself and promptly posted the best scores for the entire performance test. The 700L may only have a 100MHz FSB and PC100 memory, but the pair of PIII 700MHz processors and 256MB of memory clearly had a significant impact.

As you'd expect, management is well catered for with Intel's Server Control software, although Mesh forgot to include this so we had to borrow the copy supplied by Toshiba. Software agents can be installed to other Intel-based servers on the network allowing them to be monitored and controlled remotely from a single console. The server can also be accessed independently of the operating system as the 440GX+ board allows COM2 to act as an emergency management port (EMP). Console software for Windows 95/98 provides access either via a direct serial cable link or remotely over a modem and with this in action you can reset the server, power it off and on or view the motherboard sensor data.

There's no doubt that Mesh is offering a lot for your money, making the 700L a good choice for small businesses that happen to be on a tight budget. However, if you're prepared to sacrifice some memory and the second processor, you could choose HP's LC2000, for example, which offers far superior build, design and expansion potential.

## DETAILS

**PRICE** £2,231 (£1,899 ex VAT)

**CONTACT** Mesh 020 8208 4706

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

**PROS** Top performance for a low price; dual processors; 256MB of memory and plenty of storage

**CONS** Restrictive internal design; sloppy configuration prior to delivery

**OVERALL** A budget-priced server with a fine specification that delivers excellent network performance. Room for future expansion although internal design is cluttered

**BUILD QUALITY** ★★  
**PERFORMANCE** ★★★★★  
**VALUE FOR MONEY** ★★★★★  
**OVERALL RATING** ★★★★★

### HARDWARE SPECIFICATIONS

Motherboard: Intel  
 Chipset: Intel 440GX  
 FSB speed (MHz): 100  
 Processor type/speed: Pentium III 700  
 No of processors: 2  
 Max processors: 2

### STORAGE

Hard disk: Quantum Atlas 10K  
 Total capacity (unformatted): 18.2GB  
 Controller type: Adaptec AIC-7896N  
 Software: Intel Server Control. Stac  
 Replica Backup

## Choosing the right network infrastructure

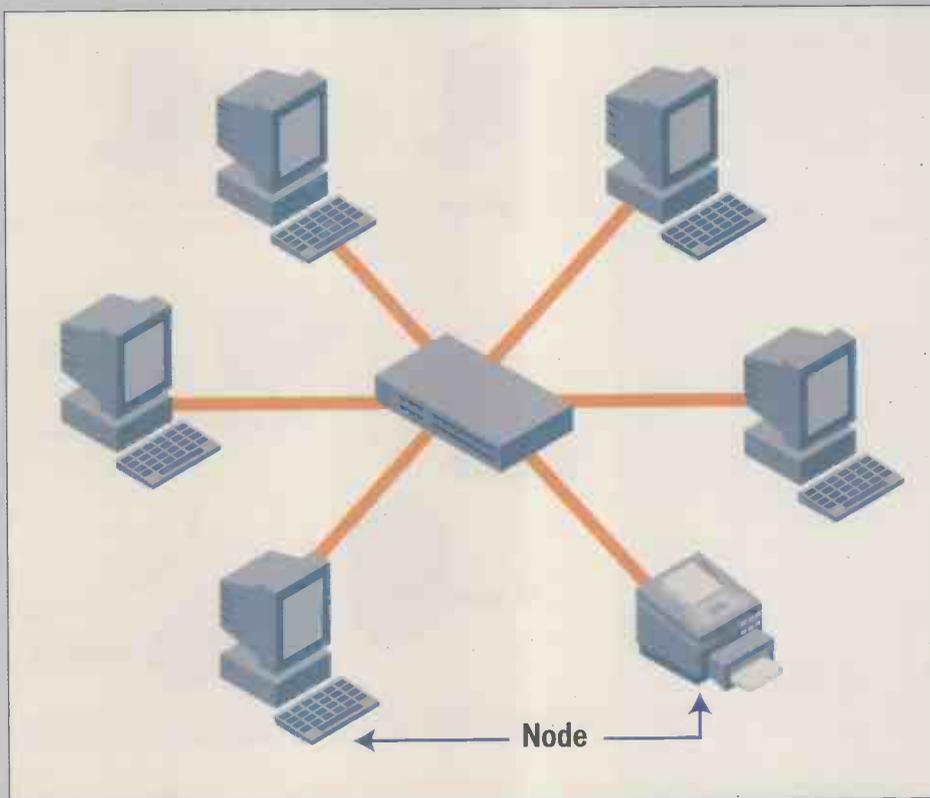
Getting your new server up and running and on the network is only a small part of the big picture – you also need to consider carefully what type of networking infrastructure will suit your company best. It goes without saying that all users will be connected over Ethernet, but the key to choosing the right networking products is understanding the needs of your business and its potential for expansion.

The most common form of network connection is over UTP (unshielded twisted pair) cable or 10BaseT with each user linked to a hub. This device creates a star topology where the hub is the central point with all connections radiating outwards. If a cable fails, only that link is affected and all others continue to function normally. The specifications of 10BaseT dictate that cable lengths are limited to 100m, but you can go beyond this by adding more hubs. Called cascading, one port on each hub is used to connect two devices together, although this also has a limit as end-stations cannot be separated by more than four hubs or five wiring segments.

Most small businesses indulging mainly in file and printer sharing will find 10Mbps/sec Ethernet provides all the bandwidth they need. However, the amount and variety of data being shunted around many of today's networks can easily soak this up so the next option is Fast Ethernet.

Fundamentally, this is no different to standard Ethernet and uses the same method of collision detection, although bit timings – the time taken for each bit of information to be transmitted – are reduced by a factor of 10 for a 10-fold increase in performance to 100Mbps/sec.

One of the biggest issues with Ethernet networks is that maximum throughput will never be reached. Ethernet is a connectionless service over shared media – when data is transmitted it is sent to every other node on the network and only one packet of data can be



Top: An Ethernet network using a star topology  
Left: Gigabit switches are still very expensive

on the wire at any one time. If two packets are transmitted at the same time they will collide so each station must back off for a random period and re-transmit. Unfortunately, as more data is transmitted, collisions increase and eventually the network reaches a stage called thrashing where no data is actually reaching its destination.

An Ethernet switch can reduce these effects as it reads the addresses contained in each data frame's header and only sends them to the port where that device is connected. By creating a virtual connection between the stations the switch is segmenting the network into

smaller collision domains. Implementing a switch doesn't mean your hubs have to go as they can be linked directly to the switch ports allowing groups of users to receive a dedicated 10 or 100Mbps/sec pipeline from the switch.

Switches also support full duplex mode which transmits and receives data on separate wire pairs so collisions on this cable length won't occur. All the servers on review have dual-speed network adaptors that support this so you could easily create a high-speed 200Mbps/sec pipeline for improved user access. You'll also need a switch if you want to use multiple network cards in your server to take

advantage of adaptor teaming and fault-tolerant links.

Network speed can be increased further, but the next step is not suited to small businesses due to high costs. Gigabit Ethernet offers a massive speed increase to 1000Mbps/sec and is aimed at backbone or large server farm connections. Originally designed to run over long-distance fibre-optic links, the latest Gigabit specification now allows it to utilise standard Category 5 copper cabling making it ideal for high-speed server links.

There are plenty of dual-speed switches on the market now with optional Gigabit uplink modules and vendors such as 3Com and Intel offer Gigabit PCI server cards, although you can expect to pay upwards of £500 for a single fibre-based card – around a quarter the cost of your new server.

Intel 01793 431155  
3Com 0800 225252

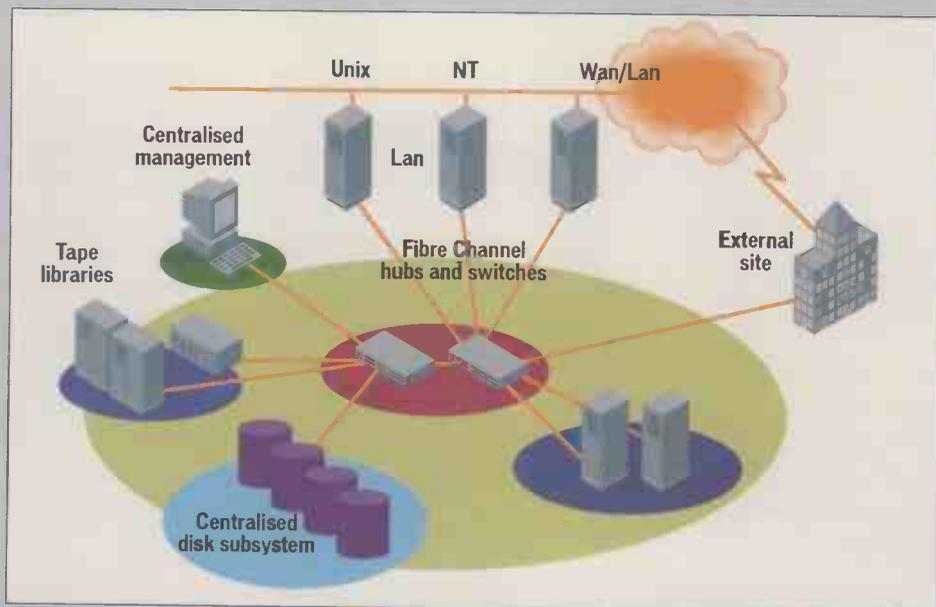
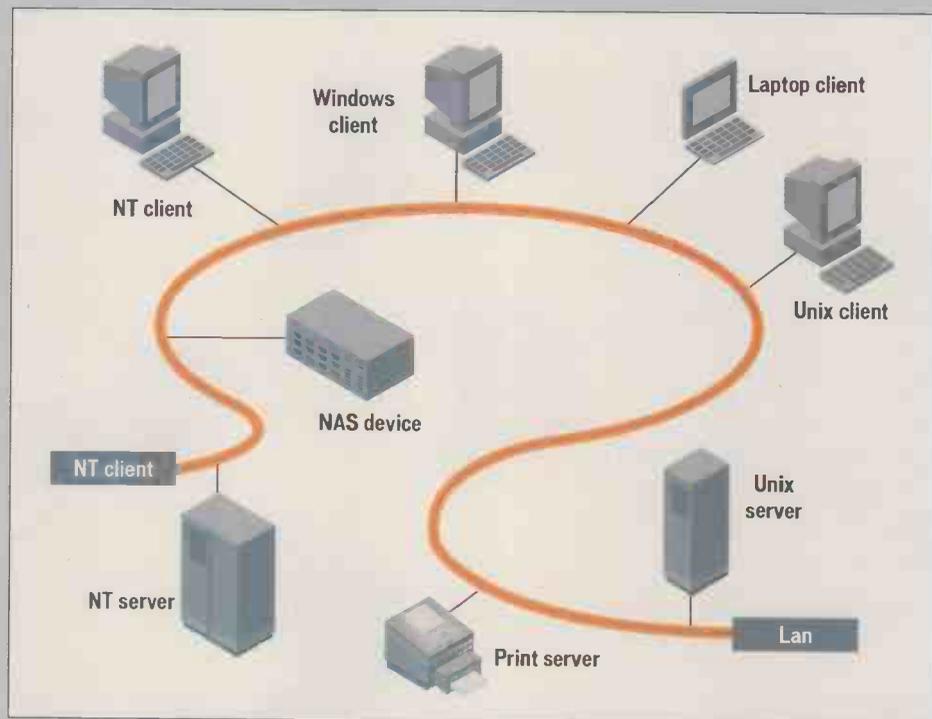
## NAS and SAN: what's the difference?

The increasing number and variety of network applications is fuelling a data explosion. To keep up with this demand, administrators must upgrade server storage, which will involve scheduling out-of-hours maintenance periods, powering down the server, installing and configuring new disks and then hoping it all comes back up safely. Both SAN (Storage Area Networks) and NAS (Network Attached Storage) are architectures aimed at relieving this pressure on servers. However, although they may sound similar they are totally different technologies. A small business is more likely to be interested in the NAS appliance so we'll look at this first.

NAS comprises drive arrays that connect directly to the network and appear to users as large hard disks. The array is contained within a dedicated system box that has its own control hardware and OS and generally has a web browser interface for management and configuration from a networked workstation. NAS appliances are designed to overcome the storage crisis as they can be plugged straight into the network as required without affecting servers and key services – as storage demands increase you just add more boxes.

Hard disk manufacturers, Quantum and Maxtor, have their own solutions with the Snap! Server and MaxAttach devices. The Snap! Server comes in 15GB, 30GB, 60GB, and 120GB models with the two- and four-drive 2000 and 4000 versions offering RAID 0 and 1 mirroring and striping. Maxtor's alternatives are the MaxAttach 3000 and 4000, with the latter offering up to 160GB of storage and both support RAID levels 0 and 1. In both cases you just plug the appliances in, connect them to the network and configure them using a web browser.

The SAN concept aims to place all storage devices on a separate, dedicated network. Taking hard-disk arrays and tape libraries away from



Top: NAS appliances can be easily added directly onto the network as required

Above: The SAN separates all storage devices from servers and places them on a dedicated network

servers and placing them on the SAN frees up resources as the servers no longer need to control them. SAN devices become a shared resource accessible to all servers on the main network. This allows data to be managed more efficiently and, as with NAS appliances, more storage can be added without impacting general operations. A big advantage of the SAN is that

storage devices can be placed in separate data centres away from the main building. Mirroring of mission-critical data to a secondary site can easily be done too, so in the event of a failure at the primary site, data recovery is virtually instantaneous. Fibre Channel is an increasingly popular method of connecting SAN devices together. It supports up to 127 devices

with 100Mbytes/sec transfer rates and distances of up to 30m for copper and 10km for fibre. The SAN network is controlled by Fibre Channel switches that are, in turn, linked to the network servers using SCSI-to-Fibre Channel adaptors. The SAN is an ideal solution for large networks as it scales easily and frees up vital server resources for increased performance.

## NEC Direct Express5800/120Ld



offering native transfer rates of around 60Mbytes/min. However, considering the server's storage potential the 12GB, native capacity of the DDS-3 format will be insufficient for all but the most basic of backups. You have two choices for hard-disk storage: you either use the basic fixed disk cage underneath the expansion bays with room for four 1.6in drives, or the hot-swap cage supplied with the review model, which has room for six 1in drives. Our review unit had two slots filled holding a pair of 9.1GB Seagate Ultra2 drives enclosed in solid carriers. NEC also offers optional Mylex RAID controllers should you wish to add fault tolerance

120Ld supports dual processors at speeds up to 733MHz. No surprises in the core logic department as ServerWorks makes yet another appearance with its Entry ServerSet III LE chipset. Along with a 133MHz FSB it offers support for up to 4GB of SDRAM. Four DIMM sockets are sited alongside the processor slots, of which one is fitted with a 128MB module. Integrated graphics and network adaptors keep all the expansion slots free, so you have a choice of three 64bit PCI, three 32bit PCI slots and a single ISA slot.

SCSI services are particularly well catered for with the integrated Ultra160 Adaptec AIC-7899G chipset. One channel is connected to the disk cage backplane while the second is routed through to the rear panel for external devices. Alas, the high SCSI transfer rates on tap had no impact in the performance tests as NEC could only supply 80Mbytes/sec Ultra2 drives for the price. Of all the servers equipped with 600MHz processors, the 120Ld came out as the slowest in both Ethernet and Fast Ethernet tests (see performance graphs).

Server configuration and NOS (network operating system) installation is aided by NEC's Express Builder utility supplied on a bootable CD-ROM. This provides an intuitive menu system to get your server up and running with the minimum of fuss. Plenty of quality management tools are provided by the EsmPro Suite, which uses the embedded sensors on the motherboard to keep track of voltages, temperatures and fan operation. Other servers and workstations can be monitored remotely with the appropriate agent software installed and the server's COM2 serial port doubles up as an EMP (emergency management port) allowing the server to be controlled directly from another system or remotely via a modem connection.

**ALTHOUGH NEC IS** a comparative newcomer to the server marketplace, the company has managed to build up an impressive range of products. However, earlier entry-level server products from NEC failed to impress because they were built around non-server-specific motherboards and had more in common with PCs. Not so with the Express5800/120Ld, though, as it offers a fine list of features for the price and they're all housed in a purpose-built chassis.

Physical security is good as the lockable front door bars access to the power switch, front bays and thumbscrews for the side panels. Three 5.25in bays are available with one occupied by an LG 40-speed IDE CD-ROM drive and a second is home to an Archive Python DAT DDS-3 drive

to your storage options.

Good build quality doesn't extend to the side panels as these are comparatively flimsy and difficult to replace once removed. Internal design is more impressive, though, as the 120Ld uses a similar layout to HP's LC2000. The drive bay assembly is positioned in a dedicated section at the front and partnered by a pair of large cooling fans. These are held in position by a single screw so they are relatively easy to

remove and replace in the event of a failure but, unlike the LC2000, the server must be powered down first. NEC's well-designed motherboard takes up the lion's share of the interior, with the pair of processor slots mounted at the top next to another large cooling fan. The review model came supplied with a single PIII 600EB module, but the

### HARDWARE SPECIFICATIONS

Motherboard: NEC  
Chipset: ServerWorks Entry ServerSet III LE  
FSB speed (MHz): 133  
Processor type/speed: Pentium III 600EB  
No of processors: 1  
Max processors: 2  
**STORAGE**  
Hard disk: 2 x Seagate ST39175LC  
Total capacity (unformatted): 18.2GB  
Controller type: Adaptec AIC-7899G  
Software: Express Builder, EsmPro Suite

### DETAILS

**PRICE** £2,349 (£1,999 ex VAT)  
**CONTACT** NEC 0870 010 6322  
[www.neccomp.com](http://www.neccomp.com)

**PROS** Good internal design with high expansion potential; Ultra160 SCSI chipset and an abundance of management tools

**CONS** Comparatively poor performance; build quality not as good as many other manufacturers; supplied tape drive of limited value

**OVERALL** A good choice as a first server with plenty of room to grow with demand, although it's let down by a below par performance

<b>BUILD QUALITY</b>	★★★★
<b>PERFORMANCE</b>	★★★
<b>VALUE FOR MONEY</b>	★★★★
<b>OVERALL RATING</b>	★★★★

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seeks dynamic producer  
to increase ratings.

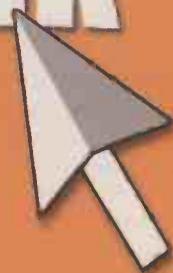
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## Toshiba Magnia 3030



**TOSHIBA STARTED** producing servers at the beginning of 1999, but it was only at the end of the year that it decided the time was right to make an assault on the UK market. The 3030 is the latest member of the Magnia family and is aimed directly at the workgroup and small to medium enterprises business sector. Initial impressions are good as the Magnia 3030 looks well built and offers plenty of expansion potential, allowing the system to grow with your business.

A hot-swap disk cage with room for six 1in hard disks is located at the front. The review model came equipped with a brace of 9.1GB Ultra2 IBM hard disks, but filling the unit with 18.2GB drives would provide a huge 109GB of storage capacity. The drives are held in sturdy metal carriers that are kept in place by a

simple plastic locking panel on the front of the unit. The front door is separated into two parts so you can secure the drive bays and leave the three 5.25in bays open or, alternatively, lock the whole lot away from wandering fingers. Power redundancy is also an option as the chassis has room for a second hot-swap supply at the rear.

When we removed the side panel the first thing we noted was that Toshiba doesn't actually manufacture its own motherboards, but uses the same Intel L440GX+ server board as Mesh and evesham.com. Although it only provides a 100MHz FSB and support for 2GB of PC100 SDRAM, it's clear that

choosing the right hardware specification will deliver good network performance. Even though the Magnia 3030 only came equipped with a single PIII 600 processor and 128MB of memory, it still put in a very creditable

performance in both the SYSmark tests we carried out (see performance results later in the group test).

Processor cooling is high on the agenda as both slots are hidden behind a large metal fan cage that pulls air directly across the modules and shunts it out

the back. Upgrade manoeuvres won't be hindered for long, though, because the unit is only held in place by two thumbscrews and can be removed within seconds.

Both the drive bay and power supply assembly are partnered with two fans each, but even so the 3030 was surprisingly quiet during operation. An

integrated Adaptec AIC-7896N chipset deals with storage and provides Ultra2 and Ultra Wide channels with the former connected to the disk cage backplane. Two IDE channels are also on offer with one servicing a 40-speed CD-ROM drive.

Graphics are handled by a simple but effective Cirrus Logic chipset, while network duties are, of course, handled by an integrated Intel Pro100+ chipset. This arrangement leaves all expansion slots free and a RAID array is a distinct possibility since one of the PCI slots can support optional AMI single or dual-channel RAID controller cards.

Toshiba failed to carry out our request for a pre-installed operating system, but at least this lapse gave us an opportunity to use its Server Setup utility. Booting the server from the supplied floppy disk and CD-ROM takes you to an intuitive menu system where you can create driver disks, install a utility partition and load your chosen operating system. Once you've supplied all the necessary information, the setup utility gets on with the job, requiring little further operator intervention, but Toshiba ensures there's plenty of help to hand throughout this process if you need it. As with the Mesh server, management comes courtesy of Intel's LANdesk Server Manager Utility. This keeps an eye on areas such as processor and chassis temperatures, along with operating voltages, and can be configured to send network messages and even shut the server down automatically if a fault is detected.

Comparing the Magnia 3030 with Mesh's well-endowed 700L shows the Toshiba alternative to be a more costly choice because you get far less hardware for your money. However, overall build quality and internal design are far better and the performance is quite respectable.

### HARDWARE SPECIFICATIONS

Motherboard: Intel  
Chipset: Intel 440GX  
FSB speed (MHz): 100  
Processor type/speed: Pentium III 600E  
No of processors: 1  
Max processors: 2  
**STORAGE**  
Hard disk: 2 x IBM DNES 309170Y  
Total capacity (unformatted): 18.2GB  
Controller type: Adaptec AIC-7896N  
Software: Server Setup, Intel Server Control

### DETAILS

**PRICE** £2,256 (£1,920 ex VAT)

**CONTACT** Toshiba 01932 828 828

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

**PROS** Good build quality; plenty of internal cooling; big-name brand

**CONS** Intel motherboard only has a 100MHz FSB and the Mesh alternative offers more hardware for less cash

**OVERALL** Comparatively expensive, but a promising entry into the server market from Toshiba. Uses the same motherboard as Mesh, but has a far better internal design with tool-free maintenance

**BUILD QUALITY** ★★★  
**PERFORMANCE** ★★★  
**VALUE FOR MONEY** ★★  
**OVERALL RATING** ★★★

## Viglen CX1



**PRIOR TO THE RELEASE** of the CX-1 in 1999, Viglen had always insisted on using Intel motherboards in its servers, but this time around it has opted for a SuperMicro board. The P6DBU

motherboard does offer plenty of useful features, but it's getting on a bit now and is not specifically designed for server applications. Consequently this server's expansion potential, internal design and management options are somewhat

restricted. The unit comes bundled with Intel's LANdesk Client Manager software that is aimed at administering other networked PCs. However, to see what's going on locally you need to install the client software, which cannot co-exist with the administrator utility. The LANdesk client can access some of the motherboard sensors, but it pales

into insignificance when compared with the software supplied by companies such as Dell, Compaq and Hewlett-Packard. Viglen also pre-installed Computer Associates' UniCenter TNG management software, but this is a complex product that's pitched more at enterprises than the small-business market.

The CX-1 comes enclosed in a compact chassis but inside you'll find that the poor design and limited space will severely hamper upgrades and maintenance. Two processor sockets are provided with one holding a PIII 650MHz chip. The server comes with 128MB of SDRAM memory and three DIMM sockets are left free for further expansion, but reaching them will

be difficult as the hard disk and floppy drive cage is mounted directly in front of the sockets and blocks access completely. In fact, it is so close it's actually resting against the installed memory module. Inside the cage you'll find a single 9.1GB Fujitsu Ultra2 hard disk with room for two more drives. Up above are three 5.25in bays with one holding a 40-speed CD-ROM drive and the second home to an HP DAT DDS-3 SCSI tape drive. The

tape drive is partnered by a copy of Veritas' Backup Exec for Windows NT/2000/NetWare that includes the intelligent disaster recovery option.

Access to the interior of the server requires the entire shell to be removed. You cannot secure the shell in place, so physical security is at a minimum. However, an intrusion detection

microswitch is located inside and this will notify you if the case has been removed – provided you have loaded up the supplied Super Doctor and LANdesk Client Manager software utilities. Also, there's no protection for the power and re-set switches at the front.

Integration is another casualty on the SuperMicro board as the only embedded chipsets are an Adaptec AIC-7890AB and AIC-3860Q which, between them, offer Ultra2, Ultra Wide and Narrow SCSI connectors. It's also worth noting that these are all located behind the hard-disk cage as well. However, Viglen does get a pat on the back for fitting a pair of Intel Pro100+ PCI network adaptor cards. Using the latest onboard 82559 chipset these cards support adaptor teaming and adaptive load balancing, so you can add fault tolerance to your network connection – if one card fails, all network traffic will be switched to the other. Using only one network card for the benchtest delivered an average performance with the CX-1 taking sixth place in the Fast Ethernet benchtests. Adaptor teaming should improve performance and we tried running the Fast Ethernet benchtest with both cards connected to the dual-speed switch, but saw no significant improvements.

Communications are well catered for as you can take advantage of fast Internet access using the Eicon Diva Pro PCI ISDN card that comes with a copy of RVS-COM Lite for fax and voicemail applications. Viglen also included an external 3Com 56K voice modem as well. Two PCI slots are still available with one supporting Adaptec's ARO1130 RAID controller cards, but the two ISA slots at the base will be of limited value.

The CX1 is let down mainly by its use of a non-server-specific motherboard and a chassis that is more suited to a desktop PC. Viglen does bundle plenty of extras but, at £1,999, the CX1 still doesn't offer great value.

## HARDWARE SPECIFICATIONS

Motherboard: Supermicro  
 Chipset: Intel 440BX  
 FSB speed (MHz): 100  
 Processor type/speed: Pentium III 650  
 No of processors: 1  
 Max processors: 2  
**STORAGE**  
 Hard disk: Fujitsu MAE3091LP  
 Total capacity (unformatted): 9.1GB  
 Controller type: Adaptec AIC-7890AB  
 Software: Intel Client Manager, Veritas Backup Exec  
 Hard disk: Fujitsu MAE3091LP

## DETAILS

**PRICE** £2,349 (£1,999 ex VAT)

**CONTACT** Viglen 020 8758 7000

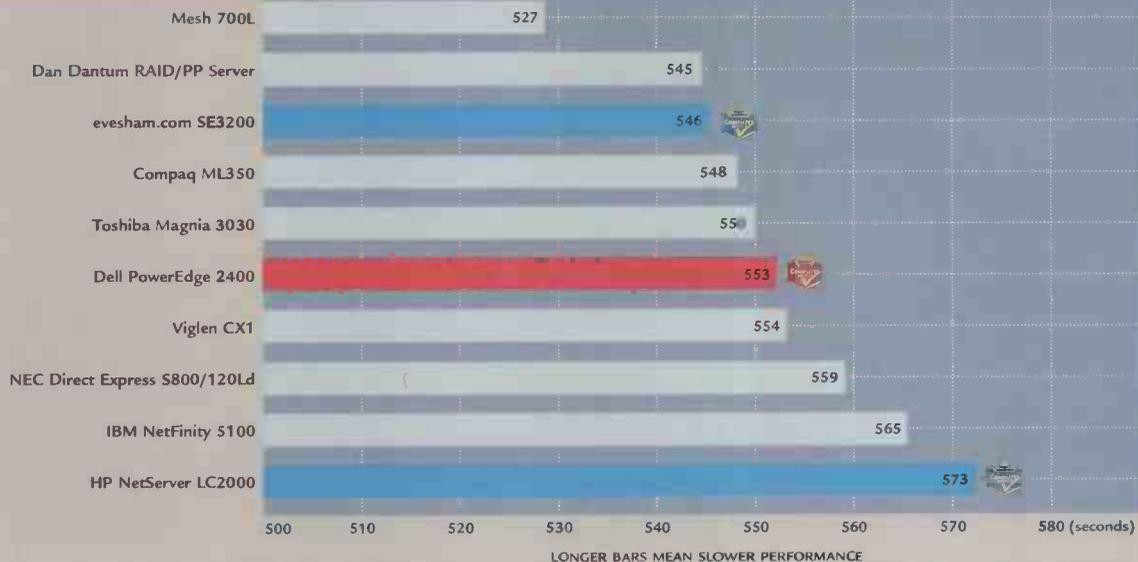
[www.viglen.co.uk](http://www.viglen.co.uk)

**PROS** Plenty of useful extras including dual network adaptors, a tape drive partnered with good backup software and an ISDN card  
**CONS** Limited expansion potential and awful internal design will make upgrades and maintenance a nightmare

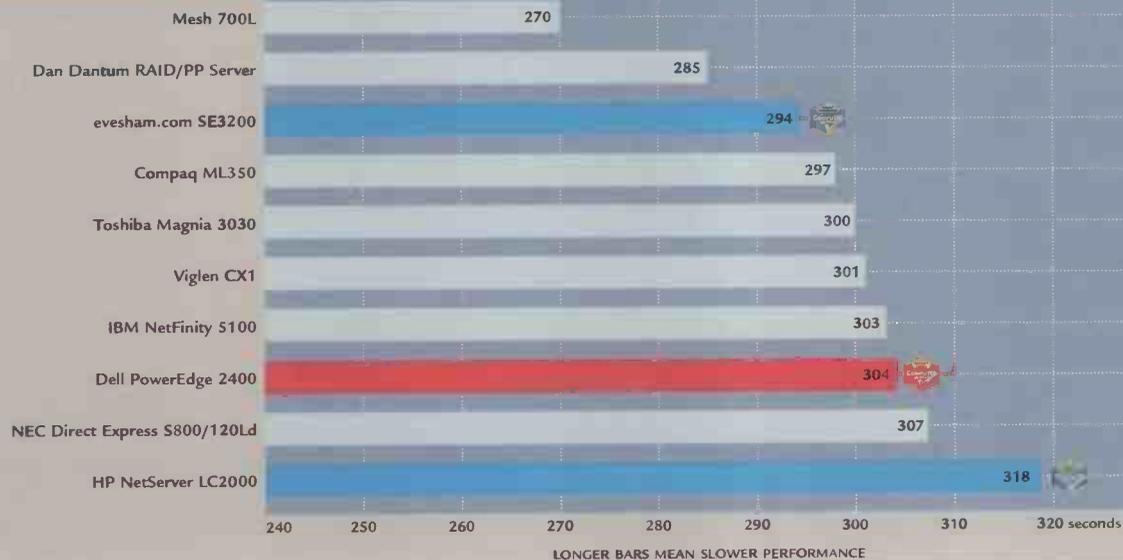
**OVERALL** A PC-based motherboard and chassis masquerading as a server. The CX1 will do the job and Viglen does include plenty of extras, but there are far better bargains on offer elsewhere in this group test

**BUILD QUALITY** ★  
**PERFORMANCE** ★★  
**VALUE FOR MONEY** ★★  
**OVERALL RATING** ★★

## Standard Ethernet performance



## Fast Ethernet performance



### How we did the tests

In an average office a server will be dealing with many different types of requests, from file and printer sharing through to complex database queries. BAPCO's SYSmark for File Servers measures network performance by loading a suite of nine applications on the server and running them simultaneously from multiple client PCs attached over a network. The suite is designed to cover a wide range of business activities such as email, word processing, graphics design and database queries. Each server had Windows NT Server 4 installed with Service Pack 6a applied. SYSmark includes tools for creating user names for each client and setting up network shares on the server's hard disk.

The client workstations do not

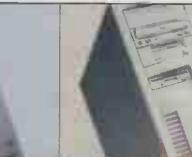
require any software other than DOS and Microsoft's client re-director, as each application in the test suite is loaded from the server before being run locally. A small batch file is also created on each client that assigns a unique number to each workstation. This determines which application in the suite it will start first and creates a more realistic test scenario as the server will be forced to cope with multiple requests for different applications and their associated data. A control workstation monitors each client and notifies the tester when all workstations are logged in and synchronised. It then issues simultaneous 'go' commands to each client causing them to start running the benchtest.

As each application loads onto the client it runs predefined instructions from a macro or a script created with Microsoft's Test utility. A complete report is then produced showing the times each client took to complete the test suite.

As all clients and servers had dual-speed network cards we ran SYSmark across standard 10Mbps/sec Ethernet and 100Mbps/sec Fast Ethernet to give a clear indication of the benefits of the higher network speeds. After these tests the clients and test server were reconnected to an Intel Express 510T dual-speed Ethernet switch so each had a 200Mbps/sec full duplex link. The run times were reduced by almost 50 per cent in some cases.

### Table of features

MANUFACTURER	COMPAQ	DAN	DELL	EVESHAM.COM
PRODUCT	ML350	DANTUM RAID/PP SERVER	POWEREDGE 2400	SE3200
Price inc VAT (ex VAT)	£2,026 (£1,724)	£2,148 (£1,828)	£2,349 (£1,999)	£2,349 (£1,999)
Telephone	0845 270 4000	0870 444 7020	0870 152 4850	0800 038 0800
<b>CHASSIS</b>				
h x w x d (mm)	467 x 212 x 670	541 x 225 x 464	442 x 260 x 600	425 x 220 x 570
PSU rating (Watts)	300	250	330	337
Standard/max PSUs	1/1	1/1	1/2	2/2
<b>HARDWARE SPECS</b>				
Motherboard	Compaq	SuperMicro	Dell	Intel
Chipset	ServerWorks Entry ServerSet III LE	Intel 840	ServerWorks Entry ServerSet III LE	Intel 440GX
FSB speed (MHz)	133	133	133	100
Processor type/speed	Pentium III 600EB	Pentium III 700	Pentium III 600	Pentium III 600E
No of processors/max processors	1/2	1/2	1/2	1/2
<b>MEMORY</b>				
RAM fitted/maximum RAM	128MB/2GB	256MB/4GB	128MB/2GB	128MB/2GB
Free/total sockets	3/4	2/4	3/4	3/4
<b>STORAGE</b>				
Hard disk(s)	2 x Fujitsu MAE3091LP	3 x Quantum Atlas IV	2 x Quantum Atlas V	2 x Fujitsu MAE3182LC
Total capacity (unformatted)	18.2GB	9.1GB (mirror + spare)	9.1GB (mirrored pair)	18.2GB (mirrored pair)
Controller type	Symbios 53C896	Adaptec AAA-130U2	Dell PERC 2/Si	Adaptec ARO-1130
Controller location	PCI Card	PCI Card	Motherboard	PCI Card
Other controllers	IDE (2)	IDE (2)	Adaptec AIC-7890 (disabled) Adaptec AIC-7880	Adaptec AIC-7896N IDE (2)
<b>NETWORK INTERFACES</b>				
Model	Compaq NC3163	Intel Pro100+	Intel Pro100+	Intel Pro100+
Location	PCI Card	Motherboard	Motherboard	Motherboard
<b>SLOTS FREE/TOTAL</b>				
64bit PCI	2/2	2/2	5/5	2/2
32bit PCI	3/4	3/4	1/1	3/4
ISA	1/1	0/1	1/1	1/1
AGP	0	0	0	0
<b>DRIVE BAYS FREE/TOTAL</b>				
Front 5.25in	2/3	0/4	2/3	1/3
Front 3.25in	2/4	0/2	4/6	4/6
Internal 5.25in	0/0	0	0/0	0
Internal 3.25in	0/0	5/5	0/0	0
<b>ADDITIONAL PERIPHERALS</b>				
CD-ROM	Compaq CDR-8435	Toshiba XM-6502B	NEC 466	LG CRD-8400
Tape device	X	Seagate TapeStor 8GB	X	OnStream DI30
Other	X	X	X	X
Graphics adaptor	ATI 3D Rage IIC PCI	ATI Xpert XL	ATI 3D Rage IIC AGP	Cirrus Logic GD5480
Location	PCI Card	AGP Card	Motherboard	Motherboard
Video memory	4MB	8MB	4MB	2MB
Monitor included	X	X	X	✓
Keyboard/mouse	✓/✓	✓/✓	✓/✓	✓/✓
Software supplied	Compaq SmartStart Insight Manager, ASR	Veritas Backup Exec	Server Assistant Resolution Assistant	Intel Server Control OnStream Echo

 <b>HEWLETT-PACKARD</b>	 <b>IBM</b>	 <b>MESH</b>	 <b>NEC DIRECT</b>	 <b>TOSHIBA</b>	 <b>VIGLEN</b>
<b>NETSERVER LC2000</b>	<b>NETFINITY 5100</b>	<b>700L</b>	<b>EXPRESS 5800/120Ld</b>	<b>MAGNIA 3030</b>	<b>CX1</b>
£2,089 (£1,777)	£2,290 (£1,949)	£2,231 (£1,899)	£2,349 (£1,999)	£2,256 (£1,920)	£2,349 (£1,999)
0990 474 747	0990 727 272	020 8208 4706	0870 010 6322	01932 828 828	020 8758 7000
453 x 215 x 695	215 x 426 x 627	488 x 210 x 455	450 x 220 x 650	440 x 220 x 620	493 x 195 x 430
349	250	300	300	300	300
1/2	1/3	1/1	1/1	1/2	1/1
Hewlett-Packard	IBM	Intel	NEC	Intel	Supermicro
ServerWorks Entry ServerSet III LE	ServerWorks Entry ServerSet III LE	Intel 440GX	ServerWorks Entry ServerSet III LE	Intel 440GX	Intel 440BX
133	133	100	133	100	100
Pentium III 533	Pentium III 667	Pentium III 700	Pentium III 600EB	Pentium III 600E	Pentium III 650
1/2	1/2	2/2	1/2	1/2	1/2
128MB/4GB	128MB/4GB	256MB/2GB	128MB/4GB	128MB/2GB	128MB/1GB
3/4	3/4	3/4	3/4	3/4	3/4
Seagate ST39102LC	IBM DNES-309170Y	Quantum Atlas 10K	2 x Seagate ST39175LC	2 x IBM DNES 309170Y	Fujitsu MAE3091LP
9.1GB	9.1GB	18.2GB	18.2GB	18.2GB	9.1GB
Symbios 53C897	Adaptec AIC-7899G	Adaptec AIC-7896N	Adaptec AIC-7899G	Adaptec AIC-7896N	Adaptec AIC-7890AB
Motherboard	Motherboard	Motherboard	Motherboard	Motherboard	Motherboard
IDE (1)	IDE (1)	IDE (2)	IDE (1)	IDE (2)	IDE (2)
HP NetServer 10/100TX	AMD PCnet Server Adaptor	Intel Pro100+	Intel Pro100+	Intel Pro100+	2 x Intel Pro100+ Server Adaptor
Motherboard	Motherboard	Motherboard	Motherboard	Motherboard	PCI Cards
2/2	3/3	2/2	3/3	2/2	0
4/4	2/2	4/4	4/4	4/4	2/5
0	0	1/1	1/1	1/1	2/2
0	0	0	0	0	0/1
2/3	2/3	4/5	2/3	2/3	1/3
5/6	5/6	0/2	4/6	4/6	1/2
0	0	0	0	0	0
0	0	2/2	0	0	2/3
Hitachi CDR-8435	LG CRD-8400B	Teac CD-532E	LG CRD-8401B	ON Technology LTN-403L	Sony CDU4811
X	X	HP SureStore T20	Archive Python DAT DDS-3	X	HP DAT DDS-3
X	X	X	X	X	Eicon Diva ISDN card
					3Com 56K modem
ATI 3D Rage IIC AGP	S3 Savage4 Pro	Cirrus Logic GD5480	ATI 3D Rage IIC PCI	Cirrus Logic GD5480	ATI Xpert98 Pro
Motherboard	Motherboard	Motherboard	Motherboard	Motherboard	AGP Card
2MB	8MB	2MB	4MB	2MB	8MB
X	X	X	X	X	✓
✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓
NetServer Navigator	ServerGuide	Intel Server Control	Express Builder	Server Setup	Intel Client Manager
HP TopTools	NetFinity Manager	Stac Replica Backup	EsmPro	Intel Server Control	Veritas Backup Exec



# Editor's Choice

The ideal small-business server needs to satisfy a wide range of requirements. Performance is always an important consideration, but there are many other factors that need to be taken into account. A server can represent a considerable financial outlay to companies on a strict budget, so it should be designed with high levels of upgrade potential. The average PC may only last a couple of years, but servers can, and should, last well beyond this to maximise your investment. Increasing online storage or adding extra processors and more memory to improve performance must be simple tasks that can be carried out easily to reduce downtime.

With your company depending on one system to provide all its networked services, reliability is paramount. Redundant power supplies, RAID arrays – even adequate cooling – all play their part in ensuring the server does its job without interruption. You need to keep a close eye on general operations and have advance warning of impending doom, so decent management software is a must, while good security keeps the curious, or worse, at bay.

## The winners

Choosing the best was a tough decision as there were a lot of very high-quality servers in this group test. There has to be a winner though so, after considerable debate, the **Editor's Choice** award goes to Dell's PowerEdge 2400 as it delivered on all counts. It came in for review with a

reasonably beefy Pentium III 600MHz processor, but there's still potential to add a second processor thanks to its dual motherboard. More memory can easily be added and, when the time comes, the totally tool-free design will ensure the server is back in business with the minimum of delay.

The server's internal design is exemplary and it's worth noting that Dell has had a big influence in this crucial area, with many other manufacturers now using similar concepts in their servers. Placing all the connectors on the edge of the motherboard right next to the devices they're servicing makes for a tidy interior and keeps ribbon cable clutter to a minimum.

Hard-disk storage is well-catered for with a six-disk capacity drive cage and a hot-swap backplane now a standard feature in the 2400. The drives are fitted in sturdy carriers that are easy to remove and replace as required. Power redundancy is an option, while server management and monitoring tools are in abundance. The icing on the cake was the integrated RAID controller chipset providing extra storage fault tolerance, ensuring the server won't let your business down. Overall, the PowerEdge 2400 is a well-focused system that fitted our requirements perfectly.

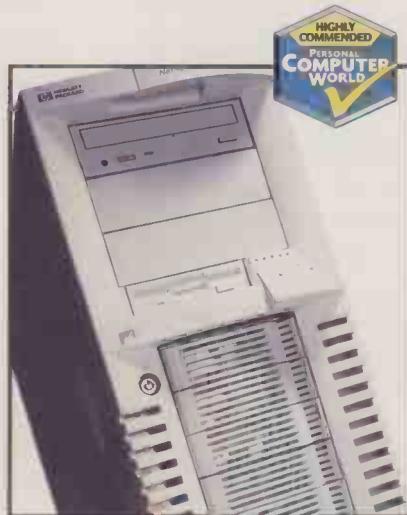
The first of our **Highly Commended** awards goes to Hewlett-Packard's mighty NetServer LC2000. Some may see this as a strange choice as the single Pentium III 533MHz processor was the slowest of the lot, resulting in a less than

impressive performance. However, the price of the LC2000 was one of the lowest, so HP could have added more hardware and still stayed within our price limit. What impressed us most was the build quality, as this was easily the best of the rest. Clearly, a lot of thought has gone into the design as the chassis and its internal layout is superb. HP has gone with the flow and fitted the ServerSet III LE chipset that offers a 133MHz FSB and support for up to 4GB of SDRAM memory. There's plenty of room to grow with demand as the LC2000 also has a hard-disk cage with capacity for up to six drives and an optional hot-swap backplane can be fitted as well.

Our second **Highly Commended** award goes to evesham.com with its SE3200. Intel's 440GX+ motherboard gets the system off to a good start as it's specifically designed for servers and comes with plenty of management and monitoring facilities. Performance was particularly good, with evesham.com securing a solid third place overall and yet there is still plenty of room for expansion. The large six-drive disk bay can keep up with future storage demands and evesham.com even managed to supply a pair of 18.2GB Ultra2 hard disks and team them up with an Adaptec PCI RAID controller card. Creating a server from off-the-shelf components can be tough as it's easy to get the recipe wrong. However, the SE3200 shows how it can be done with a fine balance of components brought together in a decent chassis.



Dell's PowerEdge delivered on all counts, including extra storage fault tolerance



The low price of HP's NetServer impressed, as did its internal design



evesham.com's server offered good performance and room for expansion



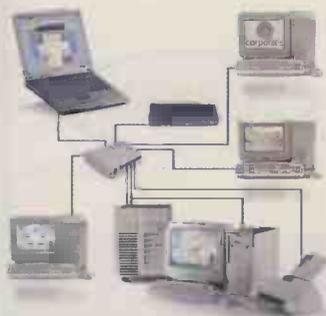
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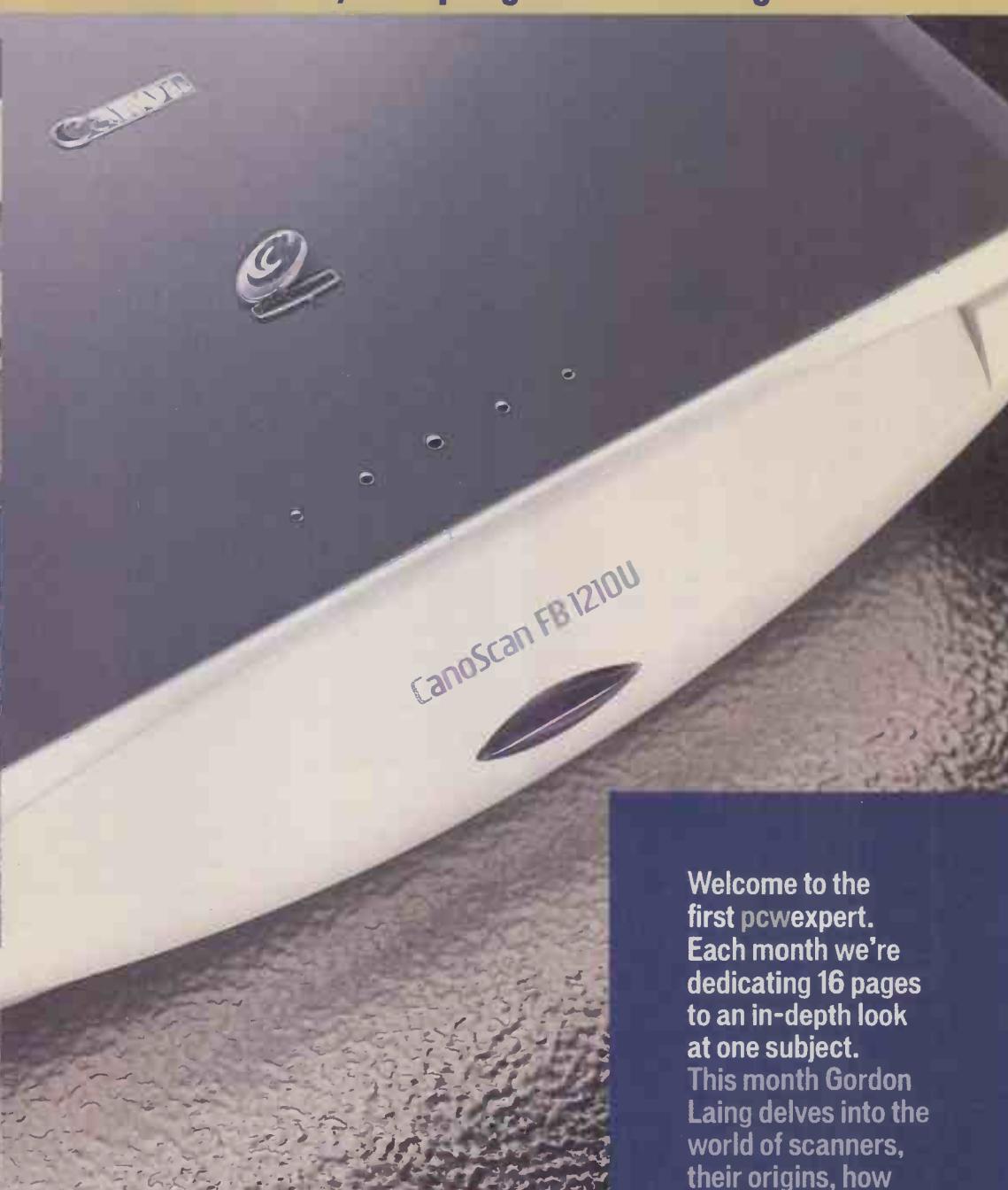
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# pcwexpert

Become an expert with our essential, in-depth guide to all things PC



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Welcome to the first pcwexpert. Each month we're dedicating 16 pages to an in-depth look at one subject. This month Gordon Laing delves into the world of scanners, their origins, how they work and how you can get the best out of them. Read on to find out more and become a PCW expert on scanners.

# scanners

PHOTOGRAPH PATRICK LLEWELYN-DAVIES

# From a swinging pendulum to electrical signals

When a French physicist couldn't find a use for his discovery, a Scot developed the idea and set the scanner ball rolling

**A** scanner is a device that captures something for later use. In the context of this feature, the subjects under capture are images, whether photographic prints, transparencies, documents, or real-life 3D objects. From this point on, unless otherwise stated, we'll use the term scanner to refer to image capture only.

The basic principle of a scanner is similar to that of a facsimile system, except that the scanner integrates the transmitter and receiver into one unit, whereas the facsimile transmitter and receiver may be on opposite sides of the planet.

The first scanners captured and processed originals, while reproducing them onto film almost simultaneously. For modern desktop scanners, the processor is the PC and the final receiver is usually a printer, or some kind of electronic media.

## Where it all began

Arguably the father of scanners was Scottish physicist and clock maker Alexander Bain (1818-1903). In 1843 Bain proposed a facsimile telegraph transmission system based on discoveries made by French physicist

Edmond Becquerel a few years earlier. Becquerel discovered that when two pieces of metal were immersed in an electrolyte, an electrical charge was developed when one of the pieces was illuminated. He couldn't think of a practical use for his discovery.

Bain, however, proposed that this could allow metallic characters to be chemically transmitted. Later, his transmitting machine used a detector mounted on the end of a swinging pendulum to sweep over the subject and scan it line by line. As the detector passed over areas of ink, it emitted a different electrical signal to when it passed over areas of no ink. This signal contained the original image, broken into small portions for transmission. The signals were transmitted over a telegraph wire to the receiving device, which applied them to chemically treated paper, recreating the image.

The problem of synchronising the two devices was solved by using large metronomes set off at the same time. The Italian Giovanni Caselli constructed an enormous version of Bain's facsimile machine called the Pantelagraph in 1856. Four years

later, Caselli used this to transmit the first long-distance fax between Paris and Amiens – an impressive 70-mile distance, but one that required the use of eight-foot tall pendulums.

## First scanner

Modern fax machines and scanners are based on photo-sensitive elements, and the first practical transmission using photo-electric cells was developed by German physicist Arthur Korn in 1902. By 1925, the American Telephone and Telegraph company (AT&T) had invented the first wire photo service.

In 1929, Bavarian electronic engineer Dr Rudolf Hell formed a company in his own name and applied to patent a 'device for the electronic transmission of written characters' – he called this electronic fax machine the Hell Recorder.

The first prototype drum scanner was constructed from a modified engineering lathe by Alexander Murray and Richard Morse in 1937 – at the time, Murray was working for Eastman Kodak. In 1946, Time took the Kodak prototype and continued its development until, in 1949, the Austin Company built it into

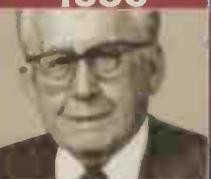
the first workable scanner, known as the Austin Scanner.

In 1947 John F Crosfield founded Crosfield Electronics. In 1955 he invented the first colour scanner, the Scanatron MK1, which used a cathode-ray tube and flying spot, similar to the technology behind TV sets; the first model was installed at Sun Printers in Watford in 1959. Crosfield's subsequent inventions included the first commercial drum scanner in 1964.

Returning to the early 1950s, Hell entered the world of reproduction with his invention of the Klischograph, which could convert continuous tone and line images directly into Klishees, or printing blocks. In 1950 Hell introduced the Colorgraph, an experimental flatbed scanner. Many innovations followed, but one of the biggest landmarks was the 1970 launch of the Hell DC 300, an enlarging and reducing scanner using digital technology.

Crosfield beat Hell to the first enlarging and reducing drum scanner (MagnaScan 450) a year earlier. Until now, scanners had captured and reproduced images the same size as the original. In 1975 Crosfield released the MagnaScan 550 drum scanner

## pcwexpert timeline™

0000	1843	1929	1950	1955	1969
					
The date and origin are arguable, but no-one can dispute that the benchmark image capture and processing system is the human eye and brain. The best scanner in the world!	Fax machine invented by Alexander Bain, who proposes a facsimile telegraph transmission system, built in 1856 using eight-foot pendulums and called the Pantelagraph (above).	Dr Rudolf Hell invents graphic transmission concept used by almost all fax machines today. Hell later merged with Linotype and both were recently swallowed up by Heidelberg.	The first experimental flatbed scanner, the Hell Colorgraph, invented by Dr Hell (above). In 1970, Hell launched the DC 300, the first digital enlarging and reducing drum scanner.	First colour scanner, the Crosfield Scanatron MK1, invented by John F Crosfield, using cathode-ray tube and flying spot. Crosfield invented first drum scanner in 1964.	Charge Coupled Device (CCD) invented by George Smith and Willard Boyle at Bell Labs. Stores electrical charge proportional to the amount of light that falls on it.

that, for the first time, exposed four colour separations simultaneously under the control of an integrated digital computer.

Drum scanners are still used in professional reprographic environments. They enjoy a higher tonal dynamic range and suffer from less noise than Charge Coupled Device (CCD)-based scanners.

The image is mounted on a spinning transparent cylinder - the drum. A high-pressure Xenon lamp illuminates the subject and the reflected or transmitted light is detected by Photo Multiplier Tubes (PMTs). Four PMTs are used: three with red, green and blue filters, and the fourth for an Unsharp mask channel. In the early days the electrical signal from the PMTs could be adjusted to control brightness and colour correction in real time, before driving a lamp to expose photographic film for colour separations. Now, the signal is converted into digital data and manipulated by a PC, before being used to output colour film separations.

**The silicon revolution**

A silicon chip sits at the heart of almost every modern imaging device. Invented in 1969 by George Smith and Willard Boyle at Bell Labs, the light-sensitive CCD revolutionised digital imaging.

Microtek claims it was the first to produce a 300dpi (dots per

inch) CCD-based sheet-fed black and white scanner in 1986. Agfa produced the first scanner for the Mac market in 1987. Microtek was also first with a 300dpi 24bit colour flatbed in 1989. However, until the early 1990s, flatbed scanners were still expensive. Users on a budget who wanted to capture images had to rely on a short-lived breed of handheld scanners. Resembling small car vacuum cleaners, these had a 4in wide scanning window, and the user dragged the unit over the image. AMS was first with a handheld scanner in 1988, but was soon after bought by Swiss mouse-giant Logitech. The latter dominated the handheld market,

which peaked with the £399 ScanMan Colour in 1992.

In the mid to late 1990s, the dedicated document scanner made a comeback. Previously an attachment for a flatbed device, this new breed was little larger than a half-finished roll of kitchen paper and fed papers through with rubber rollers. Visioneer was the undisputed king of these document scanners.

However, many unknown Taiwanese companies were building scanners for the big boys, but toward the end of the 1990s they realised they could competitively market themselves. Within a couple of years, the average price of a flatbed scanner

plummeted. Flatbed prices seem to have bottomed out today, but have just about eliminated every other type of budget scanner. The CCD is also gradually approaching the quality of high-end drum scanners, with innovative 'XY-Stitch' flatbeds moving their CCD heads both vertically and horizontally over the image to produce extremely high-resolution scans.

It is, however, refreshing to remember that the best quality imaging device is also the oldest. Coupled with the advanced processing, recognition and storage features of the human brain, our very own eyes are the best scanners in the world.

**Scanners explained**

**Flatbed Pros** - Flexibility of scanning photos, film, documents, card, books, small objects;

**Cons** - Occupies lots of desk space and you shouldn't put anything on the lid

**Drum Pros** - Highest quality scans make drums the choice for high-end reproduction; **Cons** - Very expensive, large and require expertise to operate

**Handheld Pros** - Smallest desktop scanner, and cheap too; **Cons** - Small scanning area, average quality, increasingly rare

**Document Pros** - Small and dedicated to document scanning, management and OCR

(optical character recognition); **Cons** - Not suitable for thicker originals, typically poor colour quality, also rare

**Network Pros** - High-speed document scanning and server support - ideal for large offices; **Cons** - Large, expensive and not on your desk. Requires network expertise

**Film Pros** - Concentrates high optical resolution into small area to capture small frames; **Cons** - Low flexibility - only scan film, and some only do 35mm

**Digital camera Pros** - Portable, captures small and large objects, pretty flexible;

**Cons** - Quality only sufficiently good for A4 prints with 3.3 megapixel models

1973	1981	1988	1989	1989	1999
					
The barcode standard, a linear design used to label and identify products, is chosen as the Universal Product Code symbology. Checkouts are never the same again.	Heinrich Rohrer and Gerd Karl Binning invent the Scanning Tunneling Microscope, a scanner that can image tiny atomic details. Scary insect photos follow.	AMS launches first handheld scanner, and soon after is bought by Logitech. In 1992 Logitech releases ScanMan Colour for £399. Handhelds are almost extinct today.	Microtek launches the world's first affordable 300dpi three-pass 24bit colour flatbed. By the mid-1990s, the Taiwanese dominate the budget flatbed market.	Adobe Photoshop is launched and becomes the killer application that revolutionised digital photo retouching and sold millions of scanners in the process.	Stanford and University of Washington complete project to scan the sculptures and architecture of Michelangelo in 3D using custom laser rangefinder and gantry.

# The power behind digital imaging devices

We take an in-depth tour around the technology that makes a scanner work and explain how you can get the best results

All digital imaging devices work on the same principle of reflection or transmission. The subject is placed before the imaging device, consisting of a light source, optics and a sensor. The amount of light reflected by or transmitted through the subject is gathered by the optics and focused onto the sensor, then converted to a voltage proportional to the light intensity – the brighter the image, the more light is reflected or transmitted, resulting in a higher voltage. This voltage is changed by an analog-to-digital converter into bits of information the computer can understand.

## The subject

In practice the range of subjects we want to capture digitally is varied, so many different imaging devices have been developed. Flatbed scanners are currently the most widespread, although digital cameras are increasing in popularity. While scanners and cameras seem, on the surface, to be very different, their purpose is the same: to capture a subject and present a computer with a bitmapped digital image file.

In the case of the camera, you simply point it at your subject and expose the entire sensor in one go, using natural or man-made light sources. The scanner, on the other hand, operates in an almost clinical environment, encompassing the subject and using its own light source for consistent illumination.

While a camera is forced to expose its entire sensor in one go to capture fast-moving subjects, scanners operate at a quite leisurely pace. Whether in a drum, on a flatbed, or dragged past by hand or rubber rollers, the scanner slowly passes its sensor over the subject (or vice versa) in a capture process that typically takes between 10 seconds and two minutes depending on the technology. For

more detail see the *History* section of this *pcwexpert*.

## The sensor

The most common sensor in digital imaging is the Charge Coupled Device (CCD), which is at the heart of most scanners, digital still cameras and camcorders. A CCD consists of many tiny photo-sensitive elements arranged in a rectangular grid in the case of a video or digital camera, or in a long, thin line in desktop scanners; the more photo-

sensitive elements per unit length, the higher its resolution, and greater its capability of resolving fine details in the subject. The CCD in a scanner may be 2-3in long, while one in a digital camera may only measure 0.5in across its diagonal. The number of genuine photo-sensitive elements in a CCD used to capture the subject is its optical resolution.

The energy associated with the photons of light that strike a photo-sensitive element during an exposure are absorbed by the silicon and converted into

electrical charge. At the end of the exposure, the amount of charge in the element is directly proportional to the number of photons that struck it, and to the relative brightness of the subject at that point. By converting the charge from a load of photo-sensitive elements placed closely together, it's possible to capture and recreate the subject. It's like placing transparent graph paper over the subject and measuring the brightness in every square, the smaller the squares the more accurate the reproduction will be.

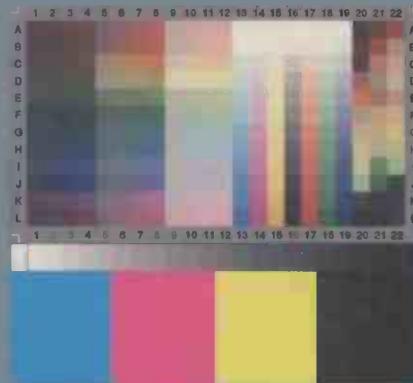
## Colour correction

Ever had one of those conversations where you're describing something as rusty orange coloured, but are then stopped and told it's clearly pillarbox red, or worse still, lime green? Yes, we all have very different ideas about colour and computers are no different.

The trouble is that monitors and scanners work with red, green and blue (RGB) light in an additive process, whereas printers work in a subtractive process using cyan, magenta, yellow and black (CMYK) inks. Not only do you have to convert between colour spaces when printing a scan, but the CMYK model cannot reproduce the same range of colours as RGB.

Just because your monitor and scanner both work with RGB doesn't mean they won't give you colour headaches. Your scanner has no idea what the brightness, contrast, or colour temperature settings of your monitor are. It's crucial to ensure your monitor is correctly set up before you start making tonal and colour adjustments on scanned images. TFT monitors are not capable of displaying the same levels of detail in shadows and highlights as a CRT.

The solution is to employ a Colour Management System (CMS) that will calibrate each component so what you scan should look the same on screen and the printed page – or at least close enough to work confidently. These systems will also warn you if you're trying to reproduce a colour that's clearly out of the printer's capabilities.



Fortunately, the International Colour Consortium (ICC) has gone to the trouble of developing a standard to describe the colour characteristics of any device, be it a scanner, monitor or printer. Called ICC profiles, they effectively plug into colour management software that can make the required corrections and compensations. ICC profiles are available for many popular imaging devices, but you can make your own by measuring how your device handles standard test targets packed with tricky coloured squares. Many decent printer drivers can be fed an ICC profile for a scanner and the printer itself, in order to produce calibrated output. If you fancy a quick, easy, yet effective means of colour matching, check out Colorific, available to order online for around £35, or bundled with some monitors and graphics cards. Colorific: [www.ecolor.com](http://www.ecolor.com)

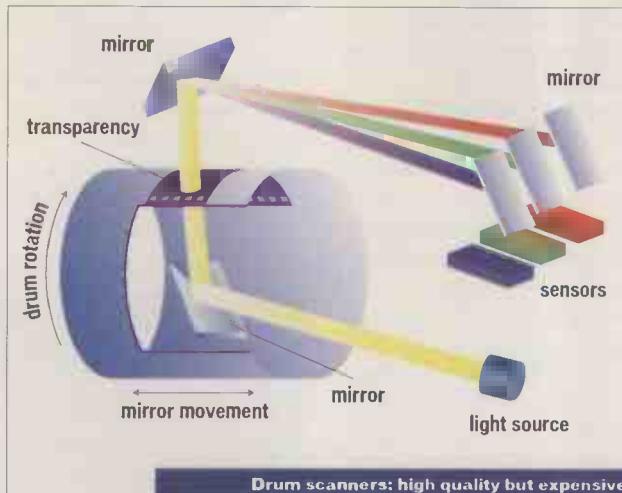
Modern budget scanners are increasingly using an array of illuminating LEDs and contact image sensors instead of a fluorescent tube and CCD for capturing images. Unlike flatbed CCD arrays that measure only a couple of inches across and use a lens to capture the full A4 width, an LED system evenly spreads its elements across the entire 8in document width. This allows them to produce images that are as sharp at the edges as they are in the middle and not rely on optical lens quality for edge performance as CCD units do.

Brightness alone doesn't, however, contain any colour information. To capture full colour, you need to place suitable filters in front of the CCD. Since mixing different amounts of red, green and blue light can make up the entire visual spectrum, digital imaging devices place red, green and blue filters in front of their CCDs - like a cathode-ray tube in reverse. Normally there are three separate CCDs, each with a different filter, while on older scanners a single CCD builds a full-colour image in three passes.

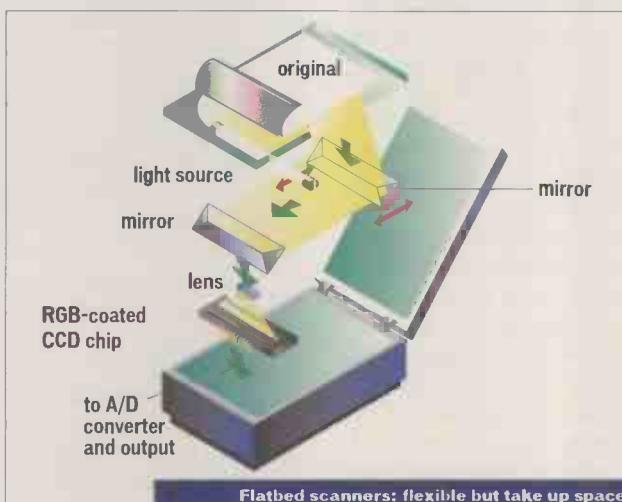
### Pixels and resolutions

Once the exposure is complete, there will be three brightness values representing a tiny section of the subject: one each for red, green and blue. When combined, the result is a single full-coloured dot, often called a pixel. Since most digital imaging devices are used to capture colour subjects, their resolution is described in full colour. Cameras, webcams and camcorders are described by the number of effective colour pixels used to capture the whole subject in one go. Hence a camera with 1,600 x 1,200 colour pixels is described as having 2.1 million pixels (2.1 megapixels).

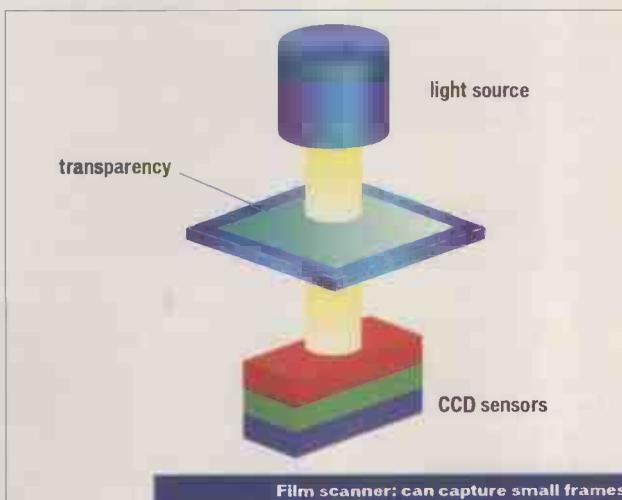
Since scanners capture subjects of different sizes, their resolving power is more fairly described as a number of dots or pixels per inch (dpi or ppi). The important figure is the optical resolution, since this refers to the number of effective photo-sensitive elements in the CCD, as opposed to extra dots invented by software later in the process.



Drum scanners: high quality but expensive



Flatbed scanners: flexible but take up space



Film scanner: can capture small frames

Unlike a camera's rectangular CCD with hundreds of dots horizontally and vertically, the CCDs used by most scanners consist of a single line of elements in a row. While the scanning CCD may only be a few inches long, it

captures a much wider area using special lenses and mirrors.

A scanner claiming a horizontal optical resolution of 600dpi and a maximum capture width of 8in will have 8 x 600, that's 4,800 light-sensitive

elements on its CCD. Most colour scanning heads contain a fluorescent tube light source with three such CCDs, filtered for red, green and blue light, plus optics to focus the subject onto the CCDs. These allow the scanner to capture a full-colour image in a single pass in around 30 seconds.

A scanner's vertical resolution is dictated by the degree of fineness by which the imaging head can be directed over the image. The first affordable PC scanners were built into handheld devices that the user dragged across the subject. Document scanners or fax machines use motor-driven rollers to drag the subject through the device and over the CCD. In the case of a flatbed scanner, the head is driven by a stepper motor, a device that turns a predefined amount every time it is fed an electrical pulse. The maximum vertical resolution may exceed the horizontal one thanks to the stepper motor being highly geared; an optical resolution of 600 x 1,200dpi is not unusual, but the important number is the (normally smaller) horizontal one referring to the actual CCD.

The optical resolution describes the maximum amount of genuine detail the device can capture. But if you look too closely, you'll see the steps originally used to chop up your subject during the digitising process. In the case of image capture, you'll begin to see the pixels as small solid squares of colour that get more obvious the greater you enlarge the picture. The closer you want to look at or enlarge a digital image, the more pixels you'll need to capture it with in the first place. This is why optical resolution is such a crucial specification of any digital imaging device. However, short of buying a higher-resolution device, what can be done to eliminate these jagged edges?

### Interpolation

The apparent resolution of a digital image can be increased by interpolation, which under software or hardware control guesses intermediate values and inserts them between real ones.

In theory, if your image has a red pixel next to a yellow pixel, it may be fair to assume that if there were an additional one in between, it would be orange. Interpolation would add that orange pixel in the appropriate place, effectively doubling the apparent resolution of the image.

In practice, interpolation can be more sophisticated. To create just one new pixel, normally all its surrounding neighbours are considered, and in some cases, the interpolator looks further outwards in the attempt to predict a trend. Of course, if you've gone to all the trouble of creating one new pixel, why not go the whole hog and insert several more between your 'real' pixels. This is exactly what's offered by just about every scanner on the market, with some 600dpi optical devices boasting interpolated resolutions up to 9,600dpi. It doesn't take a trained eye to treat such figures with at least a little scepticism, and it's certainly true that most of the time they're used purely in a marketing numbers game. So is interpolation all bad?

In the negative camp, interpolation cannot invent detail that was never captured. Consider a car number plate, where the characters are just beyond the resolving power of the imaging device and haven't appeared on the final picture. While a higher-resolution optical device would capture the characters, no amount of interpolation on the lower-resolution image will make them appear.

On the positive side, inter-

polation will increase your number of pixels to a point where the jagged edges will be smoothed away. Sure, there won't be any additional detail in your picture, but at least you won't be plagued by a blocky image. Interpolation can really help when it comes to making an acceptable-looking big enlargement from a modest-resolution digital camera.

It's worth pointing out that some original subjects are very simple and can be successfully predicted. While the car number plate is a tough subject, consider a simple circle as part of lettering or a logo. When captured with low resolution, the stepped edges of the circle will be painfully apparent, but interpolation could be used very successfully to fill in the gaps with smaller dots, producing a considerably smoother result. As with so many aspects of digital imaging, the results depend on your particular subject, device, additional processing and personal expectations. Consequently, you may find interpolation to be a winner on one day, but a pointless loser on another.

### Dynamic range

At this point you'd be forgiven for thinking that raw resolution is the be-all and end-all of digital imaging. While it is the single most important specification of an imaging device, one that follows very closely behind is dynamic range.

So far we've discussed brightness and colour as simple abstract values but, in the world of digital imaging, real numbers are required for everything. In the same way that optical resolution physically chops a subject into a grid of manageable pixels, so must each brightness value be assigned a number. The difference between the lightest and darkest value that can be captured is known as the dynamic range, and it's this range that's also divided up during the digitising process. Like optical resolution, the more steps that can be assigned to describe a level of brightness, the more accurate the result.

The assigning of a nearest number to describe a brightness value is the job of the analog-to-digital converter within the device. Normally these are described as operating with a certain number of bits. Just like

graphics cards, 8bits give you 256 levels, 16bits offer 65,536 and 24bits boast just under 16.8 million levels. It's generally accepted that the human eye cannot distinguish between adjacent grey levels when 256

## File formats

There is a wealth of graphics file formats to choose from, which can make a huge impact on the quality of your image and the amount of storage space it occupies on your PC. It's crucial to consider where you're going to use your image before making any file format decisions that could permanently compromise its quality.

Before the days of web dominance, the most common graphics file format was the Tagged Image File Format (TIFF), which stores the contents of a bitmap image in the required number of colours and nothing more. The only problem was that file sizes could become unmanageable - a 10 x 8in 300dpi TIFF in 24bit colour measures over 20MB.

As exchanging images became increasingly common online, CompuServe developed the Graphics Interchange Format (GIF). This format reduced the total colour palette to 8bit, then looked for identical coloured pixels in a row. By describing rows of identical pixels in one go, simple images could be highly compressed without any loss of quality. This technique is known as Lempel-Ziv-Welch (LZW) compression and is used by WinZIP, as well as being offered as an option when saving TIFFs from some applications. LZW is not particularly efficient at compressing full-colour images, but since the process operates without any loss of quality, you may as well use it where available. Beware of saving photos as GIF files though, as in almost all cases it will permanently reduce your total colour depth to only 8bit.

Undisputed king of Internet image formats is the JPEG from the Joint Photographic Experts Group. Unlike LZW, JPEG employs so-called lossy compression, which permanently throws away information it deems unnecessary. The level of compression is set by the user, with higher compressed images occupying less space, but looking worse for it. Finding out how much compression is tolerable is a case of experimenting, and you'll find some images look better than others. Photoshop 5.5 offers an invaluable preview of how the compression will look compared to the original. While perfect for delivering full-colour images online, we recommend important pictures are archived in the TIFF format as backup. Although using the best-quality JPEG settings may not produce the smallest file in the world, but the resulting image will be almost indistinguishable from the original.

**You'd be forgiven for thinking that raw resolution is the be-all and end-all of digital imaging**

levels are used. So basic colour scanners employ 8bit analog-to-digital conversion for each of the three colour filters, red, green and blue, making a total of 24bits per full-colour pixel.

Unfortunately, a few of the least significant bits are lost in electronic noise, while any post-scanning tonal corrections reduce the range further still. It's for this reason that superior scanners boast not 24bits per pixel, but often 30 or 36bits, or sometimes more still. These offer a much higher dynamic range with finer steps between adjacent levels, resulting in greater tonal detail, particularly in dark shadows or bright highlights. Most applications, and especially printers, cannot handle this tonal range, but once your device has captured it, you can shift these subtle details into tonal ranges that can be finally reproduced. Capturing an increased dynamic range also gives you more room to breathe when making other tonal corrections, after which you should still have a great set of 24 most significant bits to output.

Sadly, dynamic range has also become a marketing numbers game of late, with many bargain-basement scanners described as offering 36bits per pixel. While it's remarkable what cheap scanners can deliver, don't kid yourself that their final tonal performance will be anywhere near that of a high-end scanner. Tonal performance separates the men from the boys in the digital imaging world, with those that talk the talk, but not walk the walk suffering from undesirable noise and lack of detail in shadows and highlights, regardless of the number on the box. Even as high-end CCDs improve, ultimate tonal dynamic range still requires the photo-multiplier tubes used in drum scanners.

### Tonal density

Density is the degree of opacity of a photographic image on paper or film, and is usually described as a number between 0 and 4.0D. It's a description of tonal range, calculated as the  $\log_{10}$  of the number of grey levels - hence in theory, 8bit 256 grey level has

2.4D, 10bit 1024 grey level has 3.0D, while 12bit 4096 grey level achieves 3.6D. Scanners are often described as capturing a certain density, but marketers of cheap products often quote theoretical figures, without taking noise and surface reflection into account. The highest density ranges are still in the realm of drum scanners which may genuinely deliver as much as 4.0D (approaching 16bit greyscale).

### Getting the image out

At this point in the capture process, the subject has been exposed to and measured by the

imaging sensor, and a massive amount of data generated. It's this data that's processed by the scanner's built-in firmware, often under user instruction via the software driver mentioned in a moment. In the meantime, the data has to be transferred from the imaging device into the PC for subsequent use.

In the past, the dominant interface for connecting all types of scanners to computers was SCSI, which still boasts high performance along with broad device connectivity options. SCSI was the most common scanner interface since it used to be a

standard fitting on Apple Macs that previously dominated the digital imaging market and are still the most popular platform in many high-end facilities.

As PCs entered the digital imaging arena, SCSI cards were fitted to allow them to communicate with scanners. However, as many Taiwanese manufacturers moved into the market and drove scanner prices down at the entry level, a new cheaper interface was required. For a short period, the enhanced capabilities of the PC's ever-evolving parallel port were employed, but with variable

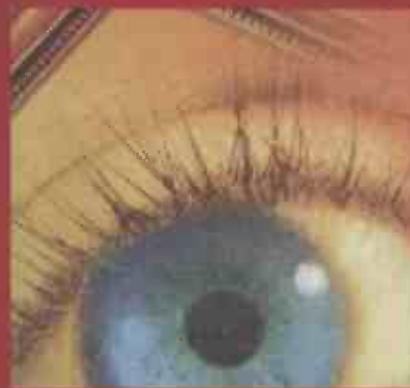
## Configuration tips

Adobe Photoshop dominates the high-end photo retouching and image-manipulation market. Much of its success is down to licensing deals where Photoshop or a cut-down version is bundled with many scanners as standard. Buying a scanner is a great way of getting hold of a copy of Photoshop, as even the limited versions come with attractive upgrade offers. The current version is 5.5, which includes a copy of ImageReady 2.0, designed for getting images optimised for web use. Online graphics manipulation is an increasing business for Photoshop, which started life as the professional printer's best friend.

Manipulating images can be thirsty work for a PC, but there are ways you can lighten the load. What follows are some configuration tips applicable to all photo retouching applications, and a few just for Photoshop.

Ultimately, memory is key. The instant you run out of memory, your hard disk is enlisted to pretend, but it's absolutely nowhere near as fast. Consequently, if image manipulation is your thing, ensure you have sufficient memory to handle your common files entirely out of RAM, and remember your applications and operating systems will want a fair portion too. When it comes to printing images, a large amount of memory also comes in handy. We recommend at least 128MB to get started with digital imaging, with 256MB and above advised for serious work.

As far as Photoshop is concerned, Adobe recommends three to five times the amount of system RAM as the size of the image you're working on. If that isn't possible, remember to



purge the cache from time to time - you'll lose your 'undos', but free up memory. Also, in Photoshop's preferences, devote all available RAM to Photoshop, and when working on heavy images, quit all other applications.

The speed of your hard disk is also paramount as it defines how long you have to wait to open and save images and prepare pictures for printing, along with being a big factor in virtual memory performance when you run out of RAM. Bigger and faster drives are always better, but consider using a pair of hard disks, as both drives firing simultaneously can effectively double your bandwidth. Try installing your OS and application on one disk, but keeping, say, files on the other.

Photoshop uses its own virtual memory system called a Scratch Disk. Decent performance increases can be enjoyed by devoting your second hard disk to the Scratch Disk. It's also useful to check the efficiency and scratch ratings in the corner of Photoshop to measure available system resources.

success usually depending on the age of the motherboard. Today the dominant interface at the low to mid-range is USB, allowing reasonably quick data transfer, but more importantly for most users, easy connectivity.

At the high end, SCSI still holds on to much of the market, although several devices now have IEEE-1394 FireWire interfaces. These mostly cater for modern Macs that have dumped SCSI in favour of FireWire, although, ironically, many high-end Mac users fit third-party SCSI cards to retain compatibility with older peripherals.

### Never the TWAIN

We take many PC technologies and innovations for granted. One of the most useful, but often ignored, was the Windows printer driver, which installs just one driver for a particular printer, that can then be used to output from every Windows application. Sounds obvious, but in the old days, a different printer driver was required by each application. Believe it or not, a similar situation existed with scanners for much longer.

Until quite recently, a scanner was supplied with a standalone piece of software that was launched each time you wanted to scan. Once your image was scanned, you had to save the often large file before launching your image-editing application and laboriously opening the file again – hardly ideal.

The solution for Windows was developed by Hewlett-Packard, Kodak, Aldus (since merged with Adobe), Logitech and Caere. Called TWAIN, but not standing for anything, it's a single scanner driver available for control from any TWAIN-compliant application.

TWAIN-compliant applications usually have two options on their File menus to select between multiple imaging devices, then to acquire the image from the chosen device. During acquisition, the scanner's unique set of drivers and controls are presented, without having to leave the host application. Once scanning is complete, the driver

## What resolution?

The biggest question facing all scanner users is deciding which resolution to use. Popular misconceptions include using the highest available simply because you've paid for it, or matching the scanner's dpi with that of your printer. The real answer is to consider the size of your subject and the size and environment in which you'd like it reproduced. For starters, we'll consider colour inkjet printers.

First, forget the resolution of your printer, as this normally refers to drops of ink and not the number of full-colour scanner pixels that can be reproduced. Virtually every colour inkjet printer is happy being fed around 200 full-colour dots of information per printed inch. Lesser models may be happy with 150, while top-of-the-range ones may be able to make use of up to 300, but any additional information will be ignored and just slow down the image handling process.

Consequently if you have a 6 x 4in photo that you want reproducing same size on your inkjet printer, scan it at 200dpi. If you want it reproducing half the actual size, then halve the resolution to 100dpi. If you want it double the size, then double the resolution to 400dpi.

High resolutions are only required when significantly enlarging small subjects. Photographic film is a prime example, where a 35mm frame measures only 1in tall. Scan this at 200dpi and you'd only get a 1in tall print. To enlarge it to 4in tall, you'd need to scan at 800dpi. To make a 10 x 8in print, you'd need to



scan at 1,600dpi. While you can fit a transparency adaptor to a flatbed scanner that shines light through the film, the sad fact is that most flatbeds just don't have sufficient optical resolution to handle 35mm film. Instead, you should use a dedicated film scanner. Typical models may only handle 35mm subjects, but boast optical resolutions of 2,700dpi, sufficient to produce a good-looking A3 print.

Scanning for the web is the other way around. The target viewing device is a monitor, which, depending on the display mode, will be operating between 70 and 100dpi, with each on-screen pixel directly handling one colour scanner pixel. So for a display running at 70dpi, scan at 70dpi for same-size reproduction, 35dpi for half-size, 140dpi for double-size and so on.

See the workshops later for some more advice on scanning for print, the web and film.

window closes, leaving the scanned image open in the host application. No unnecessary quitting, launching, or saving of potentially large or useless files.

TWAIN can be used to control almost any imaging device and, while in the early days it was occasionally used for digital cameras, today it's almost exclusively used for scanners.

All TWAIN drivers have much in common. Dominating the proceedings is a preview window that presents a low-resolution picture of the subject. Once previewed, the TWAIN driver lets you crop the subject to capture the area you desire, along with adjusting brightness, contrast and, in more sophisticated drivers, the colour and tonal curves.

Generally, the TWAIN driver will take the most significant 24bits that remain after correction and deliver these to the host application. However, since the TWAIN driver is talking directly to the scanner, this is the place to make tonal corrections, as here you're dealing with the maximum dynamic range of the device. Some scanner/TWAIN combinations can output more than 24bits to your PC, but you'll need a suitable application to deal with them. Photoshop's 48bit RGB mode can handle colour depths greater than 24bit, but almost all the options are greyed-out, and you'll be dealing with file sizes double that of 24bit.

Within the TWAIN driver you also set the operating resolution

and optional interpolation. Next to these are normally the colour settings, for capturing different types of subjects. While full 24bit (or higher) colour is suitable for colour photographic work, black and white photos need only 8bit greyscale modes, and pages of text for OCR work may only require basic mono 'line-art' capture – note that some OCR packages can make use of greyscale information for better recognising text. A CMYK option may also be available for delivering an image optimised for a specific printer, normally using standard ICC colour profiles (see Colour correction box). Epson's scanner drivers have optional settings optimised for its range of Stylus Photo printers.

# Scanning terminology

Scanner technology is full of acronyms and specialist words, but the pcw expert Glossary reveals all

**Artefacts:** Undesirable elements on an image introduced through limitations of a digital device, processing or compression system. Typically they show up as snow-like noise, speckles, blocks or banding.

**CCD:** Charge Coupled Device. A type of silicon chip used in many imaging devices. Uses a grid of light-sensitive elements that store electrical charge proportional to the amount of light falling on them. The charge is converted into digital data for processing.

**CMYK:** Cyan, Magenta, Yellow and Black. The four colours used by almost every printing process. By printing these four inks in different sized dots, the eye is fooled into perceiving full colour. CMYK is often offered as a scanning mode that is optimised for a specific printer. (The letter K is used for Black to distinguish it from the B for Blue in RGB.)

**CMS:** Colour Management System. Ensures colours you scan are the same that you see on-screen and on the printed page. Limitations in various devices mean some colours can never be perfectly matched, but a CMS can help prevent nasty surprises.

**Compression:** Mathematical formulas used to identify redundant information in a digital file and remove it to save storage space or transmission time. Compression can either operate in a lossless form where there is no loss of quality, or lossy which reduces quality, but can significantly decrease file sizes.

**Density:** Degree of opacity in an image, usually between 0 and 4.0D. A description of tonal range, it's often quoted as a scanner specification, but there is a difference between theoretical density and the tonal range a device can deliver.

**Drum scanner:** Lathe-like device that mounts image on a transparent spinning cylinder. Large, expensive, requires trained operators, but offer best quality.

**DPI:** Dots per inch, often used to

describe the resolution of a scanner or printer. Since a printer needs to drop lots of dots to recreate one full-colour scanner dot, many scanners now describe their resolution in the more accurate pixels per inch (PPI).

**Dynamic range:** The range of measurable tones in an image, ie the difference between the lightest and darkest portions.

**Flatbed:** A scanner in which the original is placed on a glass plate under a lid. Resembling a slim photocopier, flatbeds are the most flexible scanners available.



**GIF:** Graphics Interchange Format. Graphics format developed by CompuServe for online use. Reduces colour depth to 8bit (so not as suitable as JPEG for photographs) then uses LZW lossless compression.

**Halftone:** Technique used to reproduce a continuous-tone photograph as a mosaic of tiny dots. Halftoning gives the perception of full colour, when in fact only four different inks are typically used – see CMYK.

**Histogram:** A graph that indicates the tonal distribution of an image and the relative number of times each tone is present. Typically presented from 0 (black) to 255 (white), with shades of grey between.

Histograms are very useful for evaluating the quality of a digital image and tonally correcting it.

**Interpolation:** Mathematical process of increasing apparent image resolution by averaging adjacent pixels and inserting new ones. It will never create new detail but can smooth edges.

**JPEG:** Joint Photographic Experts Group. Most common image file format used by digital cameras and on the web. Uses permanently lossy compression, but at a user-variable level.

**Line art:** Black and white,

monochrome mode offered by some scanners to capture text.

**Lossy:** Type of digital compression that permanently throws away information in an attempt to reduce file sizes. Used by JPEG format – see above.

**LZW:** Lemple-Zif-Welch. Lossless compression used in WinZIP format, and several graphics formats such as TIFF and GIF.

**Moiré:** Undesirable patterns produced as a result of scanning an image that has already appeared in a book or magazine, ie halftoned. De-screening options on some scanners can reduce the effect.

**Newton's Rings:** Undesirable artefact that can occur when light shines through glass in the

scanning process. Flatbeds sometimes suffer, where dedicated film scanners may not.

**OCR:** Optical Character Recognition. Software that attempts to recognise shapes as characters from a scanned document, and output the result as an editable text file. It is rarely 100 per cent accurate but will save time retyping documents.

**Optical:** As in optical resolution, the genuine resolving capabilities of a scanner. Many unscrupulous marketeers prefer to highlight the 'invented' interpolated figures.

**PMT:** Photo Multiplier Tubes. Sensors used in drum scanners, which boast much higher tonal dynamic ranges than CCDs.

**PPI:** Pixels per inch. Used to describe resolution of scanners – see also DPI.

**RGB:** Red, Green and Blue. The three lights used by displays or filters used by scanners to handle the full visible spectrum of colour.

**TIFF:** Tagged Image File Format. A popular uncompressed graphics file format. Sometimes offers 'LZW' option.

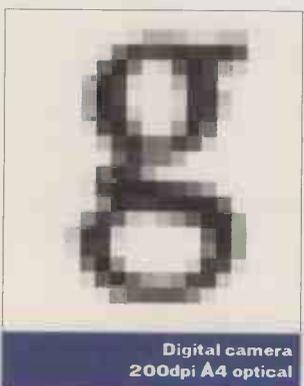
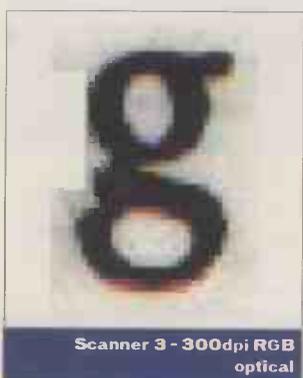
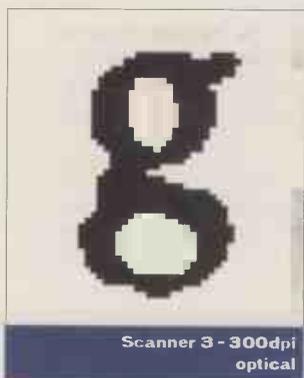
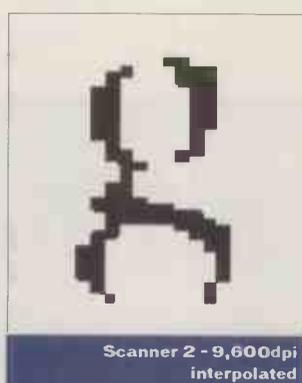
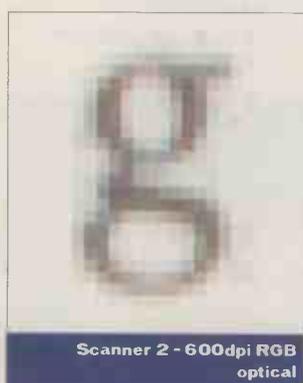
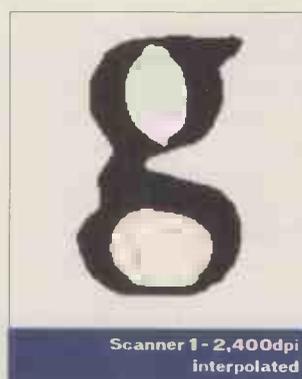
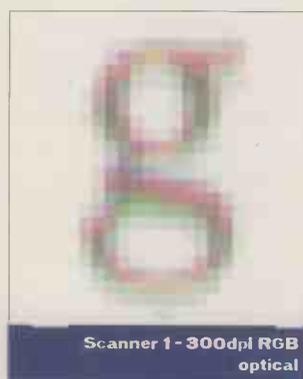
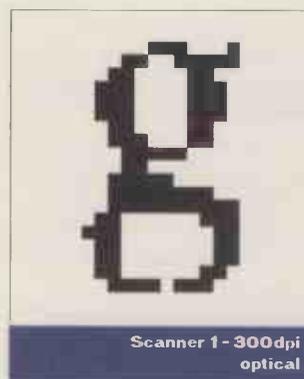
**Transparency Adaptor:** Replacement lid for flatbed scanners. Contains own light source to shine through transparent originals onto the imaging CCD. A driver lets you convert negatives to positives, but relatively low optical resolutions mean small enlargements from tiny 35mm frames.

**TWAIN:** PC standard for scanner drivers. Activated using the Acquire option on an imaging application's File menu, the TWAIN driver presents all the scanner's capture options. Doesn't actually stand for anything. Macintosh scanner drivers are normally supplied as Adobe Photoshop plug-ins.

**Unsharp mask:** A traditional film compositing technique used to sharpen image edges. Now offered digitally by many apps, it can correct blurring introduced during photographing, scanning, resampling or printing.

# Unravelling the numbers game

The numbers quoted by scanner manufacturers often bear no relation to the actual resolution or tonal dynamic range



**T**he most important scanner specifications are genuine resolution and tonal dynamic range, both of which have been described in detail earlier. Sadly, scanner marketing has a severe case of number-itis, where bigger is always perceived as better. In truth, the figures quoted are frequently misleading and in many cases bear no relation to the actual results. We devised two tests in order to find out how truthful various specification claims are in reality. On the left are the results of our resolving power and interpolation tests, while the histograms on the right reveal true tonal capabilities. In each of the two tests we took different sets of budget flatbeds to illustrate our points.

## Resolving power

The images on the left show the results of our resolution test for three different budget flatbeds and one digital camera; we'll discuss the flatbeds first. We took an A4 page of text and scanned it at the highest optical resolution in both mono and colour modes – this was typically at either 300 or 600dpi (dots per inch). Then we scanned the same page at the highest interpolated resolution, which claimed to be from 2,400dpi to as much as 9,600dpi in some cases. As we discovered, the numbers are often meaningless.

Each scan was cropped to reveal a single character: a letter g measuring a mere six points, or 1mm tall. From left to right is the optical resolution in mono, optical in colour and interpolated in mono.

Taking the three mono optical results in the first vertical column, our third budget scanner delivered the best result, even though it was rated at 300dpi. Note the worst result from scanner two, despite claiming 600dpi optical resolution.

The colour results are interesting if only to illustrate the

convergent problems facing a budget flatbed. Each of these letters in the middle vertical column should be pure black with the minimum of colour fringes. Again, scanner three delivers the best result, but none of them can really be described as great.

### Interpolation

The interpolated results are particularly revealing. Remember, each of the three results down the far right-hand vertical column were generated by the scanner from the results down the first vertical column. Given this as a starting block, scanners one and three have produced remarkable results, but note the claimed resolutions of each model. Scanner one has the best interpolated result, but only describes it as 2,400dpi, compared to scanners two and three claiming 9,600dpi. While scanner three's result is good, clearly the 9,600dpi result of scanner two leaves much to be desired.

### Digital camera

At the bottom are some results from the Nikon CoolPIX 990 3.3megapixel digital camera. We photographed the same A4 page of text in uncompressed TIFF mode to avoid JPEG artefacts. With 2,048 pixels for the entire height of the page, the camera was effectively working at around 200dpi, and the result on the far left is understandably blocky. The middle image shows the result after we took it into Adobe Photoshop and interpolated it up to 1,000dpi. It has significantly smoothed the edges. Out of interest we set the Nikon to macro and got as close as we could to the page (right-hand image), capturing just over one inch across, it was effectively working at around 2,500dpi, and the result is, of course, very smooth. With modest-sized text, digital cameras of 3.3megapixel

resolution can now clearly be used for OCR work. Compared to the flatbeds, the Nikon's colour convergence is very good too - remember each of the three test images was taken and reproduced in colour.

### Tonal range

To measure and compare tonal and colour capabilities, we scanned a standard IT-8 target, pictured at the bottom of this page, using three different budget flatbeds (not the same models as in the resolving test). The IT-8 consists of a grid of colours and a strip with 21 distinct greyscales.

Using Adobe Photoshop's histogram tool we analysed the coloured and greyscale sections separately. The top graph represents the range of colours captured, which should ideally slope off smoothly at the extreme ends. Where it falls short at the left or right sides, shadow or highlight details respectively are being lost. The lower graph should ideally show 21 sharp, thin and evenly spaced peaks; the reality indicates the number of greyscales resolved and the inability to separate adjacent grey levels in some cases.

Consider the upper graphs of figures 1, 2 and 3 for the colour results first. All three scanners are failing to capture any detail in the darkest areas using automatic settings. Figure 1 is clipping at the bright right-hand end rather than falling smoothly off as the scanner in figure 3 is doing. The one in figure 2 is simply not capturing any detail in either the dark or bright areas using automatic settings.

In contrast, the scanner in figure 2 has the best defined peaks in the lower greyscale graphs. All three models are having difficulty separating the darkest greyscales from each other, but the scanners in figures 1 and 3 are also blurring the distinctions between adjacent grey levels.

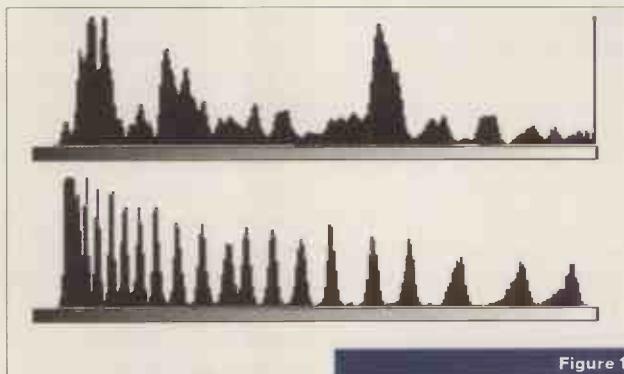


Figure 1

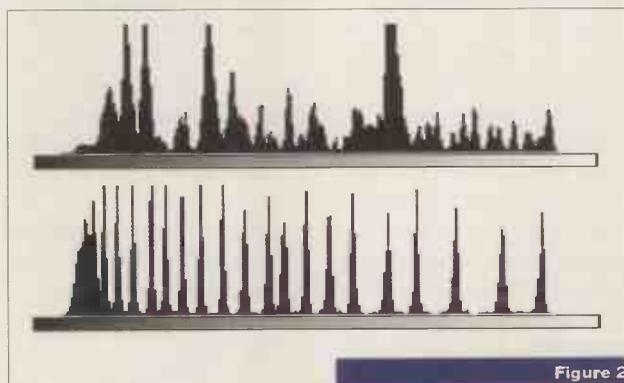


Figure 2

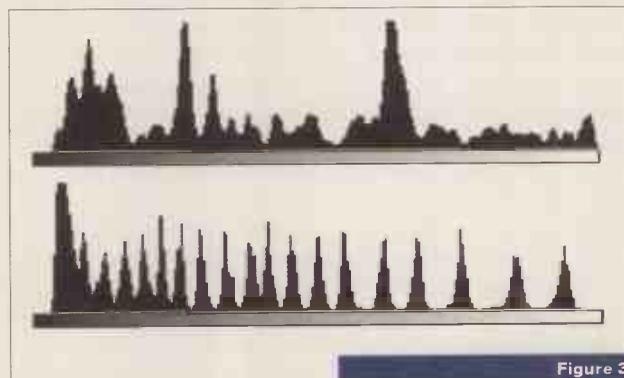
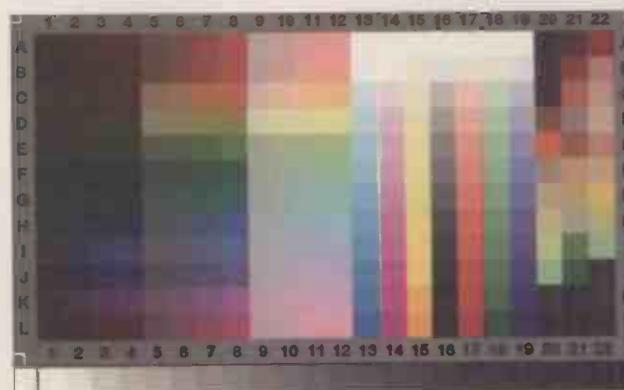


Figure 3



# Moving towards another dimension

Technology is moving so fast that it won't be long before we will be able to touch and feel 3D digital objects

**W**hat does the future hold for image acquisition? In terms of capturing two-dimensional objects, there's not a great deal left to achieve. Since the late 1990s, the Taiwanese have forced down the price of entry-level flatbed scanners to a point that has reduced many established companies to tears. Certainly, higher optical resolutions and improved tonal density will become ever more affordable, but the physical side of the flatbed scanner is unlikely to change all that much. Companies like Canon have done a great job in recent years of slimming down their flatbeds to sylph-like proportions, but most still have at least an A4 footprint and don't like anything resting on their lids.

While flatbeds offer high flexibility and decent quality at low prices, other technologies are fast catching up. A digital camera is essentially a portable scanner that doesn't need a permanent connection to your PC - many can capture moving video too. When you consider that all digital cameras feature built-in power and storage facilities, capture their images in split seconds and are pocket sized, you've got to ask why you're using a flatbed.

The answer is that the controlled environment of a flatbed offers better capturing of flat originals, such as documents and photographs. As time goes on, though, the resolution of digital cameras will increase to a point where they'll match flatbeds, while cunning post-processing will ensure that 2D flat-capture is a snap. Proper document management and OCR facilities can't be far away on digital cameras.

Times are slowly changing at the high end of image capture. The PMT technology of drum scanners may still claim the top-dog position, but how much longer can these dinosaurs fend off steadily maturing CCD-based solutions? Flatbeds may seem

large in the desktop world, but compared to floor-standing drum scanners, they're tiny and highly desirable in cramped reprographic environments.

Resolution on CCD scanners is no longer an issue, with switchable lenses concentrating resources onto specific areas, and new high-end XY-Stitch flatbeds moving their imaging heads both vertically and horizontally across the image. You can bet that the tonal dynamic range will also improve in the near future and PMTs will shuffle off into retirement. Particularly innovative designs from companies like Imacon ([www.imacon.dk](http://www.imacon.dk)) are changing the way high-end professionals think of CCD scanners.

Software won't be standing still either. As image files increase in quality, they'll inevitably need more of your precious storage space.

In the world of consumer audio and video, the days of uncompressed digital formats are now just about over. DVD didn't get where it is today by not compressing its data and forthcoming high-end audio standards are also likely to use plenty of the squeezing stuff.

The JPEG file format can preserve image quality in a reduced space, but programmers and developers the world over are working on more effective means of compression that offer better quality yet ever smaller storage

requirements. As devices sport faster processors, the intensive compressing and decompressing stages will be significantly reduced, allowing new formats to infiltrate the mainstream.

The real breakthroughs, however, will be in the realm of 3D scanning and we're not

the shape is recreated.

The trouble with 3D scanners today is that they are large, bulky, fixed devices. This is necessary in order to precisely place the scanning head in relation to the object and collect accurate coordinates. Far better would be a handheld portable 3D scanner,



3D scanner in action mapping a Merc A Class

talking about using a digital camera to make a 2D image of a 3D object. Instead we mean capturing three-dimensional coordinates of an object, then being able to move around it or zoom in and out. With improvements in human interfaces, we'll be able to pick up and feel purely digital, non-existent objects.

Far-fetched? Not really. 3D scanning has been with us for many years in fields as diverse as movie special effects and the automotive industry. Both have real-life objects they wish to capture in every detail (be it an actor's head or a car), for later testing and processing.

In the same way that a digitally captured image can be emailed across the world and printed out, a 3D scan can be transported electronically, and manipulated on screen or reproduced in three dimensions. Stereo-lithography uses a laser to draw thin sections of a model, one sliver at a time, in liquid plastic. The plastic hardens and

which could capture an object in a process not dissimilar to filming it with a camcorder.

While simple for the operator, the compensation and reconstruction algorithms would be horrifically complicated. For a handheld 3D scanner to work, the processing would have to be carried out in real time and, while that isn't commercially possible for small-scale users today, the never-ending increases in processor performance should make such devices a reality in the future. Pie in the sky? No way - Canon has already demonstrated such a unit at its research centre in the UK, and PCW featured a similar device from 3D Scanners on p25 of the June 2000 issue.

One thing is certain: image acquisition devices are getting smaller, more portable and offering ever better quality. One wonders what Alexander Bain, inventor of the fax machine, would say to a handheld 3D scanner... he'd probably ask where the pendulums were.

**We'll be able to pick up and feel purely digital, non-existent objects**

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TMB00/05

# Scanning for printing

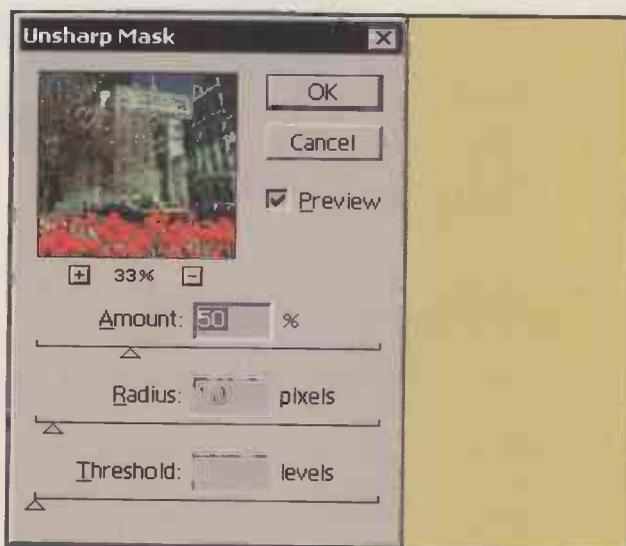
If you want to create a colour printout of a holiday snap, our first workshop shows you how to get the best results



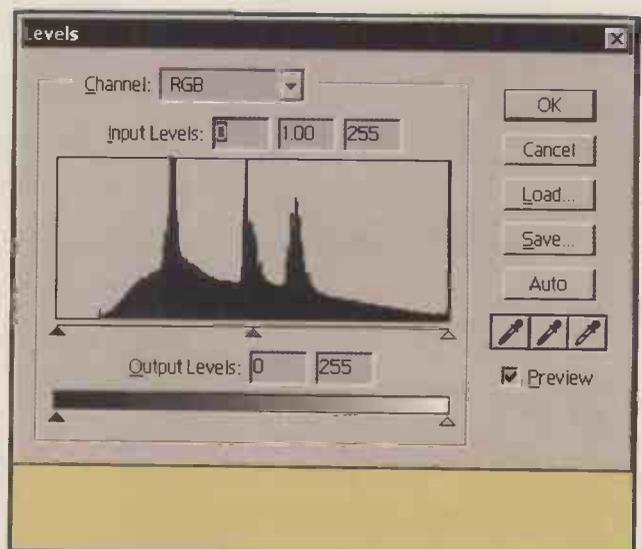
**1** The trick with scanning is to know the limits of your output device. Most colour inkjets are happy to be fed between 150 and 300 full-colour scanner pixels per printed inch. Try out different settings to see if you can tell the difference, but we find that around 200dpi is sufficient for most photos. Here we've set the scanner TWAIN driver to scan at 200dpi, and have made a preview of our photo. We've selected the picture and zoomed in – it's a 5 x 7in photo, hence the driver is stating a source of 12.80 x 18.16cm. The file size in 24bit will be 4.12MB.



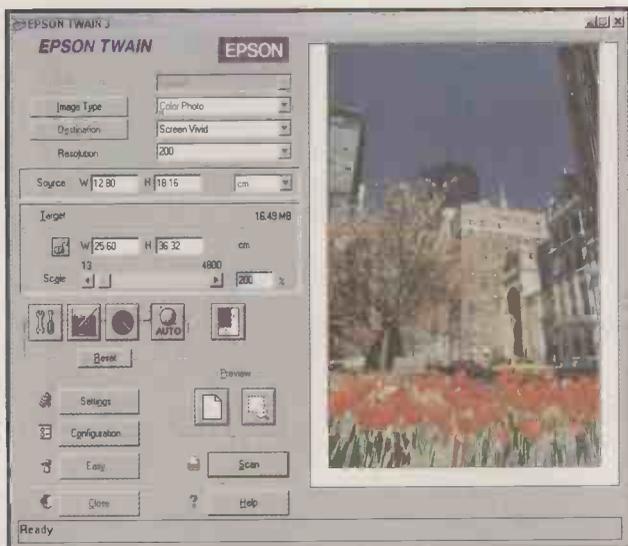
**2** If you want to resize the picture, then you'll need to change the resolution. It's a simple equation: double the size means double the resolution, whereas half the size means half the resolution. Since we've discovered that 200dpi is sufficient for same-size reproduction, then a double-size enlargement will require scanning at 400dpi, and a half-size reduction will require only 100dpi. Note that in the above screenshot at 400dpi, that the target file size has increased from 4.12MB to 16.49MB, reflecting the increase in image data.



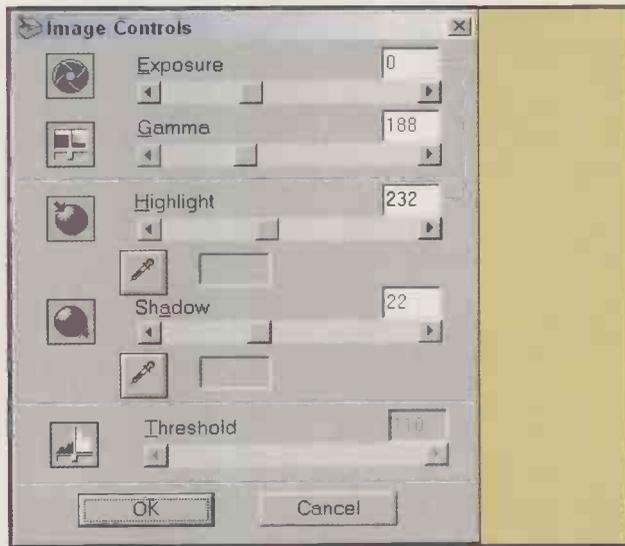
**5** Once you've made your final scan, it's time to make any corrections or enhancements. We've scanned into Photoshop 5.5, but the picture is looking a little soft. Many scanner drivers offer a sharpening control, but if that doesn't work try the sharpening controls in most photo retouching packages. Photoshop boasts no fewer than four different types of sharpening, including the strangely-named but sophisticated and preferred Unsharp Mask pictured above. A preview shows what impact the Unsharp Mask filter will have on your image.



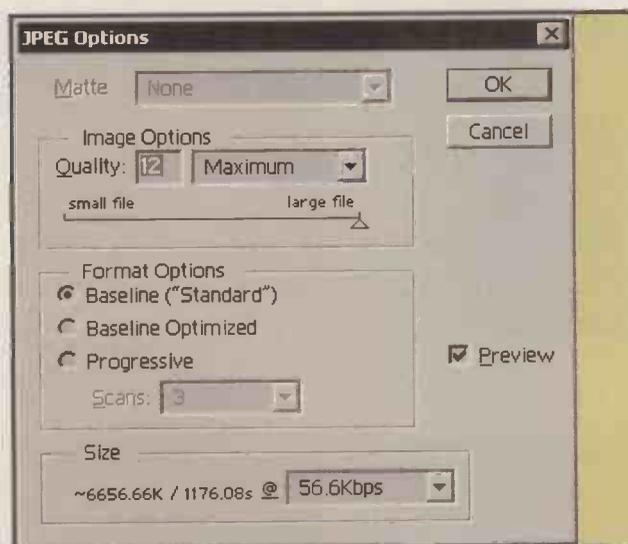
**6** Check the histogram of a digital image to see the range of tones in the picture. Histograms are offered by most photo retouching packages and some sophisticated TWAIN drivers. This histogram shows the tonal information petering off before it hits the darkest shadows on the far left. If there are supposed to be dark areas, consider stretching the tonal information across the entire range of light and dark. Photoshop's Levels control, above, lets you do this automatically or manually by dragging the input level's triangles to the limits of the captured range.



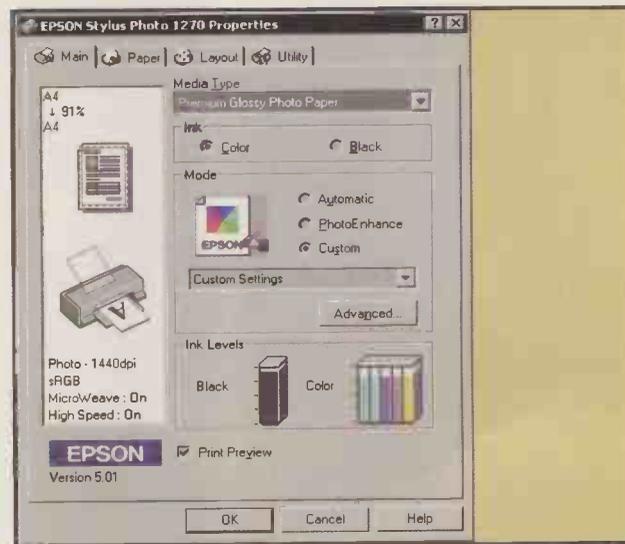
**3** Previously we doubled the resolution, but as far as the scanner was concerned, we were still going to print it the same size at 12.80 x 18.16cm. To make the enlargement, we would change the resolution to 200dpi without altering the file size in Photoshop, forcing the physical printing dimensions to increase. However, it's easier to use the scaling function. Above we have left the resolution at 200dpi, but changed the scale from 100 to 200 per cent. The file size is 16.49MB, but the physical dimensions (used to instruct a printer) have doubled to 25.60 x 36.32cm.



**4** If possible, the TWAIN driver is the best place to make tonal or colour corrections, before doing the final scan. At this point, most drivers will be working with the most possible image data, such as an increased tonal dynamic range, before normally delivering the most significant 24bits to your application. If you make brightness, contrast and colour adjustments after scanning, you may increase the level of noise or reduce the tonal dynamic range. This pre-scan stage is also where you should activate any de-screening options to eliminate moiré.



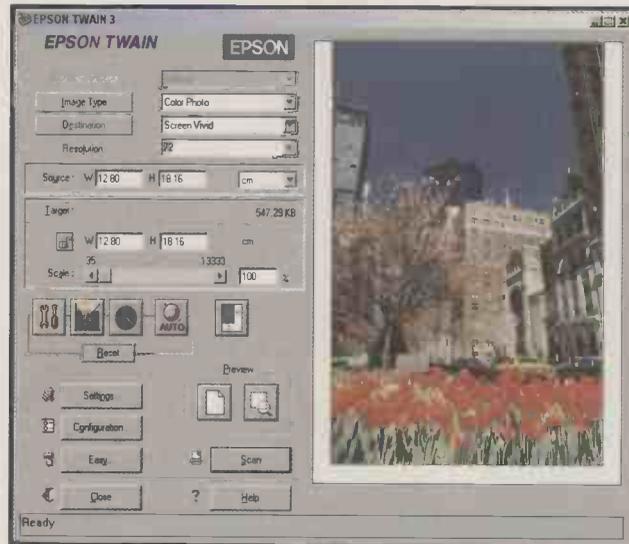
**7** Once you've got this far you'll want to save your image. The big question is whether to compress or not. The JPEG format permanently throws away information, so is not suitable for archive. Try saving as a TIFF with LZW compression – this is lossless, so may not be as effective as JPEG, but you'll still save a little space without losing quality. Then again, try using JPEG compression at its mildest setting. Above we've set the slider to maximum quality, which has reduced the file size from 16.49MB to 6.66MB without any perceptible loss in quality.



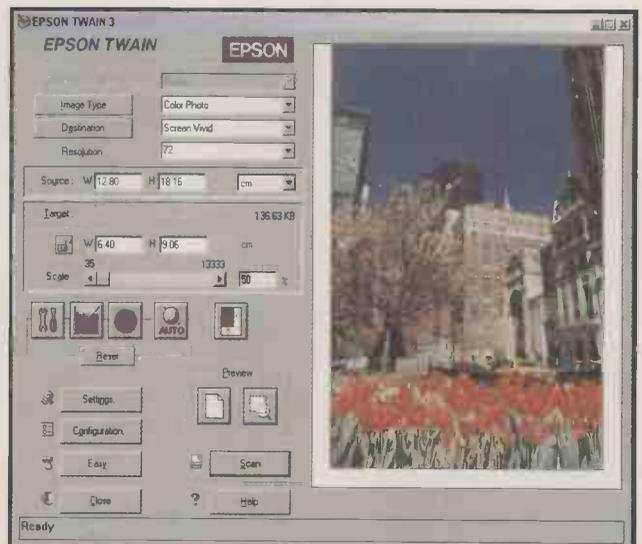
**8** Above is the printer driver for the Epson Stylus Photo 1270, which can hold your hand or let you tweak to your heart's delight. Most crucially, make sure your printer driver knows what kind of paper it's using, or you may end up with too much or not enough ink on the page. We've chosen custom colour settings in an attempt to match the colour properties of our scanner without messing around with ICC profiles. We've opted for sRGB (standard RGB), which is used by many devices to match scanner settings in order to get an accurate printout.

# Scanning for the web

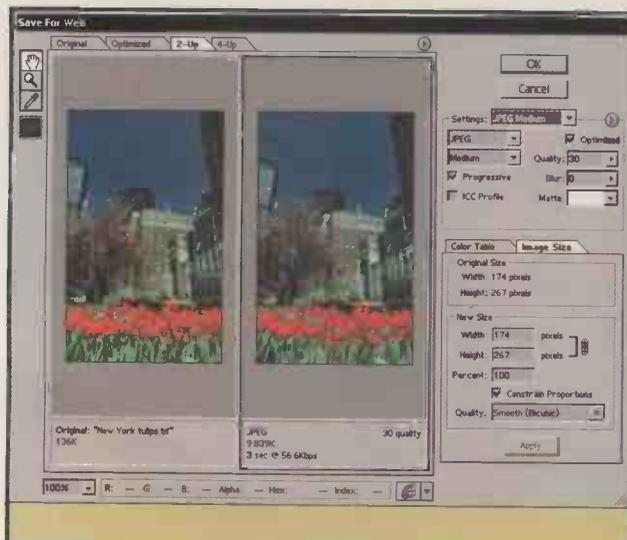
Size does matter when you put pictures on the Internet, so to avoid excessive download times, follow our advice



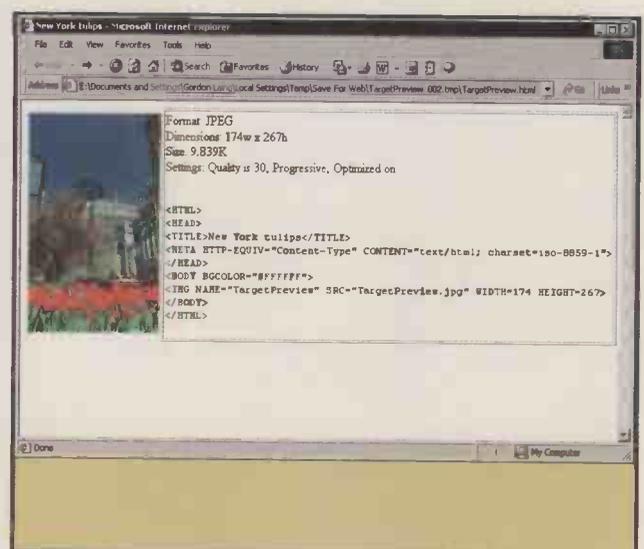
**1** Scanning images for the web is pretty simple, with just two main considerations concerning image size. First, how big would you like the picture to appear on a monitor? Most monitors operate between 70 and 100dpi, depending on the desktop setting and the physical screen size. A typical 17in monitor measures about 13in across, and if it's running at 1,024 pixels, will have a display resolution of about 79dpi. Since each monitor pixel can perfectly display each scanner pixel, use this display resolution as a base. Above we've chosen 72dpi, with a file size of 547KB.



**2** Since our original photo measures 5 x 7in, scanning it at 72dpi will reproduce it on screen at 5 x 7in. This is a bit big, so above we've halved its size using the scale to 50 per cent control. The new target size physically measures 6.4 x 9cm, and the corresponding file size has been reduced to 136KB. While you may think this is a bit small on screen, a picture 9cm tall is considered pretty big in website terms. Choosing the correct size for online publication takes a bit of practice, but generally, you'd be surprised how small most web pictures really are.



**3** A file size of 136KB may sound small compared to the tens of megabytes mentioned in the printing workshop, but it's still too big for most websites. The trick is to use JPEG compression to reduce the file size without overly compromising image quality. Photoshop 5.5 has a superb Save for Web facility (above) that displays the original image next to one or three compressed versions for direct comparison. Going for medium quality, we've reduced the file size to just 9.8KB, which Photoshop estimates will take three seconds to download using a 56K modem.



**4** Remember what we were saying about how big images can look when viewed in a web browser? The final step in preparing any image for web use is to preview it in a browser. You can either open your JPEG directly into a browser using its File menu, or you could go for a special preview mode in your image manipulation package. Above we've gone for Photoshop 5.5's Save for Web browser preview, which also shows the settings used, and even lists the HTML code used to display it. If the image is too large, consider reducing its physical size further.

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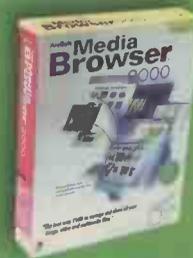
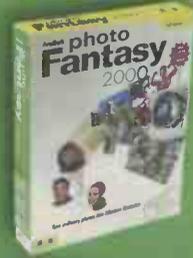
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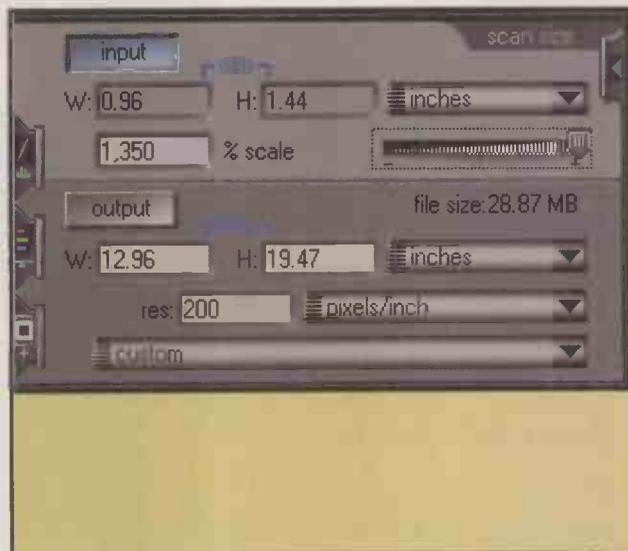
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# Film scanning

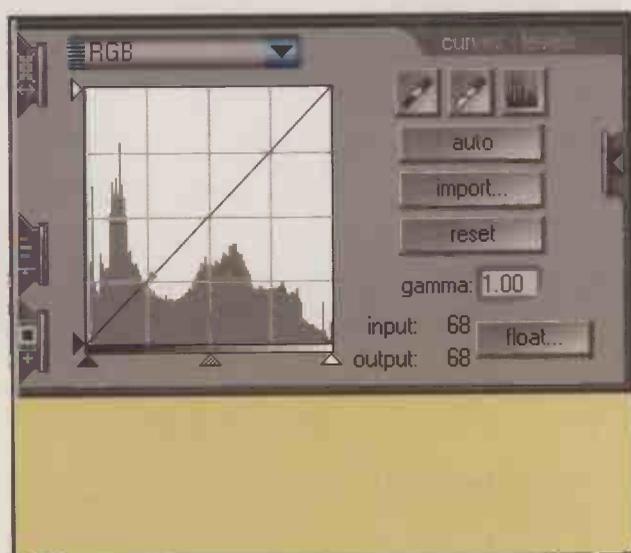
What if your favourite picture is in 35mm transparency format? Well, with a high-quality scanner you can get great results



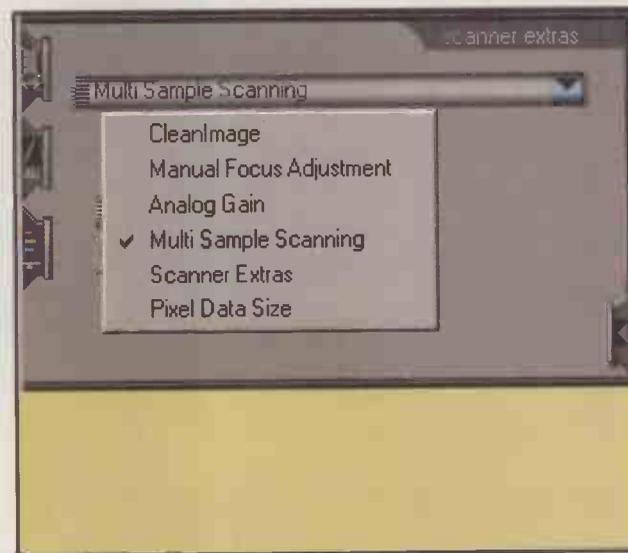
**1** Scanning tiny frames of film can be a specialist business. Flatbed scanners can have transparency adaptors, but all they do is shine a light from above and do nothing to improve the unit's relatively low resolving power. Even with 1,200dpi of genuine horizontal optical resolution, you're only looking at a 6 x 9in 200dpi print from a 35mm frame and 3 x 4.5in from a 600dpi scanner. Consider a dedicated unit such as Nikon's compact but high-quality LS-2000 SCSI-2 model. The TWAIN driver v2.5 is sophisticated with many options for advanced users.



**2** The first of the four main pull-out tabs sets the scanning resolution and image output size. The 'input' size reveals the small 0.96 x 1.44in size of a 35mm frame. By entering a desired output resolution of 200dpi for our colour inkjet, the driver calculates that a maximum 1,350 per cent scale increase will result in a print measuring 12.96 x 19.47in – A3 to you and me. At standard 24bit, the maximum file sizes from the LS-2000 are 28MB. Obviously you can go for smaller enlargements, or lower resolutions for more modest prints or online use.



**3** The second of the four tabs reveals a fully-featured histogram facility. This indicates the range of tones present in the image and lets you automatically stretch them, or manually choose bright and dark points on the preview window. This histogram is for the photo in Step 1. The Nikon's default auto-exposure settings have produced a scan with a good range of tones, so no correction is urgent. The third settings tab offers sliders to adjust brightness, contrast and colour – the TWAIN driver is the place to make these adjustments for the best quality.



**4** The fourth tab presents the advanced options. CleanImage spots specks of dust, small hairs and scratches – the bane of film scanning – and automatically retouches them. The results are excellent, but the final image is often a little soft, so there's also a Sharpen option. Pixel Data Size lets you switch from 8bit grey levels to genuine 12bit, although Photoshop will round this up to 16bit in its 48bit RGB mode. Multiple sample scanning makes four or 16 extra passes on the original, significantly increasing signal-to-noise ratio.





**W**e're all guilty of paying too much attention to all things new and not enough to things we already know. Playing around with new toys is fun, whereas mastering those that you already own can be hard work.

Well, in this month's **Workshop** (p250) Stephen Wells is on hand to show you how to get the most out of that old workhorse Excel. He guides you through some of the more advanced features and time-saving short cuts you may have missed out on if you're a casual user of the package.

Meanwhile, over at **Graphics and DTP** (p274) Ken McMahon shows you how to be a master at cutouts using Photoshop 5.5 LE's eraser tools.

In **Web Development** (p282) Tim Anderson has a step-by-step guide to creating a guestbook for your website using PHP and MySQL. And as Tim says, the humble guestbook is a real interactive web application that can be easily adapted for other purposes.

Benjamin Woolley in **3D** (p276) gets to grips with Blender and looks at Toon3D, an authoring environment for animating simple models.

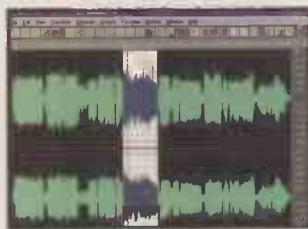
NIALL MAGENNIS, FEATURES EDITOR

NIALL\_MAGENNIS@VNU.CO.UK

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# Advice from our experts

Got a problem? Our **Hands On** columnists answer questions and solve your problems.

## Windows

**Q** I want to make a CD of a 20-minute music tape, but the software that comes with my CD-writer has no provision for recording sound, so I am trying to create a .wav file on my hard disk before using this to create an audio CD. If I try to record using the Windows 95 Sound Recorder, I'm limited to 15 seconds of recording time. How can I increase this?

Ian McPherson via email



Cooledit is better than Windows Sound Recorder

**A** One way round this is to record the 15 seconds, then use the Edit, Copy, and Edit, Paste Insert, commands repeatedly. This will double the length at each round. When you have sufficient length, rewind and record over it. To record at CD quality, you'll need around 200MB. A better solution is to find some decent recording software. Cooledit 2000 is available on a 30-day trial from [www.syntrillium.com](http://www.syntrillium.com), will do what you want, and will also remove extraneous noise, such as tape hiss.

**Q** When I boot up, I seem to have lost the Windows logo – do you know how I could get it back?

Nick Bearman via email

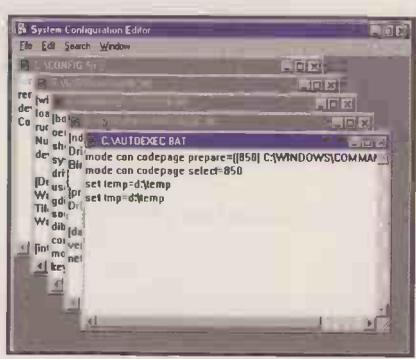
**A** First, delete (or rename) any file named LOGO.SYS in the root of C:\ (assuming your PC boots from the C: drive). Also, make sure in the file C:\MSDOS.SYS that the entry logo=0 is not present in the [options] section. You

will probably have to clear the Read-only attribute from MSDOS.SYS in order to edit it. If Windows won't let you do this then open an MS-DOS box and type: attrib -s -h -r C:\msdos.sys (you have to remove the system and hidden attributes as well this way). Don't forget to reinstate the attributes (using the plus sign instead of a minus) afterwards.

**Q** How can I change the Temp directory that Windows uses? I tried adding the line SET TEMP="D:\TEMP" to Autoexec.bat but this had no effect. Nor did using Winset.exe in the RUN section of the System Policy Editor.

Nick Lee via email

**A** You lost me with the Winset stuff, but your initial approach is along the right lines. First, you don't need the quotes. Second, you also need the line SET TMP=D:\TEMP in Autoexec.bat. This should do the trick.



You need two entries to change Temp folder

**Q** I keep setting my default signature in Outlook Express to my own text file. After reboots or restarts, Windows often – but not always – discards my signature file and replaces it with some empty KAK.HTM file. I then have to reset my signature. Any idea what is going on or where this appropriately named KAK is coming from?

Harry Collier via email

**A** This, I'm sorry to say, sounds like the Kakworm virus, which spreads itself in this way. It's specially insidious as it doesn't rely on the victim opening an attachment. You can get rid of it by

finding and deleting the file KAK.HTA (use Windows Find, Files, All hard drives, Include subfolders). Having done that, run REGEDIT and find and delete the following Registry key: HKEY\_LOCAL\_MACHINE\Software\Microsoft\Windows\CurrentVersion\Run\cAgOu.

There's also an Outlook patch to protect against Kakworm available at [www.microsoft.com/technet/security/bulletin/ms99-032.asp](http://www.microsoft.com/technet/security/bulletin/ms99-032.asp).

## Spreadsheets

**Q** How can I quickly weed out the duplicates in an Excel 97 list?

Eve Tibbles via email

**A** Make sure the list has column-heading labels. Then click anywhere in the list and choose Data, Filter and Advanced Filter. Click the Copy to another location radio button, and check the Unique records only box. The range of your list should appear in the top box, but check that it is correct. Leave the Criteria range box empty. Click in the Copy to box and then a cell several rows below your list. Click OK to close this dialog box and a revised version of your list will be displayed that will omit any duplicates.



Weeding out Excel 97 duplicates

**Q** Using Excel, how can I enter a series of consecutive dates leaving out the weekends?

David Smith via email

**A** Enter the first date, then point to the Fill Handle, which is the small black square in the corner of the cell. Press the right mouse button and draw

the dates down the column or along the row. When you first let go, you'll be offered a whole bunch of options. Choose Fill Weekdays (see *Workshop*.)

**Q** How can I enter a fraction in the Works spreadsheet module?

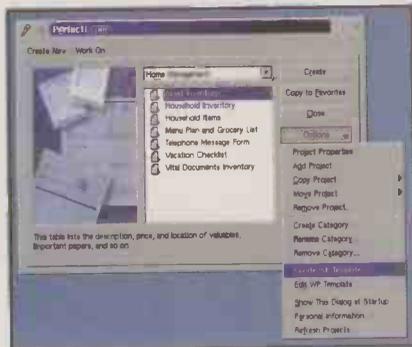
Lynda Long via email

**A** In either Excel or Works all you have to do is type a space between the number and the fraction. For example, enter 23, space, 1/4. Both spreadsheets will display 23 1/4, although they'll store the number as 23.25, so you can add or multiply this number in other cells. If you just want a fraction by itself, enter a zero, then a space and then the fraction.

## Word Processing

**Q** How do I create a new template in WordPerfect 9?

Jeremy Doyle via email



Hardly intuitive, but easy: creating a new template in WordPerfect 9

**A** This is easy, but somewhat counter-intuitive, as you first have to go to File, New from Project. In the dialog that appears, click on the Options button and choose 'Create WP Template'. Add whatever text, prompts, other macros and toolbars you want, then save; you will be prompted for a name, description and category.

**Q** Can you explain why I can't use Word 97 text boxes properly. It will only create large boxes whose size won't adjust. What am I doing wrong?

Ian Sugarman via email

**A** It sounds as if you have the 'Snap to grid' option enabled, together with a large grid size. You can turn this off by clicking on the Draw menu on the

Drawing toolbar, selecting Grid, then clearing the snap settings or changing the grid size.

**Q** I am using Word 97 and would like to check spelling in more than one language – in particular, Swedish. I've searched the Microsoft website, but all I have got is frustrated. If I don't have to pay, so much the better.

Scott Ballentyne via email

**A** The good news is that you can get a Swedish spelling checker, thesaurus and hyphenation dictionary (but not a grammar checker, unfortunately) online from [www.alki.com](http://www.alki.com).

The bad news is that it will cost you about £48. An alternative is to upgrade to Word 2000, which includes English, French and Spanish proofing tools as standard. Unfortunately, Swedish isn't included as standard, but a Proofing Tools pack, comprising 40-odd languages is available from Microsoft dealers in the UK for around £75.

## Hardware

**Q** I have a PIII 600E Flip Chip Pin Grid Array (FC-PGA) that I would like to fit into an Asus P2B-S motherboard Rev 1.02 using the Iwill Socket II. How do you set the CPU core voltage to the appropriate 1.65v?

Howard Barnfather via email

**A** First the bad news – according to Asus' website, you need Rev 1.04 of the P2B-S to support Coppermine CPUs. However, also according to Asus, you need Rev 1.12 of the P2B to do the same and we've had our Rev 1.10 work fine with the help of Iwill's Socket. Simply set the core voltage to 1.65v on the Socket and the correct clock multiplier on your P2B-S (6 x 100MHz) and everything should be fine – you should, however, also flash your BIOS to the latest version.

The 600E may also overclock to 800MHz using a 133MHz FSB (front-side bus), but you may need to increase the Socket voltage to 1.75v, use additional cooling, switch your PCI bus to one-quarter and ensure your memory is 133 compliant – your AGP graphics card may complain, but it's worth a shot!

**Q** I have a Chaintech 6ltm motherboard with an LX chipset, running a Pentium II 233. Would it be possible, with the aid of a slocket, to upgrade to a Celeron 500 processor?

Kevin Martin via email

**A** Intel's website says the LX can support Celerons and your motherboard will already be running at the right voltage and FSB for Plastic Pin Grid Array (PPGA) Celerons up to and including the 500MHz model. All you need to do is to make sure your motherboard supports sufficiently high clock multipliers, which for a 500MHz Celeron is 7.5 times. Almost any socket will do too, as you don't need compatibility with the newer FC-PGA Celerons or PIII's which demand lower core voltages.

**Q** Can I mix an Ultra160 SCSI hard disk and a SCSI CD-R without dropping the performance of the disk? I already attach two scanners to my Adaptec 19160's legacy SCSI connector and fear they may drop the performance of the CD-R if attached to the same channel, too.

Peter M Pascoe via email

**A** Keep the hard disk and any other U160 or U2W LVD drives by themselves on the LVD channel, as any non-LVD drives, such as the CD-R, will compromise the bandwidth. The CD-R will work perfectly well with the scanners on the legacy channel.

**Q** In July's Hands On, Hardware, you stated that the SuperMicro PIIIDME 840 chipset motherboard uses Intel's MTH. After hearing about the MTH problems on the 820 chipset I ran Intel's MTH ID utility and it did not detect an MTH on my motherboard – what's going on?

Stany Thibaut via email

**A** Hands up, you caught us out! Both the 820 and 840 chipsets were designed for RDRAM memory, but Intel developed a chip that would translate the protocol so that SDRAM could be used instead. This chip on the 820 is the ill-fated MTH, which is now in a process of refund or replace. The higher-end 840 chipset instead uses the different MRH-S chip which, while recently revealed not to get on with ECC SDRAM, appears to be in the clear – for now.



## question time

### Databases

**Q** In Access I created a query which worked fine, so I saved it as Query1. Later I renamed it and now when I run the query it asks me for a 'parameter' which it then ignores! This problem disappears when I rename the query back to Query1.

Andrew Walker via email

**A** Our guess is that, after saving it as Query1, you used the Sort button while looking at the answer table generated by the query and then saved the query again under the same name. Then you later renamed the query and hit the problem.

When you use the Sort button on an answer table and then close the table, Access will ask if you want to save the query. If you agree, it writes something like Query1.ColumnName into the properties of the query. Renaming the query doesn't cause this parameter to be rewritten, hence the problem. Rename the parameter to: NewQueryName.ColumnName and all should be well.

### Unix

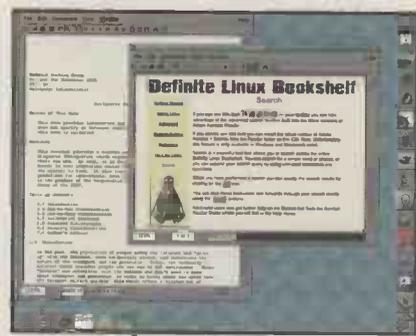
**Q** Your Unix column sweet-talked me into installing Linux, but I'm fed up with having no modem, no printer, no scanner, no sound and that's just for starters. I've zapped Linux, but I'm still left with Lilo and can't get rid of it. I bet you'll try persuading me to give Linux another try.

David Berry via email

**A** To solve your problem, boot from a DOS floppy and use fdisk/mbr to overwrite the Lilo code with the standard DOS master boot record.

As for persuading you to try again, we've no intention of doing that. It's up to you. It happens that millions of Linux users out there modem happily through to their ISPs; they have printers that print and scanners that scan as their sound cards chortle out their MP3s. And their CDs automount if and when they want them to (which incidentally isn't always - this is an operating system where the user calls the shots).

Most modern Linux distros sort all these things out automatically at install time and if there are glitches, Linux users are proactive types who read the docs and ask around, fix the problems and learn a lot in the process.



*These days you don't need to be a rocket scientist to run Linux. But it helps a lot if you have a healthy curiosity about how things work, and are prepared to put in the time maintaining that curiosity and sharing your discoveries with others.*

*For starters there is a ton of documentation out on the Internet. Phone-bill conscious Linux newbies may prefer something such as the Definite Linux Bookshelf, described as 'A gigantic collection of Linux reference material on one CD-ROM'. It contains copious PDFs relating to every facet of Linux use and you can get it from [www.definitesoftware.com](http://www.definitesoftware.com) for around £10*

### Graphics and DTP

**Q** I have a video-capture card (Motion Picture) that refuses to work with a new motherboard/processor combination I had fitted recently. Can you suggest any video cards that I can use for capturing stills from a Hi-8 video camcorder: I haven't got around to needing editing - yet - so that feature would be helpful, but my primary requirement is to capture stills.

Mike Gerynant via email

**A** Matrox, Pinnacle and ATi all produce reasonably priced cards that will allow you to capture and output analog video stills and movie clips. Cards such as the ATi All-in-Wonder 128 Pro also provide MPEG-1 and MPEG-2 digital video compression as well as a TV tuner and DVD player all for under £150.

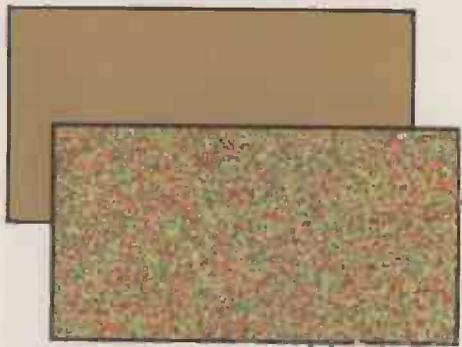
**Q** I am a professional photographer specialising in sports photography. I have a problem with regard to re-sizing photographic scans. At the start of each football and basketball season I attend as many games as possible, shooting stock action of the players. I use a Polaroid Sprintscan Plus and always scan at maximum optical resolution (2,700dpi) which results in JPEGs of around 3-6MB each, 14-24MB

uncompressed. This is an ideal size for my main uses but NOT for distribution to newspapers, which usually stipulate a maximum uncompressed file size of 6-8MB.

I wish to batch convert several hundred pictures to match this specification but cannot do it in Photoshop - or any other program I have tried (including DeBabaliser). You can set the width, height, etc, but not the resulting finished file size. Any ideas?

Pete Murphy via email

**A** The reason you cannot set the file size is that it depends on the nature of the image. Pictures with large areas of flattish colour will compress more efficiently than those with lots of detail. You can demonstrate this by creating a 1,000 x 1,000 pixel RGB image filling it with flat colour and saving it as a medium quality (5) JPEG file. Then apply 50 per cent gaussian noise and resave



The top image is 18KB in size... whereas the one below is 626KB

with the same settings. When I did this the first file was 18KB, the second 626KB. So, even if it were possible to make all your files the same (compressed) size, it might not be desirable as the quality would vary widely.

As the newspapers stipulate a maximum uncompressed file size, why not save the files as uncompressed TIFFs, you can work out arithmetically, or by trial and error the pixel resolution that will generate a 6MB file. Then you can zip the files before sending, which has the added advantage that you need only send one file, rather than any number of images.

### CONTACTS

All of our experts welcome your queries: simply respond to the appropriate address at the end of their Hands On columns.

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BJC2000/4000/5000	Tanks (BC12) £4 .. £12
BJC3000	(BC33) £35
BJC3000	Photo Cartridge (BC34) £35
BJC6000/6100/6500	(BC30/31) £23 .. £26
BJC3000/6000 Tanks (BC13B/3C/3M/3Y)	£8 .. £6
BJC6000	Photo Cartridge (BC32) £26
BJC3000/6000PhotoInk(BC13B/PC/3M)	£6 .. £6
BJC7000/7100	(BC60/61) £23 .. £25
BJC7000/7100 Colour Ink Tank (BC16)	£16
BJC7000/7100	Photo Cart (BC62) £36
BJC7000/7100	Photo Ink Tank (BC62) £24
BJC8200 Photo Ink Cart	(BC50) £75
BJC8200	Tanks (BC15BK/5C/5M/5Y) £9 .. £9
BJC8200 Photo Ink Tanks (BC15PC/5PM)	£9

**Canon Inkjet Paper Media**

A4	A3
Coated Paper	(200) (LC101) £20 .. £35
Double Sided Coated	(200) (LC301) £10 .. £21
High Resolution	(200) (100) (HR101) £17 .. £17
Glossy Paper	(44-20) (A3-20) (GP201) £6 .. £6
High Gloss Film	(20) (HG301) £16 .. £33
High Gloss Photo Film	(10) (HG301) £14
Photo Paper Pro (B200)	(15) (FR101) £10
Glossy Photo Cards 4x6	(20) (FM101) £5
Transparency	(50) (CF102) £29
Back Print Film	(20) (BF102) £24 .. £48
Iron-on-Transfer	(A4-10) (A3-5) (TR201) £12 .. £12

**HP Inkjet Cartridges**

Black Colour	Black Colour
Deskjet Portable	(33M/25A) £16 .. £18
Deskjet 500 Series	(26A/25A) £17 .. £18
Deskjet 600/660/670/690/695/29/49A	£17 .. £18
Deskjet 610/612	(6614D/43A) £17 .. £18
Deskjet 810	(6615D/1823D) £18 .. £20
Deskjet 830/840/843	(6615D/6625A) £18 .. £20
Deskjet 820/50/70/1100	(45A/41A) £18 .. £19
Deskjet 720/890/1120	(45A/1823D) £18 .. £22
Deskjet 970/P1000/1100	(45A/6578D) £18 .. £22
Deskjet 2000C	(44A/41C/42Y/43M) £22 .. £22
PhotoSmart P1000/1100	(45A/78D) £18 .. £22

**HP A4 Paper Media**

Pack Price	Pack Price
Premium+ Photo Glossy	(6832A) £20 .. £11
Premium+ Photo Matte	(6951A) £20 .. £11
Premium+ 10x15cm Glossy	(6945A) £20 .. £6
Professional Brochure & Flyer	(6818A) £50 .. £9
Premium Inkjet Paper	(5163Z4) 200 .. £12
Premium Heavy Weight	(1853A) 100 .. £11
Premium Glossy Paper	(3831A) £10 .. £7
Premium Glossy Paper	(3837A) £50 .. £30
Premium Photo Paper	(6040A) £15 .. £6
Photo Paper	(1847A) £20 .. £7
Greeting Card	(6042A) £20 .. £6
Bright White Paper	(1825A) 500 .. £7
Banner Paper 90g/2Fold	(1821A) 100 .. £8
Premium Transparency	(3832A) £20 .. £13
Premium Transparency	(3835A) £50 .. £27
Iron-On T-Shirt Media	(6050A) £10 .. £11

**HP A3 Paper Media**

Pack Price	Pack Price
Bright White Paper	(1858A) 200 .. £15
Professional Brochure & Flyer	(6821A) £50 .. £16
Premium Inkjet Paper	(1856A) 100 .. £17
Premium Photo Paper	(6059A) £20 .. £24

**HP Everyday A4/A3 Paper**

Pack Price	Pack Price
Laserjet/Inkjet 80g	(500) (C210/220) £5 .. £10
Laserjet 90g	(500) (C310) £6
Laserjet 120g	(500) (C410/420) £12 .. £25

**Compatible Cartridges**

**Compatible Inkjet Cartridges**

Black Colour	Black Colour
Canon BJ30/70	TANKS 3's (JT10) £7
Canon BJ70/80/Tanks 3's (JT11BK/11C)	£7 .. £8
Canon BJC600 Series (JT1201 BK/C/M/Y)	£3 .. £3
Canon BJC4000 Series (JT121BK/21C)	£3 .. £5
Epson 400/600	(JT093/JT089) £5 .. £10
Epson 800/1520	(JT108/JT089) £6 .. £10
Epson 440/640	(JT187/JT191) £5 .. £9
Epson 740	(JT189/JT191) £7 .. £9
Epson Photo/700/EX	(JT093/JT110) £5 .. £10

*Please Call for Quantity Discounts on Compatible Inks*

**Compatible Inkjet Refills**

Black Colour	Black Colour
JRRefills (2 Black) (Cyan/Magenta/Yellow)	£5 .. £9

**Misc Inkjet / Laser**

**Paper Media**

Pack Price	Pack Price
Metallic Paper Platinum/Pearl/Silver (120gsm)	50 .. £20
CopySpeed Inkjet/Laser	(80gsm) 2500 .. £26
PlusJet Inkjet/Laser Paper	(90gsm) 500 .. £6
Business Cards White or Ivory (35 x A4)	350 .. £7

**Laser Transparency**

Pack Price	Pack Price
HP Laser Film Paper Backed	(92296U) £50 .. £14
3M Film	Paper Backed (CG3360) £50 .. £10

**Inkjet Transparency**

Pack Price	Pack Price
Stabilo Transparency	50 .. £16
3M Transparency (Canon/Epson)	(3420) £50 .. £19
3M Transparency	(HP)(CG3460) £50 .. £20

**Kodak A4 Inkjet Paper**

Pack Price	Pack Price
Kodak Photo	120g Letter Paper 100 .. £10
Kodak Matte	120g Coated 2-Side 100 .. £11

**Other Supplies**

**Apple/Lexmark/Olivetti/Xerox**

Black Colour	Black Colour
Apple S/Writer I/II	(8041) £14
Apple S/Writer 2200	(3308/3309) £27 .. £29
Apple S/Writer 24/2500(M3240/M3328)	£28 .. £28
Apple S/Writer 24/2500/Tanks (3329/30)	£5 .. £10
Lexmark 150/1000/2000 (13400/13619)	£19 .. £22
Lexmark 500/700	(1219/700/80) £19 .. £23
Olivetti JP50/70/90	Monobloc £20
Olivetti JP150/170/350/500 Monobloc	£16
Olivetti JP170/190/360/450 Mono/Col	£16 .. £26
Olivetti JP790	Hi-Res Monobloc/Col £23 .. £33
Xerox C6/C8/XJ4C/XJ6C/Anobloc/CP	£8 .. £8
Xerox XJ8C/WC470cx/WC480cx	£26 .. £23
Xerox C20	£26 .. £26
Xerox C20	(Pack of 3) £68 .. £68

**TONERS CM K TONERS DRUMS PHOTOCONDUCTORS DEVELOPERS FUSERS**

**PHOTOCONDUCTOR / FUSER / TONER / DRUM**

HP Laserjet II / III / I/II / I/II	(92295A) £44 .. £39
HP Laserjet II / III / I/II / I/II	(92275A) £52 .. £39
HP Laserjet 4L / 4ML / 4P / 4MP	(92274A) £42 .. £119
HP Laserjet 5L / 6L / 3100 / 3150	(C3906A) £36
HP Laserjet 5P / 5MP / 6P / 6MP	(C3903A) £44
HP Laserjet 1100 / 1100A	(C4092A) £34
HP Laserjet 2100 / 2100M	(C4096A) £52
HP Laserjet 4 / 4- / 4M / 5 / 5M / 5M (92296U)	£48 .. £129
HP Laserjet III/4 / 4SI	(92291A) £65 .. £229
HP Laserjet 4V / 4VM	(C3900A) £32
HP Laserjet 5SI / 6SIMX / 8000	(C3909A) £85 .. £329
HP Laserjet 4000 / 4050	High Yield (C4127X) £72
HP Laserjet 5000 / 5000N / 5000GN (C4129X)	£86
HP Color Laserjet 4500	(4191A/92C/53M) £55 CM £69
HP Color Laserjet 4500 Drum Kit	(C4195A) £59
HP Color Laserjet 4500 Transfer Kit	(C4196A) £148
HP Color Laserjet 4500 Fuser Kit	(C4198A) £169

**PHOTOCONDUCTOR / FUSER / TONER / DRUM**

IBM 4019/2829/WinWriter 600(Hi-Yield-130502)	£133	
IBM 4039/3916	(Hi-Yield-130905)	£136
NEC Superscript 610E/640/660 (S8600C)	£84	
NEC Superscript 860	(S8860C)	£99
Okidata Okipage 4W/4W+	(5089/5096)	£15 .. £59
Okidata Okipage 6W/OP/8P/84	(5241/5248)	£13 .. £79
Okidata Okilaser OL400E-EX	(4851/4858)	£17 .. £120
Panasonic 4400/5400/4401 (XCP455/PDM6)	100 .. £56	
Panasonic 6100/6150	(XCP457/PEP3)	£12 .. £95
Panasonic 6300/6500	(XCP459/PEP5)	£12 .. £109
QMS MagicColour 2	(04B/03C/02M) £110 CM £98	
Ricoh LP1200	(G728/05/1200DK)	£85 .. £99
Samsung ML1500	(ML1500)	£65
Samsung ML6000/6050/6100	(ML6000)	£65
Sharp JX9200/9210	(JX920C/920R)	£36 .. £50
Tally MT904/908	(Pack of 2)	£11 .. £69
Xerox C55/MP/MPV/NC60(6R56/57/58)	£12 CM £45	

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# Balancing act

Uncovering **Excel's hidden depths** Stephen Wells finds shortcuts to keep your accounts in order.

**T**he spreadsheet was the killer application that got Apple started. In 1978, Dan Bricklin, a Harvard Business School student with some experience of computers from summer jobs with Wang, worked with Bob Franckston, a programmer friend, to simulate the accountant's worksheet on screen. That's where the columns and rows came from. The really clever bit, though, was that they allowed hidden formulas to be embedded within the worksheet that could perform calculations on the visible data.

This is how VisiCalc for the Apple II personal computer was born. More than 700,000 copies of VisiCalc were sold and Apple sales boomed. The VisiCalc program that ran on the IBM PC in 1981 still runs on today's PCs. It is only 27KB long and can be downloaded from [www.bricklin.com/history/vcexecutable.htm](http://www.bricklin.com/history/vcexecutable.htm) and run under Windows or DOS.

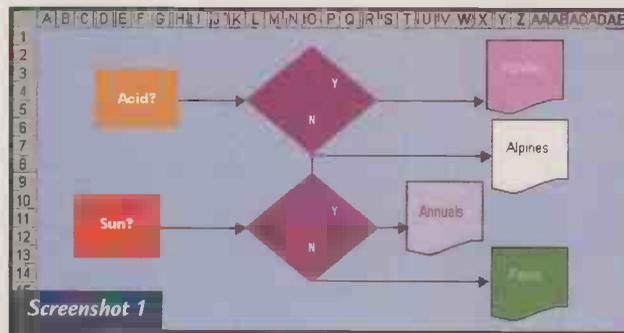
By 1984 VisiCalc had disappeared, though vestiges of it live on in Lotus 1-2-3. For years 1-2-3 was the dominant spreadsheet, but Lotus was slow to move on from its DOS-based versions. Microsoft stepped in with Excel, the first Windows spreadsheet and, after a slow start, took the market by storm.

Since the boom in the Internet, PCs have almost become household appliances and many businesses and families have acquired Excel, Lotus 1-2-3, Corel Quattro Pro, or the Works spreadsheet module as part of a software bundle with their machines.

The problem is that most people never get the best out of their spreadsheet package. So we're going to take a look at Excel in this workshop and help you understand some of its more useful features that you may have initially missed. Becoming familiar with these can save a lot of time.

## First steps

You may not have realised that Excel includes several templates for producing invoices or purchase orders. To access these just choose File, New, Spreadsheet solutions. If the selection presented



**Screenshot 1**  
Excel will create simple flowcharts using just the Drawing and Formatting toolbars

doesn't appeal to you, there is also a link from here to the Village Software website where you can order many more - although, as the company is in Boston, Massachusetts, you will have to anglicise these forms for use on these shores.

But time-saving isn't just about templates and shortcuts. Often a graphic representation of tabular data enables it to be quickly understood. Stock prices are a good example of this. Excel can make a chart instantly. All you have to do is highlight the whole table, including row and column labels and press F11. Excel will open a new sheet and put a bar chart on it with both axes labelled. If you want to change the chart type, just click on the Chart wizard tool and choose another one. To reformat any part of the chart, right-click on that element and make the changes.

Instead of bar charts, you might want to draw flowcharts. You can draw these with Excel using the tools on the Drawing toolbar. On a new sheet, click the Select All button - the grey area where the row and column headings meet. Draw the join between column headings A and B slowly to the left until the column width is reduced to 2.00. The cell borders now offer a grid for aligning AutoShapes.

For a decision shape, hit AutoShapes, Flowchart, Flowchart:Decision. Drag the mouse on the sheet, holding down Alt to snap to grid. Click on the edge of the AutoShape, right-click and choose Colors and Line, Fill Color. Then select a new colour for the decision diamond.

To draw connecting lines, click on

AutoShapes, Connectors and choose one. To eliminate the conventional spreadsheet gridlines, choose Tools, Options and uncheck the Gridlines box. For a colour background, click the Select All button and click the Fill Color

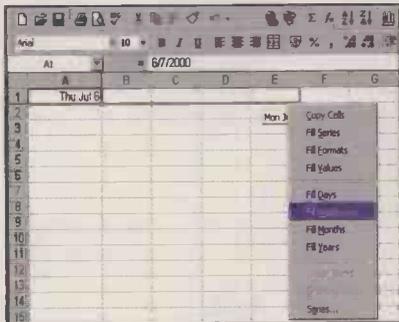
button on the Drawing toolbar. With a little practice you can create flowcharts like screenshot 1 in no time.

Perhaps the biggest time-saving feature of Excel is its support for macros. Many users don't realise Excel offers listings for a number of useful macros in the file, Samples.xls. There is code that will start a macro when someone enters data in a worksheet, a macro for looping through an array, one for retrieving data from a database and one for copying an Excel chart into a Word document.

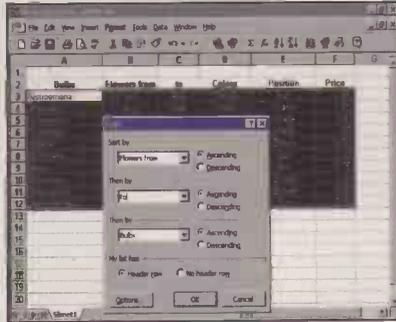
To enter a macro listing in Excel just press Alt & F11 to open the VBA for Excel editor. Double-click on Sheet 1 (if that's your current worksheet name). If there is already a macro listed there in the right-hand box, you can still add another one after it. Either way, carefully type or paste in the macro code. Press Alt & Q to return to your workbook. Press Alt & F8 to open the Macro dialog box. Click on Options and you can assign a keyboard shortcut which will run your new macro. The job's done.

Excel can do a lot more than you may have thought a spreadsheet was capable of. For example, the file Mapstats.xls, included with Excel, offers you a look into the world of mapping. The root software for Excel's mapping facility is provided by MapInfo. Its British affiliates offer datasets on everything from all the parishes of Britain to the postcode boundaries of Switzerland. You can buy lists of 13,000 UK estate agents, or 10,000 pubs, which are instantly mappable in Excel. Subscribers to a

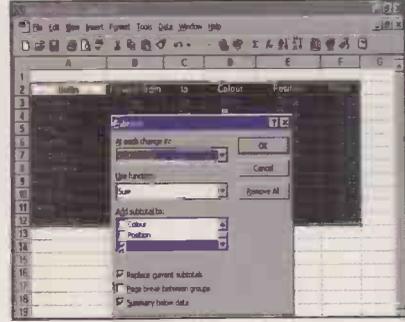
# Six helpful built-in Excel features



**1** To enter a series of consecutive dates down a column or across a row, you can drag the Fill Handle at the bottom right of the cell. But supposing you want to skip the weekends? Simply hold down the right mouse button before you drag and you're offered lots of options, including skipping Saturdays and Sundays. Or you could have a series of dates 10, 15, 30, 60 or 90 days apart. Just fill in the Step value box.



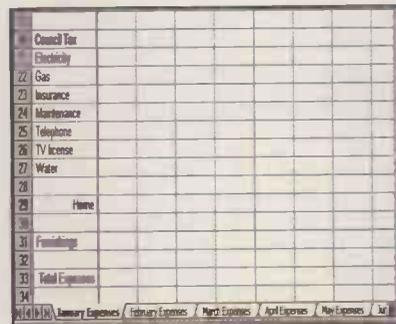
**2** To leave space around your list or format the heading labels bold, click on any cell within the list. Choose Sort on the Data menu. Your labels will appear in the drop-down boxes. Pick Ascending if the list is to be sorted in alphabetical or growing order. Here the flowering months were entered as 1/1/00 and so on, and then given a Custom Date format of mmm. The sort order is: month flowering starts; then when it ends; then by name.



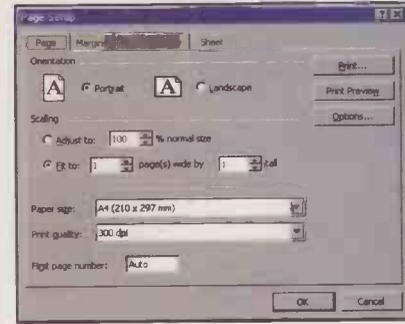
**3** Here a sort has first been made based on the Position column. Choose Subtotals on the Data menu. From the drop-down boxes choose Position as the main key, Sum as the function to enter and Price as the column in which to subtotal. When you click OK, subtotals will be added for the Shade plants, and the Sun plants, with a grand total at the bottom. You can display all the list, or just the subtotals, or just the total.



**4** Excel can automatically change formatting by recognition of a specified condition. Highlight the full range of cells for which you wish the condition to apply and choose Conditional Formatting on the Format menu. Here we have chosen to make any cell in the prices column have an ochre background if the cell's value is more than £2.99, but the range of options is enormous. In this particular case it produces that colour in the subtotal and grand total cells.



**5** To make entries apply throughout a workbook, you can Group the worksheets. Click on the tab of the first worksheet, then hold down the Shift key and click on the last tab and the whole group of sheets will react as one. For just particular sheets, click them holding Ctrl. You can enter any labels, formulas or formatting on one sheet and they will appear on all the others. To separate them, right-click on a tab and choose Ungroup sheets.



**6** To ensure all your data appears on the printed page, highlight the range you expect to print and choose File, Print Area, Set Print Area. Then choose File, Page Setup. In this dialog box, under the Page tab, check the paper size is correct, and the portrait (vertical) or landscape (horizontal) orientation of the paper. Click the Scaling radio button which specifies one page wide by one page tall. This automatically adjusts the image size so your table will fit.

service can even track ambulances and delivery vans on a map live, using a GPS (global positioning system). See the MapInfo site at [www.datassets.com](http://www.datassets.com).

If you're interested in other specialist spreadsheet applications, you can invest in an Excel Add-In, such as those from Eastern Software Publishing in Essex. Run by spreadsheet lecturer Grenville

Croll, Eastern distributes programs on risk analysis, neural networks, staff scheduling, diagramming, cost modelling, genetics, customer valuation and many more. Check out its site at [www.eastern-software.com](http://www.eastern-software.com).

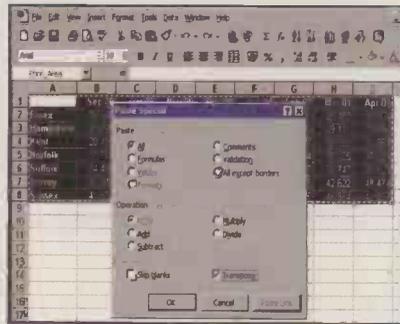
If it's Excel utilities you're after, then your first port of call should be Edwin's Power Tools at <http://users.vol.net/>

[edwintam/EPT.HTM](http://edwintam/EPT.HTM). Edwin offers Excel Add-Ins for Excel 2000, 97 and 95 for Windows, and Excel 98 and Excel 5 for the Mac.

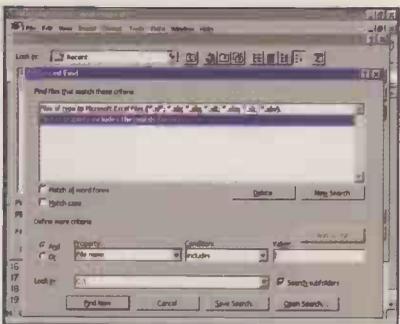
Another useful Excel site run by an enthusiast is Alan R Barasch's site at [www.barasch.com/excel/](http://www.barasch.com/excel/). But the most widely appreciated non-commercial site has been maintained for some years by



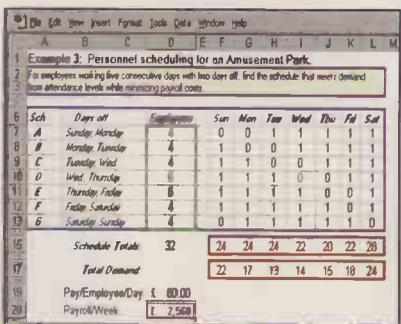
### Six more advanced Excel features



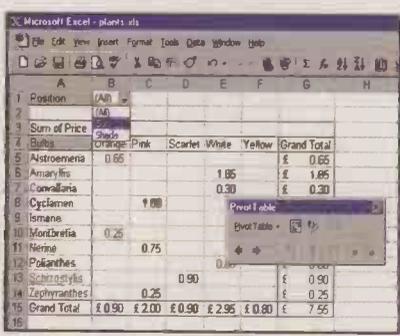
**1** If you would like to switch a table around, moving the column headings to become row labels and the row labels to become column headings, it's no problem. Highlight all of the table, right-click and choose Copy. Click on a cell at the top-left corner of a clear range which is away from the table. Choose Edit, Paste Special. In the dialog box that appears, choose All under Paste, None under Operation, check the Transpose box and then click OK.



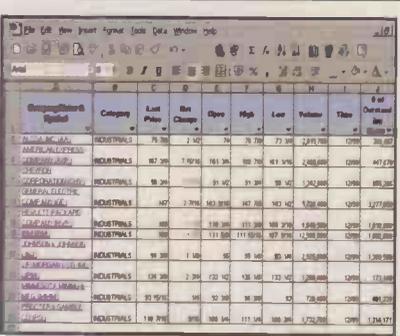
**2** Can't remember the name of a file? If you can recall a word in it, choose File, Open and enter the word in the 'Text or Property:' box. This only works for files in the specified directory. If the workbook is in some other directory, click the Advanced button. Now you'll see there is an important box at the bottom named 'Search subfolders'. Check that and change the 'Look in:' box to C:\ - if that's your main hard drive.



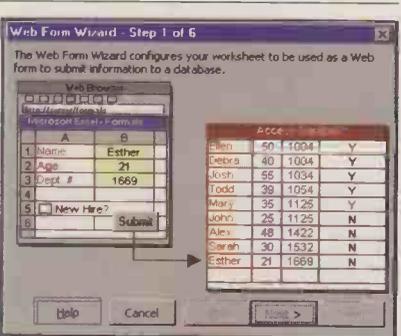
**3** When you have a problem to calculate based on a set of rules, lay out the basic table and use Excel's Solver Add-In to work out the answer. Choose Tools, Add-Ins and check the Solver box. Then it's available under Tools, Solver. For a quick tour of Solver, and four examples of its use, first find and open the file Solvsamp.xls. The example illustrated here is for scheduling staff to meet customer demand at maximum efficiency.



**4** You can view a list in numerous ways by presenting it in a Pivot Table. Click in the list and choose Data, Pivot Table Report. In the ensuing Wizard, you can move the labels of your list with the mouse into boxes representing Column, Row, Data or Page. In this example, using the plants list, we moved the label, Position, into the Page box, Colour into the Columns box and Bulbs into the Row box and Price into the Data box.



**5** Many websites offer information for downloading straight into a spreadsheet. Often this is simply in CSV (Comma Separated Values) but some sites provide special templates called Web Queries. To try out an example choose Data, Get External Data, Run Web Query. Then select Dow Jones and connect to the Internet. As shown in this example, the template includes drop-down boxes so you can pick the top 10 stocks in price rise, or volume of sales.



**6** If you have a website and there's an appropriate Access database on your web server with CGI (the Common Gateway Interface), you can display an Excel form that visitors can use to send you information. Choose Tools, Add-ins, and confirm that the Web Form Wizard box is checked. Then choose Tools, Wizard, Web Form. Step five lets you enter a thank-you message for visitors. Step six will create the .xls, .idc, .htm and .mdb files needed.

Californian John Walkenbach at [www.j-walk.com/ss/](http://www.j-walk.com/ss/). John is also the author of a number of spreadsheet books. With so many users of Excel sharing their problems with Microsoft, the first place to look for an answer to any question is the Microsoft Knowledge Base. To get Excel-specific information, go to <http://support.microsoft.com/>

[search/default.asp](http://search/default.asp). Then, in the 'My search is about:' box, pick your version of Excel. You can search by keywords, a KB article ID number if you know it, or see what's been added in the past few days. Finally, for more articles and sample applications for Excel, see The Microsoft Excel Developers' Forum at [www.microsoft.com/exceldev/e-a&sa.htm](http://www.microsoft.com/exceldev/e-a&sa.htm).

### CONTACTS

Stephen Wells welcomes your comments on the subject of spreadsheets. Contact him via the PCW editorial office or email [spreadsheets@pcw.co.uk](mailto:spreadsheets@pcw.co.uk). Please don't send any attached files until requested.



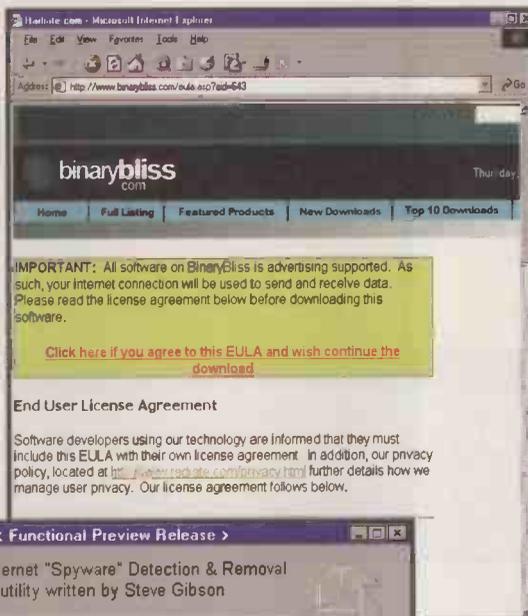
# Beware of spyware

A lot of 'free' software **does more harm** than just send you the odd advert, warns Tim Nott.

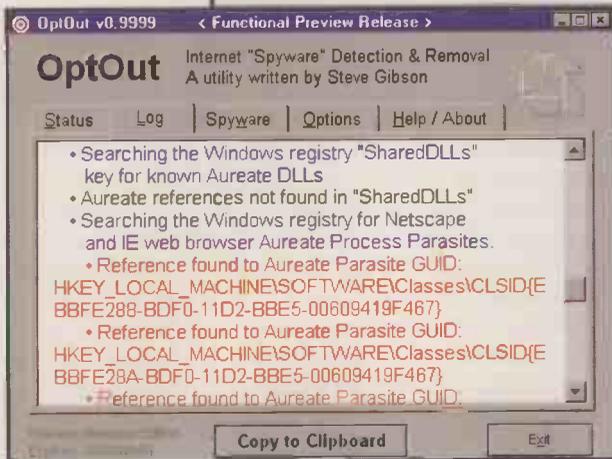
Last month we looked at the precautions you could take to protect your PC from attack by viruses and other malicious code. A related issue, which may not seem obvious at first, is how far legitimate businesses will go to attract your online custom.

Advert-supported software is a recent development - you can download it at no charge, but have to put up with banner ads, exactly as on a website. Click on one of these and you'll be taken to the advertiser's site, firing up a Dial Up Networking (DUN) connection if necessary. The software developer gets paid by the advertisers on both a 'per display' and 'per click-through' basis; one of the first operators in this field was Aureate, which provides advertising content in freeware such as Go!Zilla and the Free Solitaire game mentioned last month.

However, there is rather more to this than meets the ad-fatigued eye. Scare stories posted earlier this year claimed that the Aureate software posted software inventories of users' PCs, details of users' surfing habits and other personal information back to



Left: You have been warned, but not all sites supplying adware are this forthright. Below: Gibson's OptOut shows what you may not be aware of



prompted to fill in a lengthy questionnaire. This - according to Radiate - helps tailor the ads you will see. Note that the questionnaire is voluntary,

## Fresh adverts are delivered to your PC, even when you are not using the software

the company's site. This was denied by Aureate - which is also known as Radiate - and independent analysis appears to confirm that those scary rumours were, indeed, false. But, remember, just because you're paranoid, it doesn't mean they are not out to get you, so read on.

Typically, when you download one of these freeware packages, you'll be

and if you are happy to answer it then you can't really complain about invasion of privacy.

However, fresh adverts are delivered to your PC, even when you are not using the software, and stored on your hard disk. Information regarding which ads you have seen - and more importantly, those you have clicked on - is transmitted

back to Radiate. This, in turn, provides the information to pay the software authors and further 'tune' your advert profile.

All this can happen without your knowledge and can continue even after you have removed the original ad-bearing software. Individual profiling in this way opens a can of particularly juicy and wriggly worms. Now I'm not going to go on at length about

the moral pros and cons: suffice it to say I'm against it, especially when this is done without the user's knowledge. Certainly, I had no idea of this when I downloaded and wrote about Free Solitaire last month.

### Log on, click in, opt out

Steve Gibson, author of the Spinrite disk-recovery software and the ShieldsUP security testing website (both highly recommended), has taken the matter of 'spyware' very seriously. His website (<http://grc.com/optout.htm>) contains a detailed explanation of how Radiate and similar systems work and you can get a copy of OptOut, which will detect and/or remove spyware from your system. Steve points out that privacy is not the only issue: other problems can also include security problems and browser crashes.

I ran Steve's OptOut on my system and it found several Registry entries and files belonging to Radiate. Having decided that the Free Solitaire was too expensive, I removed it with Control Panel, Add/Remove programs. This took out the Free Solitaire program, and the store of adverts (which I'd never realised I had), but left behind the Radiate Registry entries and two DLLs -



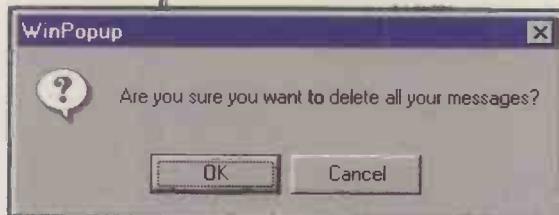
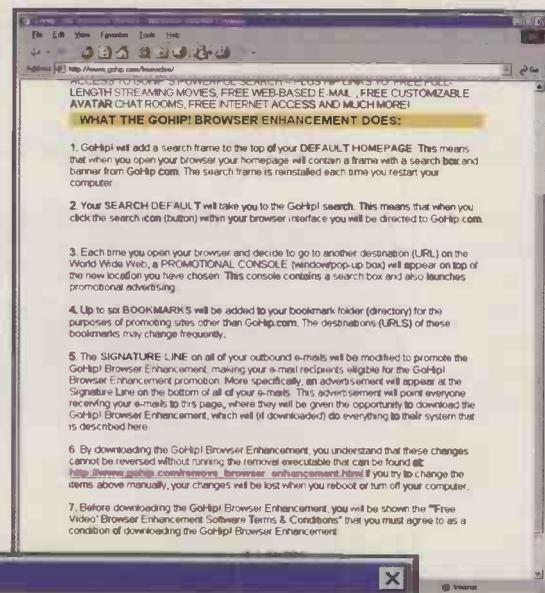
ADVERT.DLL and AMCIS.DLL. This can't be excused as sloppy housekeeping, as the next day I did a bit of spying myself, with the Windows System Information tool. As soon as I ran Internet Explorer, both DLLs were loaded into memory, and the WINDOWS\AMC folder (used to store the adverts) was recreated. I ran OptOut again and this time chose the option to remove these parasites – as Steve Gibson aptly calls them – from my system.

In the interests of fairness and accuracy, I went to download Buddyphone from [www.binarybliss.com](http://www.binarybliss.com) (a site apparently owned by Aureate Media, shown left). Here the download screen stated clearly that the software was advertising-supported and that you should read the End User Licence Agreement below – which, in turn, stated: 'understand that this software will connect to the Internet UBIQUITOUSLY to download advertisements and/or to provide software updates. You also accept responsibility for any network usage costs or any other costs incurred by using this software'. Reasonably frank, but mysterious in the use of UBIQUITOUS (its capitals): does this mean it connects everywhere or often? After download, the installation offered no further information until the application was started, when the

## If you don't want your personal information collected, please do not submit it

optional questionnaire appeared – and was dismissed unfilled. Once again, OptOut reported the presence of ADVERT.DLL and AMCIS.DLL and once again these managed to survive an uninstall of Buddyphone before I let OptOut deep-six them.

Not all sites and applications are this candid – I downloaded Aureate Go!Zilla from Tucows and received no warning at download, on installation or on use, although the same advert software was installed. However, this time uninstalling removed the DLLs – but not the Registry entries nor the advert files, so once again OptOut was asked to do its stuff.



At the time of writing, OptOut was free of charge, (and a mere 31KB download) but it only dealt with the Aureate/Radiate system – others, such as the Conducent Tsadbot that gets installed by the trial version of CuteFTP, weren't detected. By the time you read this, however, OptOut will be a commercial product and expanded to detect and remove Tsadbot and other systems. Aureate/Radiate also claims to

supply a remover for its DLLs: to find this you need to go to the (again very small print) 'privacy policy' link on the home page. The contents of this page openly states what Radiate does and makes the sensible suggestion that 'if you don't want your personal information collected, please do not submit it'. I found a link on this page to 'Aureate/Radiate DLL Remover', but clicking on this produced a '404 – not found' message.

The obvious defence is to read the small print carefully and avoid ad-supported software (unless you like that sort of thing). However, there is another defence – although the Radiate DLLs

*Left: No – this is not a joke Below: That's odd – I'm sure I said 'Copy'. Your shortcut keys may lead to unexpected places when using WinPopup*

hook into Internet Explorer and Netscape Navigator, they won't affect some other browsers, such as the fast and lightweight Opera.

In fairness, Radiate is by no means the only player in this arena and I'll be keeping a beady eye on other intrusive advertising technologies that take liberties with your operating system. One I'll mention now, as it deserves a prize for bare-faced cheek, is the

search'n'shop portal [www.gohip.com](http://www.gohip.com).

Download the 'Browser Enhancement' and it changes both your home page and your search engine to Gohip's. It adds 'up to six' changing bookmarks to your favourites folder. It opens a 'Promotional Console' each time you open your browser or go to another URL, which contains advertising and a search box.

The final, horrifying, touch is that it adds an advertisement for itself to your Outlook Express signature. This will point recipients of your mail to the Gohip site, where they, too, can have the opportunity to download and help bring a new meaning to the word 'enhancement'. Fortunately, you are told about this before you can download the file and have to click on an 'I am a complete idiot' button to continue. All right, I made up the last bit – it's 'I agree', but the rest is true.

If, by some inexplicable oversight you have fallen for this, then here's what to do. First, don't send any email messages, especially to me. Next delete 'Windows Startup' (winstartup.exe) from Windows\Start Menu\Programs\Startup. This is essential, otherwise all of the other reparations will be in vain.

Now you can reset your home page and your search engine: if you're using Internet Explorer you can reset these to the defaults by going to Internet Properties, Programs and Reset Web Settings. You can then change the home page from the General tab. Next, reset your Outlook Express signature from Tools, Options, Signature. Alternatively,

Gohip offers its own remover on its Customer Service page.

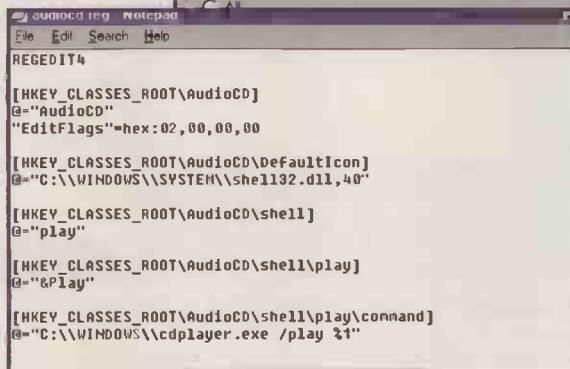
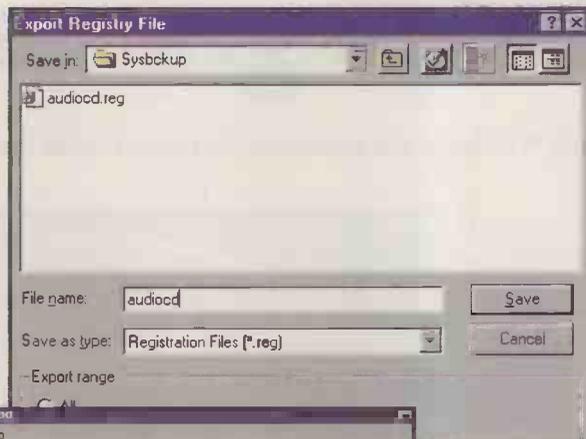
## Copy or kill?

Way back in pre-Windows 3 days, one would copy stuff to the clipboard with Control & Insert, then paste it with Shift & Insert. The Control & C that we've come to know and love was reserved for aborting DOS commands.

Somebody, somewhere, at Microsoft must have a sense of history – or maybe just a weird sense of humour. If you're not connected to a network, you probably haven't experienced the joys of WinPopup, which is a utility designed to send short text messages to other members of your workgroup.

Apart from important tasks such as announcing the lunchtime pub venue, it's quite useful for sending information such as 'Here's that email address/phone number/URL you wanted...' So, bingo, you highlight the relevant part of the message, hit Control & C and it isn't copied to the clipboard.

Instead, you are asked if you want to delete all your messages (see screenshot on previous page). Admittedly, you can copy with a right mouse click, but if you're a habitual keystroke copier, you



Top: Backing up the Audio CD default behaviour...

Bottom: ...and what the standard settings should look like

line C:\WINDOWS\EXPLORER.EXE /n,/e,/select, C:\ which, as regular readers will doubtless recognise, opens Explorer without expanding any drives in the left-hand pane. The other is the very useful 'Show Desktop' command. This has a similar effect to the Minimize All command available from a right-click on the Taskbar, but it's one less click, and

## I still like to be able to stick an audio CD in the drive and have the plain old player pop up

may find this irksome. Take heart that, amazingly enough, Control & Insert still works in WinPopup – as it seems to do in Windows generally.

### The shortcut to SCF

Windows 98 brought us the mysterious Windows Explorer Command files. These, which have the .scf extension, are plain text files that act as shortcuts. Two come as standard on the QuickLaunch toolbar. The first opens Explorer, but as this defaults to a view with the C: drive expanded, I long since replaced it with a standard shortcut that has the command

applies to objects (such as file, shortcut, and Control Panel property boxes) that the latter can't reach.

If you've removed this useful little icon, here's how to restore it. Open Notepad and type the following:

```
[Shell]
Command=2
Icon File= explorer.exe,3
```

```
[Taskbar]
Command= ToggleDesktop
Save this in C:\Windows\Application
Data\Microsoft\Internet Explorer\Quick
Launch as 'Show Desktop.scf'. The third
```

SCF file is the View Channels button, which I am not going to dwell upon, but all this gave me a healthy curiosity as to what else could be done with .scf files. After a search of first the Microsoft website and then, with a variety of technology, the Internet, I found absolutely nothing, save a rather lame tip on using a button that

doesn't do anything (ie, just consists of the [Shell] and IconFile= lines) to divide the QuickLaunch bar. So either the three standard .scf files encompass the full panoply of Windows Explorer Commands, or else there is more that Microsoft isn't prepared to tell us. If anyone reading this knows any more, do please share it.

### Sound advice

Over the past few months I've played with a variety of music players and these seem to sever the connection between Audio CDs and the Windows CD Player – even after they are uninstalled.

Wonderful though the various juke boxes are (see July's *Hands On, Windows*), I still like to be able to stick an audio CD in the drive and have the plain old player pop up automatically. So, given that the CD player is working properly, a quick piece of pre-emptive prudence is to run Regedit, go to HKEY\_CLASSES\_ROOT and select the AudioCD entry. Now, go to the Registry Menu and Export Registry File: choose a name and destination and make sure the 'Selected branch' option is chosen. You'll then have a small text file with the .reg extension: double clicking on this will merge it back into the Registry, restoring the original settings. Note that you'll still need to make sure 'Auto Insert Notification' is enabled for the CD drive in Device Manager.

## CONTACTS

Tim Nott welcomes your comments on the Windows column. You can contact him via the PCW editorial office or email: [win@pcw.co.uk](mailto:win@pcw.co.uk). Please do not send unsolicited file attachments or queries concerning the PCW CD-ROM or website.



# Permission granted

NTFS is key to a secure Windows environment, Terence Green unlocks **the resilient file system.**

**W**hen Windows NT first shipped in 1993 it sported an all-new file system, the NT File System – known as NTFS – which proved to be far more resilient than the File Allocation Table (FAT aka FAT16 and FAT32) file systems of Windows 9x. However, NTFS was revamped with added features, such as file encryption, for Windows 2000.

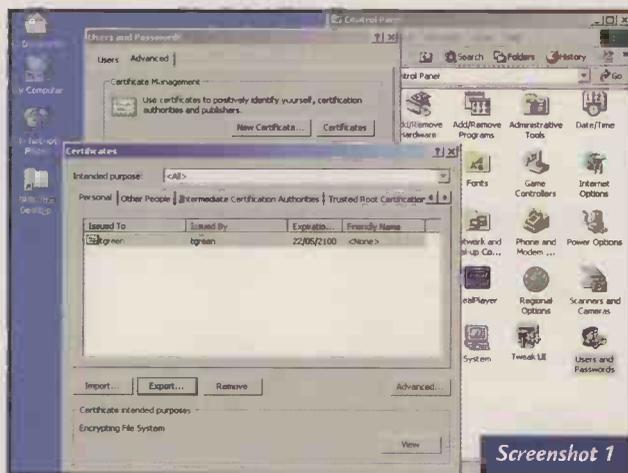
Although Windows 2000 supports FAT for backwards compatibility, using NTFS has advantages for performance, reliability and security. But there are also traps for the unwary. Security measures protect your data from unauthorised access, but can also prevent you from accessing your own data if you forget your passwords or fail to back up your encryption key.

NTFS is resilient. It can recover from errors, such as sudden power cuts, that can destroy FAT-formatted disks. This is because it keeps a transaction log of disk writes that enables NTFS to roll back to a pre-disaster consistent state. NTFS can't do magic. Data held in memory or that has only been partially written to the disk

## NTFS was revamped with added features, such as file encryption, for Windows 2000

can't be recovered. NTFS also keeps multiple copies of file system data in case of physical problems, such as bad sectors which can spell disaster for FAT-formatted disks.

The file system provides enhanced data security to protect your sensitive data. It maintains Access Control Lists (ACLs) of security permissions (read, write, execute, etc) that can be applied to files and folders. As of Windows 2000, NTFS also provides encryption for files. Windows 2000 ACLs and encryption are only available on NTFS. We don't have space here to fully explain ACLs and encryption, so we'll concentrate on the important gotchas. (The 'Security'



*When using EFS, always export and save your certificate and private keys in a safe place*

section in the Contents of Windows 2000 online Help has more information if you want some more background knowledge on the subject.)

Permissions allow several people to share a Windows 2000 computer without exposing their files to other users, except for administrative users, who can take ownership of any file and reassign the security permissions. Used

sensibly, this is a security measure enabling access to the files of a user who has forgotten their password or has left the company. Ideally, a single responsible person holds administrative rights and everyone else has a regular user account.

ACLs can also control program execution. With eborne viruses a growing threat, this can be really useful. An administrator can deny the right to execute a file or group of files. One way to tackle the ILOVEYOU virus problem might be to deny execute permission for Windows Scripting Host (WSH) to everyone except the operating system itself. This will prevent a VB script virus from activating, even if the attachment is

opened. This method also bypasses Windows 2000 System File Protection (SFP), which prevents you from deleting system files.

### Encryption

In an ideal world, security permissions would secure our data, but unfortunately, in real life, they're not impregnable. In particular, a couple of free programs from

[www.sysinternals.com](http://www.sysinternals.com) – NTFS for DOS and NTFS for Windows 98 – can read NTFS disks regardless of security permissions. To use either you must have physical access to the computer and be able to boot it. Paid-for versions of these utilities can write to NTFS from DOS and Windows 98. Seemingly a huge security hole, these tools can in fact be very beneficial in recovering data from crashed systems, allowing users with dual-boot systems to read their NTFS files from Windows 95/98.

Oddly enough, because they can only be used to read NTFS drives by someone with physical access to the computer, they help security by highlighting an aspect which is often overlooked. If you can't secure physical access to your computer you can at least use the BIOS passwords to control who can boot it and to disable booting from floppy. On some computers, IBM ThinkPads for example, BIOS passwords cannot be circumvented, but on many desktops password security can be disabled on the motherboard. Password boot security also won't provide much of a defence against someone in possession of the passwords or with the opportunity to move the hard disk into another system.

Enter the Windows 2000 encrypting file system (EFS), which scrambles files or folders so that only you can open them.

## Security permissions

To change the default permissions for Windows Scripting Host, log in with the Administrator account and locate WSCRIPT.EXE and CSCSCRIPT.EXE (the console version of WSH) by using Start/Search/For Files or Folders to search for ?SCRIPT.EXE on the Windows 2000 system drive (see screenshot 3). You'll find four entries. The duplicates in DLLCACHE folder are the copies that the System File Protection copies back into the SYSTEM32 folder if WSCRIPT.EXE or CSCSCRIPT.EXE are ever deleted. Try deleting WSCRIPT from SYSTEM32 if you like. It will reappear within minutes. There's no need to alter the permissions on the DLLCACHE versions.

Change permissions for the two system files. Right-click on WSCRIPT.EXE to open Properties/Security. You can't change permissions here

**Right: Restricting the use of Windows Script Host can prevent VBS viruses from running**  
**Below: Remove the inherited permissions for all users to fully disable WSH**

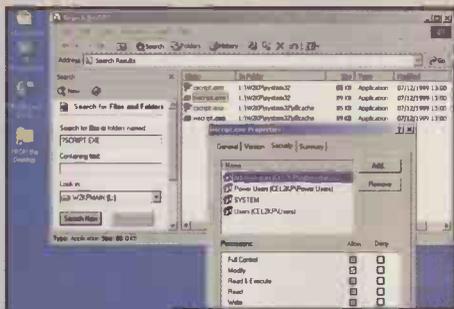
as the file has inherited them from the folder hierarchy. This is represented by the grey backgrounds of the ticked boxes. Untick 'Allow Inheritable permission' A warning message pops up because you are trying to alter these inherited permissions (see screenshot 4). Click on Remove and both the Name and Permission lists will be cleared. (Note: the defaults can be restored by ticking 'Allow' and clicking on 'Apply'.)

Now give SYSTEM complete rights to the

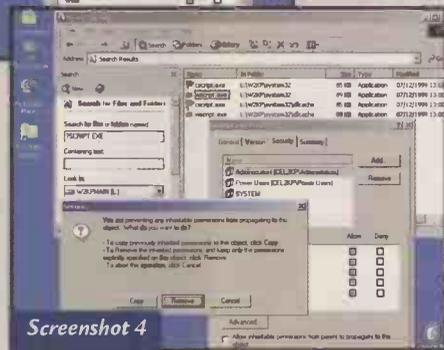
executable. Click on Add, select SYSTEM from the list and click on Add. Click on OK to return to Properties/Security and tick the Full Control box. Click on Apply to confirm the changes,

and OK to exit. Repeat the procedure for CSCSCRIPT.EXE. Now, whenever anyone attempts to run a script file such as a VBS script embedded in an email attachment they'll be refused access. Test by creating a Notepad file on the desktop, naming it TEST.VBS, and double-clicking it.

This is the briefest run-through of one of the many uses of permissions. Experiment with care, as you can easily prevent yourself from running applications, or even from accessing your own system. Should this happen, log in as Administrator and take ownership of the file from the Advanced window of the Security Properties page.



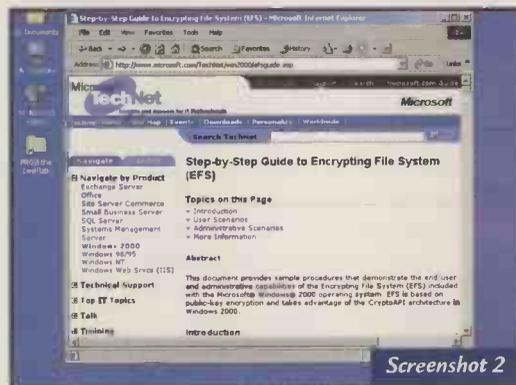
Screenshot 3



Screenshot 4

This is great for laptops and shared computers holding sensitive files. This being Microsoft, you can't share encrypted files or folders, but we are assured that this feature will be added in due course. View the online Help (search on EFS) for more detail and also search the KnowledgeBase for 'EFS' for tips ([www.microsoft.com/technet/](http://www.microsoft.com/technet/)).

The big gotcha with EFS is what to do when things go wrong. EFS is enabled via digital certificates and it's possible to lose your digital certificate - as the result of a computer crash for instance - in which eventuality you won't be able to access your files. A corporate network will have recovery measures in place, but standalone users need to take three steps to cover for this eventuality: back up; export and save a copy of your digital certificate and keys (see screenshot 1, opposite); and lastly, export and save a



The step-by-step guide to EFS has invaluable advice on the use of the Encrypting File System

copy of the default recovery agent's certificate and keys.

These keys should be kept in a secure location on floppy or on another drive. The recovery agent keys and certificates can be used to decrypt any encrypted file on a standalone system. An individual's certificate and keys can be used to decrypt files which have been relocated to another system using NT Backup.

Copying an encrypted file to an unencrypted location converts it to text, whereas NT Backup keeps encryption.

To understand the export process, have a look at the information in the Knowledge Base, including a step-by-step guide to EFS, at [www.microsoft.com/windows2000/library/planning/security/efsteps.asp](http://www.microsoft.com/windows2000/library/planning/security/efsteps.asp) (see screenshot 2). Standalone systems should adopt the procedures described under 'User Scenarios' in the guide.

EFS offers extra cover for Windows 2000 systems, especially for mobile users, but it must be used with care. As the first cut also has deficiencies, you'll have to forego sharing on encrypted files, including off-line folders. Hopefully these omissions will be rectified before long.

## CONTACTS

Terence Green welcomes your comments on the Windows 2000 column. Contact him via the PCW editorial office or email: [win2000@pcw.co.uk](mailto:win2000@pcw.co.uk)



# Get on the bus

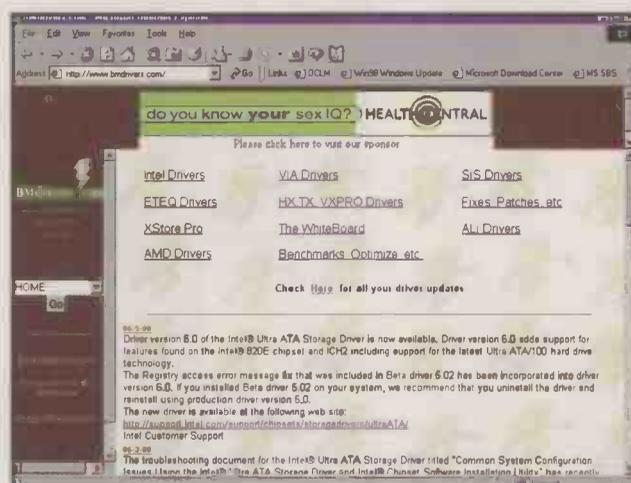
Roger Gann makes a return trip to the subject of bus mastering for improving performance.

**B**ack in July I waxed lyrical about the possible performance gains you can achieve with IDE hard disk subsystems by the simple task of turning on DMA using the simple (and free) DMACHECK.EXE download from Microsoft's website.

Now, I know that Windows NT4 and SCSI were simply made for each other and that to run IDE drives on an NT rig is heresy, but the fact remains that IDE offers tremendous bangs per buck – it's cheap and pretty damn fast, providing you've got it configured properly under NT4. It's often said by SCSI proponents that IDE (aka ATA) drives cannot touch the miniscule CPU utilisation posted by SCSI drives. This is untrue if DMA is used. The problem is, as we've seen, that DMA operation is, by default, switched off in a standard NT4 installation.

Now we know how to turn on DMA support, courtesy of DMACHECK.EXE, what can you expect in the way of performance gains? Quite a lot, is the short answer. With the right IDE device driver, turning DMA (aka bus mastering) on you can cut CPU utilisation from as high as 75 per cent down to less than two per cent. Not only that, the data transfer rate is also significantly improved as well – gains of 33 per cent are not exceptional. Check out [www.9-muses.com/freak/viewpoint/nt/nt\\_busmastering\\_3.shtml](http://www.9-muses.com/freak/viewpoint/nt/nt_busmastering_3.shtml) for some interesting benchmarks.

For day-to-day use, you may not notice much improvement, but if you multitask and run many programs that access the hard drive, you'll probably notice less lag, especially during heavy



BMdrivers.com will happily supply you with DMACHECK.EXE

disk accesses. You'll also be doing your other peripherals a favour. For example, if your IDE CD-R is bus-master capable, then you should be able to do other things while it's burning CDs, since the CPU doesn't have to watch over the entire process.

## Back of the bus

The transfer model for IDE devices has traditionally been PIO (programmed I/O) where data is transferred to and from IDE devices explicitly via CPU instructions. This is a straightforward and simple technique, but requires a relatively large amount of dedicated CPU time, especially when transferring large amounts of data to and from hard disk drives. If your PC's chipset includes support for bus mastering, then the burden on your CPU can be seriously reduced. A bus master is a chunk of

microcode that controls traffic on the computer bus or input/output paths. The bus master is the 'master' to the I/O devices on the bus, which are its 'slaves'. Once these paths are set up, the flow of data bits goes directly between the I/O device and the microprocessor.

For example, the common Intel 430 and 440

chipset series contain a PIIXn IDE controller function. The PIIXn IDE controller acts as a PCI bus master on behalf of IDE DMA slave devices, performing DMA transfers to and from devices on either primary or secondary IDE channels. More modern chipsets can also increase bandwidth via the UltraDMA33 hardware interface.

The table below maps Intel chipsets to PIIXn devices and notes each chipset's IDE hardware interface.

## Bus mastering

The original version of NT4 shipped with an IDE driver that didn't permit bus mastering. Consequently, the maximum transfer rate was limited to PIO Mode 2 or 8.33Mbytes/sec. For NT4 Service Packs 3 and above, Microsoft includes an UltraDMA-capable bus-mastering IDE driver. It's the 'IDE CD-ROM (ATAPI 1.2)/Dual Channel PCI IDE Controller' you see in the SCSI ID Adapters applet in the Control Panel. However, by default, it is not enabled for compatibility reasons. To enable it, use the DMACHECK.EXE utility described in the July NT column – you can get it from <http://support.microsoft.com/support/kb/articles/Q191/7/74.ASP>. Or look out for BMNT4.ZIP at [www.bmdrivers.com](http://www.bmdrivers.com).

Other bus-mastering IDE/ATAPI drivers are available, principally from Intel, and these offer slight advantages

Chipset	PIIXn Device	IDE h/w interface
Intel(r) 430FX PCiset	82371FB (PIIX)	ATA16
Intel(r) 430VX PCiset	82371SB (PIIX3)	ATA16
Intel(r) 430HX PCiset	82371SB (PIIX3)	ATA16
Intel(r) 430TX PCiset	82371AB (PIIX4)	UltraDMA33
Intel(r) 440FX PCiset	82371SB (PIIX3)	ATA16
Intel(r) 440LX AGPset	82371AB (PIIX4)	UltraDMA33
Intel(r) 440EX AGPset	82371EB (PIIX4E)	UltraDMA33
Intel(r) 440BX AGPset	82371AB/EB (PIIX4/4E)	UltraDMA33
Intel(r) 440GX AGPset	82371EB (PIIX4E)	UltraDMA33

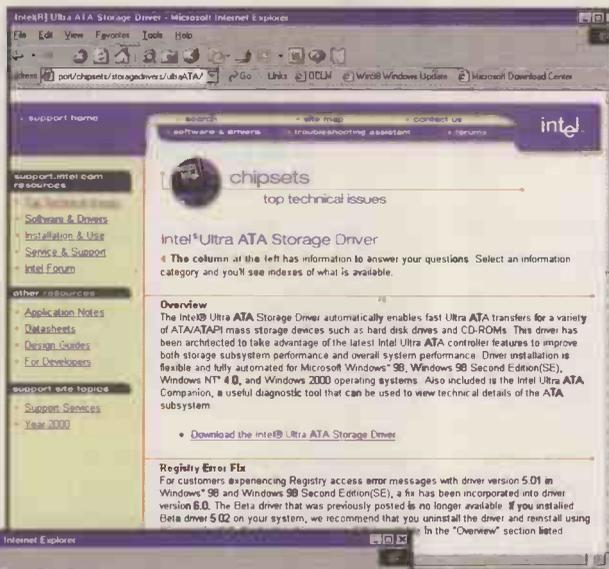
over the current Microsoft bus master IDE driver – you might want to experiment here and find out for yourself. For example, Intel's Bus Master Driver version 2.05 has been popular. They were designed for the Intel 82371AB/EB controller found in the 430TX and 440 family chipsets.

There are several different versions to be found floating around the Internet, some originating from the Hewlett-Packard website. For 800 series Intel chipsets, you'll need Intel's Ultra ATA Storage Driver 5.0. This does actually work with most BX chipset boards, but results will vary. An interesting thing about this driver is that it does not show up in the SCSI Adapters section in the Control Panels. For instance, it shows up in the Devices, but does not show up in the Drivers tab. However, it does come with its own utility that lets you see how your devices are configured. It looks like the SCSI Adapter Control Panel, but with a lot more detail.

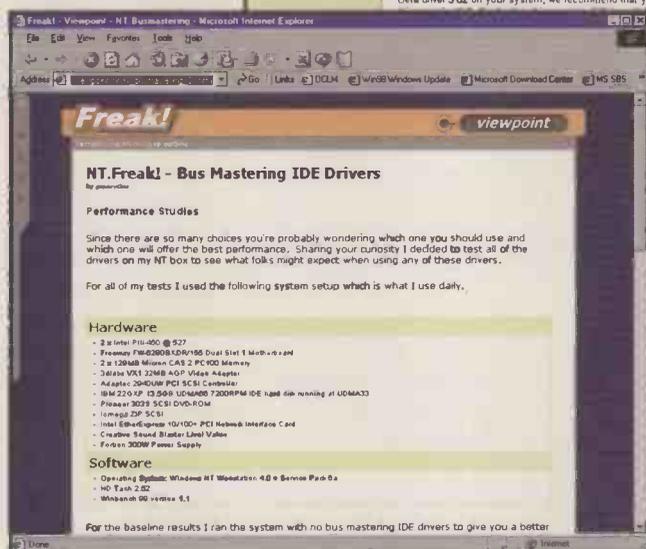
Don't forget that it's a good idea to keep similar ATAPI devices on the same chains. For instance, don't connect a CD-ROM drive to your UltraDMA-2 hard disk because it will force your hard disk to operate at the lowest common denominator, ie CD-ROM data transfer rates. For example, on my Compaq PWS-5000, there's only one IDE channel. Connecting the CD-ROM and an IDE drive on the same channel disables DMA. Also, some ATAPI devices may or may not function correctly using bus mastering. In that case you should keep them on a separate chain to prevent them from causing problems.

### Driver sources

A good source of info and drivers is BMDrivers.com at [www.bmdrivers.com/](http://www.bmdrivers.com/). Intel's very latest Ultra ATA drivers can be picked up from the Intel website at <http://support.intel.com/support/chipsets/storagedrivers/ultraATA/>. For



Left and below: There are plenty of resources out on the Internet and you can get the latest Ultra ATA drivers from Intel's site



previous releases, see the Intel Chipset Software Installation Utility Archive page: [http://support.intel.com/design/software/drivers/platform/archived\\_inf.htm](http://support.intel.com/design/software/drivers/platform/archived_inf.htm).

### Power management

Back in the July column I also alluded to the availability of power management software for the Windows OS. NT4 has no inherent support for any form of power management, which made it unpopular as an operating system for battery-powered notebooks simply because of the poor battery life it returned. However, for the past couple of years most major notebook vendors, eg Compaq, IBM, Toshiba and even Dell, have been offering their notebooks with Windows NT4 pre-installed, complete with power management software and hot-swappable PC Card support.

There are a fair few third-party vendors offering drivers and software that bestow a reasonable degree of

power management onto Windows NT4, mainly for laptops, but one is available for desktop PCs.

SystemSoft makes a number of Windows NT4 'mobile' utilities, including PowerProfiler/SE for about £30, which is perhaps the best-

known APM add-on. It provides extended suspend/resume controls and battery-status information on APM 1.x systems. PowerProfiler/SE lacks features found in PowerProfiler, but the latter only comes preinstalled on a laptop. The software will run on any notebook with a BIOS that supports the APM (Advanced Power Management) 1.1 or 1.2 specification.

Phoenix Technologies sells Desktop APM for NT [www.ptltd.com/platform/power.html](http://www.ptltd.com/platform/power.html), although this appears to be an OEM product, not retail. TouchStone Software, [www.touchstonesoftware.com/](http://www.touchstonesoftware.com/), sells a retail version of CardWare 6.0 (£70) that, as well as offering APM power management, additionally includes full PC Card support.

Finally, Softex ([www.softexinc.com/deskmktg.html](http://www.softexinc.com/deskmktg.html)) sells DeskPower Controller for around £25. This package is specifically aimed at desktop PCs and offers BIOS-independent power management. It features an APM-like user interface, support for CPU Idle, display time-out settings, hard disk spin down settings and it updates the system time on a resume from suspend. It supports the Win32 Power Management API, so that power-management-aware applications under Windows 95 will now also be power-management-aware under Windows NT.

## CONTACTS

Roger Gann welcomes your comments on the Windows NT column. Contact us via the PCW editorial office or email [nt@pcw.co.uk](mailto:nt@pcw.co.uk)



unix

# More routing around

Adding PPP software is **the finishing touch** to Chris Bidmead's Apricot Xen II ADSL-router project.

**W**e're now on the last stage of building the Linux-based ADSL router on my old Apricot Xen II 486 machine, based on the download from [www.coyotelinux.com](http://www.coyotelinux.com). Last month we got the floppy disk image, intended to route between a pair of Ethernet cards, back onto the hard disk so we could do some surgery on it. We need to add PPP software to drive the serial interface to the HomeChoice set-top box, and bring that up at boot time instead of the Internet-facing Ethernet card.

I'm not going to venture too deep into the details of the changes I made because at the time of writing the current

**FIG 1** Using `df` to display space usage within a filesystem

```
df .
Filesystem      Size Used Avail Use% Mounted on
/tmp/apricot/coyote.xen.image
                1.4M 1.2M 158k 89% /tmp/apricot/mp
```

free version of Coyote (version 1.13) now includes a script for creating a PPP dialup version of the router, which would cut out a fair bit of the fiddling I had to do. But I want to cover some of the principles involved in peeking inside the disk image and the tarballs it contains. The operation throws up some generally useful Unix and Linux techniques that are worth exploring even if you're not trying

to build a router. And you can always email me if you need help with specifics.

To access the entrails of the floppy disk image we've mounted it using the Linux loop device, with the command line:

```
mount -o loop -t msdos \
coyote.image mp
```

(Key: **✓** code string continues)

...which means we can now duck inside the `mp/` directory to find the tarballs (here called `.lrp` rather than the more usual `.tgz` or `tar.gz`) that the SysLinux boot system automatically untars when the floppy is booted.

With a little tweaking, recent versions of the Midnight Commander filemanager might be a good way of inspecting the contents of these tarballs (drop me a line if you know more about this), but I went straight for an old-fashioned pipeline. For example, `tar tvzf config.lrp` reveals a file named `var/lib/lrpkg/config.help`. One shortcut to reading its contents might be:

```
tar xvz0f config.lrp \
var/lib/lrpkg/config.help \
| less
```

...remembering that the `O` switch redirects `tar`'s output to `stdout`.

After some research it turns out that the tarballs I needed to edit were `etc.lrp`, `config.lrp` and `modules.lrp`. I also needed to add a `ppp.lrp` tarball as well as modify a couple of setup files.

It wouldn't be too smart to try to expand any of these tarballs directly inside the `mp` directory (eg `tar xvzf modules.lrp`), because `mp` is a separate floppy-sized filesystem (within `coyote.image`) and it'll fill up. The command `df` is used to display the space usage within filesystems and I get the result as shown in figure 1 above.

So I added the `C` switch to make sure the expanded files end up outside `mp` in a pre-established empty directory (so

## Mail user agents

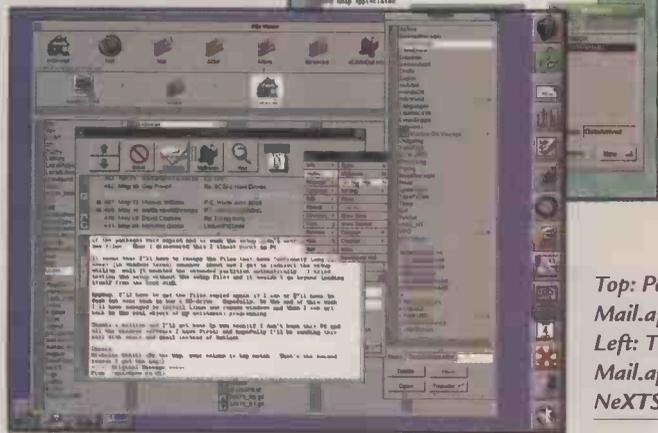
I still handle all my email from a NeXTStep system running on a 486-based Canon object.station. NeXTStep's mail user agent (MUA), called Mail.app, was very advanced when it was first designed over a decade ago and still seems to be better than any GUI MUA I can find on Linux.

However, Nic Bernstein has put together a

NeXTStep Mail.app lookalike for Linux called Postilion ([www.postilion.org](http://www.postilion.org)). It's based on Martin Forssén's TkRat MUA

([www.dtek.chalmers.se/~maf/ratatosk/](http://www.dtek.chalmers.se/~maf/ratatosk/)) and is aimed at eventual inclusion in the GNUStep project

([www.gnustep.org](http://www.gnustep.org)). It's written in C and Tcl/Tk, so should be portable across most Unix-like operating systems. Currently, I'm running it on Linux Mandrake side by side with the Real Thing on my faithful NeXT machine.



Top: Postilion mimics Mail.app under Linux  
Left: The genuine Mail.app running under NeXTStep

that it's easy to retar the files back into a .lrp file).

```
tar xvzfc modules.lrp ✓  
/tmp/working
```

(If you're new to tar the 'modem-noise' string of command-line switches reads 'expand (x) verbosely (v) while decompressing (z) the file (f) into the switched directory (C)'. The values for f and C follow as modules.lrp and /tmp/working, and have to be in the same order as the relevant command-line switches.)

The modules package inside the disk image didn't include the necessary ppp.o module in the /lib/modules directory, but it was there in the Coyote distribution under ../packages. I discovered that ppp.o also needs slhc.o to run, so I added that too. It's also necessary to add these names (without the .o) to the /etc/modules config file. Having done that I retarred the contents of my /tmp/working directory back into a new modules.lrp tarball to replace the original.

I used the same technique to open up etc.lrp and looked at the startup script in there called /etc/rc.d/rc.inet to work out the best way to get the pppd daemon up and running. Because Coyote is adapted from existing work done by the Linux Router Project ([www.linuxrouter.org](http://www.linuxrouter.org)), the start-up script was already set up to look for a file called /etc/rc.d/rc.ppp and include it if it existed.

```
elif [ "${USEPPP}" = "YES" ✓  
]; then  
# Dialup PPP Sharing  
[ -x /etc/rc.d/rc.✓  
ppp ] && . /etc/rc.d/rc.ppp
```

All I needed to do was write this script, based on the single workstation PPP connection to HomeChoice I'd already figured out (see July issue):

```
echo "Attempting to start ✓  
pppd"  
/usr/sbin/pppd /dev/ttyS0 ✓  
115200 local receive-all ✓  
noauth defaultroute
```

You'll notice that the elif stanza above depends on a variable called \$USEPPP. I could have simply snipped this out, but it seemed better not to depart unnecessarily from the existing architecture, so I looked to see where this variable gets set. Early on in the rc.inet script is the line:

```
# Read in the Coyote ✓  
configuration script  
. /etc/coyote/coyote.conf
```

This led me to investigate the config.lrp tarball, where cat /etc/coyote/coyote.conf produced:

```
LOCAL_IPADDR= 192.168.1.50  
LOCAL_NETMASK= 255.255.255.0  
LOCAL_BROADCAST ✓  
=192.168.1.255  
LOCAL_NETWORK =192.168.1.0  
USERRM=NO  
USEDHCP=NO  
IPADDR=  
NETMASK=255.255.255.0  
GATEWAY=  
DNS1=  
DNS2=  
DOMAINNAME=  
DHCPSEVER=NO  
DHCPD_START_IP=  
DHCPD_END_IP=
```

The IP addresses come from values I'd supplied in running the original script to create the floppy disk image. I added a line:

```
USEPPP=YES
```

...and recreated the config.lrp tarball. Last month I mentioned that although the running version of Coyote uses RAM disks exclusively (so mods to files like /etc/coyote/coyote.conf are volatile) there is a script for saving such changes back to the floppy. Happily this means that the management of the disk image I'm discussing here doesn't have to get all these values exactly right - they can be tuned on the fly.

## At first I cheated by disabling the built-in Ethernet and plugging in an EtherLink card

To cut a long story short, the rewarding result - after writing the diskette image back to a diskette with

```
|dd if=coyote.image ✓  
of=/dev/fd0|
```

was a working ADSL router for the price of an obsolete, diskless 486 box and a few hours' industrious exploration at the very edges of my competence (and where better to spend a few hours?).

I could have saved the time. An alternative, if you happen to have a few bob to spare, is GnatBox (see [www.globaltech.co.uk](http://www.globaltech.co.uk), where you can download a demo version of a very similar commercial single floppy disk router that times out after 180 minutes). The full working version costs £995. GnatBox is sold and supported in the

UK, and the UK sales director Kate Videon tells me you can buy a dedicated hardware version for £1,995.

The GnatBox licence says I've agreed not to 'modify or adapt' the software, or 'attempt to discover the source code'. This may be great for a small business that needs a commercially supported router-cum-firewall, but I think I'll stick with Coyote, which encourages modification and access to the source code and so makes it very easy for me to change the pppd options and add features such as remote logging whenever I want.

### Driver reviver

The Apricot Xen II 486 machine's built-in Ethernet connection is based on the i82596 Ethernet controller chip and last month I mentioned that the Linux driver for this (apricot.o) stopped working a few years ago with newer versions of the Linux kernel. It was originally written by Mark Evans, who I ran into again recently at the Linux 2000 Conference.

Mark told me that he'd stopped maintaining the driver when he parted company with his old Apricot. The new maintainer, Richard Hirst, generalised the driver to work with other network hardware based on the same i82596 Ethernet controller chip. Unfortunately, under its new name,

82596.o, it still no longer worked with the Apricot Xen II.

So, how did I handle the Ethernet side of the router operation? At first I cheated by disabling the built-in Ethernet and plugging in a 3Com EtherLink card, but this struck me as inelegant and wasteful. Obviously, it would be worth taking a look at the code for 82596.o and fixing it. So I did.

Well, I don't deserve all the credit. In fact, narrow-minded commentators might be inclined to ignore my contribution altogether. But, hey, I blew the whistle. I ran the driver and found it didn't work. I didn't whinge (well, I didn't just whinge), I damn well sought out the source code and ran my expert eye over it. I don't write C and I



## unix

don't understand much about C, but I do recognise an author's email address when I see one.

I dropped a line to Richard and he wrote back saying that he was interested in restoring Apricot Xen compatibility for the next official release of the Linux kernel. He didn't have a Xen, but he sent me some revised code to test on mine. The revision didn't work either, but I returned the diagnostics to him and within a couple of days we had a working driver.

I say 'we'... well, yes, I do say 'we'. The moral is that even if you're not a coder, there's still a proactive role to play in all this. This is what being a Linux user is all about, and it's one reason that Linux is the fastest-growing, fastest-improving operating system in the history of the world.

### Administristry over the web

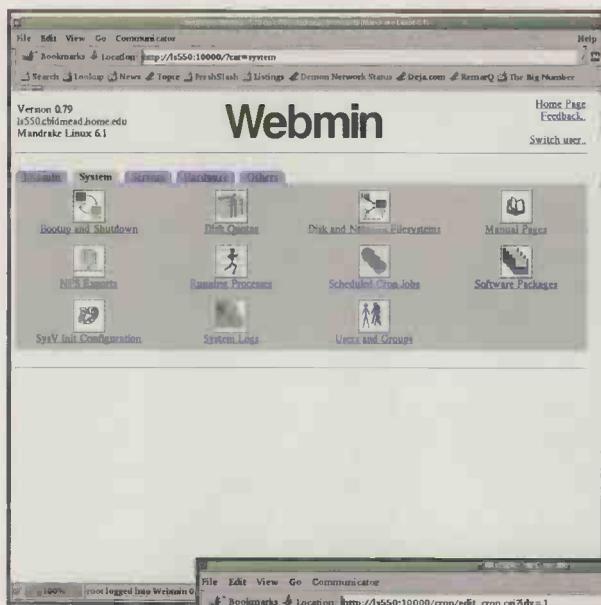
Jon Hawkesworth ([jon@unity.demon.co.uk](mailto:jon@unity.demon.co.uk)) writes: 'I haven't seen mention of Webmin in your column. In case you haven't heard of it, have a look at [www.webmin.com/webmin](http://www.webmin.com/webmin).

'It's a system administration tool for Unix, which can be handy, since it supports lots of distributions, but gives you the same web-based interface to all of them. As with any useful admin tool it is not a substitute for understanding what you are trying to achieve, but it can speed up repetitive administrative tasks and let you concentrate on sorting out the more tricky stuff.

'I'm sure someone that you have never met raving about a piece of software you haven't used isn't the most riveting read, so I'll stop here and let you draw your own conclusions. Hope you find it worthy of a mention in a future column.'

Well, thanks, Jon, for drawing my attention to a great piece of software. Can't think how I missed this. Webmin is now owned by Caldera, but is BSD-licensed, and - as you say - runs across many Unix platforms. There's an RPM package that installs directly onto RedHat and Mandrake Linux systems (I haven't tried it with SuSE), and source code is available for pretty much every Linux distribution you've ever heard of, as well as Solaris, FreeBSD, OpenBSD, HP/UX, SGI Irix, SCO UnixWare and even MacOS X.

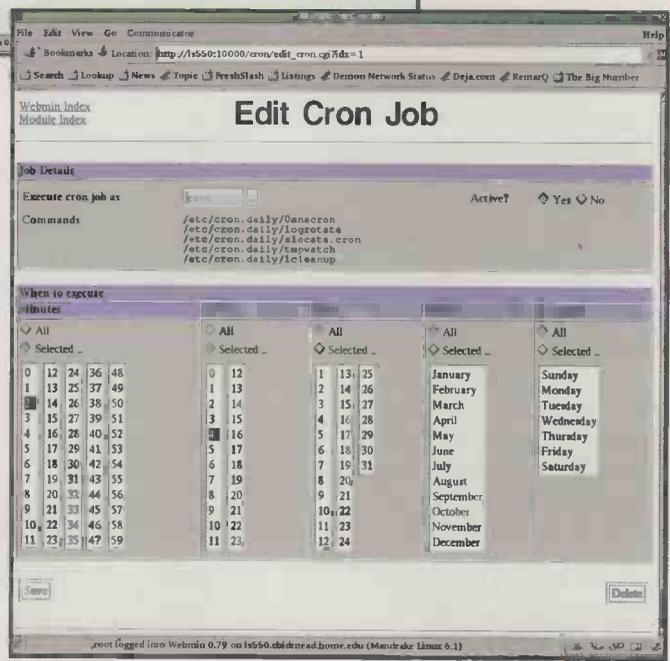
Webmin is impressive, consisting of a simple web server and a number of CGI



*Left: Webmin conceals the complexity of system administration behind a tab notebook-style interface with distinctive icons. But don't think of it as 'Admin for Dummies'. I agree 100 per cent with Jon's warning: 'As with any useful admin tool it is not a substitute for understanding what you are trying to achieve'*

programs that directly update system files such as /etc/inetd.conf and /etc/passwd. So, unlike Linuxconf and SuSE's YaST there are no intermediate special configuration files to add to the complexity. The web server and all the CGI programs are written in Perl version 5, and use no external modules. So, if Perl 5 is available for a platform, Webmin will run on it without compilation.

As Jon says, this gives you a uniform overview of every system on the network. But Webmin can also administer down to the minutest level of detail, such as editing ./rc.init scripts and cron scripts. It's also easy to add your own individual administrative elements by writing your own Webmin modules, or, more directly, simply by setting up arbitrary utilities to be run through the web interface. Several



*Setting up cron jobs traditionally involves understanding the crontab conventions, where, for example, a line such as: 42 4 1 \* \* root run-parts /etc/cron.monthly ...means 'run the script called 'run-parts' with the parameter '/etc/cron.monthly' as user 'root' at 42 minutes past four am on the first of each month'. Webmin's GUI-ified cron editor takes the pain out of this, although it's still worth getting to grips with man crontab so you know what's going on underneath*

third-party Webmin modules are available from the website (including one written by Jon).

### CONTACTS

Chris Bidmead welcomes your comments on the Unix column. Contact him via the PCW editorial office or email: [unix@pcw.co.uk](mailto:unix@pcw.co.uk)

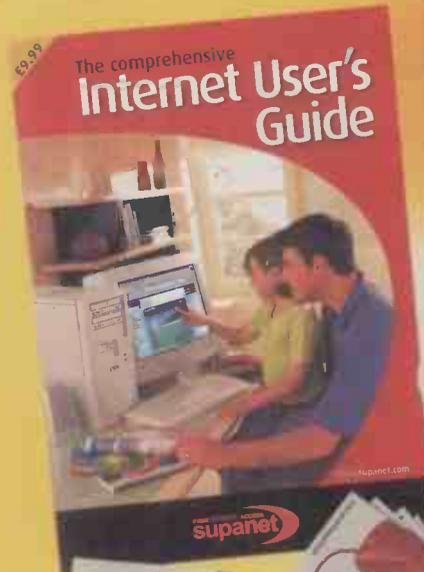
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SBG CLK007



# Asus deals an ace

Triumphant Gordon Laing assembles a plus-1GHz BX solution that out-SYSmarks RDRAM.

**L**ast month I had great fun getting my old Asus P2B motherboard to overclock a poor 866MHz Flip Chip to the heady heights of 1GHz, and actually outperform brand new 1GHz systems with expensive RDRAM! The trick was to overclock the aging BX chipset from 100MHz to 133MHz – it's a project which seems to have caught the imagination of hardware enthusiasts the world over, in a way only matched by the dual-Celeron Abit BP6 a few months back.

Of course, no self-respecting tweeker can leave anything alone for long, so this month I took my overclocked 1GHz system one step further, along with trying out new BX solutions. All that performance generates a fair amount of heat though, so I got myself down to the local computer fairs and bought the cream of case coolers.

Finally, FedEx delivered a pair of PowerLeap Neo370s that promise to let legacy PPGA motherboards accept new FC-PGA processors – could this mean dual-PIII action on an Abit BP6? Grab your anti-static wrist bands and read on!

## BX – nearing retirement?

It's funny to remember that the Intel 440BX chipset is now over two years old – funny since most chipsets have a considerably shorter lifespan of around six months. It was the first chipset to support front-side bus frequencies up to 100MHz and AGP transfers of 2X. Time, of course, stands still for no chipset, so the i820 was introduced as a replacement, supporting higher 133MHz FSB frequencies, AGP 4X and doubling the bandwidth of the onboard-IDE controller from 33Mbytes/sec to 66Mbytes/sec.

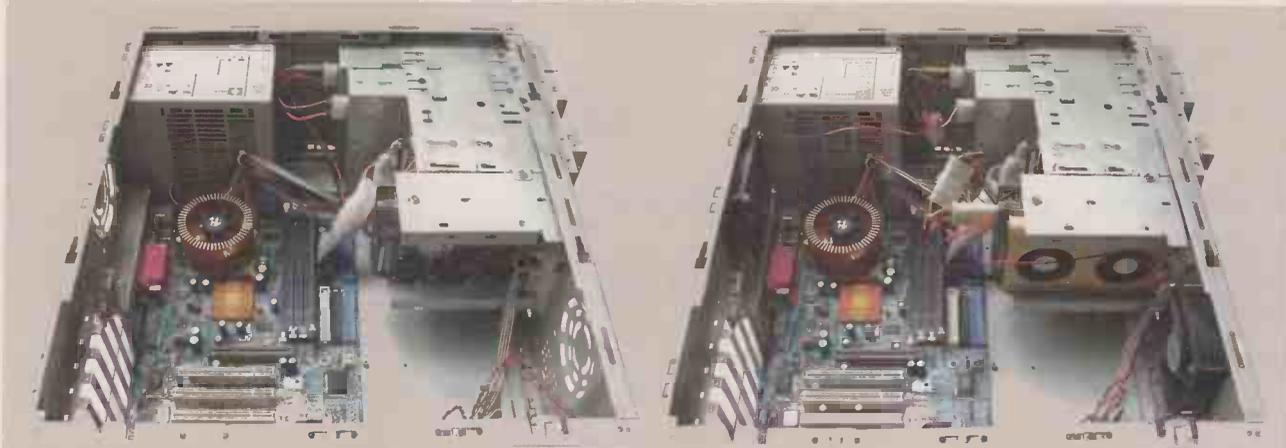
The problems started when Intel designed the 820 to use only RDRAM, which still costs around three times the price of SDRAM today. Component manufacturers and system integrators the world over demanded an SDRAM solution, so Intel built the Memory Translator Hub (MTH) chip and thought everyone would be happy.

Sadly, as most people know by now, the 820 with MTH suffered from poor SDRAM performance and recently was revealed to even spontaneously reboot under certain circumstances, forcing Intel to offer a refund or replacement

program. In the meantime, the BX chipset has enjoyed a comeback, at first as enthusiasts demonstrated old boards were quicker with SDRAM than the 820/MTH solution, then second, as genuinely new products arrived from innovative Taiwanese motherboard manufacturers singing 'better the devil you know'.

I've got some cracking results from my old Asus P2B BX motherboard, with a little encouragement here and there. First, I got around incompatibilities with Coppermine CPUs (PIIIs above 600MHz and Celerons above 566MHz), by using a Slocket convertor, which boasted an FC-PGA compatible socket and manual core voltage adjustment. Second, to get the really high CPU frequencies, I needed to run the FSB at 133MHz. Consequently, I bought 133MHz SDRAM, set my PCI divider to one quarter and kept my fingers crossed that my AGP card didn't mind being run at 89 instead of 66MHz.

It all worked beautifully, but I felt there may be a better motherboard solution – one based around a BX chipset, but which was happy to accept Coppermine FC-PGA CPUs as standard.



*Can't stand the heat? This overclocking and high-performance I/O is all very well, but things can get pretty hot inside your PC case. I recently noticed disturbing hot-wafts coming from mine, so I decided to do something about it. I headed down to the Tottenham Court Road computer fair and bought a variety of case fans for between £5 and £10 each. Along with conventional case fans, I found ones designed to cool high-speed hard disks and others to suck out nasty hot air through a spare blanking plate. If your case has two fan mountings, place one to suck air in at the bottom and the other to blow it out at the top. I've done this on mine, along with mounting another to cool my new Ultra160 hard disk*

Back in June's *PCW* we tested and recommended a Gigabyte GA-BX7 motherboard that did just that, but shortly afterwards, the GA-BX7+ arrived, just begging for a spin!

The GA-BX7+ boasts several advantages over its predecessor. Instead of three, it features four DIMM slots which support up to 1GB of SDRAM. Lack of native UltraDMA66 support on the BX chipset is remedied by the inclusion of an onboard Promise UltraDMA66 controller, with its own pair of channels. The Abit BP6 offered something similar from HighPoint, both with the advantage that instead of the traditional pair of IDE channels, you now have four to play with, doubling the number of supported IDE devices from four to eight. Finally, the GA-BX7+ features a unique Dual-BIOS facility for backup purposes and a 'Magic Booster', which increases CPU core voltage by 10, 20, 30, 40 or 50 per cent. Sadly, there are several capacitors located very close to the Socket 370, which made fitting a large heatsink like my Titan Majesty a bit of a squeeze.

I built a system using an 866MHz FC-PGA PIII, 128MB of PC133 SDRAM, a 13.6GB UltraDMA66 Quantum Fireball Plus KX and an ATI Rage Fury Maxx graphics card. Last month I built an identical system using an Asus P2B and an Iwill Slocket II CPU convertor, which scored an impressive 173 in SYSmark 2000 under Windows 98 SE. The same configuration on the new Gigabyte board scored 176, which isn't bad when you consider both boards use the same chipset and had the same components installed.

You won't be surprised that I next attempted to overclock my 866 CPU, but even with the help of the Magic Booster, the GA-BX7+ wasn't having any of it. This was a shame considering I'd got the same CPU to run reliably at 1,000MHz on my P2B/Slocket combo, scoring a huge 187 in SYSmark 2000. I guess that proves overclocking isn't an exact science, it sometimes works, but not always. I would, however, expect the GA-BX7+ to score slightly higher than 187 with a genuine

## Powerleap NeoS370

I couldn't leave this column without mentioning the pair of Powerleap Neo-S370s that I recently bought over the Internet at an end-cost of £35 each.

They're supposed to allow you to fit new FC-PGA CPUs into old PPGA sockets. I tried an 866MHz PIII in my Abit BP6 and, while it did boot, the system was rather unreliable.

When I tried a pair of 866s, with stepping certified by Intel for SMP use, the system

wouldn't even start.

Do I need an updated BIOS? Do I need different CPUs? Do I need a bit more patience? Instead, how about more sensibly spending the £70, plus a tad more, on a new dual-FC-PGA

motherboard, such as those launched at Computex in June - far more sensible.

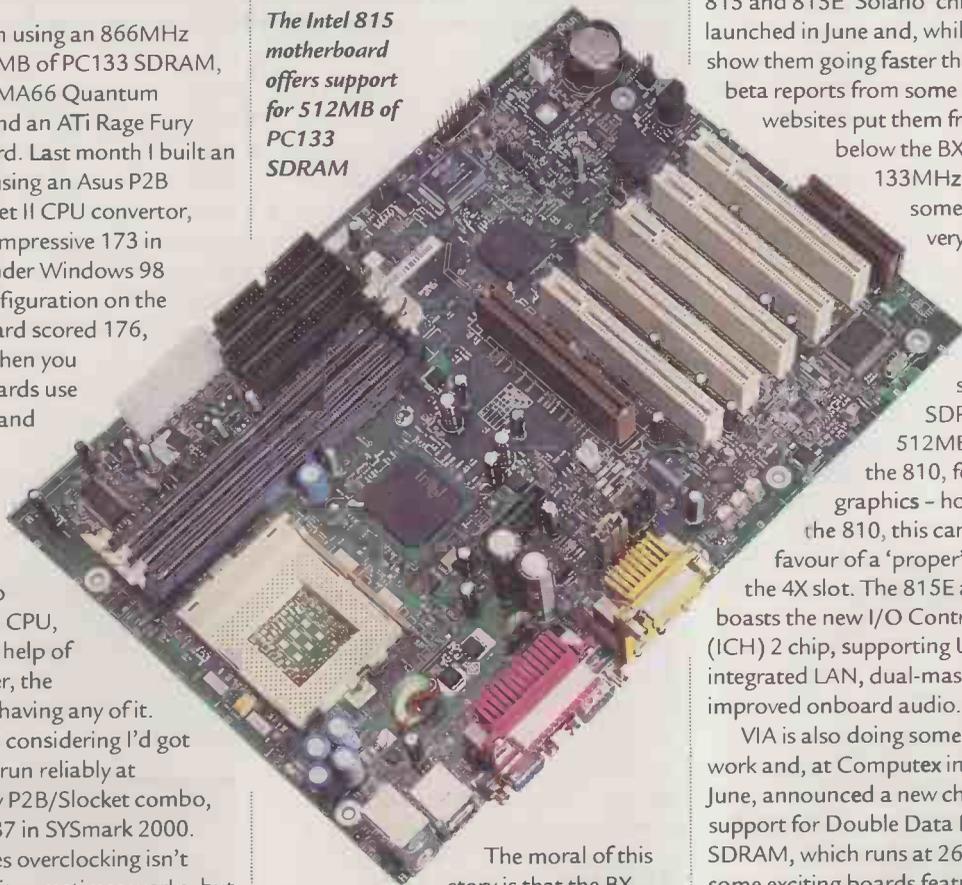
Price: \$25 plus postage and import tax (approximately £35)

Contact: PowerLeap, [www.powerleap.com](http://www.powerleap.com).



1GHz CPU in the same configuration described above.

*The Intel 815 motherboard offers support for 512MB of PC133 SDRAM*



The moral of this story is that the BX chipset still cuts it. The sad news, however, is that they're now in seriously short supply and you're unlikely to see

any new motherboards released with them. Intel's new 815 and 815E 'Solano' chipsets were launched in June and, while early results show them going faster than 820 boards, beta reports from some hardware websites put them fractionally below the BX running at 133MHz - I'll run

some comparisons very soon.

For the record, both 815s officially support PC133 SDRAM (but only 512MB of it) and, like the 810, feature onboard graphics - however, unlike the 810, this can be disabled in favour of a 'proper' AGP card in the 4X slot. The 815E additionally boasts the new I/O Controller Hub (ICH) 2 chip, supporting UltraDMA100, integrated LAN, dual-master USB and improved onboard audio.

VIA is also doing some interesting work and, at Computex in Taiwan during June, announced a new chipset with support for Double Data Rate (DDR) SDRAM, which runs at 266MHz. Expect some exciting boards featuring DDR later this year, but in the meantime it looks like supply will soon dry up on the BX. We at *PCW* salute it and wish it the



best of luck in chipset retirement – it'll certainly not have any bother from the doddering 820.

### SCSI versus IDE

I've been accused of being an I/O snob. You see, over the years I've come to prefer SCSI as the interface of choice for high-performance peripherals, not to mention the broadest flexibility – IDE in its various guises just never cut it for me. It all started with my photographic interests and the absolute need in the early days of scanning to have a SCSI card in your PC. I noticed very early on that the data transferred much quicker from one SCSI peripheral to another, than if it had to get off the SCSI bus and catch the IDE one instead; one SCSI hard disk later and my destiny was set.

Today I have all-SCSI DVD-ROM drive, Iomega ZIP and Jaz, two hard disks and still have plenty of opportunity to connect external SCSI peripherals, something IDE has never been able to do. However, over the years, IDE (in terms of interface and devices) has begun to catch up in terms of raw performance. Out of curiosity, I decided to try out my SCSI card and drive on the Asus P2B system described above, with 866MHz CPU, ATi Rage Fury Maxx and 128MB of PC133 SDRAM. My hard disk was a Seagate ST39173 9GB Ultra2 drive and my controller an Adaptec 2940U2W.

Much to my surprise, my SCSI system actually went a tad slower in SYSmark 2000 than the IDE Quantum one described earlier – 168 on SCSI versus 172 in IDE. While the SCSI subsystem still suited me overall in terms of better connectivity, I admit I felt a bit miffed.

In last month's *Reviews*, I tested an Armari R8-2000E workstation, which featured IBM's brand new 75GXP UltraDMA66 hard disk. Armari is normally a big SCSI fan, but reckoned this new drive really cut the mustard. IBM claims it sustains a whopping 37Mbytes/sec, which, for once, actually demands the bandwidth of the UltraDMA66 interface. In our tests it certainly did fly, so the challenge really was on for SCSI to regain some ground.

Taking no prisoners, I decided to go for a new Seagate Cheetah 18XL 18GB Ultra 160 hard disk, spinning at 10,000rpm. While this would work on the 80Mbytes/sec LVD channel of my Adaptec 2940U2W card, I opted for a new controller: the Adaptec 29160,



*Adaptec's SCSI-bench shows the relative performance of sequential data transfers on three disks on my system – note the Ultra160 drive is sustaining more than double the throughput of my older U2W drive, while an ancient SCSI-2 drive has virtually given up the ghost*

which as its name implies, supports the latest Ultra160 SCSI specification.

I set up the same configuration once more, ran SYSmark 2000 and was delighted to score 180, compared to 168 with the old SCSI hard disk. Out of sheer greed, I overclocked my CPU to 1,000MHz, ran the tests again and achieved a whopping 198! Suddenly, the mid-180s scored by production RDRAM 1GHz systems seemed relatively slow.

Out of curiosity I fired up Adaptec's EZ-SCSI tests and set the Seagate Ultra 160, Seagate U2W and an old Micropolis SCSI-2 sequentially firing at the same time. My U2W drive sustained just under 15Mbytes/sec, but the new Ultra160 drive delivered over 35Mbytes/sec. The old SCSI-2 disk plodded along at just over 1Mbyte/sec, albeit slightly slowing itself and the Ultra 160 in the process. The moral of this story is that a fast disk can make all the difference. I'd recommend a new Ultra160 SCSI subsystem any day, while the new IBM 75GXP will do wonders for an UltraDMA66 system.

### Thanks!

After all that excitement, I'd like to thank several readers for doing my job for me and tracking down some tricky suppliers!

In reference to Richard Pankhurst's request for some DOS CD-writing software, Alistair Cunningham and Andrew Gratton both suggested DAO from [www.goldenhawk.com](http://www.goldenhawk.com). James Pearson suggests looking up [www.fadden.com/cdrfaq](http://www.fadden.com/cdrfaq) for a list of DOS CD-R apps, while Ross Rundle uses a home-made DOS batch file employing XCOPY to write to CD-RWs that have been formatted as removable drives using Adaptec's DirectCD.

I may have gone all the way to Japan to find an Iwill Slocket II and Titan Majesty fan, but Howard Barnfather and Cyril Holmes beat me by finding UK suppliers that were cheaper to boot!

The Iwill is available from Vision Multimedia Systems: [www.vmsystems.co.uk](http://www.vmsystems.co.uk), 01274 403040, and the Titan Majesty from Hills Components: [www.hillscomponents.co.uk](http://www.hillscomponents.co.uk), 01923 424344.

## CONTACTS

Gordon Laing welcomes your comments on the Hardware column. Contact him via the PCW editorial office or email:

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





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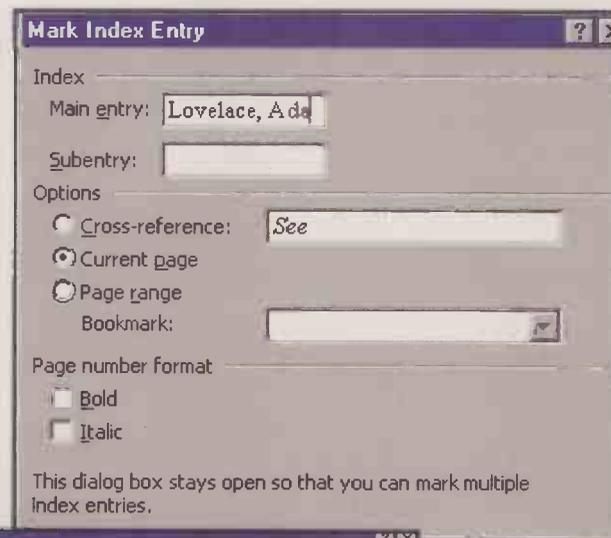
You don't appreciate a good index until you need one, so Tim Nott tells you how to make your own.

One of the great things about electronic documents is that you can search through them easily. You don't have to fumble about in an index or thumb through the pages. However, if you are writing, say, a history of computing or a study on the wines of the Quercy that is destined for the printed page, then you are going to need a conventional index.

Using Word, this doesn't pose too much of a problem. Start reading your opus on screen. When you come to a word or phrase you want to index, you select it, then mark it as an index entry. You can get at the necessary dialog through the Insert, Index and Tables command, but since you'll be doing rather a lot of this it pays to learn the keyboard shortcut – Alt & Shift & X. There are several options here, but we'll keep it simple.

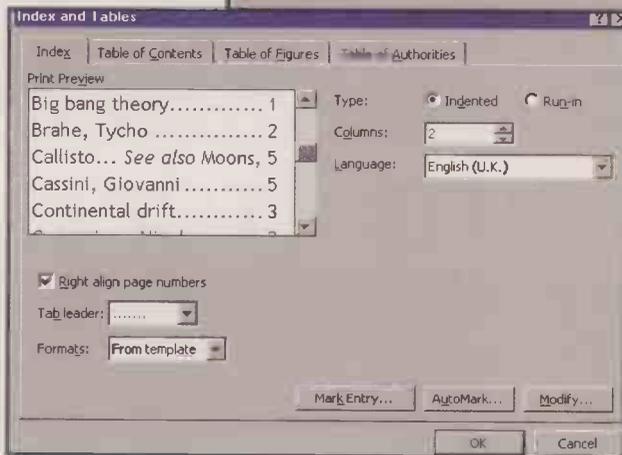
Type the main entry you want to index under, as it will appear in the index. Then hit Mark. This inserts an XE field in the appropriate place: normally this is hidden, but Word will obligingly turn on the view of non-printing symbols and text. A better strategy than hitting Mark (who might hit you back) is to click the Mark All button instead, which does exactly as it says – all occurrences of the word or phrase will be tagged.

To be absolutely accurate, only the first occurrence of a word in the paragraph is flagged and multiple instances on the same page will only be referenced once in the actual index. You need to be careful when creating an index entry – usually you'll want to capitalise it, and you need to do this at the time of creation, as the text in the index itself will not retain directly-applied formatting.



Left: Marking some text for indexing  
Below: Creating the index itself

You can do this by typing in the title of an existing entry when indexing the other forms. Be careful though, as the index is case sensitive: if you type in 'drink' when there's an existing 'Drink' entry, you'll create a second index entry.



Having marked the text to be indexed, creating the actual index is a doddle. Place the cursor where you want the index to appear and Insert, Index and Tables, Index, OK. You have a few options here, such as the number of columns and aligning the page numbers. The index itself is another Word field, so if you want to add entries after it has been created, select the index (it should turn grey) and press F9 to update it. If you add text that contains words already indexed to your book, then you will need to refresh the tags by repeating the Mark All process.

You may want to index a different word to an existing entry – your computing history may refer to Augusta Byron, Ada Byron King and the Countess of Lovelace, who are all the same person.

A better way of dealing with this, using formatting and reusability, is to create a concordance file. This wonderfully biblical-sounding device is actually nothing more than a two-column word table. The left-hand column contains the words as mentioned in the text, the right-hand column the index entry. This makes it easy to create different texts in the left-hand cells that refer to identical entries in the right-hand column.

You can also use this to harness different word forms or synonyms – drinking, drunk, boozing – to the same entry. Note that, like the index entry titles, the tagged text is case sensitive – you'll need to enter both Wine and wine to get both forms tagged. Creating the index is again a two-stage process. First you go to Insert, Index and Tables... Index and click the Automark... button. This brings up a standard file open dialog and you choose your concordance file. This closes all the dialogs and marks the entries. You then need to go back and Insert, Index and Tables... Index, OK.

## CONTACTS

Tim Nott welcomes your comments on the Word Processing column. Contact him via the PCW editorial office or email: [wp@pcw.co.uk](mailto:wp@pcw.co.uk). Please do not send unsolicited file attachments.

# Task masters

With project management, **time is of the essence**, so Stephen Wells shows you how to save it.

Every now and then I receive a request to solve the problem of having Excel change the formatting in one cell, based on an entry in another. Those readers will be interested in this excellent example (right) contributed by Simon J Warren. Earning himself a well-deserved £25 book token for his contribution, it is a worksheet Simon uses for project management and simulates the type of planning and progress chart devised by American, Henry L. Gantt.

Task descriptions are entered in column A with the number of days each task

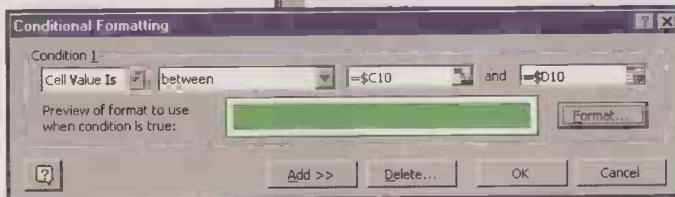
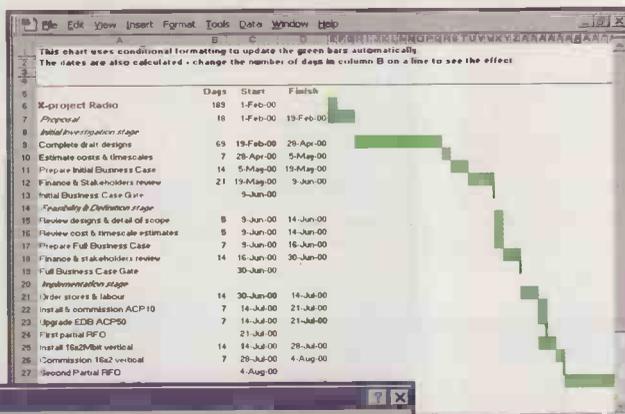
takes entered in column B. Columns C and D are the start and end dates of each task. Except for the first in the list, they are calculated from the preceding one.

All cells in column E equal the value in the start date cell and cells in column F onwards equal the previous cell plus seven. The columns are made quite narrow and formatted with the font in white on a white background, so they

## With books first editions are the most valuable. With software the opposite is true

don't display by default.

Here's where the Conditional Formatting comes in. In Excel 97, find it on the Format menu. It is used to display a green font on a green background only if the date in the cell is between the start and end dates. The stored value never displays but the cell becomes a block of green and part of a chart bar. For example, cell L10 has, as shown in the screenshot above, the conditional format that it shows green if the cell value is between C10 and D10. The formula it



Top: Simon J Warren's home-made Gantt chart created by using Excel's built-in conditional formatting facility

Above: A typical format instruction used to make the Gantt chart

holds is  $K10+7$ . As the result of this formula is not between 28 Apr (C10) and 5 May (D10) the cell shows white.

This Gantt chart works perfectly. If you find a task is going to take longer than originally planned, you just change the number of days in column B. The end date of the task, and all the other end dates, automatically change in column D. The adjacent bar lengthens to reflect

the change and all of the following chart bars shift to the right as they should.

Simon admits that his creation doesn't have the sophistication of, say, Microsoft Project 98, but it does the job and may be something you could adapt.

### Old timers

In the July column I mentioned that Excel doesn't recognise dates prior to 1900 and pointed reader Rod Strong toward Corel Quattro Pro 8. This led Matthew Inns to email me and suggest an Excel

add-in available for downloading from John Walkenbach's excellent spreadsheet site. You can read all about this series of XDATE custom functions first at [www.jwalk.com/ss/excel/files/xdate.htm](http://www.jwalk.com/ss/excel/files/xdate.htm). The add-in only works with Excel 97 or 2000, not Excel 95,

nor Excel for Macintosh, and is not guaranteed to be accurate prior to 1752. Still, it's fully functional and free. Just download and execute the xdate.exe file and it installs eight XDATE functions including XDATE, to give a date for a year, month, and day; XDATEDIF which returns the number of days between two dates; and XDATEDOW which gives the day of the week of a date.

### Excel 2000 fixes

With books, first editions are the most valuable. With software the opposite is often true as you are often best advised waiting until the publisher has responded to initial customer complaints. To see a list of the changes made to Excel 2000 so far, download the 326KB file at [www.microsoft.com/office/ork/2000/download/SR1Changes.xls](http://www.microsoft.com/office/ork/2000/download/SR1Changes.xls). It includes all 620 changes to the different applications in Office 2000, including over 80 for Excel. The actual SR1a file is much too large for most people to download but you can order the patch CD using [www.microsoft.com/uk/office/update/sr1order.htm](http://www.microsoft.com/uk/office/update/sr1order.htm), or phone Microsoft Connection on 0345 002 000 in the UK or 01 450 2113 in Ireland.

## CONTACTS

Stephen Wells welcomes your comments on the Spreadsheets column. Contact him via the PCW editorial office or email [spreadsheets@pcw.co.uk](mailto:spreadsheets@pcw.co.uk). Please don't send attached files until requested.



# A secure base

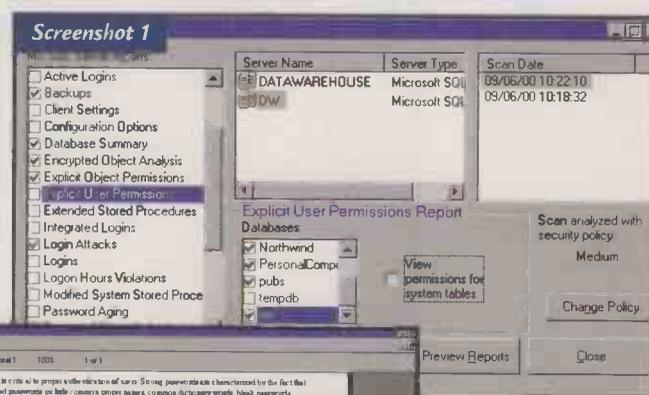
Database security is in question as Mark Whitehorn looks at **password-checking** software.

**N**ow I like to think I run a tight ship, database-wise; I didn't get where I am today by running loose databases. Client-server databases such as SQL Server and Oracle provide high levels of security, but it is up to the Database Administrator (DBA) to ensure that they are used and I certainly do that. Absolutely.

But how can I really be sure that I haven't missed anything? And how can I be sure that the users are playing the game? After all, I tell all my users to use non-guessable passwords, but since I can't make sense of the password file, I can't tell if they are following my instructions.

The answer is to use a product such as ISS

Database Scanner. This intriguing piece of software runs entirely on a client and simply requires a Systems Administrator login to the database server in question. From the client you can initiate a scan of the database security. This takes some time to run (the time depends on the size of the database, number of users, level of security check required etc), but your patience is rewarded by an extremely comprehensive report on a host of security aspects (see screenshot 1). From this you can choose to print it all or simply focus on one aspect. In this case I have chosen to look at password strength and I am pleased to report that 11 of the 12 users are using strong passwords. (This is a real operational database, incidentally, and these are real users). The twelfth person is new to the database and I had forgotten to suggest that she scatter numbers in



tailored for that platform.

If you select all the options, the complete report runs to over 120 pages. The software itself has an unpolished feel, not in terms of the functionality, which is excellent, but in

terms of the interface. It feels clunky and unhelpful, which is at odds with the highly polished and helpful reports that it ultimately produces.

The cost of Database Scanner is the non-trivial amount of circa £650 for SQL Server and £1,200 for Oracle. On the other hand, how much does a security breach cost? You can find out more information at [www.iss.net](http://www.iss.net)

## Teaser tables

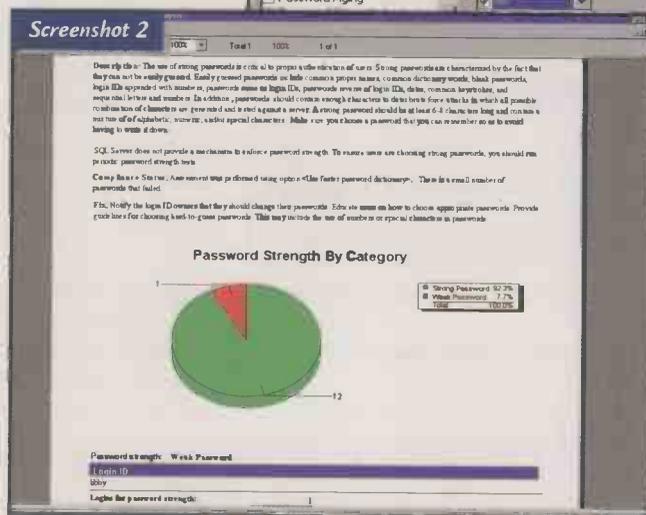
In the July issue I posed an SQL teaser from Paul Edwards ([pedwards@e-promotions.co.uk](mailto:pedwards@e-promotions.co.uk)).

He has two tables, which are tblSubject: SubjectID, SubjectName, ShowCount and tblArticle: ArticleID, ArticleTitle, ArticleText, WhenCreated, SubjectID.

He wants a list of recent articles, but wanted to see the 10 most recent articles on SQL,  
SubjectName = "SQL", ✓  
ShowCount = 10;  
the five most recent on Windows NT,  
SubjectName = "Windows NT", ✓  
ShowCount = 5  
and only the two most recent on DOS,  
SubjectName = "DOS", ✓  
ShowCount = 2

(Key: ✓ code string continues)

I was deluged with replies and thanks are due to all who responded. Check my website ([www.penguinsoft.co.uk](http://www.penguinsoft.co.uk)) for the file DBCSEP00.MDB. In this are solutions from Neil Sunderland ([neilsunderland@freeuk.com](mailto:neilsunderland@freeuk.com)) and David Portas ([dportas@acm.org](mailto:dportas@acm.org)) and in AC.MDB is a solution from Andrew



Top: Some of the report components from Database Scanner  
Bottom: Oops, there's a weak password in there

among the letters – so this one is my fault.

For this particular test Database Scanner has a huge file of known passwords which it throws at the password encryption algorithm and then checks to see if the products match the entry in the password file. It also checks to see if the password is the same as the login name, the reverse of the login name etc.

One of the joys of this product is that the printed reports not only give you bold information about the state of your database, they also try to put the information in context. For example, in the report on passwords, not only does it provide general information about what makes a strong password, it also includes SQL Server specific information (the fact that it has no mechanism to enforce strong passwords). If I had run this against an Oracle database, the report would be

Cumming (andrew@dcs.napier.ac.uk).

So, how do they work? There are various approaches and I strongly advise having a look at the three solutions provided and performing your own 'compare and contrast' exercise.

However, let's consider Andrew's variation. This solves the problem using:

```
SELECT A.ArticleTitle
FROM tblArticle AS A,
tblArticle AS B,
tblSubject AS S
WHERE A.WhenCreated <=
B.WhenCreated
AND A.SubjectID =
B.SubjectID
AND A.SubjectID =
S.SubjectID
```

```
GROUP BY A.ArticleTitle,
S.ShowCount
HAVING Count(B.ArticleID)
<=S.ShowCount;
```

To explain this he breaks it down into two stages. The first is:

```
SELECT A.ArticleID,
A.WhenCreated, B.ArticleID,
B.WhenCreated
FROM tblArticle AS A,
tblArticle AS B
WHERE A.WhenCreated <=
B.WhenCreated
ORDER BY 2 DESC;
```

This generates an answer table in which every article in the table appears a number of times. The number of times each one appears is related to the number of articles that have an equal or more recent date.

In Andrew's example, Article 21 – the most recent – shows up just once, linked with itself. Article 20 shows up twice, linked once with 21 and once with itself. Article 19 shows up three times – with 19, 20 and 21.

This becomes even more relevant if we expand the WHERE clause:

```
WHERE (A.WhenCreated<=B.
WhenCreated) AND
(A.SubjectID=B.SubjectID)
```

that ensures that only the articles on the same subject are counted together.

Clearly, the number of times that an article appears in this answer table gives us information about how recent it is, so all we have to do is to count the number of times each article appears, for example:

```
SELECT A.ArticleTitle,
Count(B.ArticleID) AS
CountOfArticleID
FROM tblArticle AS A,
```

Table	Component	Quantity	ISP
PartStructure	Part 1	2	✓
Select Part	Part 2	1	✓

Total Weight: 25

Left: The shin part's connected to the knee part...

Below: ...and the knee part's connected to the thigh part...

```
tblArticle AS B
WHERE (((A.When
Created)<=[B].
[WhenCreated]))
AND (A.SubjectID=B.
SubjectID)
GROUP BY A.ArticleTitle
ORDER BY 2;
```

Several people warned, quite correctly, that there are three things to bear in mind here. One is that these solutions work fine on small data sets and poorly on large ones; in other words, this is not an 'Order n' solution. Second, there are problems with articles having identical dates. Andrew's example demonstrates this with two of the DOS articles having the same date. Thirdly, in reality, articles are likely to have relevance for more than one subject, so an intermediate joining table may be required.

For people interested in further information on this classic problem, see *SQL for Smarties: Advanced SQL Programming* by Joe Celko (ISBN 1558605762).

### Sounds like...

Mechanisms for calculating how alike two words sound to the human ear have been mentioned in two issues recently (June and August) so I don't want to spend more time on it here (unlikely as it sounds, there may be some people for whom the subject is beginning to pall). However, I'm still interested and mail keeps arriving so check out the file SOUNDEX.TXT on my website for the latest.

### Explosive parts

Imagine that you run a company that puts together parts into assemblies

Table	Component	Quantity	ISP
PartStructure	Assembly 5	3	✓
Select Part	Part 1	6	✓
	Part 2	3	✓

Total Weight: 75

(which in turn can be used to create more complex assemblies). The parts have properties such as weight and, given that you know which parts go into which assemblies, you can calculate the weight of the final product. Well, that's exactly the problem facing reader Ken Sheridan.

For example, part one weighs 10 units and part two weighs five. So, assembly five, which is composed of (two \* part one) and (one \* part two) weighs a total of 25 units (screenshot 3). Assembly four is composed of (three \* assembly five) which makes a total of (six \* part one) and (three \* part two) giving a total weight of 75 units (screenshot 4).

All of this is fine and dandy and perfectly logical. The problem isn't the logic, the problem is how you model all of this in a database. If you have been pondering a similar problem, read Ken's email in the Soundex.txt text file and take a look at BOM.MDB (Bill of Materials) on my website.

## CONTACTS

Mark Whitehorn welcomes your feedback on the Databases column. Contact him via the PCW editorial office, or email: [database@pcw.co.uk](mailto:database@pcw.co.uk)



# Living on a player

Ian Waugh sounds out the new Windows Media Player and finds it **adapting to market needs.**

**Y**ou can imagine the call coming down from somewhere on high at Microsoft: 'Time to revamp the Media Player, fellows.' That useful one-stop app for playing MIDI, audio and movie files is looking a bit long in the tooth and doesn't support any of the neat media, CD audio or Internet-related stuff we now take for granted.

So development began and the Windows Media Player (WMP), although still in beta, is now into version 7. It has had so many changes it is now a totally new program. There are seven main options on tabs down the left of the window: Now Playing, Media Guide, CD Audio, Media Library, Radio Tuner, Portable Device and Skin Chooser. Here, we're going to concentrate on the audio stuff.

One of WMP's 'big things' is its support for streaming media. Microsoft expects us to be sitting with permanent Internet connections listening to Internet Radio and watching real-time video broadcasts. Roll out ADSL and free Internet access and some of us might.

All streaming systems buffer some data before starting playback and then continue to receive data during playback. Hopefully, data will arrive at least at the same rate as it is being played, otherwise playback will be interrupted. WMP incorporates intelligent streaming, which attempts to detect network conditions and adjusts the properties of the stream to maximise playback quality. The object is to deliver the highest quality playback whatever the conditions, although this requires the media to have been encoded at multiple bit rates, which not all media is. At least not at the moment.

WMP supports a whole range of



*Left: Windows Media Player can display groovy graphics as it plays your music  
Middle: The Media Library keeps track of all your audio and video files  
Below: You can copy files from the Media Player to a portable device*



new Pocket PC OS. There's a list of compatible models

on the website mentioned later and new devices are being added to the list as and when support becomes available.

WMP also has an option to copy audio CDs to hard disk and there are four compression options here - 64Kbits/sec, 96Kbits/sec, 128Kbits/sec and 160Kbits/sec. Now, without engaging in fisticuffs about the quality of MP3 files, it behoves one to suggest that

anyone interested in high-quality compressed audio should try Windows Media Audio (WMA) and compare the file quality. Windows Media can pack twice as many tunes into a player or PDA as MP3 so it must be worth looking at and listening to.

Considering that both Windows Media and MP3 are lossy compression formats, you will do well to let your ears suggest which

formats you're happy using.

However, it's the audio CD copying process where it gets interesting with WMP version 7. The ripping process is straightforward, but it copies the files in .wma format, so you may not be able to import them into every music program. There is no option to save such files as Wave files: a veritable missed opportunity, but doubtless an intended miss.

media file formats, but of prime interest to audiophiles is support for Windows Media (.wma and .asf), Wave (.wav) and MP3 (.mp3). These can be copied to a portable device for playback. Three levels of compression are offered - 32Kbits/sec, 64Kbits/sec and 128Kbits/sec.

The software supports what Microsoft calls portable devices, but by this it really means PDAs supporting its

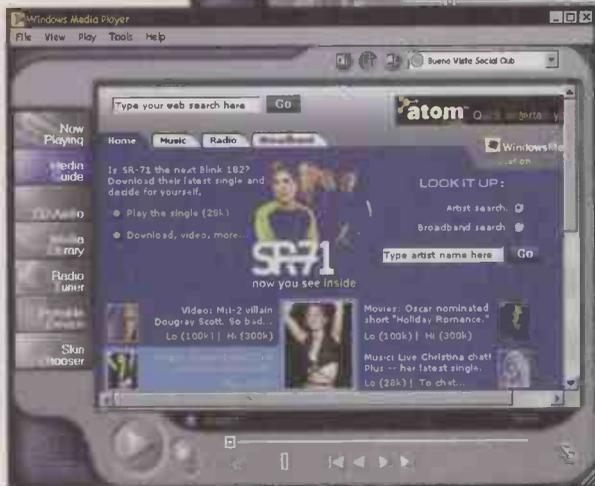
Part of the logic behind this may have something to do with WMA's support for licensed files. Such files may be downloaded from the Internet, perhaps after payment of a fee, and the licence restricts where and how the file can be played. Now, in itself, that's not a problem; the labourer is worthy of his hire and all that.

But these licences can restrict playback to the computer onto which the file is downloaded. It's like buying a CD and only being allowed to play it on your sister's My Little Pony player. You may not even be allowed to copy it to a portable device. Of course, this begs many questions that the record companies love to ask – such as, when you buy a 'song', do you buy the right to listen to it anywhere and play it on any system capable of playing the media? The licence system says: 'absolutely not'.

How well this and other restrictive licensing systems succeed depends entirely upon the take-up by the great unwashed – you, the music-buying public. If lots of people think it's a good idea and buy into it, the freedom we take for granted of being able to play our music collection where and when, and how we want, could be curtailed.

## It's like buying a CD and only being allowed to play it on your sister's My Little Pony player

What is also interesting is that the CD audio preferences in WMP have a Personal Rights Management option. If this is enabled, when you rip an audio CD, a licence is generated preventing the files from being played on any other computer. Yes, I tried it and it works! However, if you don't enable this during copying, you may then be prevented from copying the file to a portable device if that device supports SDMI (Secure Digital Musical Initiative). You don't



**Above: The CD Audio function copies audio files from CD to hard disk in Windows Media format**

**Below: Get online with the Media Guide and find the latest cool stuff to look at and listen to**

suppose anyone has realised that it's possible to make two copies with and without the option enabled?

The main message would seem to be, that if you want to put your CD collection onto a portable player, stick

with MP3. Lest the odd reader or two gets the idea that this is promoting music piracy – far from it. What it does advocate is freedom to listen to music that you have paid for in different locations. Just like we used to be able to do in the good old days.

Back with WMP, it can look up CD information on the Internet to save you typing in the names – and this worked just fine, albeit after a bit of a slow start.

The Media Library section is used to

organise your media collection. A CD track can be added simply by clicking a button and you can add URL links as well as physical media files. Collections of files are stored in a playlist and you can create any number of playlists containing any combinations of files.

The program will search your PC for both music and video files – you may even discover a

few you had forgotten about or never knew you had – and it can search the web for files, too. This feature links to a website which appears in the middle of WMP and from which location you're supposed to navigate. This is a real pain. The address is actually <http://windowsmedia.com> (www.windowsmedia.com doesn't work) so use this instead as it makes navigation far easier.

Using the Media Library options, you can set rights for the contents of your Library for applications and Internet sites. You can prevent them accessing your playlists, or allow them to read and edit the files.

One of the main problems with the WMP is that it is currently very slow. The term 'wading through treacle' comes to mind. This isn't just when it's doing anything clever; it can take an age to switch from one option to another when you click on the tabs. Oh, and it does crash sometimes.

So, WMP has some good ideas, even if some are severely limited and not everyone will welcome them. It also still needs several tweaks to make it of 'merchantable quality' – yes, even though it's free! But it certainly shows how Microsoft sees the music, media and Internet markets developing.

The latest beta of Windows Media Player can be downloaded from [www.microsoft.com/windowsmedia](http://www.microsoft.com/windowsmedia). It's a hefty file, weighing in at 7MB, so if you're on a slow connection, you may be better off waiting for the final version.

## CONTACTS

Ian Waugh welcomes your comments on the Sound column. Contact him via the PCW editorial office or email: [sound@pcw.co.uk](mailto:sound@pcw.co.uk)



# Digital scissors at work

Ken McMahon rubs shoulders with Photoshop's erasers to create flawless cutouts.

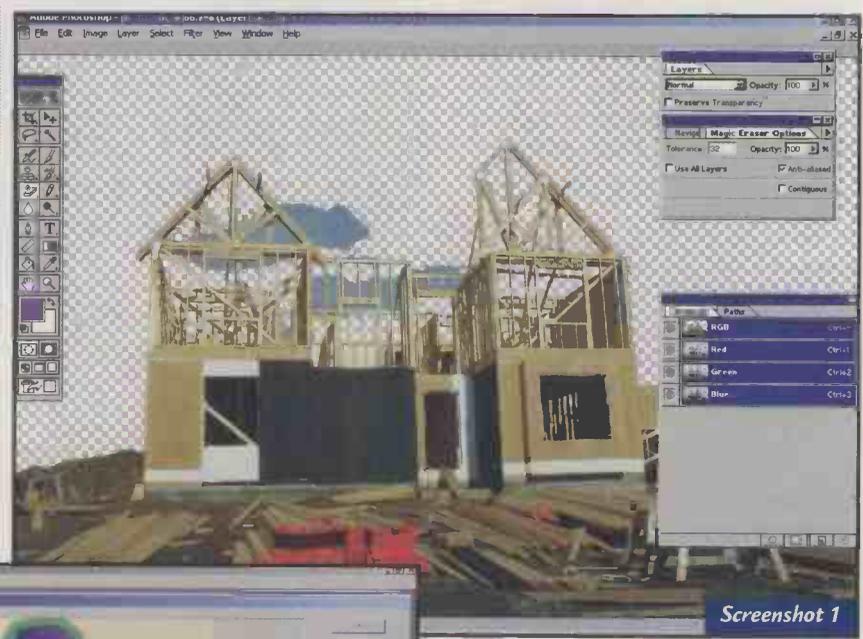
Some of the most fun to be had with image editing involves cutting out images. Whether you want to create a montage, or just remove an ugly background, producing cutouts can be a rewarding, though difficult business. When it's done well, you'd never know the digital scissors had been at work, but poor technique is visible a mile off, fringing, messy edges, stray background pixels and cut-off foreground detail are all evidence of tampering which will destroy the illusion of reality in an instant.

There was a time when the only way to produce flawless cutouts was to apply a great deal of cutout, time and effort with the pen tool and even then soft and wispy stuff like hair, fur and out-of-focus detail was extremely difficult to deal with.

Then along came Photoshop 5.5 with a batch of eraser tools that make producing cutouts an altogether much simpler, less tedious task.

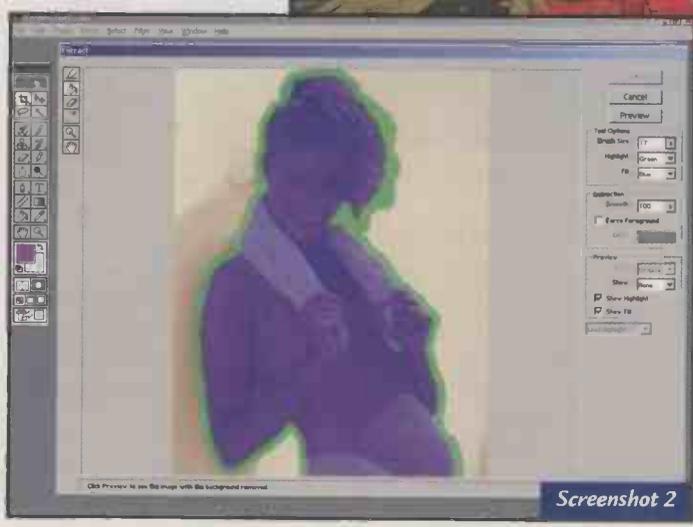
There are three eraser tools that between them are up to the task of removing virtually any subject from its background. The good news for anyone who bought a scanner bundled with Photoshop 5.5 LE is that this cut-down version contains all the same eraser tools as the full version.

The magic eraser is the simplest to use, though the least effective of all. It works in the same way as the magic wand - deleting, rather than simply selecting pixels. The pixels are selected on the basis of proximity to the first pixel clicked and the tolerance value set in the magic eraser



Screenshot 1

Above: The magic eraser works its spell removing the sky in two stages  
Left: Make sure wispy hair and other fine detail is well covered with the highlighter



Screenshot 2

palette. In contiguous mode the magic eraser deletes only adjacent pixels, anything that is only surrounded by pixels outside the tolerance remains.

Unless you are fortunate and your background consists of pixels of a similar colour all within the tolerance value, you'll need to click in several different areas to remove all the unwanted detail and this is likely to have the undesirable result of taking out some of the foreground detail too. But with certain kinds of images the magic eraser works like, well, magic.

Screenshot 1 shows a good example of what you can do with the magic eraser on a background of broadly similar

colour. First, I've unchecked the contiguous mode so that the fiddly sky detail in between the roof rafters will be erased, even though it's separated from the main block of sky by the roof timbers. Then, clicking on the blue sky detail in the top right quarter of the image with a tolerance setting of 100 has removed all but the lighter blue areas where the clouds are. Clicking on this remaining detail with the tolerance reset to 32 gives a perfect result.

The Background eraser is a sophisticated tool. Drag it along the edge of your foreground image and watch it erase the background as you go. The key to success with the background eraser is in optimising the parameters for the particular subject you're dealing with.

Sampling mode can be set to once, continuous or background swatch. Set to once, you'll need to erase in short strokes, otherwise, when you begin to move away from your starting point the background may no longer match the original pixel. You need to be precise with the background eraser and make sure

that you start on the background and don't accidentally start erasing foreground, though this can easily be undone. You can also guard against accidental foreground erasure by checking the 'Protect Foreground Colour' box in tool, options, palette and sampling a prevalent foreground colour with the eyedropper (Alt & click).

In continuous mode, the background eraser samples as you go, so if the background is complex – say brightly coloured flowers – you'll get a much better result.

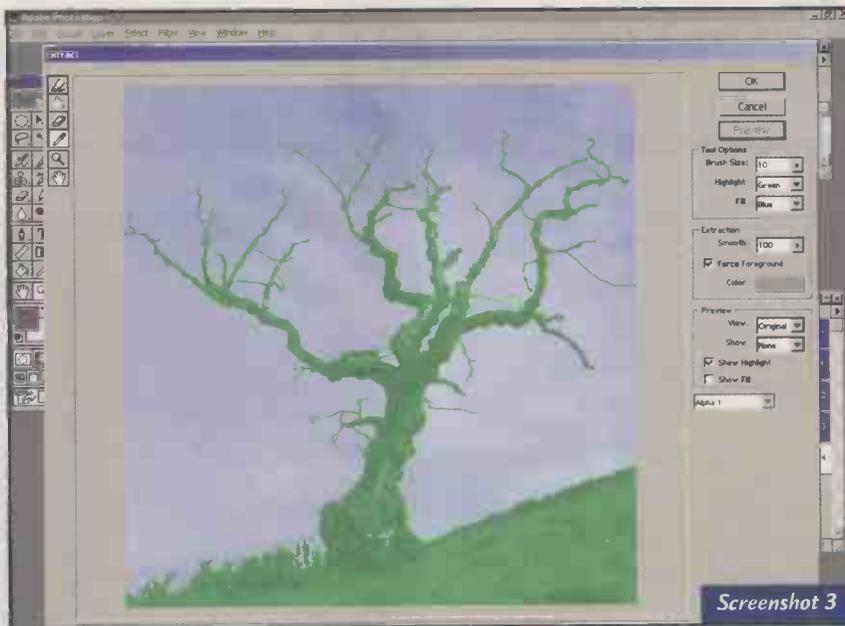
Photoshop's extract command is the most powerful of the eraser tools, but the power comes at the price of complexity. Extract uses its own dialog box that you access using image, extract or Ctrl & Shift & X. The process is quite simple – it's the options that give extract its power and complexity.

First select the highlighter tool from the toolbar on the left of the preview window and trace the edge of your foreground subject. It's important that there is no break in the outline and that you completely cover the boundary between the foreground object and background – you can change the brush size in the tool options palette, or even adjust it while you trace using the left and right square bracket keys. Holding down either of these keys accelerates the rate of change of the brush, so you can go from tiny to big very quickly.

## High smoothness settings are particularly effective for dealing with wispy hair

Next select the fill bucket and click inside the outlined object. If the fill colour bleeds out into the background it means there is a hole in your outline. Select view original from the preview palette and plug the hole using the highlighter before refilling. Unfortunately there is no undo, so if you make a mess with the highlighter you'll have to erase the problem area with the eraser tool and have another go.

The trick with the highlighter is to use a narrow brush for areas of precise detail and a broader brush to cover softer, less well defined borders. It's much easier to do this using a tablet, but if you're using a mouse, or just find it hard work, you can make life easier by Shift clicking with



**For complicated outlines use an alpha channel to create the highlight and force foreground colour to keep subject detail**

the highlighter tool to draw straight-edged lines.

When you're satisfied that you've done a reasonable job on the outline and fill, click on the preview button. If the results look good click OK to apply the extraction.

If you don't get good results first time you may need to adjust the smoothness setting above its default of zero. High smoothness settings are particularly

effective for dealing with wispy hair. Make sure all of the hair is covered with the highlighter before filling (screenshot 2).

For objects that are hideously difficult to trace, you can sometimes convert one of the colour channels into an alpha channel and use this as the basis for your selection in the extract dialog.

First check which of the colour channels provides the best contrast between subject and background detail by pressing Ctrl & 1, 2 and 3 to view the R, G, and B channels. Duplicate your chosen channel by dragging it to the new channel button in the channels palette and open the extract dialog. You can use the levels or curves command to further adjust the channel, increasing the

contrast between the areas you want to keep (black) and background detail you want to lose (white). Select Alpha1 from the load highlight pulldown, click the force foreground button, select the eyedropper and click on the most generally representative colour in the body of your subject (screenshot 3).

If you duplicate the layer you are working on before starting the extraction process you can clean up any scrappy edges using the history brush and background eraser tool. To reinstate lost foreground detail click the state in the history palette prior to the extraction and use the history brush to paint back in the missing subject detail.

Don't worry if you also paint in some unwanted background as you can remove it easily using the background eraser set to sample once.

You can also use this technique when compositing images by placing the layer containing your foreground subject on top of the new background before extracting it from the old one. See also this month's image-editing workshop earlier in the issue.

## CONTACTS

Ken McMahon welcomes your comments on the Graphics & DTP column. Contact him via the PCW editorial office or email: [graphics@pcw.co.uk](mailto:graphics@pcw.co.uk)



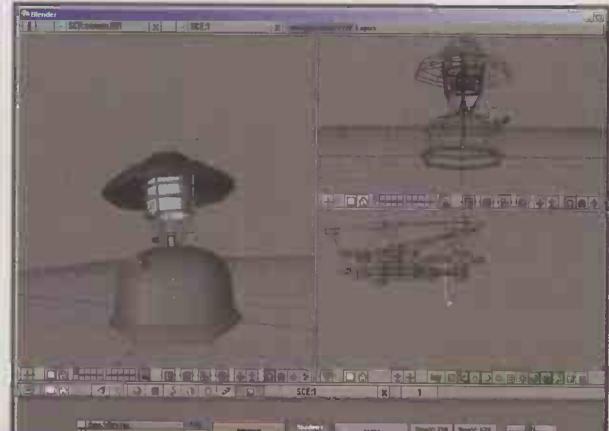
# Getting into the mix

Benjamin Woolley casts intuition aside in order to make sense of Blender's idiosyncrasies.

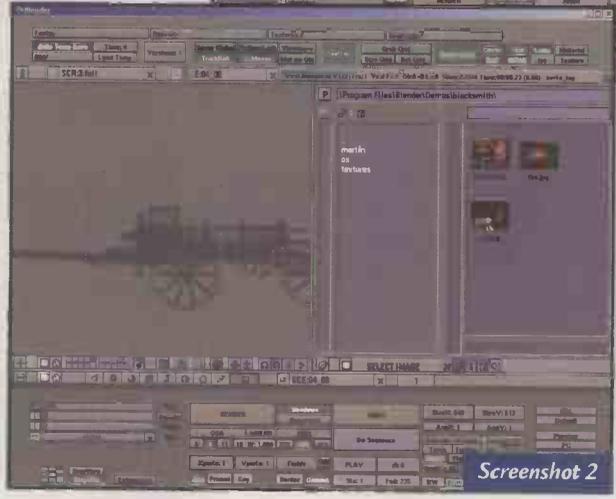
**F**ollowing the inclusion of Blender for Windows and BeOS on PCW's July cover CD, reader John Wellbelove sent me the following email: 'I've been writing software and using computers since the early 1980s and I'm usually pretty quick at figuring out how to use the basic features of a program without having to look at the manual, but Blender is beyond belief. I spent 15 minutes fiddling about, pressing buttons, selecting menus etc, which usually gives me an idea of the basics, but this program was almost completely incomprehensible. I got nowhere!

'Can I put this program forward as a candidate for "The most unintuitive program of the year" award. If there isn't such an award at PCW, can we start one?'

Blender has become the Linux of 3D. Created by Ton Roosendaal while he was at the Dutch animation studio NeoGeo, he decided to offer it as a 'freeware gift to the worldwide computer graphics community'. It now boasts a global user base of 65,000 and is available as a free download from the Blender website



Left and below: Mind Blender – the interface that sent John Wellbelove over the edge is, to say the least, complicated, but will yield its secrets to those who persist



Screenshot 1

Screenshot 2

you try to explore it blind, as John and many of us did, you quickly become unstuck.

To make matters worse, Blender does not offer any sort of context-sensitive help, nor a comprehensive manual,

## Other 3D software tends to be almost exclusively mouse driven. Blender is not

([www.blender.nl](http://www.blender.nl)), in versions for virtually every platform (BeOS being the latest).

A glance at its interface (screenshots 1 and 2) shows how the free thinking behind its marketing extends to its interface. As John so succinctly put it, to anyone brought up in the world of Windows or the Mac, or even of Linux, it is completely incomprehensible. And if

although there is a rather basic version available online and a more professional printed version, published by NaN, that you can buy for around £25.

Even practised Blender users can find it flummoxing. Blender forums are packed with cries of bewilderment. One of the FAQs on the Blender website begins with the plea 'Help!

The "Add menu" gets stuck!'

However, with Blender, as with so many things in life, first impressions are misleading. No-one could claim that the interface is an

example of software design at its best. It is cluttered and the feedback you get from mouse or keyboard actions is often perplexing, sometimes downright perverse. Nevertheless, once its strange ways become familiar to you, it begins to reveal some virtues as well.

To master Blender, you have to first follow the piece of advice you see repeated over and over again in the Blender forums and FAQs: you need to have a hand on the keyboard and one on the mouse. Other 3D software tends to be almost exclusively mouse driven. Blender is not. Theoretically, you could probably do most things with the mouse, but it would become laborious and awkward. For example, you toggle in and out of 'EditMode' (the mode for editing an individual object's geometry) by pressing Tab; you invoke the toolbox by pressing space; you exit by pressing 'Q'.

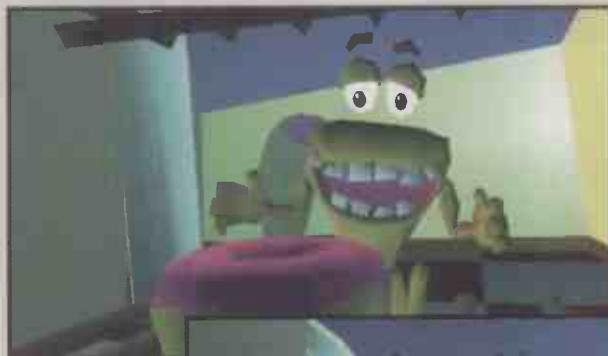
One other strange quirk of Blender is that it relies on a three-button mouse, with an option for simulating the third button if you haven't got one by using Alt-LeftButton.

The workspace is, as with more conventional packages, split into windows, but there comforting familiarity once again ends. There is no menu along the top – the nearest equivalent is the popup toolbox. You can change the number and position of all the windows, although none can float: they are always 'tiled' to fill the

## Stay tooned - The Shags are coming

The prize for the least promising name for a family of cartoon characters has to go to Toon 3D's 'The Shags'. These grisly little monsters do not, thankfully, live up to their name. In fact, their role is more prosaic: to demonstrate the latest tool for delivering 3D animations over the Internet.

Toon3D is an authoring environment for animating simple models and publishing the resulting movies. There is a range of keyframe animation tools as well as a facility for adding 'Toons'. These are used to control objects, allowing you to assign them such behaviours as those of the inimitable 'Dad Shag', featured in the demo, who



*Above and right: Scenes from 'The Shags', demonstrating some of the animation possibilities offered by Toon3D*



likes to snaffle doughnuts from the fridge.

However, there are problems with the technology demos (which you can find on Toon3D's website at [www.toon3d.com](http://www.toon3d.com)). One is that currently only Lightwave objects can be imported; another is that the movies can

only be viewed with Internet Explorer, although I don't really think the repulsive 'Shags' help much, either. On the positive side, the files are very small and the animations seem to run smoothly enough, if somewhat slowly.

workspace. Each window can be configured to be one of several types, an odd assortment that includes a 3D window, which displays the objects in the scene, an 'OopsWindow' which shows a schematic diagram of the data objects (eg the meshes, materials and so on) in the scene and their relationships to one another, a SequenceWindow, for post production, and a FileWindow, for loading and saving files. You can identify which type of window you are in by an icon/button displayed in the left-hand corner of its 'header' (which, confusingly, is sometimes displayed at the foot of the window). If you point and press on this icon and slide the mouse to the right or left, you can scroll through the different window types.

By exploiting such features, you have an infinite number of ways of both arranging the workspace and messing it up. One of the most common experiences I found with Blender was getting stuck in a window with no obvious way out.

Another cause of confusion is the mouse. Double clicking apparently has no effect, but you will find the middle



*Version 2, or GameBlender, is geared towards gaming*

mouse button often and unexpectedly does. For example, suppose you manage to find your way to the file window and navigate through to the file you want to open. If you click on its name, nothing happens. It turns out you need to click on its name using the middle button, or select its name using the left button and then press Enter.

Of course, committed Blender users would say this is all part of the charm of the package. Critics might say that it is a blatant attempt to make it unusable without the manual, for which you have to pay. However, even if the latter was true, you would still be getting a very useful 3D package for less than £30 and that is money you can be sure is going to

the good cause of future development. Furthermore, by judicious use of the free resources available on the web, both from the Blender site itself and from a growing number of third-party sites, such as [www.blendermania.com](http://www.blendermania.com), you can get enough information to get to know this fascinating, frustrating package.

At the time of writing, Blender was facing a number of radical changes. Version 2, to be called GameBlender and aimed at being a combined authoring and publishing package for games developers, was about to be released, and the practice of selling 'keys' to unlock some of Blender's more advanced facilities was about to be dropped. There were also promises of new documentation.

For those who penetrate the interface that poor Wellbelove found so perplexing, such developments, and a general enthusiasm for Blender's freeware principles, promise an exciting future and I will aim to continue bringing you news of it in these pages.

### CONTACTS

Benjamin Woolley welcomes your comments on the 3D Graphics column. Contact him via the PCW editorial office or email:

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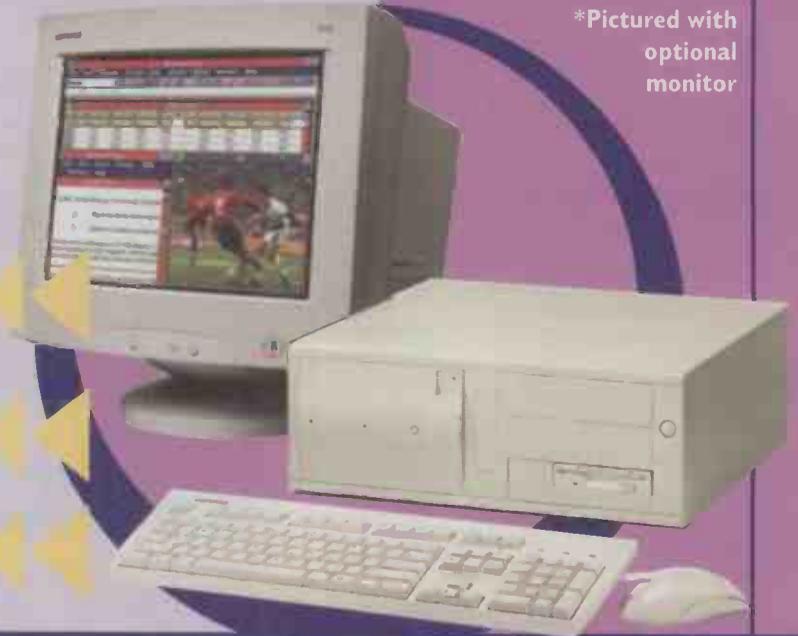
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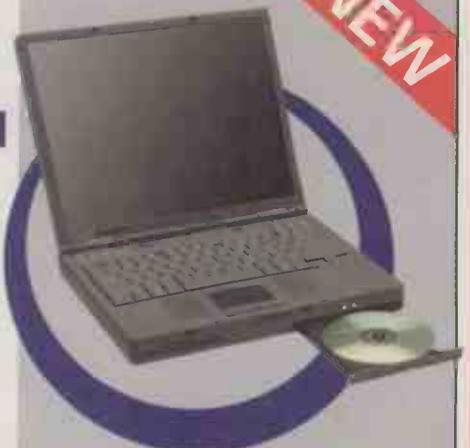


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# Coming clean

Tim Anderson **builds a web service** with Microsoft's SOAP toolkit and answers readers' queries.

**A**ccording to Microsoft, the next big thing in development is web services. This is another kind of remote object invocation, as also offered by CORBA, DCOM, or Java's Remote Method Invocation. The difference is that web services use SOAP (Simple Object Access Protocol), which is based on XML and HTTP. In one sense there is nothing particularly clever about SOAP. Sending and receiving data via HTTP is basic functionality, and you do not need SOAP to call a CGI script on a remote computer, pass it arguments and read the results.

What SOAP brings to the party is standardisation. Through SOAP, your application can query a remote site to discover what services it offers, in order to invoke them correctly as required.

There are several advantages over more elaborate schemes such as COM and CORBA. The loose coupling is more suitable for frail Internet connections and the simplicity of the link means different object technologies can be easily bridged.

Full support for web services will come in the next release of Visual Studio, but in the meantime Microsoft has issued a preview SOAP toolkit that you can use now. Here is an example of how it works. The starting point is a COM DLL server such as you can easily create with Visual Basic or Delphi.

This example was produced using Visual Basic 6.0. By choosing File, New Project, ActiveX DLL you can create a skeleton Quoteserver project. The class module is named 'quoter' and it has a single method, GetQuote, which returns a random quotation. This functionality can now be offered by SOAP.

The SOAP toolkit includes an SDLWizard. SDL stands for Service Description Language and it is an XML format that publishes the web service. The wizard asks you to select the ActiveX DLL you want to publish and next the services you want to expose. You then select a server-side web technology, either ASP or ISAPI. ASP is easier to work with, although performance is not as good.

Select ASP and the wizard generates two files. Quoter.xml is the SDL file for the service (see figure 1) and Quoter.asp is a skeleton ASP page that implements the service.

While the specification of SDL may change, the essence of it will not. Note that the generated XML includes the web address of the service and a description of the interface. In this case a single method that takes no arguments and with a return type of String.

Most of the work is done by listener.asp, a supplied generic ASP page that is included in pages generated by the

wizard. This is code that receives SOAP requests, calls your code to get results, and sends replies in the standardised format. To publish the web service, all you need to do is to place these files in a web directory. The web server also needs access to the ActiveX Server DLL itself.

## Coding a SOAP client

A SOAP client has several tasks. First, it must read the SDL file to discover what services are available and how to call them. Next, it formats an XML request conforming to the service description,

FIG 1

Quoter.xml

```
<?xml version='1.0' ?>
<!-- Generated 15/06/2000 20:33:31 by Microsoft SOAP
Toolkit Wizard, Version 1.0.204 --><serviceDescription ✓
name='Quoteserver'
  xmlns='urn:schemas-xmlsoap-org:sdl.2000-01-25'
  xmlns:dt='http://www.w3.org/1999/XMLSchema'
  xmlns:quoter='quoter'>
<import namespace='quoter' location='#quoter' />
  <soap xmlns='urn:schemas-xmlsoap-org:soap-sdl-2000-01-
25'>
    <interface name='quoter'>
      <requestResponse name='GetQuote'>
        <request ref='quoter:GetQuote' />
        <response ref='quoter:GetQuoteResponse' />
      </requestResponse>
    </interface>
    <service>
      <addresses>
        <location ✓
url='http://youripaddress/quoter.asp' />
      </addresses>
      <implements name='quoter' />
    </service>
  </soap>
<quoter:schema id='quoter' targetNamespace='quoter' ✓
xmlns='http://www.w3.org/1999/XMLSchema'>
  <element name='GetQuote'>
  </element>
  <element name='GetQuoteResponse'>
    <type>
      <element name='return' type='dt:string' />
    </type>
  </element>
</quoter:schema>
</serviceDescription>
```

(Key: ✓ code string continues)



posts it to the service address and finally parses the XML response.

The SOAP toolkit simplifies the task with a set of objects called ROPE (Remote Object Proxy Engine). ROPE is also used by Listener.asp. It does the job of parsing and generating XML in the correct format and has methods for posting data and reading the response.

The neatest ROPE trick is its Proxy object, which lets you treat the remote web service as if it were a local COM object. Figure 2 shows minimal code for a Quoter client. It reduces the client to a couple of simple steps. First, the ROPE Proxy object loads the SDL file, before calling the GetQuote method.

How does the client know that the GetQuote method exists? This information is contained in the SDL file, but clearly the code in the example relies on advance knowledge that GetQuote will work. It would be possible to write a generic client that retrieved the available methods dynamically. More likely, you would use the SDL at design time and write code accordingly. In this scenario, the application will work provided that the SDL remains compatible. As with COM objects, the onus is on the web-service provider to continue supporting a published SDL.

Although COM is used in this example, there is no necessity for it either on the client or the server. For example, you could instead use a Java servlet at one end and a VB client at the other.

The concept works best where there is a permanent Internet connection. For example, send a postcode and get back a map, or a weather or traffic report. Ecommerce is another natural use for this technology. There is no need to view a web page, so it is ideal for PDAs or other visually-challenged devices.

### How visual is visual?

Mark McKeachan asks: 'What is the difference between C++ and Visual C++? Is visual a "drag and drop" environment as opposed to typing out code?'

The difference between C++ and Visual C++ is that one is the name of a programming language, and the other the name of a product. To create applications with C++ all you need is a text editor and a compiler, such as GNU C++ or Borland C++, both of which you can download without charge.

The purist view of visual programming is that you should be able

**FIG 2** A basic Quoter client (code adapted from the SOAP toolkit)

```

Private Sub cmdQuote_Click()
Dim oProxy As ROPE.Proxy
Dim sURI As String

    sURI = "http://youripaddress/quoter.xml"

    ' create proxy object
    Set oProxy = New ROPE.Proxy

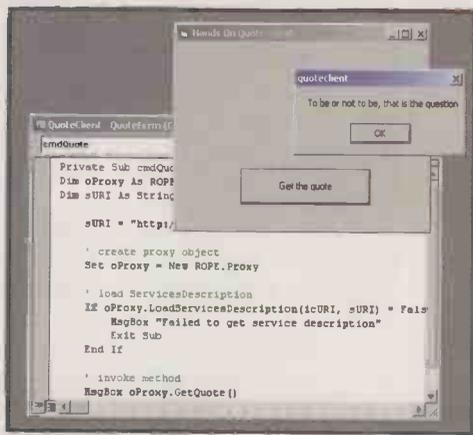
    ' load ServicesDescription
    If oProxy.LoadServicesDescription(icURI, sURI) = False ✓
Then
        MsgBox "Failed to get service description"
        Exit Sub
    End If

    ' invoke method
    MsgBox oProxy.GetQuote()

End Sub

```

(Key: ✓ code string continues)



*The Quote client in action. Using the ROPE proxy reduces the amount of code needed*

to construct both the interface and the logic of an application by drag-and-drop. The most widely used example of this is IBM's VisualAge series, particularly VisualAge for Java.

More often, supposedly visual tools let you create an interface by drawing it on the screen, but resort to text-based code for the program logic. Visual Basic, Delphi, JBuilder and C++ Builder all fall into this category.

Surprisingly, Visual C++ is one of the least visual of programming tools. There is a visual dialog editor, but in other respects you have to rely on code to design your interface. By contrast, C++ Builder is similar to Delphi. Whichever product you use, the bulk of a developer's time is likely to be spent

writing code rather than messing with dialogs and drawing objects. The rest of the code is in class libraries and, in theory, fully debugged. Delphi and C++ Builder use the Visual Component Library, while Visual C++ uses the Microsoft Foundation Classes and the Active Template Library. Visual Basic is more of a black box, although the objects presented by Visual Basic, such as Forms and CommandButtons, are the equivalent of a class library. Java has its own extensive class library. So, when choosing a programming tool, consider what class library you want to work with,

and which development environment you like the look of. You can mix and match to some extent, such as using C++ Builder to work with MFC, or using Visual C++ with the cross-platform Standard Template Library, but you lose the benefit of many of the supplied tools.

### CONTACTS

Tim Anderson welcomes your comments on the Visual Programming column. Contact him via the PCW editorial office or email: [visual@pcw.co.uk](mailto:visual@pcw.co.uk)

To find the SOAP toolkit and other online resources, visit <http://msdn.microsoft.com/xml/general/soaptemplate.asp>

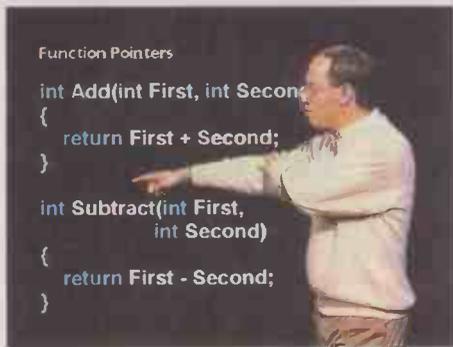
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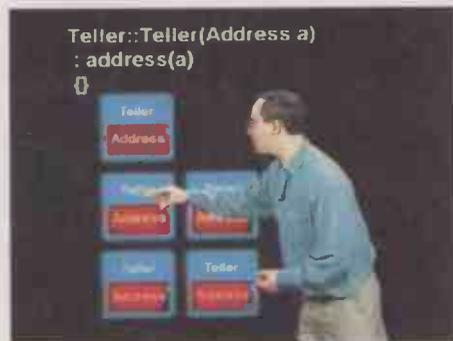


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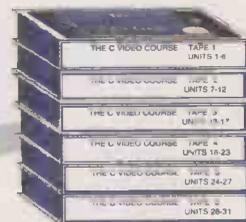
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# Sign on the dot-com line

Tim Anderson looks at how **PHP** and **MySQL** are the bricks and mortar to the online guestbook.

**T**he difference between static and data-driven websites is the difference between online publishing on the one hand and web applications on the other. What follows is an explanation of how to create an online guestbook using PHP (Hypertext Preprocessor) and MySQL, an open-source database server. The humble guestbook is a real interactive web application and this example can be easily adapted.

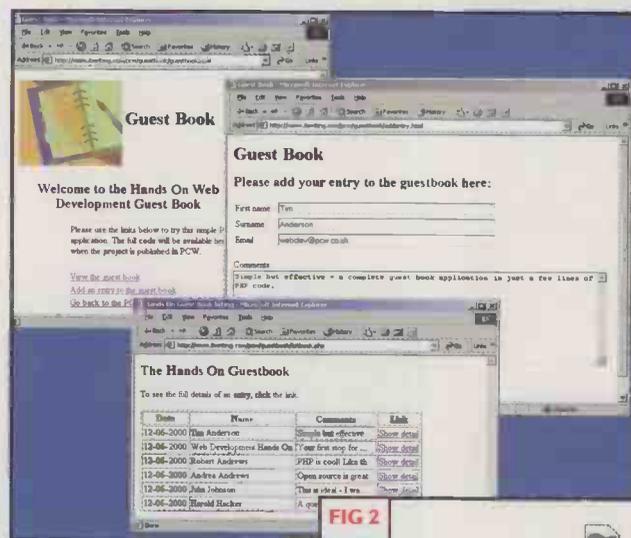
Despite its simplicity, designing a guestbook involves a number of tasks. These include database administration, web server configuration, page design and coding. This tutorial assumes you have successfully installed PHP and MySQL, or that your friendly ISP has done this for you. PHP and MySQL run on Linux and other Unix-like operating systems as well as Windows. One of the best ways to proceed is to design and test on a local intranet, before deploying it live. This is also excellent technology for use on an intranet.

## 1 Create the database

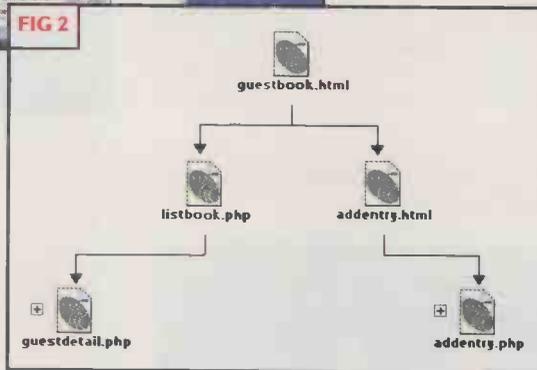
MySQL lacks the user-friendly visual IDE with which Windows developers may already be familiar. Instead, it is driven through SQL commands. The MySQL client is an SQL shell that lets you type

**FIG 1** Script to create the guestbook database table

```
USE guestbook;
CREATE TABLE thebook (id
INT UNSIGNED NOT NULL
AUTO_INCREMENT, firstname
CHAR(60) NOT NULL,
lastname CHAR(60) NOT
NULL, email CHAR(60),
regdate DATE NOT
NULL,
comment BLOB, PRIMARY KEY
(id), KEY name
(lastname,firstname), KEY
regdate
(regdate)
); (Key: code string continues)
```



**FIG 2**



commands interactively and has a batch mode so that you can run scripts.

The guestbook database needs only a single table called 'thebook'. At a minimum, the fields must include a primary key, name fields, date of entry and a comment field. Here is the structure:

- ID: primary key, auto-increment field
- Firstname: 60-character field
- Lastname: 60-character field
- Email: 60-character field
- Regdate: date field
- Comment: Memo or blob field for comments.

Typing a long Create Table command interactively is error-prone, so the best way to get this into MySQL is with a script such as that in figure 1. To use this script you need to have first created the guestbook database. Then you can run the script with the following command: `mysql < thescript.txt`

You will probably need to give MySQL a valid hostname, username and password, in which case the syntax is: `mysql -h host -u user -p < thescript.txt`

If you make a mistake and need to

recreate the table, simply run the MySQL client, use the guestbook database and enter the command: `drop table thebook;` You can then recreate the table as needed.

## 2 Design the app

Like most database applications, the guestbook interface must allow for the searching, viewing and updating of data. A delete facility is not included, but could be easily added, although you would probably want to add security to prevent users deleting other people's entries. Figure 2 shows the site layout. From the guestbook.html page users can either view the existing entries, or add a new one. The link for viewing the guestbook is listbook.php, which generates a table showing each existing entry in one-line summary form. Comments are presented as a few words with an ellipsis. To see the full detail, a generated link on each line takes you to guestdetail.php. The form for adding a new entry is held in

Left: The pages that make up the Guest Book web application  
Below: Figure 2 shows the layout of Guest Book

adentry.html, and when the form is submitted it calls adentry.php to verify the data and add the record.

The pages with .php extensions are pre-processed by PHP before being sent to the web browser. Therefore, the input to the PHP scripts is contained in the HTTP request that calls the page. The output is the HTML surrounding the scripts along with whatever you choose to generate from the script itself.

A flaw in this initial design is that the entire guestbook is returned on a single page. This is fine for a few hundred entries, but would not suit a large database. An obvious enhancement would be to return only a limited number of lines, while also providing a 'More results' link or other search options.

### 3 View the guestbook

The simplest script to start with is listbook.php, most of which is shown in figure 3. Note that PHP variables always begin with a \$ character. The function mysql\_connect() makes a database connection, the hostname, username and password parameters should be substituted as required. The connection is closed when the script ends, so there is often no need to call mysql\_close(). The die() function is a handy way to check for errors. It simply outputs a message and terminates the script. The following construct exits the script if the function returns false:

```
$var = func() or die("error message ");
```

After making the connection and selecting the database, the script sends an SQL query to the database. Assuming success, the results are read row by row with mysql\_fetch\_array, which stores the data in an array, where each field name is an index into the array. The date field is returned in standard SQL format, which is yyyy-mm-dd, although you may want to reformat this for display.

This script returns an HTML table. Each row includes a hyperlink to another PHP page, including the ID field as part of the URL. This is a simple and effective technique for providing a detail page.

The detail page itself is similar, except that it only retrieves a single record. The other difference is that the PHP script needs to read the value of an argument in the URL. This is simplicity itself. If the URL is like this:

```
href= "guestdetail.php?id=123"
```

PHP then creates a variable \$id containing the value. Therefore, the script in guestdetail.php begins like this:

```
if ($id==0) {
die "No entry specified ";
}
```

### 4 Add a new entry

The starting point for adding a new entry is an HTML form. The form tag itself begins like this:

```
<form method= "post" action
= "adentry.php">
```

The 'post' method means that the form's data is sent separately from the URL, unlike 'get' which tags it onto the

URL itself. This is the W3C (World Wide Web Consortium) recommendation and avoids the length limitation of get. Each field in the form has a name attribute, using text boxes and a text area to hold the data. There is no need for the form to provide the date or ID fields, since the date is taken from the system date while the ID is generated by MySQL.

The script for adding data is shown in figure 4. PHP automatically creates a variable for each control in the form (\$controlname), or you can read the values from the \$HTTP\_POST\_VARS() array. For the date, PHP has a gmdate() function which gets the Greenwich Mean

FIG 3

Script to list the guestbook entries

```
<table width="75%" border="1">
  <tr>
    <th><b>Date</b></th>
    <th><b>Name</b></th>
    <th><b>Comments</b></th>
    <th><b>Link</b></th>
  </tr>
<?
$conn = mysql_connect("hostname","username","password")
or die("Database connection failed");
$db = mysql_select_db("guestbook",$conn) or die("Failed
to use database");

//construct SQL query
$sql = "SELECT id, firstname, lastname, regdate, comment
FROM thebook
ORDER BY regdate ASC;";

$result = mysql_query($sql,$conn) or die("Error retrieving
data");

//add results to table
while ($record = mysql_fetch_array($result)) {
  $id = $record["id"];
  $firstname = $record["firstname"];
  $lastname = $record["lastname"];
  $regdate = $record["regdate"];
  $year = substr($regdate,0,4);
  $month = substr($regdate,5,2);
  $day = substr($regdate,8,2);
  $comment = substr($record["comment"],0,20);
  $comment .= "...";

  echo "<tr><td>$day-$month-$year</td><td>$firstname
$lastname</td><td>$comment</td>";
  echo "<td><a href=\"guestdetail.php?id=$id\">Show
detail</a></td></tr>";
}
?>
</table>
```



### PHP tips

If you find that .php files are not running at all, check the configuration of the web server. Sometimes PHP is configured so that a .php3 extension is required. For Apache, check the AddType directive or the mime.types files.

PHP's mail command is a handy way to keep in touch with users of your website. Simply use:

```
mail("me@myisp.com",  
"subject","content");
```

For example, you could have PHP mail you every time an entry is added to the guestbook.

The database support in PHP is determined by compilation options. Thus, MySQL support may not always be available and other databases such as SQL Server, ODBC and Oracle may be supported. For maximum flexibility, do your own PHP build.

Time date, which is useful if you run a UK site that may be hosted on a server in a different time zone.

After getting the data, you can do any validation that is required. The script shown checks that a surname has been supplied. PHP has a full range of string and arithmetic functions for additional validation. You might also want to check for duplicate entries with a SELECT query, restrict the length of the comment data, or run other sanity checks.

Valid data is appended to the database with an SQL INSERT INTO command. To work seriously with MySQL you will want to get hold of an SQL tutorial, as the supplied documentation does not cover this well. After inserting the data the script returns a confirmation message to the browser. Next time the user views the guestbook the new entry will be included.

### Why PHP/MySQL?

The PHP/MySQL combination is popular and with good reason. It is reliable, easy to use and its performance is excellent. PHP version 4 introduces some sophisticated new features including a session management scheme similar to that used by Active Server Pages (ASPs). Both products are open source and you can generally run PHP and MySQL on the web without paying licence fees. If you run MySQL on Windows a fee is payable.

FIG 4

Script to add a new entry

```
<?php
//Get the form values
$firstname = $HTTP_POST_VARS["edFirstName"];
$lastname = $HTTP_POST_VARS["edLastName"];
$email = $HTTP_POST_VARS["edEmail"];
$comment = $HTTP_POST_VARS["txtComments"];

$regdate = gmdate("Y-m-d"); //use SQL format

//Check for no surname
($lastname != "") or die("You must enter a surname. Go back ✓
and try again");

$conn = mysql_connect("hostname","username","password") or
die("Database connection failed");
$db = mysql_select_db("guestbook",$conn) or die("Failed to ✓
use database");

//construct SQL query
$sql = "INSERT INTO thebook (firstname, lastname, email, ✓
regdate, comment)
values ('$firstname','$lastname','$email', ✓
'$regdate','$comment')";

$result = mysql_query($sql,$conn) or die("Error ✓
inserting data");

echo("<p>Thank you for adding your entry to the guest ✓
book</p>");

?>
```

(Key: ✓ code string continues)

You can extend PHP with your own C code, but PHP is not as clever as Microsoft's ASPs with its COM support. MySQL is a simple affair alongside the major commercial database servers and lacks support for transactions along with other SQL functions such as sub-queries. Even so, many web developers find MySQL does all they need and makes a fast and cost-effective solution.

### Getting a count

Debs Eppie asks: 'You published an example music database using ASP. Any idea how to get a record count?'

There are several ways to get a record count in a web application. If you are looping through a series of records to create formatted output, you can simply maintain your own counter variable. Alternatively, the SQL COUNT function is useful. A query like: SELECT COUNT (\*) FROM mytable; returns a one-row, one-field result set which contains the count. COUNT DISTINCT gives you the number of

unique values. You can use this with a WHERE clause to count records in a subset of the data. If you are using Microsoft's ADO (ActiveX Data Objects), you can also inspect the RecordCount property of any recordset, although this may return -1 if the database driver or cursor (result set) type doesn't support it.

### CONTACTS

Tim Anderson welcomes your comments on the Web Development column. Contact him via the PCW editorial office or email: [webdev@pcw.co.uk](mailto:webdev@pcw.co.uk) Guest Book can be found at [www.itwriting.com/pcw/guestbook/guestbook.html](http://www.itwriting.com/pcw/guestbook/guestbook.html). For more information on PHP see PCW April 2000. The home pages for PHP and MySQL are at [www.php.net](http://www.php.net) and [www.mysql.com](http://www.mysql.com) respectively, and these sites have further links to web resources. Reader Richard Thomas mentions PHPmyAdmin at [www.phpwizard.net](http://www.phpwizard.net), a freeware product for web administering a MySQL database



# Slot machines

Mark Whitehorn sorts out **what slots and what's not**, delves into CE apps and scribbles on-screen.

I've recently been asked a lot about the slots in various Psion models and what follows is a brief résumé of the card-carrying members of the Psion clan, namely the Series 5s and the Series 7s.

The story starts comparatively simply. There are CF (Compact Flash) Type I slots which take CF Type I cards – these are roughly matchbook-sized but very thin. CF Type II slots take the marginally deeper CF Type II cards but will also accept Type I cards. Then there's the PC slot which will accept a PC Card (the credit-card sized ones) and also CF Type I or CF Type II cards when these are slotted into an adaptor. These adaptors are fairly freely available: you plug the tiny Type I or II cards into the adaptor and then slide the adaptor into the waiting PC slot. Figure 1 summarises the various options available.

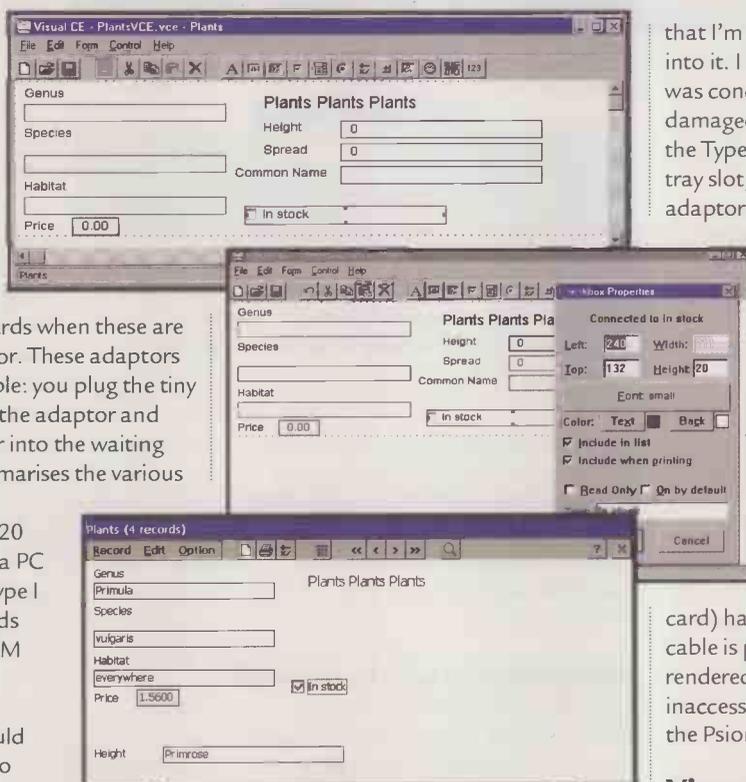
I have a Jornada 820 with a CF Type II and a PC slot as well as three Type I cards, two Type II cards (one of which is an IBM Microdrive) and an adaptor. Every combination you would expect to work does so without drama.

And now the Psion story. Series 5s have one 'memory disk' (Psion's term) slot into which CF Type I cards fit. My Series 5 happily detects each of the Type I cards, although my 5mx detects only the Kodak Digital Science 8MB card and not the Kingston Technology 8MB cards, consistently giving the error message 'Drive not present'.

My guess is that this is a glitch in my machine, but if you have the same problem and decide to send the machine back to Psion, it might be worth sending the undetectable card back as well, so it

FIG 1

	Slot type		
Card type	PC	CF Type I	CF Type II
CF Type I	X	✓	✓
CF Type II	X	X	✓
PC	✓	X	X
CF Type I + adaptor	✓	X	X
CF Type II + adaptor	✓	X	X



**Top:** Visual CE's design environment on the PC  
**Middle:** Objects on a Visual CE form have properties that are accessible by double clicking; these are for a checkbox control  
**Bottom:** A Visual CE form as viewed on the PDA

that I'm not happy fitting the Microdrive into it. I have done so and it works, but I was concerned that something might be damaged in the process. That aside, all the Type I cards worked from the card tray slot, as they did when fitted into the adaptor and then into the PC slot. The bewildering thing is that the Microdrive, fitted to its own adaptor and placed in the PC slot, doesn't work.

The CF card tray is a strange 'innovation'. It has a vertical plate that forms the leading edge of the tray when it's pulled out and shuts off the slot neatly and completely when it's closed. Modem and network cards (such as the Xircom Ethernet card) have a connector into which a cable is plugged. This connector is rendered neatly and completely inaccessible when the card slotted into the Psion 7. Great design feature, guys.

## Visual CE and Report CE

I've been playing with Visual CE and Report CE from Syware ([www.syware.com](http://www.syware.com)) and have been impressed by both, especially by the strong database bias of Visual CE.

With Visual CE, you can build form-based applications for Windows CE devices, that is, applications with a form or a collection of forms that make up the interface.

The software is installed on a PC while the CE device is connected and thereafter the design stage takes place on the PC with the completed form being downloaded onto the CE device. This is the method I used, although if you have

can be seen not to work. Otherwise there's the danger of it checking out fine when Psion tests it and opening the door to endless wrangling over the problem.

The Series 7 has, on the left of the machine, a slide-out CF card tray that will accept either a CF Type I or Type II card. On the 7's right is a PC Card slot.

A Type II card is a very tight fit in the card tray; the clearance is so minimal



an HPC Pro you can perform the whole process from there.

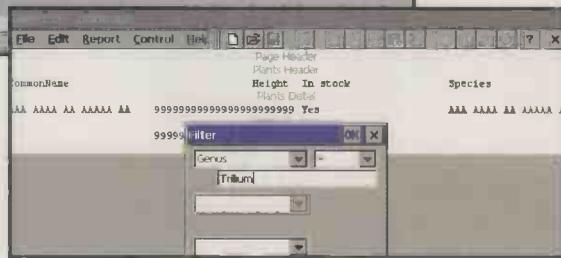
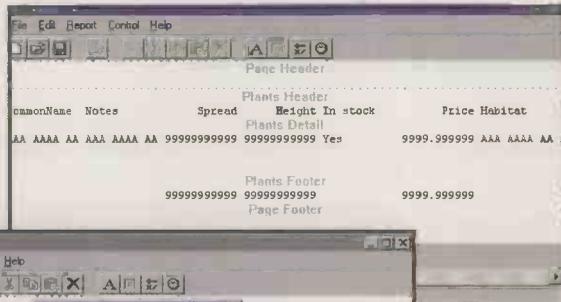
A Visual CE form can be based upon a table created within Visual CE or on a table that's already been created in Pocket Access on the CE device. Alternatively, given an application on the PC that supports ODBC, data from this can be used to create a Visual CE table. This lets you work with an existing Access table from the PC, without having to convert it to a Pocket Access table.

There are 12 types of control that can be placed on a form: edit, note and check boxes, labels, radio buttons, timestamps, calculated fields and a scribble box that accepts input from a stylus – a signature or initials, for example. Drop-down boxes where users choose input can be based on a list created during the form design process or from data in another table. Multiple objects on a form can be selected for speedy alignment and there's a snap-to-grid option too.

Downloading forms and reports to the CE device was quick, although opening a small Pocket Access table took about 19 seconds despite the fact that I'd only been experimenting with small data sets.

Report CE is, as you've probably guessed, a reporting tool for data from a Visual CE application, Pocket Access, any application that uses its .cdb format or any table held in the Windows CE Database Object Store.

Reports are of the ubiquitous banded type and easy enough to set up. Given the iterative nature of report design, the lack



**Top:** The Report CE design environment on the PC. The A and 9 placeholders give it a somewhat crude appearance  
**Middle:** Adding a timestamp control to a report  
**Bottom:** Here a filter is being set up before the report is run on the PDA

These are seriously useful tools for developing CE applications. The only bugbear is the price, which ranges from about £50 to £400 for the Enterprise Edition – check out the website for further details of versions and downloading.

### Annotation's what you need

Sometimes electronic editing of documents just isn't expressive enough. Have you ever yearned, when staring at a

up the stylus. Scribble a comment on the Palm's screen across the reviled paragraph and circle it – magically these annotations appear on the PC. You can add freehand annotations to your heart's content and then save the document. Cleverly, enotate saves the

annotations as Word objects, each pen-down pen-up action creating a separate one. These objects can be deleted one by one from the document as it's revised, or the whole lot can be removed at once.

You can also annotate PowerPoint presentations or .jpg images in the same way.

You can also start from a blank screen on the Palm and attach your artwork to an email, or you can load up an image from your digital camera, add an arrow to show exactly where you fell into the river, save it (in this case annotations will be embedded into the JPEG) and email it to those

unfortunate enough to miss the event.

One of enotate's great strengths is keeping everything digital: the annotated fax is an anachronism in the paperless age. Serious applications might include annotated images of archaeological evidence, damage reports from insurance assessors – imaginative uses abound.

Check out [www.informal.com](http://www.informal.com) for details: it costs about £30 and is great fun, has all manner of uses and is clever too.

### Club Palm

Jon Alsbury sent me details of the North London Palm User Group (NLPUG). Founded early last year and now boasting over 70 members from all over the UK (despite the name) and Europe, the group held its first meeting in May with others in the pipeline. Check out [www.nlpug.org](http://www.nlpug.org) for the latest.

## These are seriously useful tools for developing CE apps. The only bugbear is the price

of a Print Preview button is a pain: you have to go to the File menu and select it. Timestamp, calculated controls, labels and 'column controls' (the data from the underlying field) are at the designer's disposal. Data from several tables can be combined in a report and records can be filtered to show a subset of records either when you run the report or as part of its definition.

Word document that you've been asked to comment upon, to pick up a fat red marker and scrawl 'NO!' across an offending paragraph? Happily for Palm users, you can now do just this with enotate from Informal Software.

Imagine the scene: a Word document is on your PC's screen. Your Palm is plugged into the PC which also shows the Word document on its screen. Pick

### CONTACTS

Mark Whitehorn welcomes your comments on the PDA column. Contact him via the PCW editorial office or email [pda@pcw.co.uk](mailto:pda@pcw.co.uk)

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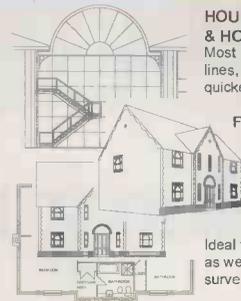
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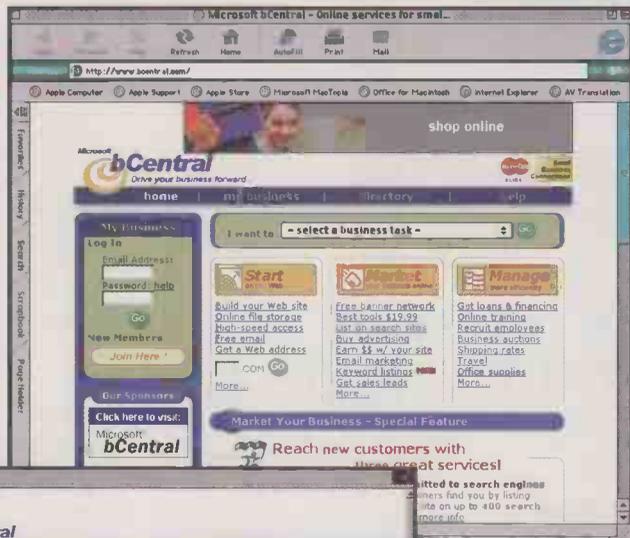
Spam is a very cheap marketing ploy, but **making your site simple** is the key, says Nigel Whitfield.

**W**hile this is only the second of our ecommerce columns, over the past few months PCW has covered a number of topics that touch on the subject and some of those have prompted readers to write in to me.

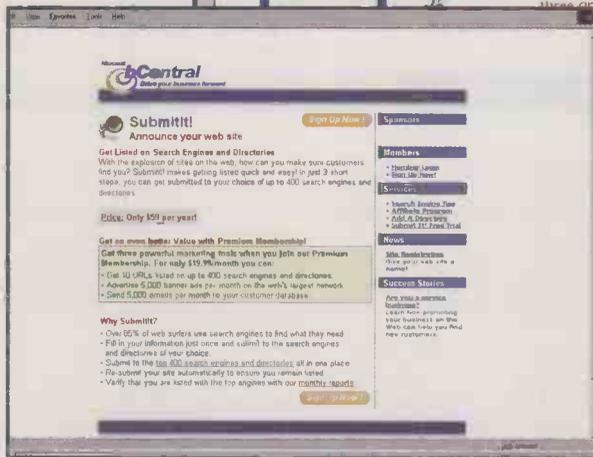
One recent topic was junk mail – how to avoid it and, if possible, arrange for your email program to delete it without prompting you. There still seem to be some people, however, who labour under the belief that unsolicited email is a good way for a business to promote itself. One reader wrote: ‘Now we must not use unsolicited email to promote ourselves and we must not start with an empty site. How the hell do you think Yahoo started?’

‘I might have hoped that you would be more encouraging of those who would give it a go. But instead you are positively discouraging. In your article you make no mention of those of us who might like to make genuine and sensible use of spam. You do not consider the problems you are creating for those who might like to try and get started.’

I’d welcome comments from other people who have businesses online. And



*Left: Microsoft's bCentral is a good place to find out about promoting your business online, without resorting to spam. Below: Submit-It enables you to have your site listed on a popular search engine*



for himself by setting out to give his business a bad reputation online. His view is that sending a single email to selected addresses, saying at the top of it that people won't get any more messages, is acceptable.

I'm afraid I disagree; junk email is

## Any business that irritates with such tactics is mentally filed under 'clueless'

doubtless someone will correct me if I'm wrong, but Yahoo never sent unsolicited email promoting its site. And yes, I will continue to be positively discouraging to people – there is no ‘genuine and sensible use’ for junk email.

My correspondent, I fear, has not considered the problems he'd be creating

unacceptable however you do it. My Demon Internet account is virtually unusable for email, receiving dozens of pieces of junk each week. Many of those promise that they're just going to send the one message. A distressingly large number now say that I'm a subscriber to an ‘opt-in’ list, giving the impression that

I somehow asked to receive their junk. I didn't and I certainly won't do business with companies that

start off their email by lying to me.

Can unsolicited commercial email ever be a good idea? I'd welcome comments from readers. For the time being, in the absence of any compelling arguments, the answer, as far as I'm concerned, remains ‘no’. Any business that irritates with such tactics is mentally filed under ‘clueless’ and won't be seeing any of my money. I'd urge other people to behave likewise.

So if you want to do ecommerce, how can you spread the word? As my correspondent pointed out, many avenues of promotion may be out of the reach of small businesses – but that's no excuse for annoying potential customers.

### Building your business

The first rule of building up a customer base has to be to make sure your site works well to begin with – you can spend as much as you like on promoting a website, but if visitors have a bad experience when they try to find out about you and your products, they're unlikely to come back. Perhaps one of the best examples is the late Boo.com – a slow site packed with the latest technology resulted in frustration for many users.

Similarly, make sure key information is easy to find. If I want to check a price, I want to do it without registering, or downloading an obscure plug-in. And if I

## Setting out your virtual stall

Over the next few issues, I'll be looking at some of the practical issues involved in setting up a site, using a variety of different systems to provide online shopping facilities, ranging from the 'drag and drop' type of catalogue-building program, to systems that provide you with much more customised control over how your site will look. As well as setting up the site itself, we'll be looking in more detail at some of the other aspects – including arranging the payment mechanisms, which can be the trickiest thing to sort out for many, especially if they're starting a business from scratch, with the aim of putting it on the Internet.

There are many different packages available to help create online shops. The first two that we'll be looking at are Shop@ssistant ([www.floyd.co.uk](http://www.floyd.co.uk)), and MiniVend ([www.minivend.com](http://www.minivend.com)), which is a full-featured package written in Perl.

Before you choose a system for your own site, you'll need to check a number of different things.

First, what are the requirements for the web server that will host your site? Does the shopping

### Shop@ssistant makes life easier for ecommerce businesses

package you've chosen need special programs running on the server?

Next, what payment services are supported by the shopping system? You'll need to decide if you want realtime processing of transactions and whether or not the card-processing service you use is compatible with the software.

And finally, do you need to make special arrangements with your ISP to provide a secure server, or have it run software to connect to

card services? Some ISPs will offer this as part of a business package, or you can arrange to have your ordering page hosted by some of the payment services on the Internet.

The two systems we'll be looking at initially take a completely different approach to setting up your online store.

Shop@ssistant handles most of the work, with the exception of the final processing of secure credit

card transactions, in the user's own web browser. It uses JavaScript, which you can add to your web pages via cut and paste – or using the supplied objects for popular web design tools – to control movement around the site and calculate prices and things such as postage. Aside from the secure credit card processing, you could run a complete online shop using the free web space given by many ISPs – all you need on the server is a script for sending email. A single-currency version of Shop@ssistant costs £199.

MiniVend runs as a script on the web server, so it's compatible with more browsers, but installation is much more difficult. Like Shop@ssistant, it relies on adding information to your existing pages, but in this case, they're in the form of special tags, which are converted on the fly by the MiniVend server program. It's also extendable – you can link it to SQL databases, for example, to integrate with the rest of your in-house systems. It's a free program – which has implications for support, as well as the startup cost.

We'll return to both of these programs next month, in more detail.

can't find a price for a product on a site, then I'll go somewhere where I can.

Email can be a way of informing people about your site – but make sure that you only email people who have requested that you do so; make it quite clear when you collect email addresses that you intend to send out information, and give people the option of declining.

You can increase the likelihood of your site appearing in search engines by ensuring that you use META tags to supply keyword and description information for web robots – but you'll also need to make sure there are links to your site from others. Ask companies you

do business with, or other appropriate pages, to link to you.

Tools such as Submit-It ([www.submit-it.com](http://www.submit-it.com)) can have your site listed on popular search engines – with costs starting from around £40, it's well within the reach of small companies. Advertising can be surprisingly cheap too, with Microsoft's bCentral ([www.bcentral.com](http://www.bcentral.com)) offering 5,000 adverts a month from around £12.50.

Of course, a small business can't expect to build a brand quickly overnight – but even if you did, could you cope with a massive increase in orders? For most firms, building slowly is the best way –

and word of mouth will help more than just about anything else.

Rather than dream about how many people you could reach with junk mail, remember instead the damage you can do by sending it out. There are other ways to promote your business – not least of which is offering good service.

## CONTACTS

Nigel Whitfield welcomes your comments on the Ecommerce column. Contact him via the PCW editorial office or email [ecommerce@pcw.co.uk](mailto:ecommerce@pcw.co.uk)

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UPS



# Ever-ready Ethernets

Troubleshooter Roger Gann shows you how to effectively **detect and locate** cabling problems.

**M**odern Ethernet CAT 5 twisted pair network cabling is pretty robust these days, certainly a heck of a lot more reliable than coaxial cable. You fit it and forget it, it's that simple. But even so, problems can crop up from time to time and this month's column is devoted to basic network cabling troubleshooting.

OK, let's say a server has disappeared from the browse list. As far as the system is concerned, you have a network, but no server. You've tried downing it and rebooting; it comes up seemingly OK, but it still remains invisible to the workstation clients. How do you track down the cause of this break in the network chain? The basic technique is simple - you methodically substitute every link in the chain with a replacement you know to work 100 per cent.

Most 10BaseT and 100BaseT networks consist of a trio of hardware components: a network interface card (NIC) in a client or server computer, a port in a hub, switch, router, or other device and the cable connecting the first two components. Problems at the NIC typically involve faulty drivers, network configuration settings within the operating system and, rarely, jumper or DIP-switch settings on the card itself.

At the hub end, the port rarely causes problems, although if it is a switch or a router, there could be complex configuration issues, such as VLAN definitions or policy settings. The cabling comprises several elements, typically twisted pair cable with an RJ-45 plug. There'll be a drop cable to the wall socket, internal cabling to a punch-down block in a patch panel and, finally, a patch cable that runs to the hub, switch, or router port. Once the cable segment is correctly installed, it will rarely cause problems.

The first thing to check is that the link light is on, at the rear of the NIC. Older coaxial-based 10Base2 and 10Base5

NICs usually don't have link indicators, but practically every 10BaseT and 100BaseT NIC sold these days has two or three status LEDs. These lights help

each second when there is no data on the cable.

The Activity or ACT LED illuminates (or blinks) when the NIC



*Above: Unlike hubs, switches can cause problems due to their configuration  
Below: The LEDs on the back of NICs indicate the source of a cabling problem*

indicate whether a problem exists with the connector, cable or hub. The Link or LNK LED lights up whenever the interface receives link pulses from the hub at the other end. 10BaseT interfaces generate link pulses about 60 times

detects read or write activity on the network, even when there is no activity on the adaptor. If the ACT LED is not on, make sure that the hub and network are operating and that the correct drivers are loaded.

You may also find a third indicator: the 100 LED illuminates when a 100Mbps/sec connection is established.

There is a corresponding Link LED back at the hub port as well. If the Link LEDs at both ends of a questionable link are lit (and if they go off when you unplug the cable), you can be confident

that the cable is wired and connected correctly, that the NIC and the hub are powered up and capable of receiving data, and that the most likely source of the problem is the configuration of the computer or the network interface.

If only one Link LED is on, the cable segment is almost certainly bad; the interface at the lit-up end is successfully receiving link pulses, while the interface at the other end is sending them but not receiving them. If possible, plug the computer into another cable that supports a working system. If the computer works on the other cable, you know the computer is configured properly. If a computer known to be





working properly shows the one-link-light-out symptom on the original cable, you have added reason to suspect the cable segment.

If both Link LEDs are OFF, there might be a bad connection or cable or a problem with the hub. For example, you might have the cable plugged into the wrong wall socket or the port itself might be faulty. The easiest way to test this problem is to see if another Ethernet-capable computer can connect using the port. Check that the patch cable to the hub is actually plugged in!

Another possibility is dud cabling. Make sure both ends of the cable are firmly plugged in and are in good shape (ie there are no cracks in the plastic, no bent pins, etc). The easiest way to test this problem is to swap in another Ethernet cable and see if this solves the problem. If you have a cable tester, use it to pinpoint the problem to a particular length of cable or to a connector along the path. It's useful in situations such as this to use a working networked laptop as a diagnostics tool - it allows you to rapidly substitute the suspect computer for a known 'runner'.

If you installed your own Ethernet hardware, you also may not be getting a Link LED because the Ethernet hardware isn't installed correctly. Try reinstalling the network drivers that came with the NIC. Or check the manufacturer's website and download the latest drivers.

Rarely, you'll come across a problem where the Link LED is on, but there's still no connection. The Link LED tells you that your computer can see the link pulse from the network, but a complete connection is a two-way street, so it's necessary for the network to see the link pulse from the computer as well. If you can, swap in an Ethernet cable you know is working. Try swapping the card as well.

If both Link LEDs are off, it could be down to a 'smart' hub: they're designed to automatically 'partition' or isolate faulty ports, so a malfunctioning port might be behind the absence of Link LEDs. To check this, plug the cable into a different port on the hub and see if the Link lights come on. If a known 'good' hub port doesn't light up the Link lights at both ends, you should connect a known 'good' computer, such as your laptop, to the computer end of the cable segment. If the lights stay out at this point, then something along the cable path is definitely the culprit.

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*Investing in a cable tester from specialists such as Fluke can save you a lot of time rather than resorting to trial and error*

The other indicator LED you'll see on hubs is the 'collisions' LED. A flicker of the collisions light every few seconds is to be expected on a normal network, but anything resembling a constantly lit collision indicator is likely to indicate serious problems. The most common reasons for excessive collisions are violations of the 10BaseT rules: no links longer than 100 metres and no more than five repeated segments, with no more than three of the segments populated and no more than four repeaters (hubs) between any two nodes.

If everything checks out but you're still having connection problems the next step requires a slightly more analytical approach. If you can't log on to a server when others can, or if you can't ping a destination that responds to other pings, then the cable comes under suspicion again, even if the link lights are on. Particularly at 100Mbps/sec, CAT 5 cable can be sufficiently below spec to prevent a link from working, without obvious electrical or mechanical faults. Inadequate connectors, electromagnetic interference and poor wiring techniques are three of the most common ways the

cable link might fail while still letting the Link lights come on.

It might be worth investing in a cable tester. A cable tester that can measure near-end crosstalk and attenuation across the frequency band from 0Hz to 100MHz is the only way to be sure of a good cable link for 100BaseT. If you have a lot of coaxial cable-based Ethernet to troubleshoot, cable testers that estimate the distance of problems along the cable using time domain reflectometry can save a lot of trial-and-error operations.

The big names in cable testing are Fluke ([www.fluke.com](http://www.fluke.com)), Microtest ([www.microtest.com](http://www.microtest.com)), Wavetek Wandel Goltermann ([www.wvgolutions.com/](http://www.wvgolutions.com/)), Datacom Textron ([www.datacom.textron.com](http://www.datacom.textron.com)), and Hewlett-Packard/Agilent Technologies.

## CONTACTS

Roger Gann welcomes your comments on the Networks column. Contact him via the PCW editorial office or email: [networks@pcw.co.uk](mailto:networks@pcw.co.uk)

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Introduction



Welcome to the September 2000 issue of Direct Focus, our monthly magazine for consumer and small business buyers. (For larger businesses we have Professional Focus - please order your free copy from our Web site). This month we have at last the new Socket A motherboards for the AMD Athlon and Duron processors. Also, in components, memory prices are on the roller coaster again - upwards as I write but who knows?

This month we are proud to announce a major new initiative - dabs.com is the **only** supplier to offer AIR MILES Awards for computer peripherals. Our new dabspoints scheme has started on all purchases made over the Web at dabs.com, and these points can be redeemed with us for AIR MILES Awards. See www.dabs.com/airmiles for more information. Remember, you only get points if you buy on the Web.

All the best for the summer and I hope you have a great holiday

Regards

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**TECRA 8100 £2355 (£2767.12)** quicklink K2VPW

- Intel Pentium III 650MHz SpeedStep™ Technology
- 64MB SDRAM
- 12GB Hard Drive
- 6X DVD
- 14.1" TFT Colour LCD Display
- Plug and Play BIOS
- NT option also available £2399 (£2818.82)

**TECRA 8100 £2639 (£3100.82)** quicklink MJ4PW

- Intel Pentium III 700MHz processor
- 128MB SDRAM (expandable to 512MB SDRAM)
- 11.24GB Hard Drive
- 6xSpeed DVD-ROM
- 14.1" TFT Colour LCD Display
- 2x PC Card Type II or 1x PC Card Type III (CardBus supported)
- S3 Savage MX 64 Bit AGR 8MB SGRAM BiBTL Graphics Processor
- Weights 2.65kg • Plug and Play BIOS
- Integrated V.90 56k modem
- Win 95/98 (Dual Boot - one time choice)
- NT option also available £2679 (£3147.82)

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Portables

quicklink	ACER EXTENSA	ex VAT	inc VAT
J0XPW	342T PIII500 64/9 12.1"	1295	1521.62
MBYPW	507T C466 64/8.4 12.1"	835	981.12
NKLPW	600TER PIII600 64/12 13.3"	1665	1956.37

All listed Acer Extensa models include a 56k modem

COMPAQ ARMADA

LKMPW	V300 CeI466 32/6.4GbCD W95	975	114.62
J2JPW	V300 CeI433 64/4.3 14.1TFT W95	1299	1526.32
KPJPW	E500 PIII 500 64/6.4 13.3TFT W95	1369	1608.57
KPKPW	E500 PIII 500 64/12 14.1TFT W95	1489	1749.57
MW8PW	M300 PIII 333 128/6.4 11.3TFT W95	1459	1714.32

Other models available please call for details

HEWLETT PACKARD OMNIBOOK

Omnibook XE2			
KP4PW	AMD6K 2.450 32/4.0 12.1"	655	769.62
KR0PW	C450 32/4.8Gb 12.1" W98	745	875.37
NJ4PW	CeI500 35/5Gb 12.1" W98	795	934.12
NJ5PW	PIII500 64/5GbCD12.1" W98	1065	1251.37

Omnibook 900

HTWPW	PIII 450 64/6.4 12.1" W98	1379	1620.32
JLVPW	PIII 500 64/12 13.3" W98	1689	1984.57
KLVPW	PIII 600 64/6 13.3" W98	1745	2050.37
KLSPW	PIII 650 64/12 13.3" W98	1935	2273.62

Omnibook 6000

MM3PW	CeI 550 64/5GbCD 14.1" W98	1355	1592.12
MMKPW	PIII 600 64/6GbCD 14.1" W98	1890	2220.75
MMMPW	PIII 600 128/6GbCD 14.1" W98	2119	2489.82

Omnibook 4150

HTYPW	PIII 450 64/10.0 DVD 14.1" W98	2295	2696.62
KPGPW	PIII 500 64/6CD 14.1" W98	1729	2031.57
HXBPW	PIII 500 64/12.0 DVD 14.1" W98	2159	2536.82
KLOPW	PIII 650 128/18 14.1" W98	2589	3042.07

Windows NT models also available  
HP online [www.dabs.com/hp](http://www.dabs.com/hp)

IBM THINKPAD

ThinkPad 240			
4PDPW	C300 64/6.4 CD 10.4" W98	699	821.32
K4FPW	C400 64/12 10.4" W98	1259	1479.32
J5JPW	C400 64/4.8 CD 12.1" W98	1165	1368.87
LF9PW	PIII400 64/6.4GbCD14.4" W98	1265	1486.37
MV3PW	C500 64/12 15" W98	1555	1827.12

ThinkPad 570

LFCPW	PIII450 64/6 13.3" W98	2015	2367.62
LFDPW	PIII500 64/12 13.3" W98	2315	2720.12

ThinkPad 600E

LFPPW	PIII400 64/10 CD 13.3" W98	1985	2332.37
4P6PW	PIII400 64/10 DVD 13.3" W98	2139	2513.32
KF0PW	PIII450 64/6 CD 13.3" W98	2035	2391.12
LHPPW	PIII500 64/128 13.3" W98	2199	2583.82

SONY VAIO

K21PW	NS05SN/LT PIII 400 64/6.410.4"	1189	1397.07
N7DPW	SR1 PIII500 64/9GbCD 10.4"	1335	1568.62
N7EPW	F701 CeI500 64/9GbCD 13.3"	1089	1291.32
N7BPW	F707 PIII600 64/9GbCD 14.1"	1725	2026.87
N7FPW	Z600NE PIII650 128/12GbCD 12.1"	1885	2214.87
K22PW	C1XD/LT PIII 400 64/12.0 8.9"	1325	1556.87
N7CPW	X29 PIII750 128/18Gb DVD 14.1"	2909	3418.07
N79PW	F709 PIII750 128/18.1Gb DVD 15"	2595	3048.12

TOSHIBA Satellite PRO

KNPPW	4270 CeI 500 13" 64/6.0 CD	949	1115.07
KN0PW	4270 CeI 500 14.1" 64/6.0 CD	1225	1439.37
KNRPW	4270 CeI 500 15" 64/6.0 CD	1319	1549.82
K2NPW	4280 PIII 500 13.3" 64/6.0	1345	1580.37
K2FPW	4280 PIII 500 14.1" 64/6.0	1515	1780.12
K2PPW	4320 PIII 600 14.1" 64/12.0	1929	2266.57
NS0PW	4290 CeI 550 12.1" 64/6.0	1065	1251.37
NS2PW	4290 CeI 600 14.1" 64/6.0	1299	1526.32

Portégé

MJ2PW	3140CCT PII 400 64/6GbCD	1249	1467.57
MJ3PW	3440CCT PII 500 64/6GbCD	1499	1761.32
4N4PW	7020CCT PII 366MMX 64/6.0	1499	1761.32
K2QPW	7140CCT PIII 500 64/6.0	1795	2109.12
K2RPW	7200CCT PIII 600 64/12.0	2079	2442.82

Tetra

4NGPW	8000CCT PII 400 64/10.0	1679	1972.82
4NKPW	8000DVD PII 400 128/14.0 DVD	1899	2231.32
HP9PW	8000CCT PIII 500 64/6.0CD14.1"	1929	2266.57
K27PW	8100 PIII 600 64/6.0CD 14.1"	1889	2219.57
K2VPW	8100 PIII 650 64/12.0CD 14.1"	2355	2767.12
MJ4PW	8100 PIII700 128/12.0GbCD	2639	3100.82

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K2WPW	246T C46664/6.4 10.4 TFT	1099	1291.32
MK3PW	347T AMD.474 64/6 GbCD	799	938.82
MK2PW	653T C500 64/6GbCD	1199	1408.82
MK4PW	860T PIII 600 64/12GbCD	1399	1643.82

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quicklink MK3PW

ActionBook 653T £1149 (€1350.07)

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- 4MB AGP Graphics • 3yr Limited Warranty

quicklink MK2PW

ActionBook 860T £1399 (€1643.82)

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quicklink MK4PW

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**HP Jornada 545/548**

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HP Jornada 545 quicklink MNWP £299 (€351.32)

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£229 (€269.07 inc VAT) quicklink JH0PW

PC Systems

quicklink	HEWLETT PACKARD	ex VAT	inc VAT
N5N5PW	Brio Mini Tower	549	645.07
NXBPW	CeI 566 64/10GbCD M 15"	699	821.32
NXCPW	CeI 600 64/10GbCD M 17"	749	880.07
P10PW	PIII 700 128/15GbDVD M 17"	849	997.57

HP online [www.dabs.com/hpbrn](http://www.dabs.com/hpbrn)

E-Vectra			
LHLPW	C500 64/8.4Gb	405	475.87
LHMPW	C555 128/8.4Gb CD	565	663.87
NS6PW	C566 64/8.4Gb	539	633.32
NS7PW	C600 64/8.4Gb CD	655	769.62
LHPPW	PIII667 256/8.4Gb CD LAN W2K	869	1021.07
NS8PW	PIII733 128/8.4Gb CD LAN	895	1051.62
NS9PW	PIII800 256/8.4Gb CD LAN Win2K 1119	1314.82	

Toshiba Equium

KT0PW	7100S PIII600 128/8Gb CD	745	875.37
KT1PW	3200M PIII600 64/8Gb CD	625	734.37

Other models available please call or check out [www.dabs.com/toshiba](http://www.dabs.com/toshiba) for a full list

Handhelds

quicklink	CASIO	ex VAT	inc VAT
4Z7PW	Cassiopeia E-15 Win CD Mono	235	276.12
MWVPW	Cassiopeia E-115 Win CE Colour	359	421.82

COMPAQ

4ZJPW	Compaq Aero 1520 Mono	215	252.62
MNXPW	Compaq Aero 1550	209	245.57
4ZMPW	Compaq Aero 2130	309	363.07
4MLPW	Compaq Aero 8000	635	746.12

HEWLETT PACKARD

MNWPW	Jornada 545	299	351.32
LKKPW	Jornada 548	359	421.82
4YYPW	Jornada 680 Windows CE	465	546.37
JF6PW	Jornada 690 Windows CE 32Mb	535	628.62

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PALM

JLFPW	Palm IIIe	95	111.62
LFPW	Palm IIIc	249	292.57
KRLPW	Palm Vx 8Mb	219	257.32

Please call for Palm accessories & software

PSION

4YPPW	Series 3MX 2Mb Backlit	159	186.82
HOQPW	Revo 8Mb	215	252.62
NCSPW	Revo 8Mb Internet	279	327.82
4YQPW	Series 5MX 16Mb + PsiWin	309	363.07
4YRPW	Series 7	549	645.07

Please call for accessories, memory upgrades & software

XIRCOM

4ZYPW	REX3 Pro 512k	85	99.87
4Z2PW	REX3 Pro 512k inc Dock	99	116.32

Accessories

4Z2PW	Docking Station	25	29.37
4ZWPW	Intellisynch	25	29.37
53FPW	Wallet/Leather Case	8	9.40

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quicklink	3COM	ex VAT	inc VAT
<b>OfficeConnect</b>			
6CYPW	3C16700A 8 Port Ethernet Hub RJ45	50	58.75
6CZPW	3C16701A Ethernet Hub 8C	60	70.50
6DOPW	3C16702A Ethernet Hub 16C	106	124.55
6D1PW	3C16703A Ethernet Hub 4C	44	51.70
6D2PW	3C16704A Ethernet Hub 4	30	35.25
6D3PW	3C16721A Fast Ethernet Hub 12	169	198.57
6D4PW	3C16722A Fast Ethernet Hub 8	99	116.32
6D5PW	3C16723A Fast Ethernet Hub 4	65	76.37
<b>SuperStack II</b>			
69XPW	3C16405 Port Switch 40 12x 10Mb	210	246.75
69YPW	3C16406 Port Switch 40 24x 10Mb	409	480.57
69ZPW	3C16450 Port Switch 50 24x 10Mb	525	616.87
68FPW	3C16440 Entry Hub 12x 10Mb	97	113.97
68GPW	3C16441 Entry Hub 24x 10Mb	155	182.12
6CDPW	3C16593 DS 24x10/100Mb	340	399.50
68LPW	3C16610 DS 500 12x10/100Mb	397	466.47
68MPW	3C16611 DS 500 24x10/100Mb	539	633.32
69SPW	3C16670 Hub10 12x 10Mb	299	351.32

### BAY NETGEAR

6KAPW	EB104 4port Starter Kit ISA	41	48.17
6K1PW	FB104 4port Fast Starter Kit PCI	70	82.25
6J2PW	EN104TP 4x10Mb Compact	19	22.32
6K1PW	EN106TP 6x10Mb Compact	25	29.37
6K2PW	EN108TP 8x10Mb Compact	29	34.07
6K0PW	EN104 4x10Mb & BNC Compact	27	31.72
6K3PW	EN108 8x10Mb & BNC Compact	35	41.12
6K5PW	EN116 16x10Mb & BNC & AUI Comp	64	75.20
6K6PW	EN156 16x10Mb & BNC & AUI Rack	74	86.95
6K7PW	EN524 24x10Mb & BNC & AUI Rack	115	135.12
6K8PW	FE104 4x100Mb Compact	44	51.70
6KCPW	FE108 8x100Mb Compact	77	90.47
6KDPW	FE116 16x100Mb Compact	139	163.32
6KMPW	DS104 4x10/100Mb Compact	50	58.75
6KLPW	DS108 8x10/100Mb Compact	71	83.42
6KNPW	DS508 8x10/100Mb Rack	140	164.50
6KPPW	DS516 16x10/100Mb Rack	209	245.57
6KQPW	DS524 24x10/100Mb Rack	289	339.57

### DABS

65XPW	5x10Mb	21	24.67
65YPW	8x10Mb	28	32.90
65ZPW	16x10Mb	62	72.85
650PW	8x100Mb	90	105.75

### DLINK

6DNPW	DE805TP 5x10Mb	23	27.02
6DLPW	DE809TC 8x10Mb & BNC	31	36.42
6DMPW	DE8091P 9x10Mb	37	43.47
6DPPW	DE816TP 16x10Mb & BNC & AUI	74	86.95
6DQPW	DE824TP 24x10Mb & BNC & AUI	109	128.07
6DXPW	DE1824 24x10Mb Client	145	170.37
6DZPW	DE1824i 24x10Mb SNMP Master	195	229.12
6DFPW	DFE904 4x10/100Mb	52	61.10
6G5PW	DFE905 Network Kit 10/100	75	88.12
6FLPW	DFE2616 16x10/100Mb Client	242	284.35
6FJPW	DFE2616X 16x10/100Mb C & S	259	304.32
6FKPW	DFE2616i 16x10/100Mb Master	349	410.07
6FMPW	DFE2616iX 16x10/100Mb M & S	445	522.87

### INTEL

6JSPW	Express 330TX 10/100 16port	315	370.12
6JTPW	Express 330TX 10/100 24port	465	546.37

### INTEL INBUSINESS

6J9PW	SH10T5 5x10Mb	32	37.60
6JCPW	SH100TX4 4x100Mb	60	70.50
6JDPW	SH100TX8 8x100Mb	107	125.72

### Network Routers

quicklink	3COM	ex VAT	inc VAT
<b>Officeconnect</b>			
6NGPW	3C410012 Remote 531S D/W/WAN	419	492.32
<b>BAY NETGEAR</b>			
6ORPW	RT238 ISDN Voice/Data	185	217.37
6OSPW	RH348 ISDN V/Data & 4port Hub	219	257.32
6GZPW	RM356 56K V90 Router	185	217.37
<i>D = Data, V = Voice</i>			

### Network Switches

quicklink	3COM	ex VAT	inc VAT
<b>Officeconnect</b>			
6B3PW	3C16732 280 8x10Mb, 2x10/100Mb	276	324.30
6CLPW	3C16734 DC 800 10/100Mb	129	151.57
6D7PW	3C16735 Dual Speed 16	225	264.37
<b>SuperStack II</b>			
6B7PW	3C16460 Switch 320 12port	339	398.32
6BYPW	3C16465 10/100 Switch 24port	499	586.32
6BHPW	3C16951 1100 12x10Mb, 2x10/100Mb	405	475.87
6BJPW	3C16950 1100 24x10Mb, 2x10/100Mb	509	598.07
6B1PW	3300 12x10/100Mb	649	762.57
<b>BAY NETGEAR</b>			
6KXPW	Compact 8x 10/100Mb	99	116.32
6KYPW	8x 10/100Mb Internal PSU	135	158.62
6KZPW	Rack 8x 10/100Mb	239	280.82
6L0PW	Rack 16x 10/100Mb	279	327.82

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3C16702	Hub TP16C	16port & BNC	£106	(£124.55 inc VAT)
3C891A	ISDN Lan Modem	4 port	£249	(£292.57 inc VAT)

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3C16750B	Dual Speed 8port auto 10/100TX	£115	(£135.12 inc VAT)	
3C16723	Hub TP400	4port & 100TX	£65	(£76.37 inc VAT)
3C16722	Hub TP800	8port & 100TX	£99	(£116.32 inc VAT)

#### OfficeConnect® Switches

3C16731	Switch 140M4x 10BASE-T, 1x 100TX	£289	(£339.57 inc VAT)
3C16733	Switch 400M4x 10/100BASE-TX auto	£117	(£137.47 inc VAT)
3C16735A	Dual Speed Hub 16	£225	(£264.37 inc VAT)
3C16733A	10/100 4 Port Switch	£109	(£128.08 inc VAT)
3C16734B	10/100 8 Port Switch	£139	(£163.33 inc VAT)
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3C509B-TPC	RJ45 & BNC, ISA	£42	(£49.35 inc VAT)

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3C515-TX	RJ45, cat 5 UTP, ISA	£92	(£108.10 inc VAT)
3CR990-TX-97	10/100 PCI Nic (with 3XP Processor for Windows 2000)	£65	(£76.37 inc VAT)

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### Network Cards

quicklink	3COM	ex VAT	inc VAT
<b>Bare Cards</b>			
DYNPW	3C-509TP RJ45 ISA	30	35.25
DZ1PW	3C-509B Combo ISA	54	63.45
DYHPW	3C-900TP RJ45 PCI	26	30.55
HPKPW	10/100 PCI Oem	36	42.30
<b>Retail Boxed</b>			
DYPPW	3C-509TP RJ45 ISA	37	43.47
OZ1PW	3C-515TX 10/100 ISA	92	108.10
DYCPW	3C-900 Combo PCI	78	91.55
DZ6PW	10/100 WOL PCI	48	56.40
DY9PW	10/100 EISA	140	164.50

### BAY NETGEAR

F5FPW	FA310TX 10/100 PCI	14	16.45
F5HPW	FA410 10/100 PCMCIA	54	63.45

### DABS

DV7PW	Combo ISA	9	10.57
DV8PW	Combo PCI	10	11.75
DV8PW	10/100 PCI	12	14.10
DV9PW	Combo PCMCIA	31	36.42

### DIAMOND

F56PW	HomeFree Desktop Kit ISA	114	133.95
F57PW	HomeFree Network Kit Combo	129	151.57
F58PW	HomeFree Single Kit ISA	60	70.50
F59PW	HomeFree Single Kit PCI	60	70.50
F5BPW	HomeFree Single Kit PCMCIA	78	91.65

### DLINK

F2NPW	DE-220PCT Combo ISA	10	11.75
F2PPW	DE-528CT Combo PCI	11	12.92
F2TPW	DFE-530TX 10/100 PCI	16	18.80
F2LPW	DE-660CT Combo PCMCIA	34	39.95

### GENIUS

DWZPW	Combo ISA	10	11.75
DWYPW	Combo PCI	10	11.75
DX2PW	10/100 PCI	14	19.97
DX1PW	Combo PCMCIA	27	31.72

### INTEL ETHER EXPRESS

F4DPW	Pro 10+ Combo PCI	72	84.60
F4GPW	Pro 100 ISA	99	116.32
F4MPW	Pro 100+ PCI	42	49.35

### PSION DACOM NETGLOBAL

F0TPW	PCMCIA	45	52.87
F0VPW	10/100 PCMCIA	64	75.20
F0SPW	10Mb & 56K Modem PCMCIA	150	176.25

### XIRCOM

F1DPW	RJ45 PCMCIA (10/100 upgradeable)	89	104.57
F1GPW	Combo PCMCIA (10/100 upgradeable)	119	139.82
F1BPW	10/100 PCMCIA	97	113.97
F20PW	CardBus Ethernet II 10/100	99	116.32
F24PW	CardBus Ethernet 10/100 & 56K M	149	175.07
F1RPW	10/100 RJ45 & 56K M PCMCIA	165	193.87
F1SPW	10/100 Combo & 56K M PCMCIA	185	217.37
F22PW	RealPort Ethernet 10/100 PCMCIA		

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Cases

quicklink	ENLIGHT	ex VAT	inc VAT
G85PW	ATX Desktop	44	51.70
G81PW	ATX Mini Tower	42	49.35
G8RPW	ATX Midi Tower	47	55.22
<b>VASCO</b>			
G84PW	AT Mini Tower	60	70.50
G85PW	AT Full Tower	79	92.82
G8FPW	AT File Server	675	793.12
G87PW	ATX Midi Tower	75	88.12
G88PW	ATX Full Tower	89	104.57
G8HPW	ATX File Server	675	793.12

Keyboards

quicklink	MICROSOFT	ex VAT	inc VAT
N01PW	Internet OEM PS/2	12	14.10
G50PW	Natural Elite OEM PS/2	16	18.80
G54PW	Internet PS/2	14	16.45
G42PW	Natural Elite PS/2 & USB	21	24.67
G53PW	Internet Pro PS/2 & USB	25	29.37
G52PW	Natural Pro PS/2 & USB	30	35.25
<b>MITSUMI</b>			
G6HPW	Ergo Classic Serial	7	8.22
G6KPW	Ergo Classic PS/2	7	8.22

Gaming Devices

quicklink	MICROSOFT	ex VAT	inc VAT
9Y3PW	SideWinder joystick	17	19.97
9Y4PW	SideWinder Gamepad	22	25.85
9Y9PW	Precision Pro USB	35	41.12
9YFPW	Forcefeedback Pro	69	81.07
9Y8PW	FreeStyle Pro USB	35	41.12
9Y7PW	Forcefeedback Wheel	79	92.82

SCSI Cards

quicklink	ADAPTEC	ex VAT	inc VAT
F83PW	AVA-1505 Kit ISA	30	35.25
F85PW	AHA-1520B Sgl ISA	45	52.87
F85PW	AHA-1542CP Sgl ISA	127	149.22
F8XPW	AVA-2004CD Kit PCI	29	34.07
F8BPW	AHA-2940U Kit PCI	149	175.07
F8VPW	AHA-2944UW Kit PCI	261	306.67
KMVPW	ASC-19160 PCI U160 Kit	150	176.25
KMWVW	ASC-2916N PCI U160 Kit	186	218.55
KN2PW	ASC-29160 PCI U160 Kit	198	232.85
KN3PW	ASC-39160 PCI U160 Kit	224	263.20
F8VWPW	AVA-2906 Mac Kit PCI	37	43.47
F8TPW	AHA-2930U Mac Kit PCI	61	71.67
<b>IWILL</b>			
F9GPW	2930C PCI SCSI	17	19.97
F9HPW	2936UW PCI SCSI	45	52.87
F9JPW	2935U2W PCI SCSI	85	99.87

Mice

quicklink	MICROSOFT	ex VAT	inc VAT
N0XPW	Trekker OEM PS/2	4.50	5.28
9WGPW	Standard OEM PS/2	7	8.22
N0YPW	Trekker Wheel OEM PS/2	8	9.40
9WDPW	IntelliMouse OEM PS/2	10	11.75
N0ZPW	IntelliMouse OEM USB	11	12.92
N0APW	IntelliMouse Web OEM PS/2	13	15.27
9WHPW	Basic PS/2 & USB	9	10.57
9WMPW	Wheel PS/2 & USB	13	15.27
9WJPW	IntelliMouse v3.0 PS/2 & USB	15	17.62
9WPPW	Cordless Wheel PS/2 & USB	19	22.32
9WNPW	IntelliMouse v. IntelliEye PS/2 & USB	19	22.32
9WBPW	Standard v2.0 PS/2 & USB	20	23.50
M42PW	IntelliMouse Optical PS/2 & USB	24	28.20
HG0PW	IntelliMouse Explorer PS/2 & USB	31	36.42
9WFPW	IntelliMouse Trackball PS/2 & Serial	13	15.27
<b>MITSUMI</b>			
9XC PW	2 button Classic Serial	4	4.70
9XD PW	2 button Classic PS/2	4	4.70
NR1PW	Scroll Elegance Serial	6	7.05
NR2PW	Scroll Elegance PS/2	6	7.05
9XFPW	Wireless Scroll PS/2 & Serial	12	14.10

USB Accessories

quicklink	XIRCOM	ex VAT	inc VAT
<b>Hubs</b>			
BK5PW	4port USB Stackable	29	34.07
BK6PW	7port USB Stackable	43	50.52
BK7PW	4port Multifunction USB Hub	64	75.20
BKCPW	7port Multifunction USB Hub	89	104.57
BKBPW	4port Ethernet USB Hub	70	82.25
<b>Cards</b>			
BKZPW	2port USB Card PCI	20	23.50
BL0PW	4port USB Card PCI	24	28.20
<b>Converters</b>			
BKV PW	USB to SCSI	37	43.47
BKNPW	USB-Parallel Converter Kit	25	29.37
BKPPW	USB-Serial Converter Kit	38	44.65
BKRPW	USB-Serial DB9 Converter Kit	29	34.07
BKSPW	USB-Apple Serial DB Converter Kit	30	35.25

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FY9PW	8Mb 2Mx32	Call	Call	FZZPW	64Mb 8Mx64	Call	Call
FYBPW	16Mb 4Mx32	Call	Call	G00PW	128Mb 16Mx64	Call	Call
FYCPW	32Mb 8Mx32	Call	Call	G01PW	256Mb 32Mx64	Call	Call
FYDPW	64Mb 16Mx32	Call	Call	<b>PC133 SDRAM</b>			
FYFPW	128Mb 32Mx32	Call	Call	G02PW	64Mb 8Mx64	Call	Call
<b>PC66 SDRAM (LX Chipset)</b>				G03PW	128Mb 16Mx64	Call	Call
FZFPW	32Mb 4Mx64	Call	Call	G04PW	256Mb 32Mx64	Call	Call
FZGPW	64Mb 8Mx64	Call	Call	G05PW	512Mb CAS 2 8Mx64	Call	Call
FZJPW	128Mb 16Mx64	Call	Call	G06PW	128Mb CAS 2 16Mx64	Call	Call
<b>PC100 SDRAM (J &amp; J Chipset)</b>				G07PW	256Mb CAS 2 8Mx64	Call	Call
FZKPW	32Mb 4Mx64	Call	Call	G08PW	512Mb CAS 2 16Mx64	Call	Call
FZLPW	64Mb 8Mx64	Call	Call	G09PW	256Mb CAS 2 32Mx64	Call	Call
FZMPW	128Mb 16Mx64	Call	Call	<b>72pin FP SIMM</b>			
FZNPW	256Mb 32Mx64	Call	Call	FY5PW	16Mb 4Mx632	Call	Call
FZOPW	512Mb CAS 2 8Mx64	Call	Call	FY6PW	32Mb 8Mx32	Call	Call
FZPPW	1024Mb CAS 2 16Mx64	Call	Call	FY7PW	64Mb 16Mx32	Call	Call
FZQPW	2048Mb CAS 2 32Mx64	Call	Call	FY8PW	128Mb 32Mx32	Call	Call

Speakers

quicklink	CREATIVE	ex VAT	inc VAT
G02PW	CSW-20 20W	12	14.10
G0DPW	CSW-100 100W & Sub woofer	39	45.82
G04PW	FPS 1000	39	45.82
M2RPW	Soundworks Digital	45	52.87
G05PW	FPS 2000	109	128.07
G06PW	DTT2500 Digital	139	163.32
<b>LABTEC</b>			
G0HPW	LCS-1040 USB	32	37.60
G0QPW	APX 4620	69	81.07
<b>PHILIPS</b>			
G0JPW	MMS-110	11	12.92
<b>TEAC</b>			
HYXPW	PowerMax PM500 Sub System	35	41.12
G5FPW	PowerMax 1000ProLogic Set	92	108.10
<b>YAMAHA</b>			
G0JPW	YST-MSW10 25W	33	38.77
G0BPW	YST-MS28 15W	45	52.87
<b>VIDEOLOGIC</b>			
G0ZPW	Sirocco Speakers 100W RMS	165	193.87
G0CPW	Sirocco Crossfire Speakers	159	186.82
L5KPW	Digi Theatre DTS	330	387.75
G0DPW	Digi Theatre	175	205.62
HY9PW	Sirocco Pro	425	499.37
HYBPW	Sirocco Spirit OEM	112	131.60

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quicklink	GUILLEMOT	ex VAT	inc VAT
F8TPW	MaxiSound Home/S Pro 64 PCI	125	146.87
F8VPW	MaxiStudio ISIS PCI	189	222.07
<b>PINE</b>			
F83PW	Crystal 4820 PCI	9	10.57
F92PW	Schubert 3D Mac	B	9.40
<b>VIDEOLOGIC</b>			
F9VPW	SonicVortex2 PCI Rp	44	51.77
<b>YAMAHA</b>			
F9KPW	SW10002XG PCI	319	374.82
<b>CREATIVE LABS</b>			
F8DPW	Soundblaster 16 PCI	21	21.15
F8GPW	SB Live! Player 1024 PCI	48	56.40
F8HPW	SB Live! Platinum PCI	123	144.52

Multimedia Cards

quicklink	ATI	ex VAT	inc VAT
D07PW	TV Tuner OEM	23	27.02
K0BPW	TV Wonder PCI OEM	37	43.47
<b>HAUPPAUGE</b>			
MGYPW	USB-Live	42	49.35
K61PW	WinTV Primio FM	55	64.62
H0GPW	WinTV PCI FM	72	84.60
DHLPW	WinTV Theater	85	99.87
DHMPW	WinTV Go	38	44.65
DHNPW	WinTV USB	63	74.02
L9GPW	WinTV USB FM	80	94.00
L85PW	WinTV DVB-S	199	233.83
DHJPW	WinTV CCD Camera Bundle	99	116.32
<b>PINNACLE</b>			
DHZPW	Video Director Studio 400	45	52.87
DJ1PW	microVideo DC10 Plus	125	146.87
DHWPW	microVideo DV300	375	440.62
DHSPW	microVideo DC30 Plus	255	299.62
DJ3PW	microVideo MP10	189	222.07
<b>VIDEOLOGIC</b>			
DJRPW	DVD Player	65	76.37

Digital Audio

quicklink	DIAMOND	ex VAT	inc VAT
FCSPW	Rio PMP500	159	186.82
K0DPW	Rio PMP500 Purple	159	186.82
FCVPW	Rio PMP500 Car Adaptor	10	11.75
FCTPW	Rio PMP500 Leather Case	19	22.32
NVGPW	Rio PMP500 Black Travel case	11	12.92
<b>PINE</b>			
FCLPW	D Music MP3 Player	81	95.17
MHCPW	D Music MP3 CD Player	145	170.37
<b>SAMSUNG</b>			
JK9PW	Yepp MP3 Player 32MB	105	123.37
MPKPW	Yepp MP3 Player 64MB	145	170.37
<b>TERRATEC</b>			
KJ7PW	M3PD	279	331.35
<b>JAZZ</b>			
L8ZPW	Piper MP3 Player 32MB	99	123.37
NMRPW	Piper MP3 Player 64MB	199	233.82
<b>SONY</b>			
M8BPW	Memory Stick Walkman 64MB	209	245.57

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## Motherboards

quicklink	ABIT	Chipset	Socket/Slot	Memory	Slots-PCI/	Form	(AKV/S)	Exc	Var	inc	VAT
NR3PW	VH6	VIA 694X	FC-PGA	0/3	5/1/A/4x	133	ATX	HAU66	67	78.72	
NR4PW	SL6	Intel 815	FC-PGA	0/3	6/0/C/4x	133	ATX	HAVU66	88	103.40	
NR5PW	SE6	Intel 815e	FC-PGA	0/3	6/0/C/4x	133	ATX	HAVU100	99	116.32	
HO2PW	VA6	VIA 693A	Slot 1	0/3	5/2/1/2x	133	ATX	HU66	50	58.75	
M4JPW	VT6X4	VIA 694X	Slot 1	0/3	5/2/1/4x	133	ATX	HU66	63	74.02	
HOXPW	WB6	Intel 810e	Slot 1	0/2	3/0/0/N	133	MATX	HAVU66	65	76.37	
HJZPW	BE6-2	Intel BX	Slot 1	0/3	5/1/1/2x	100	ATX	HU66	78	91.65	
M4KPPW	KA7	VIA KX133	Slot A	0/4	6/1/1/4x	200	ATX	HU66	88	103.40	
M4LPW	KA7-10	VIA KX133	Slot A	0/4	6/1/1/4x	200	ATX	HU100	102	119.85	
P01PW	K17	VIA KT133	Socket A	0/3	6/1/0/4x	200	ATX	HU66	98	115.15	
P02PW	K7-100	VIA KT133	Socket A	0/3	6/1/0/4x	200	ATX	HU100	110	129.25	
<b>ASUSTEK</b>											
G1NPPW	P5A-B 512Kb	ALI Aladdin V	Socket 7	0/3	3/2/0/2x	100	AT	HU33	60	70.50	
G1OPW	P5A 512Kb	ALI Aladdin V	Socket 7	0/3	3/2/1	100	ATX	HU33	62	72.85	
MZTPW	CUBX	Intel BX	FC-PGA	0/4	6/1/0/2x	100	ATX	HU66	99	116.32	
NKDPW	CUV-4X	VIA 694X	FC-PGA	0/3	5/1/1/4x	133	ATX	HU66	85	99.87	
NRPFW	CUSL2	Intel 815e	FC-PGA	0/3	6/1/2/4x	133	ATX	HAVU100	116	136.30	
G1TPW	MEW	Intel 810	Socket 370	0/3	6/1/0/N	100	ATX	HAVU66	84	98.70	
LSSPW	P3V4X	VIA 694X	Slot 1	0/4	6/1/1/4x	133	ATX	HU66	80	94.00	
G1VPW	P3B-F	Intel BX	Slot 1	0/4	6/1/0/2x	100	ATX	HU33	93	109.27	
KWVPW	K7M-RM/Audio	AMD 750+VIA	Slot A	0/3	5/1/0/2x	200	MATX	HU66	107	125.72	
G1YPW	K7-M	AMD 750+VIA	Slot A	0/3	5/1/1/2x	200	ATX	HU66	108	126.90	
ND8PW	AT7	VIA KT133	Socket A	0/3	5/0/1/4x	200	ATX	HU100	see dabs.com		
KWVPW	K7M/Audio	AMD 750+VIA	Slot A	0/3	5/1/1/2x	200	ATX	HU66	113	132.77	
<b>GIGABYTE</b>											
G0SPW	GA-5AX 512Kb	Aladdin V	Socket 7	0/3	5/2/1/2x	100	ATX	HU66	52	61.10	
NF6PW	GA6-VX7-4X	VIA 694X	FC-PGA	0/3	5/1/1/4x	133	ATX	HU66	67	78.72	
G0YPW	GA-6BXC	Intel BX	Slot 1	0/3	4/3/1/2x	100	ATX	HU33	62	72.85	
G0ZPW	GA-BX2000	Intel BX	Slot 1	0/4	5/2/1/2x	100	ATX	HU33	72	84.60	
L7HPW	GA-BX2000+	Intel BX	Slot 1	0/4	6/2/1/2x	100	ATX	HU33	83	97.52	
LG3PW	GA-6VXE+	VIA 693A	Slot 1	0/3	5/2/1/2x	133	ATX	HU66	55	64.62	
MXSPW	GA-6VX-4X	VIA 694A	Slot 1	0/4	5/1/0/4x	133	ATX	HU66	71	83.42	
L6TPW	GA-71XE	AMD 750	Slot A	0/3	5/2/1/2x	200	ATX	HU66	80	94.00	
<b>SMICRO</b>											
G2KPPW	370SWD	Intel 810	Socket 370	0/2	3/0/0	0k	MATX	HAV	75	88.12	
G2SPW	370WST	Intel 810	Socket 370	0/2	3/0/0	0k	MATX	HAV	75	88.12	
HS4PW	370SED	Intel 810e	FC-PGA	0/2	3/0/0	0k	MATX	HAV	88	103.40	
HS5PW	370SEA	Intel 810e	FC-PGA	0/2	6/1/0	0k	ATX	HAV	95	111.62	
HS6PW	PII5ED	Intel 810e	Slot 1	0/2	6/0/0	0k	ATX	HAV	87	102.22	
HS7PW	PII5SEA	Intel 810e	Slot 1	0/2	4/3/0	0k	ATX	HAV	85	99.87	
<b>TMC</b>											
KV6PW	K6XV3+/512M	VIA MVP3	Socket 7	0/3	4/3/1/2x	100	ATX	HU66	52	61.10	
KV7PW	K6XV3+/512Kb	VIA MVP3	Socket 7	0/3	4/3/1/2x	100	ATX	HU66	55	64.62	
KV8PW	K6BV3+/512Kb	VIA MVP3	Socket 7	0/3	4/3/1/2x	100	ATX	HU66	52	61.10	
M04PW	M15VP4/1Mb	VIA MVP4	Socket 7	0/3	4/3/0/2x	100	MATX	HAVU66	67	78.72	
NDGPPW	TK7VG	VIA KX133	Slot A	0/3	5/1/1/4x	200	ATX	HU66	95	111.62	

(A)udio, (V)ideo, (S)CSI, (L)AN, (H)ardware monitor, (R)aid Port, (U)DMA 33/66/100

## Processors

\*The price of processors is very volatile, please check www.dabs.com to confirm prices\*

quicklink	AMD (OEM)	Level 2 Cache	Socket/Slot	Bus Speed	ex VAT	inc VAT
FW0PW	K6-2 With 3D Now! 500Mhz	0Kb	Socket 7	100Mhz	35	41.12
KLGPW	K6-2 With 3D Now! 533Mhz	0Kb	Socket 7	97Mhz	40	47.00
L52PW	K6-2 With 3D Now! 550Mhz	0Kb	Socket 7	100Mhz	52	61.10
NC1PW	Duron 600	64Kb	Socket A	200Mhz	59	69.32
NC2PW	Duron 650	64Kb	Socket A	200Mhz	74	86.95
NC3PW	Duron 700	64Kb	Socket A	200Mhz	108	126.90
NC4PW	Duron 750	64Kb	Socket A	200Mhz	131	152.92
FW8PW	Athlon™ 700Mhz	512Kb	Slot A	200Mhz	120	141.00
NW8PW	Athlon™ 700Mhz	256Kb	Socket A	200Mhz	120	141.00
JKHPW	Athlon™ 750Mhz	512Kb	Slot A	200Mhz	140	164.50
NWCPW	Athlon™ 750Mhz	256Kb	Socket A	200Mhz	140	164.50
JYXPW	Athlon™ 800Mhz	512Kb	Slot A	200Mhz	180	211.50
NWDPW	Athlon™ 800Mhz	256Kb	Socket A	200Mhz	180	211.50
KF7PW	Athlon™ 850Mhz	512Kb	Slot A	200Mhz	239	280.82
NWFPW	Athlon™ 850Mhz	256Kb	Socket A	200Mhz	239	280.82
LD3PW	Athlon™ 900Mhz	512Kb	Slot A	200Mhz	318	373.65
NWGPW	Athlon™ 900Mhz	256Kb	Socket A	200Mhz	318	373.65
LD4PW	Athlon™ 950Mhz	512Kb	Slot A	200Mhz	425	499.37
NWHPW	Athlon™ 950Mhz	256Kb	Socket A	200Mhz	425	499.37
LD5PW	Athlon™ 1Ghz	512Kb	Slot A	200Mhz	599	703.82
NWJPW	Athlon™ 1Ghz	256Kb	Socket A	200Mhz	599	703.82
<b>INTEL (BOXED)</b> Pentium is a registered trademark and MMX and Celeron are trademarks of Intel Corporation						
All Intel processors come retail packed with fan, heatsink.						
K51PW	Celeron 533	128Kb	Socket 370	66Mhz	65	76.39
MF1PW	Celeron 533A	128Kb	FC-PGA	66Mhz	66	77.55
M4FPW	Celeron 566	128Kb	FC-PGA	66Mhz	77	90.47
M4GPPW	Celeron 600	128Kb	FC-PGA	66Mhz	93	109.27
M4HPW	Celeron 633	128Kb	FC-PGA	66Mhz	112	131.60
M2FPW	Celeron 667	128Kb	FC-PGA	66Mhz	137	160.97
NBSPW	Celeron 700	128Kb	FC-PGA	66Mhz	154	180.95
KFPWP	Pentium III 667EB	256Kb	FC-PGA	133Mhz	156	183.30
KFPWP	Pentium III 700E	256Kb	FC-PGA	100Mhz	182	213.85
KGBPW	Pentium III 733EB	256Kb	FC-PGA	133Mhz	182	213.85
KGBPW	Pentium III 750EB	256Kb	Slot 1	100Mhz	215	252.62
KHDPW	Pentium III 750EB	256Kb	FC-PGA	100Mhz	215	252.62
KHFPW	Pentium III 800E	256Kb	Slot 1	100Mhz	235	276.12
KHFPW	Pentium III 800E	256Kb	FC-PGA	100Mhz	235	276.12
KHFPW	Pentium III 800EB	256Kb	Slot 1	133Mhz	235	276.12
KHLPW	Pentium III 800EB	256Kb	FC-PGA	133Mhz	235	276.12
L6BPW	Pentium III 850E	256Kb	Slot 1	100Mhz	369	433.57
L6CPW	Pentium III 850E	256Kb	FC-PGA	100Mhz	369	433.57
L6DPW	Pentium III 866EB	256Kb	Slot 1	133Mhz	375	440.62
L6FPW	Pentium III 866EB	256Kb	FC-PGA	133Mhz	375	440.62
L6GPW	Pentium III 933EB	256Kb	Slot 1	133Mhz	535	628.62
L6HPW	Pentium III 933EB	256Kb	FC-PGA	133Mhz	535	628.62

## SCSI Hard Discs

quicklink	IBM Ultrastar	Part Code	Capacity (Gb)	Access (ms)	Cache	RPM	ex VAT	inc VAT
FHNPW	18ES U	DNES-309170	9.1	7	2Mb	7200	150	176.25
FHSPW	18ES U	DNES-318350	18.2	7	2Mb	7200	185	217.37
FHTPW	18ES UW	DNES-318350	18.2	7	2Mb	7200	185	217.37
FHPWP	18ES U2W	DNES-318350	18.2	7	2Mb	7200	185	217.37
JF7PW	36LP Ultra 160/m	DPSS-309170	9.1	6.8	4Mb	7200	165	193.87
JF9PW	36LP Ultra 160/m	DPSS-318350	18.3	6.8	4Mb	7200	242	284.35
FHZPW	18LZX U2W	DRYS-9	9.1	4.9	2Mb	10000	235	276.12
FJ1PW	18LZX U2W	DRHS	18.3	4.9	2Mb	10000	330	387.75
JFGPW	36LZX Ultra 160+	DDYS-T19070	9.1	4.9	4Mb	10000	222	260.85
JFKPW	36LZX Ultra 160+	DDYS-T18350	18.3	4.9	4Mb	10000	335	393.62
<b>SEAGATE</b>								
JG0PW	Barracuda 18XL U	ST39216N	9.2	5.9	2Mb	7200	159	186.82
JG6PW	Barracuda 18XL Ultra 160/m	ST39236LW	9.2	5.9	1Mb	7200	159	186.82
JGBPW	Barracuda 18XL Ultra 160/m	ST39236LWV	9.2	5.9	4Mb	7200	165	193.87
JGGPW	Barracuda 18XL U	ST318416N	18.4	5.9	2Mb	7200	239	280.82
JGHPW	Barracuda 18XL UW	ST318416V	18.4	5.9	2Mb	7200	239	280.82
JGNPW	Barracuda 18XL Ultra 160/m	ST318436LW	18.4	5.9	2Mb	7200	239	280.82
JGPPW	Barracuda 18XL Ultra 160/m	ST318436LWV	18.4	5.9	4Mb	7200	245	287.87
FFFPW	Barracuda 36 U2W	ST136475LW	36.4	6.9	1Mb	7200	505	593.37
JGSPW	Cheetah 18XL Ultra 160/m	ST318404LW	18.4	5.2	4Mb	10000	360	423.00
JH6PW	Cheetah 36LP Ultra 160/m	ST336704LW	36.7	5.2	4Mb	10000	680	799.00
JH8PW	Cheetah 36LP Ultra 160/m	ST336704LWV	36.7	5.2	16Mb	10000	685	804.87
JHCPW	Cheetah 73 Ultra 160/m	ST173404LW	73.4	5.6	4Mb	10000	1150	1351.25
JHDPW	Cheetah 73 Ultra 160/m	ST173404LWV	73.4	5.6	16Mb	10000	1200	1410.00

## IDE Hard Discs

quicklink	FUJITSU	Part Code	Capacity	Interface	Access	Cache/RPM	ex VAT	inc VAT
N1WPW	PicoBird 15	MFP3102AT	10.2					

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### Removable Drives

quicklinx	IOMEGA	Capacity	Interface	Internal	inc vat	External	inc vat
FJWPW	Zip 250	250Mb	SCSI	-	-	95	111.62
FJVPW	Zip 250	250Mb	Parallel	-	-	95	111.62
FJZPW	Zip 250 Atapi	250Mb	EIDE	99	116.32	-	-
HQBPW	Zip 250 USB	250Mb	USB	-	-	109	128.07
HQ7PW	PCMCIA Adaptor	-	-	-	-	25	29.37
FK3PW	Zip2000 Kit (w.software)	100Mb	Parallel	-	-	69	81.07
FK4PW	Zip 250 Pro Kit	250Mb	Parallel	-	-	115	135.12
FJTPW	Zip	100Mb	USB	-	-	79	92.82
FJMPW	Zip	100Mb	SCSI/Parallel	-	-	63	74.02
FJYPW	Jaz 2Gb	2Gb	SCSI	205	240.87	-	-
FJXPW	Jaz 2Gb	2Gb	SCSI	-	-	199	233.82
FK0PW	Click PC Card Drive	40Mb	PCMCIA	-	-	119	139.82
FK1PW	Click Plus Mobile Drive	40Mb	Parallel	-	-	125	146.87

### Removable Drive Media

quicklinx	IOMEGA	ex vat	inc vat	quicklinx	IOMEGA	ex vat	inc vat
CCTPW	Zip 100Mb	7	8.22	CCVPW	Jaz 1Gb	55	64.62
CD0PW	Zip 100Mb 10 Pack	54	63.45	CCZPW	Jaz 1Gb 3 pack	149	175.07
CD9PW	Zip 250Mb	12	14.10	CD1PW	Jaz 2Gb	65	76.37
JC9PW	Zip 250Mb 4 Pack	44	51.70	CD2PW	Jaz 2Gb 3 pack	149	175.07

### Tape Drives

HP	Capacity	quicklinx	Internal	ex VAT	inc vat	quicklinx	External	ex VAT	inc vat
Colorado 8Gb	4/8Gb	9H3PW	IDE	131	1153.92	9H4PW	IDE	159	186.82
Colorado 14Gb	7/14Gb	H0FPW	IDE	157	184.47	H0GFW	IDE	189	222.07
Colorado 20Gb	10/20Gb	H0HPW	IDE	168	197.40	H0KFW	IDE	198	237.65
SureStore 8 DAT	4/8Gb	9GNPW	SCSI	409	480.57	9GPPW	SCSI	501	588.67
SureStore 24 DAT	12/24Gb	9GVPW	SCSI	561	659.17	9HNPW	SCSI	645	757.87
SureStore DAT40	20/40Gb	9HPPW	SCSI	723	849.52	H0RPW	SCSI	805	945.87
<b>ONSTREAM</b>									
15/30Gb ADR	15/30Gb	J57PW	IDE	131	153.92	J58PW	Parallel	249	292.57
15/30Gb ADR	15/30Gb	J59PW	SCSI	309	363.07	MN9	USB	249	292.57
25/50Gb ADR	25/50Gb	J5BPW	SCSI	435	511.12				
30Gb ADR	30Gb								
<b>SEAGATE</b>									
Homet Travan	10/20Gb	9JMPW	IDE	169	198.57	9JNPW	SCSI	295	346.62
Homet Travan	10/20Gb								
<b>SONY</b>									
SDT-7000 DDS2	4/8Gb	9JRPW	SCSI	335	393.62	9JSPW	SCSI	425	499.37
SDT-7200 DDS2	4Gb								
SDT-9000 DDS3	12/24Gb	9JTPW	SCSI	439	515.82	9K2PW	SCSI	475	558.12
SDT-11000 DDS4	20/40Gb	M9RPW	SCSI	655	769.62	9JVPW	SCSI	555	652.12

### CD-ROM Drives

quicklinx	AOPEN	Interface	Speed	Int/Ext	Exc Vat	Inc Vat
9QPPW	CD940E OEM	IDE	Forty	Int	26	30.55
9QBWP	CD948E OEM	IDE	Forty Eight	Int	25	31.72
HSCPW	CD952E OEM	IDE	Fifty Two	Int	27	31.72
LORPW	CD952E Retail	IDE	Fifty Two	Int	29	34.07
<b>ASUSTEK</b>						
9PTPW	CD-S400 40	IDE	Forty	Int	29	34.07
9PVPW	CD-S500 50	IDE	Fifty	Int	34	39.95
<b>CREATIVE LABS</b>						
HSDPW	52x DEM	IDE	Fifty Two	Int	29	34.07
<b>MITSUMI</b>						
HSEPW	FX-4820 OEM	IDE	Forty Eight	Int	27	31.72
9PRPW	FX-4820 Retail	IDE	Forty Eight	Int	29	34.07
<b>PHILIPS</b>						
9N6PW	PCA40x Retail	IDE	Forty	Int	30	37.60
9N7PW	PCA48x Retail	IDE	Forty Eight	Int	33	44.65
KLCPW	PCA52x Retail	IDE	Fifty Two	Int	38	44.65
<b>PLEXTOR</b>						
9MVVP	UltraPlex PX40TSi DEM	SCSI	Forty	Int	49	57.57
9MVWP	UltraPlex PX40TSi Retail	SCSI	Forty	Int	50	58.75
9MXPW	UltraPlex PX40TSe Retail	SCSI	Forty	Ext	85	99.87
<b>TEAC</b>						
HSPW	CD-S40E OEM	IDE	Forty	Int	26	30.55
HSYPW	CD-S40EK Retail	IDE	Forty	Int	29	34.07
9XPW	CD-S32S OEM	SCSI	Thirty Two	Int	43	50.52

### CD-Recordable & CD-ReWriteable Drives

quicklinx	HP SURESTORE	Interface	Speed	Int/Ext	S/W	SCSI	Media	Ex VAT	Inc VAT
KOZPW	8250i CD-RW	IDE	24r 4w 4rw	Int	Yes	n/a	1 CDR 1 CD-RW	105	123.37
9R0PW	8210e CD-RW	USB	6r 4w 4rw	Ext	Yes	n/a	1 CDR 1 CD-RW	165	193.87
HJRPW	9110i CD-RW	IDE	32r 8w 4rw	Int	Yes	n/a	1 CDR 1 CD-RW	135	158.62
HPOPW	9210i CD-RW	SCSI	32r 8w 4rw	Int	Yes	No	1 CDR 1 CD-R	148	173.90
HP1PW	9210e CD-RW	SCSI	32r 8w 4rw	Ext	Yes	No	1 CDR 1 CD-RW	202	237.35
KYVPW	9310i CD-RW	IDE	32r 10w 4rw	Int	Yes	n/a	1 CDR	148	173.90
<b>IOMEGA</b>									
K3ZPW	ZIP CD	USB	6r 4w 4rw	Ext	Yes	n/a	2 CDR	165	193.87
P07PW	ZIP CD	IDE	32r 8w 4rw	Int	Yes	n/a	1 CDR	145	170.37
<b>CREATIVE</b>									
L6MPW	Blaster CD-RW 8432	IDE	32r 8w 4rw	Int	Yes	Yes	1CDRW 1CDR	125	146.87
<b>MITSUMI</b>									
9S9PW	CR4804TE	IDE	24r 4w 4rw	Int	Yes	N/a	1 CDR 1 CD-RW	109	128.07
KNLPW	CR4804TU	USB	8r 4w 4rw	Ext	Yes	N/a	1 CDR 1 CD-RW	149	175.07
<b>PHILIPS</b>									
HH5PW	PCRW404K	IDE	32r 4w 4rw	Int	Yes	n/a	1 CDR 1CDRW	105	123.37
KSNPW	PCRW804K	IDE	32r 8w 4rw	Int	Yes	n/a	1 CDR 1 CD-RW	120	141.00
HH7PW	PCRW464K	USB	6r 4w 4rw	Ext	Yes	n/a	1 CDR 1 CD-RW	192	225.60
<b>PLEXTOR PLEXWRITER</b>									
HTXPW	PX-W8432Ti Retail	IDE	32r 8w 4rw	Int	Yes	n/a	1 CDR 1CDRW	130	152.75
K96PW	PX-W124Tsi Retail	SCSI	32r 12w 4rw	Int	Yes	No	1 CDR 1CDRW	199	233.82
KXZPW	PX-W124Tsi OEM	SCSI	32r 12w 4rw	Int	No	No	No	188	220.90
K97PW	PX-W124Tse Retail	SCSI	32r 12w 4rw	Ext	Yes	No	1 CDR 1CDRW	240	282.00
INVPW	PX-W1210ta Retail	IDE	32r 12w 10rw	Int	Yes	No	1CDR 1CDRW	189	222.07
<b>RICOH</b>									
MBMPW	MP780A-DP	IDE	24r 8w 4rw	Int	Yes	n/a	1CDR 1CDRW	118	138.65
KX1PW	MP9060A 4xDVD-ROM	IDE	24r 6w 4rw	Int	Yes	n/a	No	160	188.00
<b>NYXPW</b>									
SDR1002	4xDVD24r4w4rw	Int	Yes	n/a	No	No	120	141.00	
<b>YAMAHA</b>									
JXHPW	CDRW 8424E-Bulk	IDE	24r 8w 4rw	Int	No	n/a	No	115	135.12
K3BPW	CDRW 8424E-VK	IDE	24r 8w 4rw	Int	Yes	n/a	1 CDR 1 CD-RW	127	149.22
JBPW	CDRW 8424S-Bulk	SCSI	24r 8w 4rw	Int	No	No	No	123	144.52
K3CPW	CDRW 8424S-VK	SCSI	24r 8w 4rw	Int	Yes	No	1 CDR 1 CD-RW	148	173.90
K3DPW	CDRW 8424S-VK-KIT	SCSI	24r 8w 4rw	Int	Yes	Yes	1 CDR 1 CD-RW	166	195.05
K3FPW	CDRW 8424SX-VK	SCSI	24r 8w 4rw	Ext	Yes	No	1 CDR 1 CD-RW	184	216.20
K3GPW	CDRW 8424SX-VK Kit	SCSI	24r 8w 4rw	Ext	Yes	Yes	1 CDR 1 CD-RW	210	246.75
K3HPW	CDRW 8424SX-VK (MAC)	SCSI	24r 8w 4rw	Ext	Yes	No	1 CDR 1 CD-RW	193	226.77
NDMPW	CRW-8824E-Bulk	IDE	24r 8w 8rw	Int	No	n/a	No	141	165.67
NDNPW	CRW-8824E-VK	IDE	24r 8w 8rw	Int	Yes	n/a	1 CDR 1CDRW	150	176.25
NDOPW	CRW-8824S-Bulk	SCSI	24r 8w 8rw	Int	No	No	No	154	180.95
NDRPW	CRW-8824S-VK	SCSI	24r 8w 8rw	Int	Yes	No	1 CDR 1 CD-RW	163	191.52
NDSPW	CRW-8824S-VK-KIT	SCSI	24r 8w 8rw	Int	Yes	Yes	1 CDR 1CDRW	180	211.50
NDTPW	CRW-8824SX-VK	SCSI	24r 8w 8rw	Ext	Yes	No	1 CDR 1 CD-RW	201	236.17
NDVPW	CRW-8824SX-VK-KIT	SCSI	24r 8w 8rw	Ext	Yes	Yes	1 CDR 1 CD-RW	226	265.55
NDYPW	CRW-8824SX-VK-MAC	SCSI	24r 8w 8rw	Ext	Yes	No	1 CDR 1 CD-RW	208	244.40

### DVD-ROM & DVD-RAM Drives

quicklinx	AOPEN	Interface	Speed	Int/Ext	s/w	SCSI	media	Exc Vat	Inc Vat
HV3PW	DVD-1040Pro Retail	IDE	10x DVD, 40x CD	Int	n/a	n/a	n/a	Call	Call
9VVPW	DVD-520S Retail	SCSI	2r, 1w, 20x CD	Int	Yes	Yes	1x5.25"	Call	Call
<b>CREATIVE LABS</b>									
9V8PW	PC-DVD Encore 6x DXR3	IDE	6x DVD, 24 xCD, mpeg ca	Int	Yes	Yes	n/a	Call	Call
<b>PANASONIC</b>									
9YVPW	LFD103E DVD-RAM	SCSI	DVD, 32x CD	Int	Yes	No	n/a	Call	Call
<b>PHILIPS</b>									
KQVPW	PCD8220 DVD Re	IDE	8x DVD, 32x CD	Int	n/a	n/a	n/a	Call	Call
<b>SONY</b>									
9VGPW	SDM1201B OEM	SCSI	DVD, 32x CD	Int	n/a	No	n/a	Call	Call
HV7PW	SDW1110F1	IDE	2r, 1w, 16x CD	Int	Yes	No	n/a	Call	Call
L74PW	SDM1300	IDE	8x DVD, 40x CD	Int	n/a	n/a	No	Call	Call
SDR1002		IDE	4.8xDVD 24r 4w 4rw	Int	Yes	n/a	No	Call	Call



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The only CD-RW that writes at 4X through USB, parallel port, PC Card and IEEE 1394 (FireWire/iLink)

- Also available CD-ROM or DVD Drive
- CD-RW also for iMac (USB only)
- Make your own CD's on CD-R media
- 4X CD-ReWritable. ReWrite your own CD-RW's
- Ideal for CD creation, backup, archiving and exchanging data
- Everything you need to get up and running (CD-Mastering and UDF software, CD-R, CD-RW disk etc.)
- Choice of connectivity; PCMCIA, Parallel and/or USB (cables required)

**EXTERNAL STORAGE FOR LAPTOPS & NOTEBOOKS**

The worlds smallest external CD-RW Recorder

- Also available CD-ROM or DVD PCMCIA Drive, perfect for mobile use
- Rechargeable battery with 6 hour life, automatic charging and sleepmode
- CD Traveller, 24X read (110 ms)
- DVD Traveller, 20X read (140 ms) / 4X DVD optional MPEG-2 Decoder PC Card for Windows '95/'98 & NT to run DVD movies
- Choice of connectivity; PCMCIA, Parallel, USB and/or IEEE 1394 (cables not included).

**DigiTheatre Complete Home-Cinema Speaker System**

- Dolby Digital audio (AC3) for DVD movies
- Dolby Pro Logic sound from any VCR, TV or PC
- Includes: audio decode unit with LCD display and remote control; 5 dedicated, amplified speakers plus sub-woofer • 175 RMS power

quicklink **G60PW** **£175** (£205.62 inc VAT)

**Sirocco Spirit** quicklink **HYBPW** **£112** (£131.80 inc VAT)

- HiFi Quality Active Speakers
- Two inputs - play CDs AND games
- Two speakers with integrated 50 RWS amplifiers & Aulax cones
- MDF cabinets with removable grilles
- Dynamic Virtual Sub Technology™

**Sonic Fury Next-Gen High Performance Sound Card**

- DSP-accelerated MP3 playback, 3D audio or MIDI
- Six channel output for Dolby Digital, music and games
- Supports all major audio standards
- Extensive software bundle

quicklink **P19PW** **£65** (£76.37 inc VAT)

**DigiTheatre DTS High performance DTS Home cinema speaker system**

- Integrated DTS, Dolby Digital & Pro Logic decoder, 6-speaker system & integrated amplifier
- Connects to DVD players, TV/VCRs
- 175w RMS

quicklink **TKPW** **£330** (£387.75 inc VAT)

**FREECOM PORTABLE AND TRAVELLER SERIES**

NR.	Description	Ex VAT	Inc VAT	quicklink
14420	Portable Desktop 4X4X24X CD-RW	£179	£210.32	N1PPW
14857	Portable Desktop 12X40X DVD-ROM	£99	£116.32	P16PW
14348	Portable Desktop 48X CD-ROM	£65	£76.37	L62PW
13684	Traveller Light 24X CD-ROM PCMCIA full kit	£89	£104.57	903PW
12805	Traveller 4X20 DVD inc. PCMCIA cable + DVD SoftWare	£179	£210.32	MN2PW
14458	Traveller Light 4X4X20 CDRW PCMCIA full kit	£225	£264.37	M6DPW
14451	Traveller Light 4X4X20 CDRW USB (Win98) full kit	£225	£264.37	M6FPW
14324	FreeCom CD-RW Internal IDE 4X4X32X	£100	£117.50	K55PW
14480	FreeCom CD-RW Internal IDE 8X4X32X	£119	£139.82	MFJPW
12544	Parallel Cable for use with Desktop & Traveller Series	£25	£29.37	CNMPW
12545	PCMCIA Cable for use with Desktop & Traveller Series	£25	£29.37	CNPPW
12775	USB (Win98) cable for use with Desktop & Traveller Series	£35	£41.12	CNPPW
13660	USB Mcc Cable for use with Desktop & Traveller Series (inc. Toast)	£49	£57.57	CNQPW
13552	Firewire Cable 1394 for PC only for use with Desktop & Traveller series	£55	£64.62	JMLPW

[Please Note: All the Traveller Lights have no rechargeable battery packs]

**AWARD WINNING MONITORS**

**ProVista E55** quicklink **NB6PW** **£55** (£135 inc VAT)

17" FST, 0.27mm, 1280 X 1024 @ 60Hz Speaker optional

**MicroScan E75** quicklink **NBFPW** **£75** (£163 inc VAT)

17" FST, 0.26mm • 1600 x 1200 @ 65Hz 75Hz USB hub and speaker option • TCO '99 App.

**MicroScan E66** quicklink **NORPW** **£228** (£267.90 inc VAT)

E66 19" FST, 0.26mm, 1600 x 1200 @ 75Hz USB hub, speaker options MSEG6 -

**MicroScan G500** quicklink **K26PW** **£127** (£149.22 inc VAT)

15" FD, "Trinitron"® 0.25mm AGP, 1280x 1024 @ 60Hz

**MicroScan G700/G710** quicklink **K27PW** **£205** (£240.87 inc VAT)

17" 1600 x 1200 @ 65Hz FD "Trinitron"® 0.24mm AGP TCO '99 Approved

**MicroScan G710** quicklink **KLPPW** **£229** (£269.07 inc VAT)

17" FD "Trinitron"®, 0.24mm AGP, 1782 x 1344 @ 75Hz TCO '99 Approved

**MicroScan G910** quicklink **KW0P** **£345** (£405.37 inc VAT)

19" SLT, 0.26mm, 1600 x 1200 @ 75 Hz, G66 E285 (£334.87 inc VAT)

**MicroScan G66** quicklink **7D5PW** **£285** (£334.87 inc VAT)

19" SLT, 0.26mm, 1600 x 1200 @ 75 Hz, TCO'99 approved

**MicroScan G1000** quicklink **KW1PW** **£555** (£652.12 inc VAT)

21" SLT, 0.26mm, 1920 x 1440 @ 75 Hz, TCO'99 approved

All ADI monitors are covered by 3 year on site warranty (Mainland UK only)

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## LCD panels

quicklink	ADI	ex VAT	inc VAT
M20PW	A600	15.0	1024 x 768 599 703.82
KT2PW	A610	15.0	1024 x 768 699 821.32
709PW	Microscan 9L	18.0	1280 x 1024 1845 2167.87
<b>BELINEA</b>			
7NFPW	10 15 20	15.1	1024 x 768 639 750.82
7NKPW	10 18 10	18.0	1280 x 1024 1799 2113.82
<b>CTX</b>			
7CPPW	PV751	15.1	1024 x 768 629 739.07
<b>DABS</b>			
7C6PW	15RX-AH	15.0	1024 x 768 499 586.32
<b>Iiyama Pro Lite</b>			
HLLPW	TXA-3612JT	14.1	1024 x 768 649 762.57
NWRPW	TXA 3813	15.0	1024 x 768 655 769.62
HTMPW	TXA-3822JT	15.0	1024 x 768 799 938.82
LG8PW	TXA-4634HT	18.0	1985 2332.87
<b>MITSUBISHI</b>			
MX6PW	LXA-580W	15.0	1024 x 768 609 715.57
7H3PW	LCD-620	18.0	1729 2031.57
<b>NEC</b>			
7K7PW	LCD	20.1	1280 x 1024 3349 3935.07
<b>PHILIPS Brilliance</b>			
LO7PW	150B	15.0	655 769.62
LOBPW	150P	15.0	649 762.57
7G5PW	181AS	18.1	1829 2149.07
<b>SAMSUNG</b>			
7JSPW	SM700TFF	17.0	1599 1878.82
<b>SONY</b>			
L88PW	SDM-N50ST	15.1	1224 x 768 979 1150.32
7JKPW	CPD-1181	18.0	1280 x 1024 1849 2172.57

## Video Cards

quicklink	ASUS	MB Chip	exVat	incVat
72WPW	V7700 GF2 GTS Pure	32 GF2	229	269.07
<b>ATI</b>				
DGPPW	Xpert 2000 OEM	16 R1	39	45.82
DGWPW	Xpert 2000 TvOut OEM	16 R1	45	52.87
LOSPW	Rage Fury MAXX	64 R1	116	136.30
L95PW	Rage Fury Pro VIVO OEM	32 R1	68	79.90
KW4PW	Xpert 2000 RP	32 R1	53	62.27
DH1PW	All in Wonder 128 OEM	16 R1	95	111.62
L38PW	All in Wonder 128 OEM	32 R1	108	126.90
<b>CREATIVE LABS</b>				
DLDPW	Blaster TNT M64	32 TN	69	81.07
KNNPW	Blaster TNT Vanta PCI	32 TN	57	66.97
J4RPW	GE Force Annihilator Pro	32 GF	159	186.82
NOXPW	GE Force GTS	32 GF2	183	215.02
<b>DIAMOND</b>				
KMHPW	Viper II Z200 RP	32	95	111.62
DM5PW	Stealth III S540 RP	32 S4	54	63.45
<b>ELSA</b>				
N54PW	Gladiac GeForce2	32 GF256	184	216.20
<b>GUILLEMOT</b>				
DNGPW	3D Prophet TV-out	32 GF	158	185.65
NYQPW	3D Prophet II GTS	32 GF2	285	334.87
<b>MATROX</b>				
DPSPW	Millenium G400 RP	32 G4	109	128.07
DPTPW	Millenium G400 MAX RP	32 G4	129	151.57
<b>STB</b>				
DKKPW	Voodoo 3 2000	16 V3	59	69.32
DKMPW	Voodoo 3 3000 TvOut	16 V3	75	88.12
DKNPW	Voodoo 3 3500	16 V3	99	116.32
MMPW	Voodoo 5 5000	64 V5	179	210.32
<b>VIDEOLOGIC</b>				
DJTPW	Grafixstar 650 OEM	8 P2	30	35.25
KG2PW	Grafixstar 670	16 S4	39	45.82
KZHPW	Grafixstar 670 PCI	16 S4	39	45.82
DJSPW	Neon 250	32 PVR2	75	88.12

All cards listed are AGP. Check out [www.dabs.com](http://www.dabs.com) for PCI.  
RP = Rage Pro TN = TNT II R1 = Rage 128  
RT = Riva TNT II S3 = S3 GF = GeForce 256  
G4 = G400 V3 = Voodoo 3 P2 = Permedia 2

## Video Conferencing

quicklink	CREATIVE LABS	ex VAT	inc VAT
MVN	WebCam GO Plus USB	99	116.32
H21PW	WebCam GO USB	85	99.87
82BPW	VideoBlaster WebCam III USB	46	54.05
<b>KODAK</b>			
823PW	DVC325 Desktop USB	57	66.97
<b>PHILIPS</b>			
80XPW	PCVC675K Vestra USB Webcam	39	45.82
80YPW	PCVC680K Vestra Pro USB Webcam	45	52.87
<b>VIDEOLOGIC</b>			
80GPW	HomeCam USB	55	64.62

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Display Products



### Diamond Scan 70

Setting a new standard for cost/performance, this 17" display uses MICROFILTER™ CRT technology to provide extra high brightness and contrast.

£145  
(£170.37 inc VAT)

quicklink 7GTPW



### Diamond Plus 73

The NEW 17" differs from the Pro 720 in that it has a lower horizontal refresh rate at 70kHz still allowing an addressable refresh rate of 1280 x 1024 @ 65Hz. It also has a fixed signal cable.

£175  
(£205.62 inc VAT)

quicklink MVVP



### Diamond Pro 720

Mitsubishi's NEW 17" combines NF screen & higher precision. Combining a completely flat CRT with an optimally designed inner curvature, delivering optically correct images.

£220  
(£258.50 inc VAT)

quicklink L4XPW



### Diamond Plus 91

This award winning Mitsubishi Diamondtron NF™ display with its 100% flat front CRT offers a perfect distortion-free image at an affordable price.

£315  
(£370.12 inc VAT)

quicklink JZDPW



### Diamond Plus 200

Perfectly flat from edge-to-edge, Mitsubishi's Diamondtron NF™ display gives you pixel-perfect image reproduction at a new level of graphic precision.

£552  
(£648.60 inc VAT)

quicklink KB3PW

Turn on your imagination

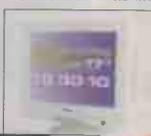
## Belnea

MONITORS BY MAXDATA



**Belnea 10 20 10**  
• 15" FST monitor  
• 1024 x 768 maximum resolution  
• 0.28mm dot pitch  
• 3 year swap out warranty  
• MPR II compliant  
• Easy to use on-screen menu

£82 (€96.35)



**Belnea 10 30 10**  
• 17" FST monitor  
• 1280 x 1024 maximum resolution  
• 0.27mm dot pitch  
• 3 year swap out warranty  
• TCO'99 compliant  
• Easy to use on-screen menu

£129 (€151.57)



**Belnea 10 60 30**  
• 19" FST monitor  
• 1600 x 1200 maximum resolution  
• 0.26mm dot pitch  
• 3 year swap out warranty  
• TCO'99 compliant  
• Easy to use on-screen menu

£203 (€238.52)

Prices shown in brackets are inclusive of VAT  
All monitors include 3 years on-site exchange warranty (except for model 102010 which includes 3 years warranty with first year on site exchange)

## Iiyama



**VM-Pro411** £209 (€245.57)

- 17" DiamondTron NF
- Ultra-fine 0.25ag pitch
- Max resolution of 1280x1024@80Hz
- USB & speaker hub available
- Comprehensive user controls

quicklink N6XPW



**S700JT1** £149 (€175.07)

- 17" 0.28mm FST
- Up to 1280x1024@65Hz
- On-Screen Display Menu
- Anti-Reflect, Anti-Static screen coating
- TCO '95

quicklink K3JPW



**VM-Pro450** £379 (€445.32)

- 19" 0.25mm DiamondTron NF
- Up to 1800 x 1440 @80Hz
- 27-115kHz horizontal frequency
- All CE Ergonomic, safety and environmental approvals
- Plug & play compatible

quicklink 7NVPW

Prices shown in brackets are inclusive of VAT

All Iiyama monitors are now with a 3 year on-site warranty as standard

## Monitors

quicklink	ADI	ex VAT	inc VAT
7CYPW	ProVista E33	14"	CRT 0.28 79 92.82
K26PW	G500	15"	FD 0.25 127 149.22
N8CPW	ProVista E44	15"	FST 0.28 95 111.62
K27PW	G700	17"	FD 0.24 205 240.87
KLPWP	M/S G710	17"	FST 0.24 229 269.07
N8DPW	ProVista E55	17"	FST 0.28 135 158.62
705PW	M/S G66	19"	SLT 0.26 285 334.87
KW0PW	M/S G910	19"	TT 0.24 345 405.37
KW1PW	M/S G1000	21"	FST 0.26 555 652.12
<b>BELINEA</b>			
7N1PW	10 40 10	14"	CRT 0.28 75 88.12
7N5PW	10 20 10	15"	FST 0.28 82 96.35
7N7PW	10 20 15	15"	- 0.28 86 101.05
KQGWP	10 30 20	17"	- 0.27 188 220.90
7N6PW	10 30 10	17"	FST 0.27 129 151.57
7N3PW	10 30 30	17"	FST 0.27 150 176.25
7N4PW	10 30 40	17"	FST 0.26 139 163.32
L42PW	10 60 30	19"	- 0.26 203 238.52
7N8PW	10 60 60	19"	FST - 259 304.32
7NCPW	10 80 60	21"	FST 0.25 480 564.00
<b>CTX</b>			
7C7PW	VL500	15"	FST 0.28 92 108.10
7C6PW	MS500	15"	FST 0.28 127 149.22
7C8PW	VL700	17"	FST 0.28 125 146.87
7C9PW	VL10ST	17"	S/CRT 0.26 179 210.32
7C1PW	VL950T	19"	FST 0.26 230 270.25
7C1PW	VL950ST	19"	S/CRT 0.26 230 270.25
7C1PW	EX1200	21"	FST 0.26 489 574.57
PW	EX1300	21"	FST 0.26 555 652.12
<b>FORMAC PRONITRON</b>			
7DPPW	17/250	17"	FST 0.27 175 205.62
LLKWP	17/300	17"	FST 0.27 145 170.37
7DPPW	17/600	17"	OT 0.25 189 222.07
N6WPW	19/400	19"	OT 0.25 289 339.57
LQVPW	19/600	19"	FDT 0.24 325 322.07
LLMPW	21/750	21"	FDT 0.26 549 645.07
K3CPW	21/800	21"	FDT 0.24 649 762.57
7DHPW	24/600	24"	TT 0.27 1029 1209.07
<b>HANSOL</b>			
7C1PW	500A	15"	FST 0.28 85 99.87
7C0PW	501P	15"	FST 0.28 90 105.75
7C5PW	710A	17"	FST 0.28 122 143.35
HDDPW	701P	17"	FST 0.26 136 159.80
KCMPPW	710D	17"	FST 0.25 165 193.87
7C2PW	900P	19"	FST 0.26 214 251.45
<b>Iiyama</b>			
7NLPW	VM-350	15"	FST 0.28 129 151.57
K3JPW	S700JT1	17"	0.28 149 175.07
J8XPW	VM-404	17"	FST 0.26 225 264.37
7NZPW	VM-Pro410	17"	DT 0.25 235 276.12
7P5PW	VM-451	19"	FST 0.26 329 386.57
7NVPW	VM-Pro450	19"	NFDT 0.25 379 445.32
7POPW	VM-Pro510	22"	DT 0.27 645 757.87
<b>MITSUBISHI</b>			
7GYPW	DScan 50	15"	FST 0.28 100 117.50
7GTWP	DScan 70	17"	FST 0.25 145 170.37
MVVPW	DPlus 73	17"	- 0.25 175 205.62
L4XPW	OPro 720	17"	- 0.25 220 258.50
JZDPW	OPlus 91	19"	NF 0.25 315 370.12
MW2PW	DPro 920	19"	NF 0.25 390 458.25
KB3PW	DPlus 200	22"	- 0.24 552 648.60
KGXPW	DPro 2040U	22"	NF 0.24 665 781.37
<b>NOKIA</b>			
7E2PW	447X Pro	17"	TT 0.25 235 276.12
K62PW	446 Pro	19"	FDT - 365 428.87
7FCPW	446XS	19"	SFST 0.25 335 393.62
<b>PHILIPS</b>			
7FNPW	1048	14"	CRT 0.28 75 88.12
JM7PW	105S11	15"	FST 0.28 89 104.57
JM6PW	105B11	15"	- 0.27 100 117.50
JM8PW	107S11	17"	FST 0.27 149 175.07
JM9PW	107B10	17"	FST 0.25 185 217.37
7G2PW	109B	19"	XSB 0.26 305 358.37
7FTPW	109S	19"	CRT 0.26 265 311.37
7G4PW	BriL 109MP	19"	CRT 0.26 359 421.82
7FXPW	BriL 201P	21"	CRT 0.26 609 715.57
<b>SAMSUNG</b>			
7JTPW	SM550S	15"	FST 0.28 94 110.45

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Modems

quicklink	3COM	ex VAT	inc VAT
87VPW	56K V90 Faxmodem External	56	65.80
87JPW	56K V90 Voice Faxmodem Int	66	77.55
JYLPW	56K V90 Professional Message	81	95.17
KHWPW	Courier V34 External	159	186.82
<b>DABS</b>			
86JPW	56K V90 Voice Internal	31	36.42
86MPW	56K V90 Voice Internal PCI	15	17.62
86KPW	56K V90 Voice External	35	41.12
86LPW	56K PCMCIA	32	37.60
86NPW	56K Voice USB	27	31.72
<b>CREATIVE</b>			
INPPW	CRTV Modem Blaster 56K EXT	43	50.52
<b>DIAMOND</b>			
885PW	SupraSST 56i Pro PCI OEM	20	23.50
883PW	Supra Express 56K Pro Int OEM	27	31.72
882PW	Supra Express 56K Pro Ext	40	47.00
884PW	Supra Express 56K Memory Ext	58	68.15
KL8PW	SupraMax 56K USB Ext Rp	37	43.47
<b>ELSA</b>			
881PW	Elsa MicroLink 56K Int EXT V90	42	49.35
88VPW	Elsa MicroLink 56K USB	45	52.87
88XPW	Elsa MicroLink 56K MC PCMCIA	98	115.15
88WPW	Elsa MicroLink Office	114	133.95
<b>HAYES</b>			
89PPW	Accura 56k V90 Voice External	75	88.12
<b>MULTITECH</b>			
88DPW	MT5634ZPX 56K Voice Internal	82	96.35
88CPW	MT5634ZPX 56K Voice Int/PCI	79	92.82
888PW	MT5600ZDX 56K External	67	78.72
888PW	MT5634ZBA-USB 56K Voice Ext	85	99.87
88GPW	MT5634MU 56K Portable USB	109	128.07
88FPW	ISI5634PCI/8-GB 56K Bport PCI	729	856.57
885PW	ISI3334/4 M/port 4 V34+ 33k6 Int	399	468.82
886PW	ISI3334/8 M/port 8 V34+ 33k6 Int	665	781.37
<b>XIRCOM</b>			
88XPW	Credit card 56K PCMCIA	115	135.12
894PW	RealPort 56K G/Access PCMCIA	129	151.57
896PW	RealPort 56K V90 CTR21	85	99.87
898PW	RealPort CardBus56K Modem	120	141.00

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### 56K\* Professional Message Modem

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- Integrates V.90 56K\* standard amd x2™ technology
- Stores voice and fax messages when your PC is switched off
- Features Caller ID
- Answerphone and Message Management
- Built-in voice quality speaker & microphone
- Flash ROM memory for easy upgrades

### 56K\* Message Modem

£75 (£88.12 inc VAT)

Includes V.90 56K\* standard and x2™ technology

- Flash ROM memory for future upgrades
- Internet ready
- Compatible at 33,600bps and other modem speeds
- Full Duplex speakerphone
- Remote voice message and fax retrieval

### 56K\* Voice Internal PCI

£44 (£51.70 inc VAT)

The 56K\* Voice Internal PCI is the best value PCI technology voice modem available. Get the best from the Internet, speed up to 56K and benefit from a full suite of professional fax and voicemail! Easy software upgrades and a Lifetime limited warranty ensure your investment for the future.

### 56K Voice/Fax Modem Internal ISA Card

£66 (£77.55 inc VAT)

The 56K Voice/Fax Modem internal represents a great value ISA Modem. You can achieve internet speeds of up to 56K, coupling with full voice and fax software gives you upto 1000 voicemail boxes, flash upgradeable to ensure your investment is protected and backed by 3Com's lifetime limited warranty.

\*Due to varying line conditions, the actual download speeds you experience may be lower. Requires connectivity to an analogue telephone line which is compatible with 56K technology

ISDN Terminal Adaptors

quicklink	3COM	ex VAT	inc VAT
8G7PW	Courier-I ISDN & 33k6 M Int/Ext	195	229.12
<b>ELSA</b>			
BHTPW	Elsa MicroLink ISDN USB	68	79.90
<b>EICON</b>			
BJ4PW	Diva 2.0 PCI	45	52.87
BJ7PW	Diva LAN ISDN Modem	220	258.50
BJ6PW	Diva Terminal Adaptor External	139	163.32
<b>MULTITECH</b>			
BGGPW	128k Internal PCI	35	41.12
BGHPW	128k & 56k PCMCIA	159	186.82
<b>XIRCOM</b>			
BGPPW	CreditCard ISDN PCMCIA	139	163.32
BGQPW	RealPort ISDN Upgrade Kit	115	135.12

Printer Servers

quicklink	BAY NETGEAR	ex VAT	inc VAT
6TVPW	PS110 2 parallel & 1x10/100 RJ45	83	97.52
<b>HP JETDIRECT</b>			
<b>Internal</b>			
6RFPW	J3110A RJ45 EIO	165	193.87
6RGPW	J3111A Combo & LocalTalk EIO	189	222.07
6RHPW	J3112A Token Ring DB9	289	339.57
6RJPW	J3113A 10/100 RJ45 EIO	210	246.75
<b>External</b>			
6RCPW	J2591A Plus Combo	179	210.32
6RLPW	J3263A 300X 10/100	185	217.37
6RKPW	J3264A 500X Token Ring RJ45	315	370.12
6RDPW	J3265A 500X 10/100 3 parallel	215	252.62
6RMPW	J4100A 400N 10/100	255	299.62
6RNPW	J4105A 400N Token Ring DB9	335	393.62
6RPPW	J4106A 400N RJ45	195	233.82
HLNPW	J4102A 170X OfficeConnect	93	111.62

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£185  
(£217.37 inc VAT)

quicklink JM9PW



£89  
(£104.57 inc VAT)

quicklink JM7PW

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- Maximum resolution: 1600x1200@70Hz
- Digital control with OSD plus Customax via USB
- Dimensions: 399 x 410 x 368mm (W x H x D)
- Weight: 14.8Kg • MTBF: 75000 hours (excl CRT)
- Optional multimedia base • TCO '99

#### 105S11 15" CRT

- 15" Shortest footprint in its class
- 0.28mm Dot Pitch • 30 • 60KHz
- Max resolution: 1024 x 768 @ 75Hz
- Digital control with OSD
- Dimensions: 358 x 370 x 379mm (WxHxD)
- Weight 12Kg • MTBF: 75000 hours (excl CRT)
- Optional multimedia base

Quality, Colour Monitors

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quicklink 7C5PW



710P  
£136  
(£159.80 inc VAT)

quicklink HHDPW

- 17" (16" viewable)
- 0.27mm dot pitch
- Digital control
- Max resolution 1280 x 1024
- 85Hz refresh at 1024 x 768
- Deflection 90°
- Plug & Play compatibility
- 3 Year on site warranty

- 17" monitor, (16" viewable)
- 0.26mm dot pitch
- Max resolution 1600 x 1200
- 85Hz refresh at 1280 x 1024
- 3 year on-site warranty
- 5 language on-screen display

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Scanners

quicklinkx	AGFA	ex VAT	inc VAT
7WZPW	SnapScan 1212U	75	88.12
7XGPW	SnapScan Touch	85	99.87
HPZPW	SnapScan 1236 USB	99	116.32
MN0PW	SnapScan e40	125	146.87
MNJPW	SnapScan e50	165	193.87
7XZPW	DuoScan T1200 SCSI	445	522.87
<b>CANON</b>			
J2VPW	Canoscan FB630P Parallel	61	71.67
J7ZPW	Canoscan FB630U USB	69	81.07
L63PW	Canoscan FB636U Silver USB	99	116.32
<b>EPSON</b>			
7T5PW	Perfection 610 USB	90	105.75
7T3PW	Perfection 1200S SCSI	164	192.70
7T4PW	Perfection 1200U USB	134	157.45
7T2PW	Perfection 1200 Photo	179	204.45
JZ0PW	Expression 1600	495	581.62
JZ2PW	Expression 1600 Pro	650	763.75
7T1PW	GT-10000 A3	688	808.40
HX0PW	GT-10000 Pro A3	1313	1542.77
<b>HEWLETT PACKARD</b>			
7S8PW	ScanJet 3300C USB	63	74.02
N75PW	ScanJet 3400C USB	55	64.62
N76PW	ScanJet 4300C USB	78	91.65
N7HPW	ScanJet 5370C	140	164.50
7S8PW	ScanJet 6300C USB/SCSI	220	258.50
7S9PW	ScanJet 6350C USB/SCSI	273	320.77
7S8PW	ScanJet 6390C USB/SCSI	490	575.75
<b>MICROTEK</b>			
L21PW	ScanMaker 3600 USB	64	75.20
K17PW	ScanMaker V6USL	135	158.62
L55PW	ScanMaker X6 USB Advanced	169	198.57
HPPPW	ScanMaker X6 SCSI Advanced	155	182.12
L5ZPW	ScanMaker X12 USL USB	179	210.32
7V5PW	ScanMaker 4 SCSI	439	515.82
7TPPW	35T Plus Slide Scanner	289	339.57
HPLPW	Arixscan 4000 Film Scanner	975	1145.62
<b>UMAX</b>			
7YPPW	Astra 2000P Parallel	59	69.32
K0DPW	Astra 2100U USB	68	80.30
7Y0PW	Astra 2200SU SCSI/USB + T/Unit	127	149.22
7Y1PW	Astra 2400S SCSI	199	233.82
KQ1PW	Astra 4000U USB	170	199.75

EPSON

**EPSON Perfection 1200U** **USB only £134** (£157.45 inc VAT) quicklinkx 7T4PW

High Quality 1200 x 2400dpi Scanner with Plug & Play USB Interface

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- Maximum interpolated resolution 9600 x 9600dpi
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- 36bit Internal scanning capability for excellent colour reproduction
- Ultra fast scanning - a leader in it's class
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1200 x 2400dpi Optical Resolution for High Quality Scanning including Negatives and Slides

**EPSON Perfection 610** quicklinkx 7T5PW only £90 (£105.75 inc VAT)

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**SnapScan E50** £165 (£189.17) quicklinkx MNJP

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- Highly intelligent ScanWise interface: auto-location, auto-rotation, auto-exposure, auto-sharpening, auto-colour-correction, auto-perfect-results-everytime!

**SnapScan Touch** £85 (£116.32) quicklinkx 7XGPW

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- Stylish landscaped design with 7 interchangeable coloured lid handles included
- 4 easy to use buttons: Scan directly to your printer, fax or to email

Easy to use buttons

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Digital Cameras

quicklinkx	AGFA	ex VAT	inc VAT
83KPW	ePhoto 1680	425	499.37
83LPW	ePhoto CL30	225	264.37
83MPW	ePhoto CL50	339	398.32
<b>CANON</b>			
812PW	PowerShot Pro 70	625	734.43
813PW	PowerShot A50 MegaPixel	355	417.12
HXPFW	PowerShot S10	449	527.57
L1VPW	PowerShot S20	589	692.07
N0PPW	IXUS Digital	529	621.57
<b>EPSON</b>			
80LPW	PhotoPC 800	408	479.40
H0BPW	PhotoPC 850z	476	559.30
80MPW	PhotoPC 650	199	233.82
<b>FUJI</b>			
LBPPW	MX-1200	175	205.62
LB0PW	MX-1400	250	293.74
83BPW	MX-2900	439	515.82
LB0PW	FP-1400	250	293.74
LB8PW	FP-4700	499	586.32
<b>KODAK</b>			
824PW	DC215	189	222.07
81YPW	DC240	249	292.57
821PW	DC260	309	363.07
822PW	DC290	445	527.87
NXKPW	DC5000	389	466.82
822PW	DC290	525	616.87
<b>NIKON</b>			
JBLPW	CoolPix 800	429	504.07
JBM0PW	CoolPix 800 Premiere	469	551.07
82YPW	CoolPix 950	569	668.57
822PW	CoolPix 950 Premiere	589	692.07
<b>OLYMPUS</b>			
M4XPW	C-9602	349	410.07
N6NPW	C-3030	589	692.07
83DPW	C-2500L	619	727.32
<b>SONY</b>			
81PPW	Mavica FD73	315	370.12
M5VPW	Mavica FD85	389	457.07
M5WPW	Mavica FD90	459	536.32
M5XPW	Mavica FD95	649	762.57
81VPW	DSC-F505	499	586.32
M5YPW	DSC-S50 USB	409	480.57
M60PW	DSC-S70 USB	519	609.82
M61PW	DSC-D770 SLR	849	997.57

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**HP ScanJet 3300c** £63 (£74.02 inc VAT) quicklinkx 7S8PW

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**HP ScanJet 3400c** £55 (£64.62 inc VAT) quicklinkx N75PW

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**HP ScanJet 4300c** £78 (£91.65 inc VAT) quicklinkx N76PW

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**HP ScanJet 5300c** £102 (£119.85 inc VAT) quicklinkx JY2PW

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**HP ScanJet 5370c** £102 (£119.85 inc VAT) quicklinkx N7HPW

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**astra 2000P** £59 (£69.32 inc VAT) quicklinkx 7YPPW

- Single-pass, 36-bit, colour CCD
- Optical resolution: 600 x 1,200 dpi, 9,600 x 9,600 dpi maximum
- Scan area up to 8.5" x 11.7"
- astra 2000P, Parallel Port supports Windows '95/'98/NT
- Bundled software: Adobe PhotoDeluxe, Presto! PageManager, Vistascan, Vistasuttle and Recognita

**astra 2100U** £68 (£79.90 inc VAT) quicklinkx K0DPW

As above except:

- 3 customised programmable buttons • Optional transparency adapter
- Interface: USB "Plug and Play" supports Windows '95/'98 & MacOS 8.1
- Software: Adobe PhotoDeluxe, Presto! PageManager, and Vistasuttle (PC)

**astra 2200SU** £127 (£149.22 inc VAT) quicklinkx 7Y0PW

- 3 push button control
- Single-pass, 36-bit, colour CCD
- Optical resolution: 600 x 1,200 dpi, 9,600 x 9,600 dpi maximum
- Scan area up to 8.5" x 11.7" • Transparency Adaptor as standard
- Interface: USB & SCSI, supports Windows '95/'98/NT & MacOS 8.0
- Bundled software: Adobe PhotoDeluxe and Presto! PageManager

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**MICROTEK** Scanning technology

**Scanmaker 3600** £64 (£75.20 inc VAT) quicklinkx L21PW

- A4 flatbed scanner for reflective media
- 600 x 1200 dpi optical resolution
- 9600 x 9600 dpi interpolated
- 42 bit (D.O.T) colour depth
- USB interface (iMac & PC)
- Optional accessories include: Lightlid 35 (35mm scanning adaptor)

**Scanmaker X12 USL** £179 (£210.32 inc VAT) quicklinkx L5ZPW

- 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 (iMac & PC)
- Optional accessories include: ADF (Automatic Document Feeder) MIMA (Magnetic Transparent Media Adaptor), Lightlid 5"x6", Lasersoft Silverfast Prescan software

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**Software**

quicklink	ACCOUNTING	ex VAT	inc VAT
LPPPW	Intuit QuickBooks v8.0	69	81.07
LPOPW	Intuit QuickBooks Pro v8.0	145	170.37
L19PW	Intuit Quicken 2000	22	25.85
1RBPW	Intuit Quicken 2000 Deluxe	38	44.65
17JPW	MS Money 2000	25	29.37
17KPW	MS Money 2000 Financial Suite	32	37.60
J3MPW	MYOB Accounting	145	170.37
J3NPW	MYOB Accounting Plus	295	346.62
1H8PW	Sage Accountant v6.0	395	464.12
1H9PW	Sage Accountant Plus v6.0	575	675.62
1GWPW	Sage Instant Accounting 2000	84	98.70
1H5PW	Sage Instant Acc. Made Easy	49	57.57
1GXPW	Sage Instant Payroll 2000	84	98.70
1GYPW	Sage Instant Acc./Payroll 2000	150	176.25

**ANTIVIRUS**

282PW	CA. InnoCulateIT 4.53 WinNT WG	199	233.82
2B1PW	CA. InnoCulateIT 4.53 WinNT Adv	299	351.32
1IGPW	Dr Sol. VirusScan Toolkit	55	64.62
1G1PW	Dr Sol. VirusScan S/Suite 5n	125	146.87
1G2PW	Dr Sol. VirusScan S/Suite 10n	245	287.87
1G3PW	Dr Sol. VirusScan S/Suite 25n	549	645.07
1F2PW	McAfee T/Virus Defense 5n 1yr	159	186.82
M10PW	McAfee VirusScan v5.0 Classic	19	22.32
M11PW	McAfee VirusScan Deluxe v5.0	25	29.37
1CKPW	Symantec Norton Anti Virus 2000	29	34.07

**BACKUP**

289PW	CA. ArcServe Single/S Netware	269	316.07
287PW	CA. ArcServe WG Netware	295	346.62
29YPW	CA. ArcServeIT v6.61 WG Ed	299	351.32
287PW	CA. ArcServeIT v6.61 Adv Ed	499	586.32
	CA. ArcServeIT v6.61 Options	Call	Call
2D6PW	Veritas Backup Exec v7.3 Server	247	290.22
2D5PW	Veritas Backup Exec v7.3 Multi-S	529	621.57
1CVPW	Veritas Backup DOS/Win 3.11v5.5	65	76.37
K78PW	Veritas Backup Exec v4.2	45	52.87

**CAD**

1LRPW	Autodesk AutoCAD LT 2000	425	499.37
1LRPW	Autodesk AutoCAD View v2.0	119	139.82
HXTPW	Autodesk AutoSketch v7.0	79	92.82
KYOPW	Autodesk Actrix Technical 2000	239	280.82

**COMMUNICATIONS**

2CKPW	Equisys ZetaFax Str Kit v6.0 5u	310	364.25
1SNPW	RedRock FaxNow! 2000	39	45.82
1Y8PW	STAC Reach Out Ent M/Net H+V	99	116.32
LGCPW	Symantec PC Anywhere H+R v9.2	125	146.87
LGCPW	Symantec Procomm Plus v4.8	75	88.12
1CFPW	Symantec TalkWorks Pro v3.0	125	146.87
LG9PW	Symantec WinFax Pro v10.0	45	52.87
J4OPW	Travelling Software Laplink 2000	99	116.32

**CONTACT MANAGEMENT**

1SGPW	Maximizer v5	149	175.07
2D3PW	Maximizer v5 10 u network sys	895	1051.62
NM3PW	Interact Act 2000	125	146.87
NVFPW	Interact Act 2000 5 User	385	452.37

**DATABASES**

12QPW	Borland Visual base Pro v7.0	219	257.32
12RPW	Borland Visual base C/S v7.0	849	997.57
152PW	Filemaker Pro v5	175	205.62
16SPW	MS Access 2000	229	269.07
15YPW	MS Visual FoxPro Pro v6.0	329	386.57

**DIAGRAMING**

LDVPW	Visio Standard 2000	135	158.62
LDVPW	Visio Technical 2000	259	304.32
LDXPW	Visio Professional 2000	259	304.32

**DTP**

1DBPW	Adobe FrameMaker v5.5	419	492.32
MKPPW	Adobe InDesign v1.5	445	522.87
1DYPW	Adobe PageMaker Plus v6.5	299	351.32
1FBPW	Adobe Publishing Collection v7.0	639	750.82
1FGPW	Adobe Design collection	799	938.82
16PPW	MS Publisher 2000	69	81.07
MJ6PW	Quark Xpress v4.1	779	915.32

**GRAPHICS**

1DVPW	Adobe Acrobat v4.0	149	175.07
1FBPW	Adobe After Effects v4.1	399	468.82
1D7PW	Adobe Dimensions v3.0	85	99.87
MDDPW	Adobe Illustrator v9.0	275	321.12
M9XPW	Adobe PhotoDeluxe v4.0	35	41.12
1F3PW	Adobe Photoshop v5.5	409	480.57
1DNPW	Adobe Premiere v5.1	359	421.82
1F1PW	Adobe Type On Call v4.2	39	45.82
1D3PW	Adobe Type Manager Deluxe v4.0	39	45.82
1MMPW	Corel Draw! Select Edition	45	52.87
1MTPW	Corel Draw v9.0	279	327.82
1N1PW	Corel Draw v9.0 Premium	389	457.07
1N4PW	Corel Gallery Magic 1.3 Million	79	92.82
1N2PW	Corel PrintOffice 2000	39	45.82
1NDPW	Corel PhotoPaint v9.0	199	233.82
147PW	Extensis Profolio v4.0	129	151.57
3PRPW	Extensis QX Tools v4.0	89	104.57
1RKPW	Jasc PaintShop Pro v6.0	75	88.12
KRKPW	Macromedia Freehand v8.0	279	327.82
KRNPW	Macromedia Director Shock Int S	799	938.82
16TPW	MS Powerpoint 2000	227	266.72

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**Software**

quicklink	INTEGRATED PACKAGES	ex VAT	inc VAT
1MVPPW	Corel WordPerfect Suite 2000	179	210.32
1MWPPW	Corel WordPerfect Suite 2000 Voice	189	222.07
16HPW	MS Office 2000 Standard	329	386.57
16JPW	MS Office 2000 Premium	499	586.32
16KPW	MS Office Pro 2000	425	499.37
16VPPW	MS Office Developer 2000	589	692.07
16LPW	MS Office Small Business 2000	325	381.87
17CPW	MS Works 2000	49	57.57
17VPPW	MS Works Suite 2000	75	88.12
1CJPPW	Symantec Norton S/Works 2000 Std	65	76.37
1CPWP	Symantec Norton S/Works 2000 Pro	79	92.82

**INTERNET PUBLISHING**

1DGPW	Adobe PageMill v3.0	58	68.15
J36PW	Macromedia DreamWeaver v3.0	229	269.07
1HPW	Macromedia Flash v4.0	199	233.82
J38PW	Macromedia Fireworks v3.0	139	163.32
160PW	MS FrontPage 2000	89	104.57

**OCR**

1J6PW	Caere OmniPage Pro v10.0	345	405.32
1J7PW	Caere PageKeeper v3.0	75	88.12
ML1PW	Caere Scansuite plus v10.0	335	393.62
1FFPW	Xerox Wordscan Plus v4.0	285	334.87
MG7PW	Xerox TextBridge Pro Millennium	39	45.82

**OPERATING SYSTEMS**

15CPW	MS Plus98! Pack	26	30.55
16PPW	MS Windows 98 2nd Edition Full	115	135.12
2Z2PW	MS Windows 98 2nd Edition Upg	59	69.32
165PW	MS Windows NT 4.0 Workstation	212	249.10
24DPW	MS Win NT 4.0 Server & 5 Client	599	703.82
24GPPW	MS Win NT 4.0 Server & 10 Client	759	891.82
JL0PW	MS Windows 2000 Server	679	797.82
JLRPW	MS Windows 2000 Professional	219	257.32
JLSPW	MS Win2000 Advanced Server	2679	3147.82

**PROGRAMMING**

KKLPW	Borland C++ Builder Standard	69	81.07
1KPPW	Borland C++ Builder 5.0 Pro	499	586.32
13KPW	Borland Delphi 5.0 Standard	69	81.07
13LPW	Borland Delphi 5.0 Pro	479	562.82
LNYPW	Borland JBuilder v3.5 Professional	499	586.32
LP2PW	Borland JBuilder v3.5 Student	55	64.62
15HPW	MS Visual Basic v6.0	69	81.07
17NPPW	MS Visual Basic Pro v6.0	329	386.57
17MPW	MS Visual Basic Enterprise v6.0	789	927.07
160PW	MS Visual C++ v6.0	65	76.37
170PW	MS Visual C++ Pro v6.0	329	386.57
17FPW	MS Visual C++ Enterprise v6.0	789	927.07
K68PW	MS Visual Interdev v6.0	329	386.57
163PW	MS Visual J++ v6.0	65	76.37
15JPPW	MS Visual Studio Pro v6.0	649	762.57
15TPW	MS Visual Studio Enterprise v6.0	659	774.32
K71PW	Symantec Vis Cafe Standard Ed.	65	76.37
K72PW	Symantec Vis Cafe Expert Ed.	499	586.32

**REFERENCE**

177PW	MS Encarta 2000	15	17.62
178PW	MS Encarta 2000 Deluxe	75	88.12
176PW	MS Encarta 2000 Ref Suite DVD	65	76.37
179PW	MS Encarta 2000 World Atlas	22	25.85

**ROUTING**

J1WPPW	MS Autoroute Express GB/Europe	55	64.62
LN6PW	MS Autoroute 2001 Europe	45	52.87

**SPEECH RECOGNITION**

HX7PW	Dragon Naturally Speaking Std v4	42	49.35
HX2PW	Dragon Naturally Speaking Pref d v4	99	116.32
HK8PW	Dragon Naturally Speaking Mobile	169	198.57
HFFPW	IBM ViaVoice Millennium STD	29	34.07
HX4PW	IBM ViaVoice Millennium Pro	89	104.57
145PW	Philips Freespeech 2000 + mic/mouse	59	69.32

**SPREADSHEETS**

18VPW	Lotus 1-2-3 Millennium Edition	79	92.82
16NPPW	MS Excel 2000	227	266.72

**UTILITIES**

1K1PW	Adaptec CD Creator CreatorDeluxe	65	76.37
1K2PW	Adaptec EZ-SCSI Deluxe v5.0	45	52.87
1GCPW	McAfee Office 2000	35	41.12
1LJPW	Power Quest Data Keeper v3.0	22	25.85
1LDPW	Power Quest DriveCopy	15	17.62
1LCPW	Power Quest Drive Image	38	44.65
1LFPW	Power Quest Partition Magic v4.0	37	43.47
1B6PW	Symantec PC Handyman	29	34.07
1C0PW	Symantec Norton 2000 v2.0	39	45.82
1C9PW	Symantec Norton CleanSweep 2k	19	31.72
1CJPPW	Symantec Norton Sys Works 2k	57	66.97
1PWPW	Symantec Norton Util 2k	29	34.07
1C0PW	Symantec Norton Util 2k VUP	23	27.02

**WORD PROCESSING**

16RPW	MS Word 97	229	269.07
16RPPW	MS Word 2000	227	266.72
17VPW	MS Works Suite 2000 (inc Word)	72	84.60

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Providing a full range of products, Office 2000 provides everything you need to do better business. Word processing, spreadsheets, presentation and database management software integrate fully with contact management, e-mail and the Web give you the tools to increase your productivity.

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- quicklink 3BFPW Premium £115 (£135.12)



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quicklink 39CPW £45 (£52.87)

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quicklink 39DPW £65 (£76.37)



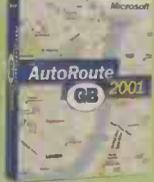
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quicklink LN6PW £45 (£52.87)

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quicklink 9WPP £19 (£22.33)



**Intellimouse IntelliEye™ Optical**  
Optical sensor scans your desktop up to 1,500 times per second. Has five programmable buttons, including two new side buttons. Ambidextrous design for maximum comfort. Both USB and PS/2 & PC compatible.  
quicklink M4ZPW £24 (£28.20)



**Internet Keyboard Pro**  
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quicklink G53PW £25 (£29.37)

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### Laser Printers

quicklink	BROTHER	ex VAT inc VAT
K20PW	HL-1030	159 186.82
5NDPW	HL-1240 2MB	179 210.32
5NFPW	HL-1250 4MB	209 245.57
5NHPW	HL-1250 4MB + Lower Tray	299 351.32
5NGPW	HL-1250 8MB	225 264.37
5NJPW	HL-1250 8MB + Lower Tray	315 370.12
5NKPW	HL-1270N 4MB PostScript	309 363.07
5NMPW	HL-1270N 4MB PS + Lower Tray	389 457.07
5NLPW	HL-1270N 8MB PostScript	329 386.57
5NPPW	HL-1270N 8MB PS + Lower Tray	399 468.82
5MKPW	HL-1660e 8Mb	579 680.32
L77PW	HL-1660e 16Mb	549 645.07
5MYPW	HL-1660e Ethernet 8Mb	779 915.32
5MZPW	HL-1660e Ethernet 16Mb	795 922.37
5N8PW	HL-2060 8Mb	639 750.82
5N9PW	HL-2060 16Mb	599 703.82
5NBPW	HL-2060n Ethernet	779 915.32
5NCPW	HL-2060n Ethernet 16Mb	875 1028.12
L11PW	HL-2400Ce 32Mb Colour PS	1129 1326.57
L1XPW	HL-2400CeN 64Mb Col. PS E/net	1325 1556.87
L1YPW	HL-2400CeN 160Mb Col. PS E/net	1475 1733.12
L1ZPW	HL-2400CeN 160Mb Col. PS E/net	1825 2144.37
L20PW	HL-2400CeN 288Mb Col. PS E/net	2200 2585.00
M6HPW	HL-3400CN A3 64Mb	2250 2643.75
M6JPW	HL-3400CN A3 192Mb	2600 3055.00

quicklink	CANON	ex VAT inc VAT
HLFPW	LBP-900	175 205.62
506PW	LBP-1760	655 769.62
JL6PW	LBP-3260N	1769 2078.57
508PW	CLBP-460PS	1895 2226.62

quicklink	EPSON	ex VAT inc VAT
5NTPW	EPL-5700	221 259.67
JHXPW	EPL-5700L	169 198.57
5NVPW	EPL-5700EN Ethernet	355 417.12
5NWPW	EPL-5700PS PostScript	369 433.57
M3JPW	EPL-5800	236 277.30
M3KPW	EPL-5800EN	369 433.57
M3LPW	EPL-5800PS	443 520.52
5NXPW	EPL-N1600	456 535.80
5NYPW	EPL-N1600T Twin Bin	579 680.32
5NZPW	EPL-N1600ENT Ethernet Twin Bin	703 826.02
5NRPW	EPL-N2000	950 1116.25
5NSPW	EPL-N2000PS PostScript	1182 1388.85
K2BPW	EPL-N2050	772 907.10
K29PW	EPL-N2050T Twin Bin	1120 1316.00
K2BPW	EPL-N2050PS PostScript	1043 1225.52

### Introducing the next generation of Colour Bubble Jet Printers from Canon

**NEW BJC-2100**  
The Printer Designed For The Home

**£65 (76.37)**  
quicklink MS2PW

- Outstanding 'out-of-box' print quality using Drop Modulation Technology™
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- Compact design and simple operation - perfect for the home user
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- Easy connection via USB and Parallel ports
- Works with Windows 95/98, NT 4.0, Mac-OS (iMac and G3/G4) & Windows 2000

**NEW BJC-6200**  
The Advanced Printer for Business Use

**£120 (141.00)**  
quicklink M3SPW

- 10ppm mono and 7ppm colour printing
- Separate ink tanks for all colours
- 1440 dpi Drop Modulation Technology™
- Six colour photo system delivers exceptional photo prints when required
- IS-32 scan cartridge transforms printer into high quality scanner
- Manual feed handles A4 + sheets and media up to 550gsm
- Works with Windows 95/98, NT 4.0, Mac-OS (iMac and G3/G4) & Windows 2000

**See line listing for full range of Canon Printers**  
DIGITAL CAMERAS • BUBBLE JET PRINTERS • LASER PRINTERS • SCANNERS  
Prices in brackets include VAT [www.canon.co.uk](http://www.canon.co.uk)

### Laser Printers

quicklink	EPSON continued	ex VAT inc VAT
5P4PW	EPL-N2700	1187 1394.72
5P5PW	EPL-N2700T Twin Bin	2310 2714.25
5P3PW	EPL-N4000	1744 2049.20
5P2PW	EPL-N4000T Twin Bin	3280 3854.00
K2CPW	EPL-C8200	2656 3120.80
5P6PW	EPL-C8200PS Colour Postscript	3280 3854.00
5P7PW	EPL-C8200PST Colour Postscript	4080 4794.00

**Accessories**

5YWPW	EPL-5700 500sh: Lower Cassette	109 128.07
5YXPW	EPL-5700 PostScript SIMM	179 210.32
5Z2PW	EPL-1600 500sh: Lower Tray	195 229.12
5Z3PW	EPL-1600 Duplex Unit	209 245.57
5Y2PW	EPL-N2000 250sh: A3 Lower Feed	225 264.37
5Z0PW	EPL-N2000 500sh: A4 Lower Feed	225 264.37
5Z1PW	EPL-N2000 Duplex Unit	279 327.82

**HEWLETT PACKARD LaserJet**

5MBPW	1100	232 272.60
5MCPW	1100A Multifunction	285 334.87
5MPPW	2100	423 497.02
5MOPW	2100M	480 564.00
5MRPW	2100TN	600 705.00
5MVPW	4050	741 870.67
5MTPW	4050T Twin Cassette	807 948.22
5MSPW	4050N Ethernet	941 1105.67
5MWPW	4050TN Twin Cassette E/net	1011 1187.92
5M3PW	5000 A3	960 1128.00
5M4PW	5000N A3 Ethernet	1379 1620.32
5M5PW	5000GN A3 Ethernet	1701 1998.67
5M6PW	8000 A3	1477 1735.47
5M7PW	8000N A3 Ethernet	1642 1929.35
5M8PW	8000DN A3 E/net Duplex	1935 2273.62
5MLPW	8100 A3	1687 1982.22
5MMPW	8100N A3 Ethernet	1875 2203.12
5MNPW	8100DN A3 E/net Duplex	2145 2520.37
5MDPW	Colour 4500	1500 1762.50
5MPFW	Colour 4500N Ethernet	1770 2079.75
5MGPW	Colour 4500DN E/net Duplex	2287 2687.22
L6YPW	Colour 8550 A3	2966 3485.05
L6ZPW	Colour 8550N A3 Ethernet	3652 4291.10
L70PW	Colour 8550DN A3 E/net Duplex	4766 5600.05
L71PW	Colour 8550GN A3 E/net Duplex	5625 6609.37
L72PW	Colour 8550MFP A3 E/net Duplex	8212 9649.10

**LaserJet Accessories**

5XGPW	4050 500sh: Universal Tray	85 99.87
5XFPW	4050 500sh: Feeder	185 217.37
5XCPW	4050 Duplex Unit	209 245.57

### OKIPAGE 8p Plus £195 (£229.13 inc VAT) quicklink LC3PW

- Digital LED 8ppm page printer
- 2Mb memory upgradeable to 10Mb
- 600 x 1200 dpi
- USB Interface
- Centrics bi-directional parallel interface
- Windows 3.1, Windows 95/98, and Windows NT compatible
- Oki microfine spherical toner - crisper characters, improved grey scale



### OKIPAGE 10ex £199 (£233.82 inc VAT) quicklink 5P6PW

- 10 ppm Robust Digital LED desktop page printer
- 4Mb memory upgradeable to 37Mb
- 600 x 1200 dpi
- 12 seconds time to first print
- Optional Serial interface
- HP PCL6
- 250 sheets paper input / 850 sheet maximum



**ideal Personal Windows printer**

# OKI

People to People Technology



### Laser Printers

quicklink	HP continued	ex VAT	inc VAT
5XMPW	5000 250sht Feeder	155	182.12
5XNPW	5000 500sht Feeder	219	257.32
5XLPW	5000 Duplex Unit	309	363.07
5XYPW	8000 Duplex Unit	309	363.07
5XXPW	8000 2 x 500sht Feeder	585	687.37
5XWPW	8000 200sht Feeder	585	687.37
5Y0PW	8000 PowerBox Upgrade Kit	79	92.82
5XRPW	8000 Tablet Mailbox	519	609.82
5XTPW	8000 Multi-bin Mailbox	779	915.32
Memory			
3FGPW	LJ1100/2100/4000/4050 8Mb	55	64.62
3FPW	LJ1100/2100/4000/4050 16Mb	99	116.32
DXPW	LJ4050/5000/8000 4Mb SDRAM	35	41.12
3DZPW	LJ4050/5000/8000 16Mb SDRAM	109	128.07
Warranty (Support Pack)			
3L5PW	LJ1100 3yr Support	80	94.00
3L8PW	LJ2100/M/TN 3yr Support	125	146.87
3L1PW	LJ4050/5000 3yr Support	180	211.50
3LDPW	LJ4500/8000/8100 3yr Support	660	775.50

### KYOCERA

3TJPW	FS-680	239	280.82
3TKPW	FS-680T	309	363.07
3TLPW	FS-680N	429	504.07
3TMPW	FS-680TN	479	562.82
3T3PW	FS-800	309	363.07
3TGPW	FS-800N	499	586.32
3TKVPW	FS-1200	449	527.57
3KTPW	FS-1200N	649	762.57
3KWPW	FS-1200T	629	739.07
3KXPW	FS-1200TN	799	938.82
3TRPW	FS-1750	599	703.82
3KYPW	FS-1750N	779	915.32
3TTPW	FS-3750	789	927.07
3TSPW	FS-3750N	979	1150.32
3TCPW	FS-6700 A3 PostScript	1029	1209.07
3T1PW	FS-7000+ A3 Twin Cassette	1749	2055.07
3L3PW	FS-7000N+ A3 Twin Cass E/net	1899	2231.32

### LEXMARK

37KPW	Optra E312	235	276.12
3R9PW	Optra M410	419	492.32
37MPW	Optra M412	545	640.37
37PPW	Optra M412 Ethernet	769	903.57
3RBPW	Optra M410N Ethernet	515	605.12
3R1PW	Optra T610	619	727.32
3R2PW	Optra T610N Ethernet	835	981.12
3R5PW	Optra T614	745	875.37
37RPW	Optra T614N Ethernet	959	1126.82
3R6PW	Optra T614N Ethernet	1105	1298.37
3R7PW	Optra T616	1289	1514.57
3R8PW	Optra T616N Ethernet	1525	1791.87
37TPW	Optra C710 Colour Laser	1169	1373.57
37WPW	Optra C710N Colour Ethernet	1399	1643.82
37XPW	Optra C710DN Colour Ether. Dup.	2185	2567.37

### MINOLTA/QMS

3V0PW	MagiColor2 DeskLaser Plus	899	1056.32
3VRPW	MagiColor2 DeskLaser Duplexer	1299	1526.32
3VBPW	2060GX	1305	1533.37
3V9PW	2060EX	2365	2778.87
3JCPW	MagiColor 2+ CXE	1579	1855.32
3J0PW	MagiColor 2+ GXE	1665	1956.37
3JRPW	MagiColor 2+ EXE	2019	2372.32
3JSPW	MagiColor 2+ EXD	2635	3096.12
3JCPW	MagiColor 6100N	2755	3237.12
3JL1PW	MagiColor 6100GN	3035	3566.12
3JMPW	MagiColor 6100EN	3585	4212.37
3JN1PW	MagiColor 6100DP	4875	5728.12
3M0PW	PagePro 18L	365	428.87
3M0PW	PagePro 18LN	545	640.37

### OKI

L78PW	OkPage 8w Lite	139	163.32
L3CPW	OkPage 8p Plus	195	229.12
5PGPW	OkPage 10ex	199	233.82
5RHPW	OkPage 10exs	229	269.07
5RJPW	OkPage 12i/n Ethernet	319	374.82
5PLPW	OkPage 20 Plus	599	703.82
5PM1PW	OkPage 20 Plus DX	689	809.57
5PN1PW	OkPage 20 Plus N	799	938.82
5PP1PW	OkPage 20 Plus DXN	907	1065.72
5PQ1PW	OkPage 24 Plus DX	799	938.82
5PR1PW	OkPage 24 Plus DXN	999	1173.82
5PZ1PW	OkPage 8c Plus Colour	1599	1878.82
5PY1PW	OkPage 8c Plus/n Colour	1709	2008.07

### SAMSUNG

N8ZPW	Izzi Laser	129	151.57
N90PW	Izzi Laser Plus	149	175.07
N91PW	ML6060	209	245.57
N92PW	ML6060N	299	351.32

### TALLY

J2CPW	T9308	190	223.25
5RLPW	T9112	385	452.37
5RMPW	T9116D	545	640.37
5RHPW	T8004	825	969.37
5RPPW	T8204 Colour	2699	3171.32
5RQPW	T8204 Plus Colour	2999	3523.82

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#### HP OfficeJet G Series

##### HP OfficeJet G55

Home and office users who want to print, scan and copy - with great performance

- Space, time and money savings of an All in one
- Based on the multiple award winning 2400dpi DeskJet 970 printer
- Excellent scan resolution
- Easy to set up and use

**G55 £305** (€358.37)  
With HP Support Pack **£370** (€434.75)

quicklink **KX5PW**  
quicklink **GLNPW**

##### HP OfficeJet T45

Home and office users who want complete office functionality, printing, faxing, copying - at their fingertips

**T45 £232** (€272.60)  
With HP Support Pack **£297** (€348.97)

quicklink **79MPW**  
quicklink **GLHPW**

##### 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

- All the features of the G55 plus
- Colour faxing
- Convenience of an ADF

**G85 £382** (€448.85)  
With HP Support Pack **£522** (€613.35)

quicklink **KX6PW**  
quicklink **GL6PW**

##### HP OfficeJet 710

Home and office users who want to print, copy, scan or fax the widest range of colour documents

**710 £199** (€233.82)  
With HP Support Pack **£264** (€310.20)

quicklink **79JPW**  
quicklink **GLHPW**

##### HP OfficeJet G95

Business users who want a network ready printer, scanner, copier, fax and colour fax with advanced functionality such as automatic two sided printing

- All the features of the G85 plus
- JetDirect included
- Automatic 2 sided printing

**G95 £450** (€528.75)  
With HP Support Pack **£Call** (€Call)

quicklink **KX7PW**  
quicklink **GL7PW**

##### HP LaserJet 3150

The HP LaserJet printer and fax that copies - the professional All-in-One.

- Professional quality & reliability of an HP LaserJet
- Excellent business performance in an easy-to-use networkable solution
- Printing, copying, scanning at 6 pages per minute
- 250 speed dials, including 25 group dials for quick & easy dialing
- Integrated JetSuite Pro desktop software

**3150 £382** (448.85)  
With HP Support Pack **£472** (€554.60)

quicklink **K1RPW**  
quicklink **GLRPW**

### Laser Printers

quicklink	TEKTRONIX	ex VAT	inc VAT
MV7PW	Phaser 750N Ethernet	1690	1985.75
MV2PW	Phaser 750P	2035	2390.12
MVDPW	Phaser 750DP	2500	2937.50
MW1PW	Phaser 750DX Duplex Ethernet	3025	3554.37
5LVPW	Phaser 780N A3 Ethernet	3595	4224.12
5LWPW	Phaser 780GN A3 Ethernet	4695	5516.62
5LXPW	Phaser 780P A3 Ethernet	5495	6456.62

### XEROX

LBYPW	N2125B USB Parallel	765	898.87
LC0PW	N2125 USB Ethernet	855	1004.62
LC2PW	N2125TD USB E/net T/Bin Duplex	1195	1404.12
LC0PW	N2025 USB Ethernet	1069	1256.07
LC5PW	N2025D USB Ethernet Duplex	1225	1439.37
LC4PW	N2025T USB Ethernet Twin Bin	1205	1415.87
LC6PW	N2025TD USB E/net T/Bin Duplex	1405	1650.87

### Laser Consumables

quicklink	BROTHER	ex VAT	inc VAT
HJLPW	HL-1240/50/70 Toner	29	34.07
HJNPW	HL-1240/50/70 Drum	75	88.12
BT3PW	HL-1260/1660 Toner	59	69.32
BTKPW	HL-2060 Toner	72	84.60
BT8PW	HL-2400C Black Toner	75	88.12
BT9PW	HL-2400C Cyan Toner	65	76.37

### EPSON

BV0PW	EPL-5700/EPL-5800 Toner	55	64.62
BV1PW	EPL-5700/EPL-5800 Drum	42	49.35
BV2PW	EPL-N1600 Toner	78	91.65
BTZPW	EPL-N2000 Toner	104	122.20
KZYPW	EPL-N2050 Imaging Cartridge	120	141.00
KZZPW	EPL-N2700 Imaging Cartridge	105	123.37
LO0PW	EPL-N4000 Imaging Cartridge	149	175.07
LO1PW	EPL-N4000 Imaging Cartridge	142	167.35
KBDPW	EPL-C8000/C8200 Black Toner	49	57.32
KBHPW	EPL-C8000/C8200 Cyan Toner	69	81.07
KBFPW	EPL-C8000/C8200 Magenta Toner	69	81.07

### HEWLETT PACKARD

BSFPW	LJ 1100 Toner	35	41.12
BSYPW	LJ 2100 Toner	50	58.75
BSCPW	LJ 4050 6k Toner	55	64.62
BSBPW	LJ 4050 10k Toner	77	90.47
BSDPW	LJ 5000 Toner	93	109.27
BSXPW	LJ 8100 Toner	117	137.47
BSGPW	LJ 4500 Black	53	62.27
BSHPW	LJ 4500 Cyan	67	78.72
BSJPW	LJ 4500 Magenta	67	78.72

### Laser Consumables

quicklink	HP continued	ex VAT	inc VAT
BSPKW	LJ 4500 Yellow	67	78.72
BSLPW	LJ 4500 Drum	50	58.75
BSMPW	LJ 4500 Transfer Kit	119	139.82
BSPPW	LJ 8500 Black	64	75.20
BSQPW	LJ 8500 Cyan	94	110.45
BSRPW	LJ 8500 Magenta	94	110.45
BSSPW	LJ 8500 Yellow	94	110.45

### KYOCERA

JDL1PW	FS-1200 Toner	38	44.65
C1SPW	FS-680/800 Toner	28	32.90
C1RPW	FS-1750/3750 High Yield	40	47.00
K0RPW	FS-7000+ Toner	79	92.82

### OKI

BVTPW	8w Lite/8iM/8p Plus Toner	12	14.10
BVKPW	10ex Toner	16	18.60
BVDPW	16n Toner	32	37.60
BVGPW	16m Drum	199	233.82
BVNPW	20n Toner	32	37.60
BVMPW	20n Drum	194	227.95
BVPPW	8c Plus Black	9	10.57
BVQPW	8c Plus Yellow	11	12.92

### TALLY

LTPPW	T-9308 Toner	55	64.62
BZDPW	T-9112/T9116D Toner 2pk	52	61.10
BZGPW	T-8104 Black	99	116.32
BZLPW	T-8104 Drum	242	284.35
BZNPW	T-8204 Black Toner	39	45.82
BZRPW	T-8204 Yellow Toner	89	104.57

### XEROX/TEKTRONIX Phaser

LQ9PW	N2125 Toner	89	104.57
LQBPW	N2125 Toner High Yield	109	128.07
LQCPW	N2125 Maintenance Kit	170	199.75
LQDPW	N2025/N2825 Toner	120	141.00
LQSPW	P 750 Black Toner	59	69.32
N9DPW	P 750 Cyan Toner	130	152.75
N9GPW	P 750 Magenta Toner	130	152.75
N9JPW	P 750 Yellow Toner	130	152.75
BR9PW	P 780 Black Toner	126	148.05
BRCPW	P 780 Cyan Toner	126	148.05
BR9PW	P 780 Yellow Toner	126	148.05

### Inkjet Printers

quicklink	BROTHER	ex VAT	inc VAT
5GFPW	MP21C Mobile Printer	159	186.82
5GGPW	MP21CDX Mobile Printer	199	233.82

### CANON

5HRPW	BJC-50	192	225.60
JZNPW	BJC-85 Parallel/USB/IrDA	169	198.57
5H2PW	BJC-1000	46	54.05
HLCPW	BJC-2000	61	71.67
MS2PW	BJC-2100 USB/Parallel	65	76.37
JZKPW	BJC-3000 USB	92	108.10
MS3PW	BJC-6200 USB	120	141.00
JZLPW	BJC-6500 A3 USB	215	252.62
JZMPW	BJC-8200 Photo USB	230	270.25

### EPSON

5H4PW	Stylus Color 460	59	69.32
N6TPW	Stylus Color 480	Call	Call
L4VPW	Stylus Color 670 USB/Parallel	74	86.95
5H6PW	Stylus Color 760 USB	103	121.02
5H7PW	Stylus Color 860 USB	148	173.90
KJAPW	Stylus Photo 870 USB/Parallel	177	207.97
LR6PW	Stylus Photo 875DC	237	278.47
5G2PW	Stylus Color 900 USB	192	225.60
5GYPW	Stylus Color 900N	355	417.12
5H8PW	Stylus Color 1160 A3 USB	266	312.55
5G0PW	Stylus Photo EX	207	243.22
5H0PW	Stylus Photo 1200	266	312.55
KJ6PW	Stylus Photo 1270 USB/Parallel	296	347.80
5GJPW	Stylus Color 1520	315	

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**EPSON STYLUS COLOR 480**

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- Easy to use panel-free design
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- Print Speeds up to 4 ppm black, 2.5 ppm colour
- Win 95, 98 2000 NT 4.0
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quicklinx **IN6TPW** **£59** (£69.32 inc VAT)

**EPSON COVERPLUS**  
EPSON CoverPlus 3 year RTB extended warranty  
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**USB**  
iMac compatible

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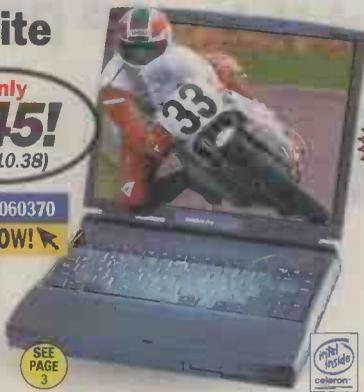
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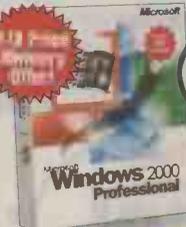
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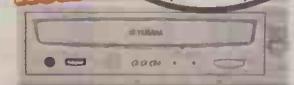
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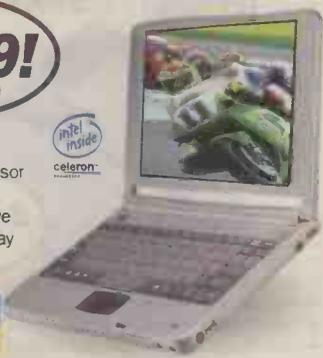
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### Palm IIIc

- Crystal clear colour display
- 8MB memory
- Store 10,000 addresses, 400 e-mails and more!
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- PalmOS® 3.5
- Fast PC synchronisation – from the box

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### Psion Revo



Only **£239.99!**  
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- 8MB RAM
- Exceptionally light - only 200g
- High contrast display
- Latest PsiWin software included
- Stay connected with optional modem kit

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### Puma Intellisync

Keep your Palm Computing platform organiser in sync with your favourite applications.

- Easy, one step synchronisation
- Integrated sync of calendar, e-mail, contacts and tasks
- Optimised for Microsoft Outlook
- Powerful custom filtering

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MOBILE COMPUTING

Boost your Performance with Quality Chips from only **£39<sup>99</sup>!** (£46.99)

Increase the speed of your applications with our fantastic memory!

## COMPAQ DESKTOPS

Model	Size	Quantity	Order No.	Price	Inc. VAT
JesKPro 2000/4000 166, 200	32MB	1	MY6589	£60.99	£71.66
JesKPro 2000/4000 166, 200	64MB	1	MY7504	£69.99	£82.24
JesKPro 2000/4000 233 (Pentium w/ MMX)	32MB	1	MY6589	£60.99	£71.66
JesKPro 2000/4000 233 (Pentium w/ MMX)	64MB	1	MY7504	£69.99	£82.24
JesKPro 6000 Pentium II w/MMX	64MB	1	MY9289	£159.99	£187.99
JesKpro EN/EP 6266, 6300, 6333	64MB	1	MY7504	£69.99	£82.24
JesKpro EN/EP 6350, 6400	32MB	1	MY9369	£36.99	£43.46
JesKpro EN/EP 6350, 6400	64MB	1	MY9370	£68.99	£81.06
JesKpro EN/EP PIII Models	32MB	1	MY9369	£36.99	£43.46
JesKpro EN/EP PIII Models	64MB	1	MY9370	£68.99	£81.06
JesKpro EN/EP PIII Models	128MB	1	MY9371	£128.99	£151.56

## TOSHIBA NOTEBOOKS

Model	Size	Quantity	Order No.	Price	Inc. VAT
Portege 650CT, 660CDT	32MB	1	MY6809	£60.99	£71.66
Portege 650CT, 660CDT	64MB	1	MY6876	£127.99	£150.39
Portege 7200CT	32MB	1	E060912	£39.99	£46.99
Portege 7200CT	64MB	1	E060136	£66.99	£78.71
Satellite 460CDT/440CDT/CDX	32MB	1	MY6809	£60.99	£71.66
Satellite 460CDT/440CDT/CDX	48MB	1	MY6875	£119.99	£140.99
Satellite 460CDT/440CDT/CDX	64MB	1	MY6876	£127.99	£150.39
Satellite Pro 4270	32MB	1	E060912	£39.99	£46.99
Satellite Pro 4270	64MB	1	E060136	£66.99	£78.71
Satellite Pro 4280	32MB	1	E060912	£39.99	£46.99
Satellite Pro 4280	64MB	1	E060136	£66.99	£78.71
Tecra 520CDT, 530CDT, 750CDT	32MB	1	MY6809	£60.99	£71.66
Tecra 520CDT, 530CDT, 750CDT	64MB	1	MY6876	£127.99	£150.39
Tecra 710CDT/720CDT/730/740CDT	32MB	1	EURMY1462	£129.99	£152.74
Tecra 710CDT/720CDT/730/740CDT	64MB	1	MY6556	£151.99	£178.59
Tecra 8100	32MB	1	E060912	£39.99	£46.99
Tecra 8100	64MB	1	E060136	£66.99	£78.71

## SIMMS

### 72-pin EDO SIMMS

RAM	Speed	Layout	Item #	Price	Inc. VAT
32MB	60ns	8 x 32	EURMY1643	£90.99	£106.91
64MB	60ns	16 x 32	MY6995	£153.99	£180.94

### 72-pin FPM Non-Parity SIMMS

RAM	Speed	Layout	Item #	Price	Inc. VAT
32MB	70ns	8 x 32	CHP0104	£85.99	£101.04
32MB	60ns	8 x 32	EURMY1293	£93.99	£110.44
64MB	60ns	16 x 32	MY11305	£196.99	£231.46

### 168-pin 100MHz (PC100) SDRAM DIMMS

RAM	Speed	Layout	Item #	Price	Inc. VAT
32MB	8ns	4 x 64	MY9369	£36.99	£43.46
64MB	8ns	8 x 64	MY9370	£68.99	£81.06
128MB	8ns	16 x 64	MY9371	£128.99	£151.56
256MB	8ns	32 x 64	MY9301	£298.99	£351.31

### 168-pin 133MHz (PC133) SDRAM DIMMS

RAM	Speed	Layout	Item #	Price	Inc. VAT
64MB	8ns	8 x 64	MY12294	£68.99	£81.06
128MB	8ns	16 x 64	MY12295	£138.99	£163.31
256MB	8ns	32 x 64	MY12293	£303.99	£357.19

### 168-pin 66MHz SDRAM DIMMS

RAM	Speed	Layout	Item #	Price	Inc. VAT
32MB	10ns	4 x 64	MY6589	£60.99	£71.66
64MB	10ns	8 x 64	MY7504	£69.99	£82.24
128MB	10ns	16 x 64	MY8004	£139.99	£164.49

### MOBILE SOLUTIONS

## COMPAQ

### Armada M300

Only **£1565!** (£1838.88)  
ITEM #E063748

- 500MHz Intel Pentium® III Processor
- 64MB SDRAM
- 6.4GB Hard Drive
- 11.3" TFT Display
- Windows® NT

## SONY

### VAIO Z600NE

Only **£1905!** (£2238.38)  
ITEM #E226128

- Intel Pentium® III 600MHz processor
- 128MB RAM
- 12GB hard drive
- Windows 98SE
- 16X (max) CD-ROM
- 12.1" TFT Display

## DC240 Zoom Digital Camera

From Only **£299<sup>99</sup>!** (£352.49)

- Fast USB connection
- 3x optical zoom
- 2x digital zoom lens
- Very responsive



**Kodak**

Item #INP1940

Fully USB compatible!

DESCRIPTION	ITEM #	PRICE
DC240w/ additional memory, Case & Adapter	BND3728	£349.99 (£411.24)

## Digital Dream 2900 Camera

Only **£119<sup>99</sup>!** (£140.99)

- VGA Digital Camera
- Digital Zoom x 2
- CYBERSCREEN gives a review of photos individually or as a slideshow
- Stores up to 12 photos in internal memory



**DIGITAL DREAM**

Item #IN8523

## Psion 5MX

Only **£329<sup>99</sup>!** (£387.74)  
ITEM #PDA1005

- Backlit, Colour Display
- Just 260g
- Up to 8 hour battery life!

## Samsung SmartMedia

Samsung is the largest memory manufacturer in the world and a technology leader. Samsung SmartMedia is produced under the most stringent quality procedures to ensure integrity with repeated use. Current sizes available are 8mb, 16mb, 32mb and 64mb. 128mb cards will be available later this year.



From **£13<sup>99</sup>!** (£16.44)  
Item #IN8484

DESCRIPTION	ITEM #	PRICE
8MB	IN8484	£13.99 (£16.44)
16MB	IN8485	£29.99 (£35.24)
32MB	IN8486	£59.99 (£70.49)
64MB	E066439	£124.99 (£146.96)
PCMCIA Adapter	E109961	£29.99 (£35.24)

## Integral CompactFlash

Integral, a preferred choice of digital camera memory, simply because it brings together the world's biggest CompactFlash manufacturers all under one name. This means you receive:

- The highest quality & reliability that comes from the world's biggest manufacturers
- Compatibility Fits almost every brand of CF camera and reader
- Value for money

**integral**

A Standard in CompactFlash Memory!

DESCRIPTION	ITEM #	PRICE
8MB	IN8487	£24.99 (£29.36)
16MB	IN8488	£34.99 (£41.11)
32MB	IN8490	£59.99 (£70.49)
48MB	IN8491	£84.99 (£99.86)
64MB	IN8492	£124.99 (£146.86)
128MB	IN8493	£249.99 (£293.74)
PCMCIA Adapter	E109962	£9.99 (£11.74)

## SONY

### VAIO F701

Only **£1109!** (£1303.08)  
ITEM #E226130

- Intel Celeron® 500MHz processor
- 64MB RAM
- 9GB hard drive
- Windows 98SE
- 24X (max) CD-ROM
- 13" HPA Display

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HP PRINTERS

## NEW!! HP Colour Printing from £59

(£69.33)

Optional 3 year warranty available on all HP Printers. Ask for SupportPack

### HP PRINTERS

#### LaserJet 2100



From **£419<sup>99</sup>!**

(£493.49)

ITEM #PR14648

- 10ppm, first page out in 17 seconds
- True 1200 x 1200 dpi
- 600dpi mode enhanced with RET
- HP PCL6 (45 scaleable typefaces built-in)

DESCRIPTION	ITEM #	PRICE
HP LaserJet 2100	PR14648	£419.99 (£493.49)
HPLaserJet 2100M	PR14649	£479.99 (£563.99)*
HP LaserJet 2100TN	PR14650	£599 (£703.83)*

#### LaserJet 4050



From **£739<sup>99</sup>!**

(£868.33)

ITEM #PR14949

- 133MHz RISC processor.
- First page out in less than 15 secs
- 600dpi, FastRet 1200 (1200dpi quality)
- Network capable with optional HP Jet Direct Print Server
- 8MB RAM

DESCRIPTION	ITEM #	PRICE
HP LaserJet 4050	PR14949	£739 (£868.33)
HP LaserJet 4050T	PR15040	£805 (£945.88)*
HP LaserJet 4050N	PR14947	£939 (£1103.33)*
HP LaserJet 4050TN	PR14946	£1005 (£1180.88)*

### HP Supplies

DESCRIPTION	PART NO.	PRICE
<b>DeskJet Cartridge Ink</b>		
Black 750C/850C/820CX1/1600C	51645A	£17.15 (£20.15)
Tri-Colour DJ890C/895CX1	C1823D	£20.99 (£24.66)
Black DJ 600/660C/690C/695C	51629A	£17.65 (£20.73)
Black DJ/DJ+/400/DJ500 TO 560C	51626A	£16.99 (£19.96)
Tri-Colour DJ600/660/690/695	51649A	£18.50 (£21.74)
Tri-Colour DJ850C/820CX1	51641A	£17.45 (£20.50)
Large Black 2000C/CN	PR14046	£21.99 (£25.83)
Black 610/612	PR15217	£17.99 (£21.14)
Tri-colour 970CX1	PR15491	£25.99 (£30.53)
Tri-Colour DJ Portable	51625A	£16.85 (£19.80)
Black DJ 350C/250C/230/1200C	51640A	£16.99 (£19.96)
<b>LaserJet Cartridge Toner</b>		
Black LJ4/4M/4+/4M+/5/5M/5N	92298A	£48.99 (£57.56)
Black Long Life LJ 4000/7N/7N	PA0991	£75.99 (£88.28)
Black LJ 5P/5MP/6P/6MP	C3903A	£44.99 (£52.86)
Black LJ 4000/7N/7N/4050	PA0990	£52.99 (£62.26)
Black LJ2100	PR14717	£54.99 (£64.61)
Black LJ 5L /6L /3100	C3906A	£33.35 (£39.19)
Black LJ551/MX/NX/MOPIER	C3909A	£102.99 (£121.01)
Long Life LJ 4/4M/5/5M	PA0461	£54.25 (£63.74)
Black 1100/1100A	PR14255	£34.99 (£41.11)
Black LJ4/L4/4ML/4P/4MP	92274A	£38.99 (£45.81)
LJ 5000 SERIES	PA1318	£90.99 (£106.91)
Black LJ4V/MV	C3900A	£81.45 (£95.70)
Black 4500	PR14249	£53.99 (£63.43)
Black LJUIJS/4S/4S1MX	92291A	£63.99 (£75.19)
Black LJ1100/1100	92295A	£40.99 (£48.16)



### Hewlett Packard Printers

#### HP DeskJet 640C

- Up to 6ppm black, 3ppm colour
- Crisp black text
- Photo quality Colour Images
- Parallel & USB connectivity
- Manual two-sided printing



Only **£58<sup>99</sup>!**

(£69.31)

DESCRIPTION	ITEM #	PRICE
HP DeskJet 640C & HP SupportPack	E236331	£89.99 (£105.74)
HP Black Ink Cartridge	51645A	£16.65 (£19.56)
HP Colour Ink Cartridge	C1823D	£20.45 (£24.03)

Item #E220494  
**BUY NOW!**

#### HP DeskJet 1220PS

- Up to 11ppm (A4)/7ppm (A3) black and 9.5ppm (A4)/6.4ppm (A3)
- A5-A3 printer - Printing ultimate photo-quality with HP PhotoRet III Precision Technology and alternate 2400 dpi mode
- Supports parallel, also network capable via JetDirect
- PostScript as standard



Only **£314<sup>99</sup>!**

(£370.11)

Item #E111029  
**BUY NOW!**

HP DeskJet1220PS & SupportPack: E111274 £349.99 (£411.24)

#### HP DeskJet 930C

- Up to 9ppm black and 7.5ppm colour
- HP PhotoRet III Precision Technology and alternate 2400dpi mode
- Space-saving fold up paper tray
- Supports Parallel and USB for user-friendly operation



From **£109<sup>99</sup>!**

(£129.24)

DESCRIPTION	ITEM #	PRICE
HP DeskJet 930C & HP SupportPack	BN7427	£139.99 (£164.49)
HP Black Ink Cartridge	51645A	£17.15 (£20.15)
HP Colour Ink Cartridge	C6578D	£25.99 (£30.54)

Item #PR15977  
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#### HP DeskJet 950C

- Up to 11ppm black and 8.5ppm colour
- High speed output for home and business use
- Ultimate photo-quality with HP PhotoRet III Precision Technology and alternate 2400dpi mode
- A4 or 4"x6" photo paper



Only **£148<sup>99</sup>!**

(£175.06)

DESCRIPTION	ITEM #	PRICE
HP DeskJet 950C & HP SupportPack	BN7429	£178.99 (£210.31)
HP Black Ink Cartridge	51645A	£17.15 (£20.15)
HP Colour Ink Cartridge	C6578D	£25.99 (£30.54)

Item #PR15979  
**BUY NOW!**

#### HP DeskJet 840C

- Up to 8ppm black and 5ppm colour printing
- Excellent photo quality printing
- 600dpi black printing and enhanced PhotoRet III Precision Technology, Optional 1200dpi mode
- Very quiet operation



Only **£77<sup>99</sup>!**

(£91.64)

HP DeskJet 840C & HP SupportPack: BN7426 £107.99 (£126.89)

Item #PR15976  
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#### HP DeskJet 970CXi

- Up to 12ppm black
- Up to 10ppm colour
- Automatic two side printing
- Compact design and quiet operation



Only **£184<sup>99</sup>!**

(£217.36)

Item #PR15933  
**BUY NOW!**

HP DeskJet970CXi & SupportPack: BN6943 only £234.99 (£276.11)

#### HP DeskJet 350C

- Up to 5ppm black, 2ppm colour
- Up to 600 x 600 dpi
- Infrared adapter for wireless printing



From **£134<sup>99</sup>!**

(£158.61)

HP DeskJet 350C: E063115 only £149.99 (£176.24)

HP DeskJet 350C & SupportPack: E063669 only £169.99 (£199.74)

#### HP LaserJet 3150

- Printing, copying, scanning at 6 pages per minute
- 250 speed dials
- Integrated JetSuite Pro desktop software



Only **£379<sup>99</sup>!**

(£446.49)

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HP LaserJet 3150 & HP SupportPack: BN7430 only £459.99 (£540.49)

#### HP 2000C

- Up to 600dpi
- Up to 10ppm black, 7ppm colour

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(£264.36)

HP 2000C & SupportPack: BN7007 £319.99 (£375.99)

Item #PR13882  
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#### HP DeskJet 895CXi

- Up to 10ppm black
- Up to 3ppm colour
- Photo RET II for photo quality
- USB and parallel port



Only **£148<sup>99</sup>!**

(£175.06)

Item #PR14020  
**BUY NOW!**

HP DeskJet895CXi & SupportPack: BN7001 £174.99 (£205.61)

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# 0800 338 000

PRINTERS

## NEW! EPSON Colour Printer Only £58<sup>99</sup> (£69.31)

### EPSON® Colour Inkjet Printers

#### EPSON Stylus COLOR 480

- Print 4ppm black and 2.6 ppm colour
- Easy to use panel-free design
- 720dpi 4-colour printing
- Variable Sized Droplet Technology
- Photo Enhance 4 for image optimisation
- Parallel interface as standard
- Win 95, 98 2000 NT4.0

Only **£58<sup>99</sup>** (£69.31)

**New!**



Item #E224678  
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#### EPSON Stylus COLOR 670

- Print speeds up to 5ppm black and 3.8ppm colour
- 1440dpi Super Micro Dot 4-colour printing
- Variable Sized Droplet Technology
- Photo Enhance 4 for image optimisation
- Parallel and USB interface
- Windows 95, 98, 2000, NT 4.0 and Mac drivers

Only **£73<sup>99</sup>** (£86.94)



Item #E060935  
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#### EPSON Stylus COLOR 760

- Prints up to 7ppm black, 6.8ppm colour
- 1440dpi MicroPiezo four colour printhead
- Ultra MicroDot™ - 4 Picolitres
- Improved design for quiet printing
- Parallel and USB interface
- Windows 3.1, 95, 98, NT 4.0 and MAC drivers
- 1 year callout warranty

Only **£102<sup>99</sup>** (£121.01)



Item #PR15496  
**BUY NOW!**

#### EPSON Stylus COLOR 860

- Prints up to 9.5ppm black 9.2ppm colour
- Small dots for high quality at speed
- New aesthetic product design and quiet printing
- Photo enhance 4
- Parallel and USB as standard
- Windows 3.1, 95, 98, NT 4.0 and Mac drivers
- Optional network server

Only **£132<sup>99</sup>** (£156.26)



Item #PR15498  
**BUY NOW!**

DESCRIPTION	ITEM #	PRICE
EPSON Stylus Photo EX	PR13448	£204.99 (£240.86)
EPSON Stylus Photo 8750C	E064708	£236.99 (£278.46)
EPSON Stylus COLOR 760 Transparent Blue	E060551	£109.99 (£129.24)

DESCRIPTION	ITEM #	PRICE
EPSON Stylus Photo 1270	PR15955	£294.99 (£346.61)
EPSON Stylus COLOR 900	PR14783	£204.99 (£240.86)
EPSON Stylus COLOR 1160	PR15611	£284.99 (£311.36)
EPSON Stylus Scan 2500	PR15462	£219.99 (£258.49)

### PRINTERS/ SUPPLIES

**EPSON**

#### EPSON Stylus Photo 870

Only **£176<sup>99</sup>** (£207.96)

ITEM #PR15956

- A4 Photo printer
- Up to 9ppm black, 8.8ppm colour
- 10 years light fastness - with premium Photo Glossy Paper
- 1440dpi Ultra Micro Dot
- iMac, G3 & G4, PC support



**EPSON**

#### EPSON Stylus Scan 2000

Only **£139<sup>99</sup>** (£164.49)

ITEM #PR15464

- All-in-one print, copy, fax\*, scan to e-mail\*, scan to disk from one device
- 1440dpi, 6pi MicroPiezo™
- USB and Parallel Interfaces
- Windows and Mac compatible



\*Via software supplied (requires computer modem)

From **£234<sup>99</sup>** (£276.11)

Item #PR15894  
**BUY NOW!**

**brother**

#### HL-1240

Only **£174<sup>99</sup>** (£205.61)



#### HL-P2500

- 12 ppm Printing & Copying
- Up to 600dpi for Printing, Copying & Scanning
- Scan to E-Mail Function
- Scan to File Function
- Scansoft Textbridge OCR Software
- 250 Sheet Paper Tray Plus Optional 250 Sheet Paper Tray
- Parallel & USB Ports as Standard



At your side.

- 12ppm laser printer
- 600 x 600 dpi print quality
- 4MB memory
- USB Port as standard
- Two toner options
- Optional NW connectivity with full management capabilities

Item #PR15447  
**BUY NOW!**

DESCRIPTION	ITEM #	PRICE
MP-21C	PR14836	£158.99 (£186.82)
MP-21CDX	PR14875	£194.99 (£229.11)
HL-1030	PR15864	£158.99 (£186.81)
HL-1240 8MB	PR15447	£174.99 (£205.61)
HL-1250 4MB	PR15448	£204.99 (£240.86)
HL-1250 8MB	PR15449	£234.99 (£276.11)
HL-1250LT 4MB	PR15450	£294.99 (£346.61)
HL-1250LT 8MB	PR15454	£314.99 (£370.11)
HL-1270N 4MB	PR15564	£324.99 (£381.76)
HL-1270N 8MB	PR15565	£344.99 (£405.36)
HL-1270NLT 4MB	PR15566	£414.99 (£487.61)
HL-1270NLT 8MB	PR15567	£434.99 (£511.11)
HL-1660e 8MB	PR13498	£579 (£680.33)
HL-1660e 8MB	PR13657	£779 (£915.33)
HL-1660e 16MB	PR13653	£795 (£934.13)
HL-2060 8MB	PR14318	£639 (£750.83)
HL-2060 16MB	PR14319	£655 (£769.63)
HL-P2500 4MB	PR15894	£234.99 (£276.11)
HL-P2500LT 4MB	PR15891	£294.99 (£346.61)

#### Canon BJC-6200

- 10ppm mono & 7ppm colour
- Separate ink tanks for all colours
- 1440dpi plus Drop Modulation Technology
- Windows 95/98/NT 4.0, Windows 2000, Mac OS

Only **£119<sup>99</sup>** (£140.99)



Item #E067080  
**BUY NOW!**

#### LEXMARK Z52

**New!**

Only **£109<sup>99</sup>** (£129.24)



- Up to 15ppm black, 7ppm colour
- Incredible 2400 x 1200 dpi resolution
- Sharp, clear laser quality text
- Windows and Mac Compatible

Item #E064734  
**BUY NOW!**

DESCRIPTION	ITEM #	PRICE
Canon BJC-2100	E067078	£84.99 (£76.36)
Canon BJC-3030	PR15861	£81.99 (£108.08)
Canon BJC-6500	PR15882	£214.99 (£252.61)
Canon BJC-8200 Photo	PR15883	£229.99 (£270.24)

DESCRIPTION	ITEM #	PRICE
Lexmark Z11	PR15284	£49.99 (£58.74)
Lexmark Z32	E110682	£69.99 (£82.24)
Lexmark Optra E312	E224427	£244.99 (£287.66)
Lexmark Optra M412	E224428	£545 (£640.38)

### EPSON Stylus Supplies

DESCRIPTION	PART NO.	PRICE
Stylus 800/1000/Black	99201	£6.99 (£8.21)
Stylus 400/500/600/700/Photo EX/Black	PA0204	£12.95 (£15.21)
Stylus Color 400/600/800/850/1520/Colour	PA0414	£12.99 (£15.26)
Stylus Color 800/850/1520/Black	PA0415	£12.99 (£15.26)
Stylus Pro XL+/Colour	AC20006	£17.99 (£21.14)
Stylus 500/200/Colour	PA0205	£15.99 (£18.78)
Stylus 300/Black	EURP0057	£13.99 (£16.43)
Stylus Color 300/Colour	ACC22715	£10.99 (£12.91)
Stylus Color 440/460/640/760 Photo 1200/750/Black	PA1580	£13.99 (£16.43)
Stylus Color 740/760/860/ Black	PR1581	£15.99 (£18.74)
Stylus Color 440/460/640/660/740/760/860/ Colour	PR1582	£17.95 (£21.14)
Stylus Photo 700/Photo EX/Colour	ACC2878	£10.99 (£12.91)
Stylus Color 3000/Pro 5000/Black	ACC2845	£31.99 (£37.58)
Stylus Color 3000/Cyan	ACC2843	£31.99 (£37.58)
Stylus Color 3000/Pro 5000/Yellow	ACC2844	£31.99 (£37.58)
Stylus Color 3000/Magenta	ACC2847	£31.99 (£37.58)
Stylus Color/Pro/Pro XL/Black	220372	£7.99 (£9.38)
Stylus Color/Pro/Pro XL/Colour	220373	£16.99 (£19.96)
Stylus Color II/IIIS/820/200/Black	223212	£11.99 (£14.08)
Stylus Color II/IIIS/820/200/Colour	223213	£14.99 (£17.61)
Stylus Color 900/Colour	PR14728	£19.99 (£23.49)
Stylus Color 900/Black	PR14726	£17.95 (£21.09)
Stylus Color 750/Colour	PR14797	£9.50 (£11.16)

### EPSON Stylus Paper

A4 360dpi InkJet Paper	ACC2550	£5.99 (£7.04)
A4 360dpi InkJet Paper	EURPR1112	£16.99 (£19.96)
A4 Photo Quality Glossy Paper	PA0416	£4.99 (£5.86)
4" x 6" Photo Paper	PR12955	£4.99 (£5.86)
A4 Photo Quality Glossy Film	EURZZ1043	£19.99 (£23.48)
A3 Photo Quality Glossy Film	EURPR1111	£31.99 (£37.58)

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YOUR 1ST CHOICE FOR ALL PC HARDWARE, SOFTWARE AND SUPPLIES!

MONITORS

## 17" Mitsubishi Monitors from £154<sup>99</sup>! (€182.1)

### MONITORS

#### SONY

#### FD Trinitron 17" CPD-G200

Only  
**£259<sup>99</sup>!**  
(£305.49)

ITEM #MT3026

MODEL	ITEM #	PRICE
15" FD CPD-E100E	MON1060	£139.99 (€169.68)
17" FD CPD-E200E	MON1052	£219.99 (€268.49)
19" FD CPD-G400	MON1042	£428.99 (€505.24)
21" FD CPD-G500	MT3213	£699.99 (€821.33)

• 17" CRT Sony FD Trinitron visually flat screen monitor  
• 1600x1200 @ 75Hz  
• Max resolution  
• TCO 99  
• 3 year warranty

#### PHILIPS

#### Philips LCD 150P

- 15.1" colour monitor
- Maximum resolution 1024 x 768 @ 75Hz
- Dual input
- Built in front firing stereo speakers and microphone
- Optional protective cover



MODEL	ITEM #	PRICE
Philips 1048	MT1379	£74.99 (€90.89)
Philips 105S11	MT3473	£89.99 (€105.74)
Philips 107S11	MT3302	£149.99 (€176.24)
Philips 1098	MT2848	£309.99 (€364.24)

Only  
**£649!**  
(£762.38)  
ITEM #E060535

#### 3M

#### 3M Screen Filter

Only  
**£28<sup>99</sup>!**  
(£34.06)

ITEM #AC23793

- Economy Flat Frame Design
- 13" 15" size
- Offers Static reduction by up to 90%
- Blocks 99% of radiation



Full Range available - please call for details.



#### Stackable Monitor Blocks

Only  
**£13<sup>99</sup>!**  
(£16.44)

ITEM #BNG264 (3Pk Starter Kit)

- Increase or decrease to your personal preference
- Heavy duty construction
- Supports monitors up to 30 kg
- Raises monitor by 32mm (each segment)
- Also available in singles



PAGE 8 OF 16

### Mitsubishi 100% Diamondtron

#### Diamond Plus 91

- 19" Mitsubishi Diamondtron NF display (18" viewable)
- Precise 0.25-0.27mm grille pitch
- 1600 x 1200 max resolution
- 30-96kHz horiz. scan range
- Convenient OSD for easy to use screen control
- TCO99
- 3 year manufacturer's on-site warranty



Only  
**£324<sup>99</sup>!**  
(£381.86)  
ITEM #MT3502

#### Diamond Plus 73

- 17" Mitsubishi Diamondtron NF Display (16" Viewable)
- Precise 0.25mm aperture grille (unified)
- Recommended resolution of 1024 x 768 @ 85Hz
- 31-70kHz Horizontal Scan Frequency
- TCO 99
- 3yr onsite warranty



New!  
Only  
**£184<sup>99</sup>!**  
(£217.36)  
ITEM #E065064

#### Diamond Plus 200

- 22" Mitsubishi Diamondtron NF display (20" viewable)
- Precise 0.24mm uni pitch aperture grille
- 1800 x 1440 max resolution
- 30-108kHz horiz. scan range
- (FPM) Fine Picture Mode - Improves contrast
- Convenient OSD for easy to use screen control
- TCO99
- 3 year manufacturer's on-site warranty



Only  
**£579!**  
(£680.33)  
ITEM #MT3581

DESCRIPTION	ITEM #	PRICE
Diamond Scan 50	E060940	£99.99 (€117.49)
Diamond Scan 70	E062890	£154.99 (€182.11)
Diamond Plus 73	E065064	£184.99 (€217.36)
Diamond Pro 920	E060694	£394.99 (€464.11)
Diamond Plus 91	MT3502	£324.99 (€381.86)

DESCRIPTION	ITEM #	PRICE
Diamond Plus 200	MT3581	£579 (€680.33)
Diamond Pro 720	E060575	£234.99 (€276.11)
Diamond Pro 2040u	MT3634	£729 (€856.57)
LCD 580 NEW!	E065043	£639 (€750.83)
LCD 820	MT3209	£1749 (€2055.08)

MITSUBISHI DISPLAY PRODUCTS

### Introducing VALUEVISION, a new brand from TAXAN

#### Valuevision 1710 TCO 99

- 17" FST CRT
- 0.27mm Dot Pitch
- 1024 x 768 @ 87Hz
- TCO 99 Compliant
- 3 year On-site exchange warranty

Only  
**£134<sup>99</sup>!**  
(£158.61)



Item #MT3547  
BUY NOW!

#### Valuevision 1910 TCO 99

- 19" FST
- 0.26mm dot pitch
- 1600 x 1200 @ 75 Hz
- TCO 99 Compliant
- 3 year On-Site exchange warranty

Only  
**£234<sup>99</sup>!**  
(£276.11)



New!

Item #E081297  
BUY NOW!

DESCRIPTION	ITEM #	PRICE
Ergovision 535 TCO 99	MT3031	£129.99 (€152.74)
Ergovision 735 TCO 99	MT2515	£174.99 (€222.06)
Ergovision 745 TCO 99	MT2516	£214.99 (€264.36)
Ergovision 755 TCO 99	MT3038	£234.99 (€276.11)

DESCRIPTION	ITEM #	PRICE
Ergovision 985 TCO 99	E081298	£329.99 (€392.24)
Ergovision 2280 TCO 99	MT3243	£775 (€910.53)
Crystalvision 675 TCO 99-S	MT3024	£749 (€880.08)
Crystalvision 875 TCO 99	MT3025	£2049 (€2407.57)

### ViewSonic for Performance and Price

#### ViewSonic E651

- 15" (13.8" viewable) CRT monitor
- 0.28mm dot pitch
- 800 x 600 recommended resolution @ 85Hz
- MPRII

Only  
**£89<sup>99</sup>!**  
(£105.74)



Item #E086975  
BUY NOW!

#### ViewSonic GS773

- 17" (16" viewable) Short-depth CRT monitor
- Takes up similar desktop space to conventional 14" CRT
- Fine 0.26mm dot pitch
- 1024x768 recommended resolution at 87Hz
- TCO '99 & Energy

ViewSonic on top  
Only  
**£194<sup>99</sup>!**  
(£229.11)



Item #MT3167  
BUY NOW!

Free!  
3 year 24 hour Express Exchange on site warranty

- 2000 compliant
- Super contrast screen with SuperClear

# 0800 338 000

GRAPHICS CARDS/DVD/CD-RW DRIVES

## NEW Range of Plextor CD-ReWriters

From Only **£159<sup>99</sup>** (€187.99)

### PlexWriter 12x4x32x SCSI CD-ReWriter

From Only **£234<sup>99</sup>**  
(£276.11)  
ITEM #DR12294

**New!**



Perfect all-in-one product for backup, duplication and all multimedia applications

- Write: 12x
- Rewrite: 4x
- Read: 32x
- Interface: Ultra SCSI
- Data Buffer: 4MB
- Warranty period: 1 year
- Package includes: 1 CD-R disk, 1 CD-RW disk, Recording software: WinOn CD + Packet CD + BackMeUp (Backup software), 12-language manual, Plextors own utility software "Plextools".

### PlexWriter 8x4x32A EIDE CD-ReWriter



Only **£159<sup>99</sup>**  
(£187.99)  
ITEM #DR11850

- Write: 8x
- Rewrite: 4x
- Read: 32x
- Interface: E-IDE (ATAPI)
- Data Buffer: 4MB
- Warranty period: 1 year
- Package includes: 1 CD-R disk, 1 CD-RW disk, WinOn CD + Packet CD recording software, 12-language manual

### PlexWriter 8x4x32A EIDE with Burn Proof Technology



From Only **£199<sup>99</sup>**  
(£234.99)  
ITEM #E232073

**New!**

- Write: 12x
- Rewrite: 10x
- Read: 32x
- Interface: E-IDE (ATAPI)
- Data Buffer: 2MB with BURN-Proof technology
- Warranty period: 1 year
- Package includes: 1 CD-R disk, 1 CD-RW disk, Recording software, WinONCD, PacketCD, BackMeUp, 12 language manual, Plextors own utility software Plextools

DESCRIPTION	ITEM #	PRICE
PlexWriter CD-RW 12X/4X/32X Internal SCSI	DR12294	£234.99 (€276.11)
PlexWriter CD-RW 12X/4X/32X External SCSI	DR11293	£274.99 (€323.11)
PlexWriter CD-RW 8X/4X/32X Internal IDE	DR11850	£159.99 (€187.99)



### ATI Xpert Pro 8MB



From Only **£25<sup>99</sup>**  
(£30.53)

Item #E091028  
**BUY NOW!**

- With the new Rage XL Chipset, PC 99 Compatible
- The Powerful 3D, 2D and DVD accelerator
- 64-bit 2D acceleration ultra-high resolution support up to 1600 x 1200 at 85 Hz
- With Xpert boards and the ATI DVD player software (sold separately) enjoy true colour DVD/MPEG 2 video in any graphics mode and full frame rate playback as if you were watching TV.
- PC 99 compliant

### ATI Xpert 2000 32MB



Only **£50<sup>99</sup>**  
(£59.91)

Item #EX10582  
**BUY NOW!**

- 32MB of powerful memory
- 128-bit RAGE 128 graphics engine
- Incredible 3D and 2D graphics
- Hardware DVD video playback
- 32-bit true color 3D graphics up to 1920 x 1200
- 2D graphics up to 1600 x 1200 @ 85Hz
- Full DirectX, Direct3D and OpenGL acceleration
- TV version also available



### Pioneer 16X DVD/40X CD-ROM

The DVD-105 16X DVD-ROM (40X CD-ROM) features the unique slot-in mechanism and is compatible with single and dual layer DVD-ROM and DVD-Video, DVD-R, DVD-RW, CD-ROM, CD-R, CD-RW, CD-DA, Video CD and Photo CD media, preserving compatibility with conventional CD formats.

- Max transfer speeds: 16X DVD-ROM: 21.6MB/s, 40X CD-ROM: 6.0MB/s.
- Random seek times of less than 85 msec for DVD-ROM (70 msec for CD-ROM)
- Access times less than 95 msec (80 msec for CD-ROM)
- ATAPI interface
- Slot-in disc loading systems
- Horizontal or vertical mounting capabilities

DESCRIPTION	ITEM #	PRICE
Pioneer 10X/40X DVD/CD-ROM Int. ATAPI Drive	DR12179	£124.99 (€146.87)
Pioneer 6X/32X DVD/CD-ROM Int. SCSI Drive	DR12180	£114.99 (€135.11)
Pioneer 6X/32X DVD/CD-ROM Int. SCSI (OEM) Drive	DR12502	£104.99 (€123.36)
Pioneer 16X/40X Internal IDE	E226284	£118.99 (€139.81)



Includes 2 FREE games!

Only **£118<sup>99</sup>**  
(£139.81)

Item #E226284  
**BUY NOW!**

**New!**

### APG GRAPHICS CARDS FROM ONLY £189.99 (€223.23)

3dfx **New!**

### Voodoo 5500 AGP Graphics Card



Only **£189<sup>99</sup>**  
(€223.23)  
ITEM #E107924

- Supports resolutions up to 2048 x 1536
- 166MHz Core Clock
- Full 128-Bit 2D accelerator
- 350 MHz RAMDAC
- TV/S-Video out
- 16MB SDRAM
- 166MHz Core Clock Speed
- 7 Million triangles/sec
- 333 Megatexels/sec.

### PYRO Digital Video



Create Exciting Videos in Minutes!

Only **£84<sup>99</sup>**  
(£99.87)  
ITEM #EX10376

Use the PYRO Digital Video Card to transfer video from your digital camcorder to your PC, edit the video with titles, effects, background music and more. Then send your edited video back to your digital recorder. Display your broadcast quality production on your TV or copy to your VCR. Your friends will be amazed with your Hollywood directorial style!

- Connects to Digital Camcorders
- Works with 1394 hard drives
- Edit Video and send out to tape
- Product Digital Video Movies
- 3 Ports at 400Mb/Sec
- Fully IEEE 1394a compliant
- Plug and Play
- Includes 1394 PCI 3 port host card, 1394 to DV editing cable, U-Lead video studio editing package & user manual



### Adaptec Ultra SCSI Card 2930U



Only **£59<sup>99</sup>**  
(£70.49)  
ITEM #EX10225

- Boost the performance of your CD-R or Jaz drive
- Transfer rate up to 20Mbps
- Connect up to 7 peripherals with just one card

PAGE 9 OF 16

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HARD DRIVES

## lomega External USB CDRW from only £175<sup>99</sup> (£206.78)

**HARD DRIVES FROM ONLY**  
£64<sup>99</sup> (£76.36)

### lomega USB CDRW Drive

Only £175<sup>99</sup>!

(£206.78)

ITEM #DR12387

- 4x4x6
- Adaptec Easy CD Creator
- Avermedia software labeller for CD's
- Adobe Photoshop 5 LE
- .650mb



### TV and video conference on your PC! AVerTVCam

Only £79<sup>99</sup>! (£93.99)

**New!**

- 125 TV Channels with Nicam Stereo Sound
- Teletext
- Inc. video e-mail and video conferencing software
- Inc. camera & microphone
- Inc. remote control

Item #E065078  
**BUY NOW!**

### Turn your PC monitor into a TV! JoyTV

- Plug-n-Play TV tuner box
- 181 TV channels
- Teletext
- Play video games on your PC monitor!
- Inputs: Comp. video and S-video
- Output: Comp. video
- Inc. remote control

Only £69<sup>99</sup>! (£82.24)

Item #INP1990  
**BUY NOW!**



### 2GB lomega Jaz Drive

Only £199<sup>99</sup>!

(£234.99)

ITEM #DR7039

- Super-Fast - It works as fast as you do
- Super-Light - Jaz is portable it goes where you go
- Transfer rate up to 8.70MB per second
- Windows® 98 compatible
- Provides 4GB capacity with 2:1 compression



Cartridges available

### For professional PC presentations! AverKey 300

Only £144<sup>99</sup>! (£170.36)

- Plug-N-Play PC-to-TV converter
- Make PC/laptop presentations on 'big screens': TV, plasma, video projectors!
- Spot, Spotlight and Pointer features
- Powerful zoom
- 1,024x768 resolution
- Inc. remote control

Item #INP1994  
**BUY NOW!**

### Full-screen video camera (USB) Intercam Elite

Only £39<sup>99</sup>! (£46.99)

- 640 x 480 resolution
- 24-bits colour
- Electronic Exposure / Gain / White balance control
- Contrast / Gamma / Saturation / Sharpness control
- Inc. software for video e-mail, photo album & video conferencing

Item #IN8226  
**BUY NOW!**



AVerMedia®

### HARD DRIVES

**New!** Seagate **New!**  
THE DATA TECHNOLOGY COMPANY

#### BARACUDA IDE HARD DRIVE

Capacity	Model	Interface	Speed	Order No	Price
20GB	ST320420A	ATA/66	7200	E099651	£107.99 (£126.89)
30GB	ST330630A	ATA/66	7200	E138825	£139.99 (£164.49)

#### CHEETAH SCSI HARD DRIVES

Capacity	Model	Interface	Speed	Order No	Price
9.2GB	ST39204LW	Ultra 160	10000	E099664	£259.99 (£305.49)
9.2GB	ST39204LC	Ultra 160 SCA	10000	E099663	£259.99 (£305.49)
18.2GB	ST318404LW	Ultra 160	10000	E099646	£379.99 (£446.49)
18.2GB	ST318404LC	Ultra 160 SCA	10000	E099645	£379.99 (£446.49)
36GB	ST336704LW	Ultra 160	10000	E099656	£746.99 (£877.71)
36GB	ST336704LC	Ultra 160 SCA	10000	E097523	£746.99 (£877.71)
73GB	ST713404LW	Ultra 160	10000	E226141	£1213.99 (£1426.44)
73GB	ST713404LC	Ultra 160 SCA	10000	E226142	£1213.99 (£1426.44)

#### MEDALIST IDE U8 HARD DRIVES

Capacity	Model	Interface	Speed	Order No	Price
10GB	ST310212A	ATA/66	5400	E099640	£64.99 (£76.36)



### New Evergreen Firewire PC Card, CardBUS and Hot drive

- Gives PC users firewire connection
- Firewire gives you data transfer speeds of 400 Mbits/sec, 40 times faster than USB
- Hot swappable
- PCI Card 3 external and 1 internal firewire ports
- CardBUS 2 external ports for Notebooks
- Hotdrive External hard drive 20GB



From £99! (£116.33)

Item #E065816  
**BUY NOW!** EVERGREEN technologies

### Amacom Baby CD

- Ultra slim 24X PCMCIA CD-Rom
- No need for bulky mains adapters, powered direct from your PC
- PCMCIA Type II interface
- 3,600 KB/S transfer rate



AMACOM

Only £98! (£115.15)

Item #DR10136  
**BUY NOW!**



### HP CD-RW External 4X4X6X 8210E

Get connected fast with Plug-and - Play USB!

- 4X Write, 4X Rewrite, 6X Read
- USB Interface
- Easy Drag and Drop functionality
- Highly versatile and extremely portable
- Includes Adaptec Software, HP Fast Format, 1 x HP CD-R & 1 CD-RW Media



Only £179<sup>99</sup>! (£211.48)

Item #DR11463  
**BUY NOW!**

### HP Colorado Tape Drive External 8GB C4388B

- Travan Tape technology
- Parallel External Drive
- Transfer rate 502KB
- 8GB compressed capacity
- System requirement win 3.1 or higher/ Dos 5.0 or higher



Only £174<sup>99</sup>! (£205.61)

Item #DR7939  
**BUY NOW!**

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# 0800 338 000

## Lightning fast ELSA from only £35<sup>99</sup>! (£42.29)

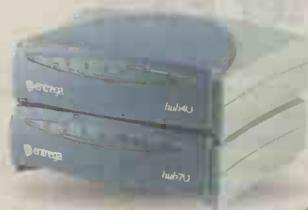
USB/MODEMS/NETWORKING

### Xircom Port Expansion Solutions

Xircom PortGear™ port expansion solutions are the simplest way to hook up your devices to PC and Mac computers via a single USB connection.

**USB network adapter only**  
**£42<sup>99</sup>!**  
(£50.51)

Item #DAD1689  
**BUY NOW!**



**4 Port USB Hub only**  
**£31<sup>99</sup>!**  
(£37.59)

Item #DEH5025  
**BUY NOW!**

**USB to SCSI only**  
**£44<sup>99</sup>!**  
(£52.86)

Item #DAD1694  
**BUY NOW!**

DESCRIPTION	ITEM #	PRICE
Xircom PortGear 2 port USB UPG Kit PCI Card	DEC4036	£24.99 (£29.36)
Xircom PortGear 4 port USB UPG Kit PCI Card	DEC4037	£29.99 (£35.24)
Xircom PortGear 7 port USB Hub	DEH5024	£49.99 (£58.74)
Xircom PortGear 4 port USB Hub	DEH5037	£34.99 (£41.11)
Xircom PortGear 4 port USB Blueberry Hub	DEH5025	£31.99 (£37.59)
Xircom PortGear 3 port USB Hub with Ethernet 10MB	DEH5026	£73.99 (£86.94)
Xircom PortGear 7 port Blueberry USB Hub	DEH5027	£48.99 (£57.56)
Xircom PortGear 4 port Multifunction Hub	DEH5029	£69.99 (£82.24)
Xircom PortGear 6 port Multifunction Hub	DEH5038	£99.99 (£117.49)
Xircom PortGear 7 port Multifunction Hub	DEH5030	£96.99 (£113.96)
Xircom PortGear C36pin Parallel Adapter	DAD1684	£27.99 (£32.89)

DESCRIPTION	ITEM #	PRICE
Xircom PortGear Serial DB25 Adapter	DAD1685	£44.99 (£52.86)
Xircom PortGear Serial Mac DIN8 Adapter	DAD1686	£34.99 (£41.11)
Xircom PortGear Serial DB9 Adapter	DAD1687	£33.99 (£39.94)
Xircom PortGear Ethernet 10MB Adapter	DAD1688	£39.99 (£46.99)
Xircom PortGear USB Networking Adapter	DAD1689	£42.99 (£50.51)
Xircom PortGear 0.5 M USB Cable	DCA6026	£3.99 (£4.68)
Xircom PortGear 1M USB Cable	DCA6027	£4.49 (£5.28)
Xircom PortGear 2M USB Cable	DAD6028	£6.99 (£8.21)
Xircom PortGear 5M USB Cable	DCA6220	£7.99 (£9.39)
Xircom PortGear USB to SCSI Adapter	DAD1694	£44.99 (£52.86)

### ELSA GLADIAC geFORCE 2GTS

**New!**



**Only £224<sup>99</sup>!**  
(£264.36)

Item #E226092  
**BUY NOW!**

### ELSA MicroLink™ 56K\* Internet

The ELSA MicroLink™ 56K Internet is the ideal modem for fast Internet access and e-mail. Save valuable time, effort and money browsing through Web pages faster and more easily using 56K modem speed technology.

- Windows® 95, 98 and NT compatible
- Plug and Play
- V.90 56K standard
- Answering machine within ELSA COMMUNICATE! Lite software

**Now only £39<sup>99</sup>!**  
(£46.99)



Item #DMD4320  
**BUY NOW!**

- The Hyper-Reality Graphics**
- Powered by NVIDIA GeForce2 GTS
  - Ultra fast 32MB or 64MB Double Data Rate RAM guarantees rapid data processing
  - Enhanced visual display with NVIDIA Shading Rasterizer(r) (NSR) and 'per-pixel shading' technology
  - Optional upgrade to Video-In/Out
  - Compatible with Windows(r) 95, Windows(r) 98, Windows(r) NT 4.0 (i386), Windows(r) 2000 and Linux
  - 6-year ELSA warranty

DESCRIPTION	ITEM #	PRICE
ELSA MicroLink ISDN 2 A/B	DMD4753	£119.00 (£139.83)
ELSA MicroLink ISDN Serial	DMD4757	£79.99 (£93.99)
ELSA MicroLink Internet 56K V.90 Voice/Fax/Data Modem	DMD4320	£39.99 (£46.99)
ELSA MicroLink 56K V.90 USB Modem PNP	DMD4321	£34.99 (£64.61)
ELSA MicroLink Office 56K V.90 External Modem	DMD4322	£86.99 (£102.21)
ELSA MicroLink 56K V.90 PCI Internal Modem PNP	DMD4323	£34.99 (£41.11)
ELSA MicroLink 56K MC-PC Card V.90 Modem	DEC3753	£98.99 (£116.31)
ELSA MicroLink ISDN USB Win 98 PNP T/A	DMD4324	£69.99 (£82.24)
ELSA MicroLink ISDN PCI	DMD4756	£35.99 (£42.29)

\*The ELSA V.90 modems are capable of download speeds up to 56,000bps, however due to varying line conditions actual speeds achieved may be lower.

### NETWORKING/MODEMS/GRAPHICS



#### Surgemaster Powerstrips

DESCRIPTION	OUTLETS/CONG LENGTH	EQUIPMENT WARRANTY	ITEM #	PRICE
Master Cube				
Home Office Grade 1/Wall	£6,000	DUP2485	£7.95 (9.34)	
Home Office Grade 1/Wall	£6,000	DUP2486	£10.95 (12.87)	
SurgeMaster				
Home Office Grade 4/2m	£3,000	DUP2487	£14.95 (17.57)	
Home Office Grade 4/2m	£3,000	DUP2489	£19.95 (23.44)	
Home Office Grade 4/4m	£3,000	DUP2483	£24.95 (29.32)	
Home Office Grade 5/2m	£10,000	DUP2490	£16.95 (19.92)	
Home Office Grade 5/2m	£10,000	DUP2492	£24.95 (29.32)	
Home Office Grade 5/4m	£10,000	DUP2491	£29.95 (29.32)	



#### WebRamp 410i

Integration high-speed ISDN connection with IP router, 4-port, 2 voice ports and security features.

**Affordable and easy to use!**

**Only £284<sup>99</sup>!**  
(£334.86)

ITEM #DEB2457



#### Axis OfficeBasic Print Server

**Only £79<sup>99</sup>!**  
(£93.98)

ITEM #DEP1865

The ideal solution for 10baseT or 10/100baseT networks of 50 or fewer users, the AXIS OfficeBasic print server attaches directly to any parallel port printer and offers "one-click" installation and embedded Web pages for simple management. The AXIS OfficeBasic supports Windows 95/98/NT using TCP/IP and NetBIOS/NetBEUI.



#### SPECIAL OFFER KVM Switch prices cut for a limited period only

Save up to £40 on the Duette & Quartette

Description	Item #	Offer Price	Save
Duette 2way (without cables)	DS02121	£99 (£116.33)	£30
Duette 2way (with 2m cables)	91143	£139 (£163.33)	£30
Quartette 4way + OSD (without cables)	DS02122	£149 (£175.08)	£40
Quartette 4way + OSD (with 2m cables)	DW1268	£229 (£229.08)	£40

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YOUR 1ST CHOICE FOR ALL PC HARDWARE, SOFTWARE AND SUPPLIES!

MODEMS/NETWORKING

## Cut Loose to a World Without Wires!

**New!** 3COM

### Megahertz 10/100 16-bit LAN PC Card with XJACK

Only **£76.99!**  
(£90.46)  
ITEM #E000152

Use the 3Com Megahertz 10/100 LAN PC Card with your notebook with 16-bit PC Card slots. This PC Card easily migrates to a notebook with 32-bit CardBus slots. DynamicAccess® technology support makes this PC Card ready for future networking performance enhancements. Its highly reliable with low power consumption and thermal ratings.



**New!** 3COM

### 3Com 10/100 LAN + 56K Modem CardBus PC Card

Only **£129.95!**  
(£152.69)  
ITEM #E020521

The 3Com Megahertz 10/100 LAN+56K\* Global Modem CardBus PC Card, gives you fast, reliable, LAN and modem access with any notebook with a 32-bit CardBus slot running Windows 95 OSR-2, 98, 2000, or Windows NT 4.0. One connector gives you LAN and modem access automatically. Plus, this PC Card delivers GSM access and is easily upgradable for ISDN\*\* connections.



**New!** 3COM

### HomeConnect Dual PC Digital Camera

High Quality "grab and go" camera detaches easily from USB cable - take it from one PC to another. Install and see live video minutes. Get sharp images for video snapshots, e-mail, video phone calls over the Internet, Webcam. Adjusts automatically from full sunlight to birthday candles.

Only **£86.99!**  
(£102.21)  
ITEM #E060532



**New!** 3COM

### OfficeConnect Dual 56K LAN Modem

- Simple to install
- Incorporates 2 high speed V.90 modems, a router, two voice ports and a 4 port ethernet hub
- Includes Intelligent NAT technology
- Lifetime Warranty

Only **£215!**  
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## AirConnect Wireless LAN Starter Pack



Wi-Fi™  
The Standard for Wireless Fidelity.

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A 3Com AirConnect wireless LAN starter pack provides everything you need to deploy a wireless LAN solution. Each pack contains one access point and three PC Cards. Included with the access point is a:

- Power supply with power cable • PowerBASE-T module • Mounting bracket
- Null modem serial cable • CD-ROM including all Site Survey, HyperTerminal script, and online documentation • Access point Quick Start Guide • Warranty and registration card • Included with the three AirConnect wireless LAN PC Cards is a Quick Start Guide and a CD-ROM featuring driver, installation, diagnostics software, and online documentation.

## AirConnect Wireless LAN Access Point

The 3Com® AirConnect® wireless LAN Access Point acts as a bridge between the Ethernet backbone of a wired network and a wireless client. Typically affixed to a ceiling or wall, access points send and receive data from up to 63 simultaneous users within a radius of 300 feet (91 meters) in a standard office environment. 3Com AirConnect wireless LAN access points feature built-in diagnostics and power-up selfcheck, upgradable firmware, antenna diversity, and support for SNMP. Each includes a PowerBASE-T module, which supplies the access point with both the data connectivity and the DC power it requires, giving you the cost-saving option of running a single 10BASE-T line out to it.

## AirConnect Wireless LAN PC Card

The 3Com AirConnect wireless LAN PC Card is a 16-bit, 5-volt, Type II PC Card for notebooks. It transmits data to and from the network over the access point with which it is associated at any given time. Each PC Card features an extended antenna for optimal reception.

The AirConnect wireless products are Wi-Fi™ compliant ensuring standards-based interoperability.

DESCRIPTION	ITEM #	PRICE
AirConnect Wireless LAN Starter Pack 3CRWE343A	E063096	£859.99 (£1010.49)
AirConnect Wireless LAN Access Point 3CRWE747A	E219846	£569.99 (£669.99)
AirConnect Wireless LAN PC Card 3CRWE737A	E219847	£115.99 (£136.99)

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The OfficeConnect Network Assistant has been carefully designed to guide OfficeConnect users through every stage of Network set up, from installation through to the day to day network maintenance.

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Ethernet Hub 4 port 10Base-T Combo	3C16703A	DEH4899	£42.99 (€50.51)
Ethernet Hub 8 port 10Base-T	3C16700A	DEH4898	£46.99 (€55.21)
Ethernet Hub 8 port 10Base-T Combo	3C16701A	DEH4901	£57.99 (€68.14)
Fast Ethernet Hub 4 port	3C16723A	DEH4896	£59.00 (€69.33)
Dual Speed Hub 8 port	3C16750B	E049413	£79.99 (€93.99)
Dual Speed Switch 4 port	3C16733A	DEH5055	£99.99 (€117.49)
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3CS09BTP0 EtherLink III UTP Only	DEC1473	£34.99 (€41.11)
3CS09BTP EtherLink III UTP/AUI	DEC1470	£59.99 (€70.49)
3CS09B Combo EtherLink III Combo	DEC1477	£69.95 (€82.19)
3CS09BTPC EtherLink III BNC/UTP	DEC2425	£47.95 (€56.34)
3C905-TX-M FastEtherLink 10/100 PCI	DEC3843	£47.95 (€56.34)
3CXES98EC Megahertz RJ45/BNC 10Mbps LAN PC Card w/XJACK	DEC3575	£109.95 (€129.19)
3CXES98ET Megahertz RJ45 10Mbps LAN PC Card w/XJACK	DEC3576	£75.95 (€89.24)
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MODEMS/CABLES/NETWORKING

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Centronics 50 (M) - Centronics 50 (M)	1.0m	EURAC3670	£9.95 (£11.69)
Centronics 50 (M) - Centronics 50 (M)	2.0m	EURAC3697	£10.95 (£12.87)
Centronics 50 (M) - Centronics 50 (M)	3.0m	EURAC3671	£15.95 (£18.75)
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Centronics 50 (M) - Centronics 50 (F)	2.0m	EURAC3673	£15.95 (£18.74)
Centronics 50 (M) - DB25 (M)	1.0m	EURAC2158	£8.95 (£14.01)
Centronics 50 (M) - DB25 (M)	2.0m	EURAC3674	£19.95 (£23.44)
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Mini - 50 SCSI II (M) - Centronics 50 (M)	0.5m	DCA2170	£10.95 (£12.87)
Mini - 50 SCSI II (M) - Centronics 50 (M)	1.0m	EURAC3700	£19.95 (£23.44)
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Mini - 50 SCSI II (M) - Centronics 50 (M)	3.0m	DCA2090	£28.95 (£35.19)
<b>SCSI II - II</b>			
Mini - 50 SCSI II (M) - Mini - 50 SCSI II (M)	0.5m	DCA2173	£16.95 (£19.92)
Mini - 50 SCSI II (M) - Mini - 50 SCSI II (M)	1.0m	DCA2559	£22.95 (£26.97)
Mini - 50 SCSI II (M) - Mini - 50 SCSI II (M)	2.0m	DCA2657	£28.95 (£35.19)
Mini - 50 SCSI II (M) - Mini - 50 SCSI II (M)	3.0m	DCA2648	£38.95 (£47.24)
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5m	DCA3915	£19.95 (£23.44)	
<b>A-A DB25-DB25 Cable</b>			
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3.0m	DCA3912	£7.49 (£8.80)	
5m	DCA3867	£13.49 (£15.85)	
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DB9F/DB25M	5m	EURAC2258	£7.49 (£8.80)
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IEC-Mains Cable 3m	DCA4083	£3.99 (£4.69)	
IEC-Mains Cable 6m	DCA4084	£6.99 (£8.21)	
<b>IEC M-F Mains Cables</b>			
IEC M-F 2m	DCA2900	£2.99 (£3.51)	
IEC M-F 3m	DCA4085	£3.99 (£4.69)	
IEC M-F 6m	DCA4086	£6.99 (£8.21)	
<b>SCSI II Internal Ribbon Cables</b>			
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W4 x IDC 50s-45cm	DCA3914	£3.19 (£3.79)	
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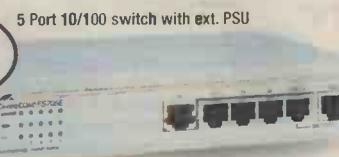
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- Allows information to be searched with just partial search criteria and wildcards
- Win 95/98/2000 interface design makes it easy and fast to use. No jargon, no need for manuals
- Build your own internal lists with Tag Master
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- Reverse searchable - by using anything from names, street names, door numbers and many more you are able to find any record, anyhow you wish
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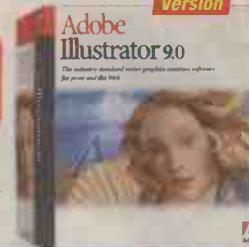
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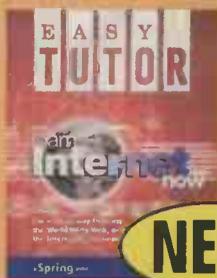
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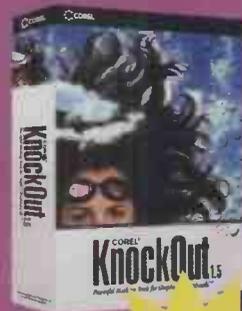


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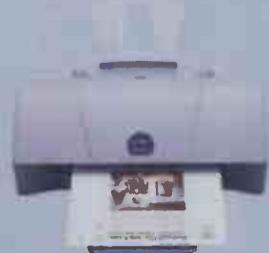
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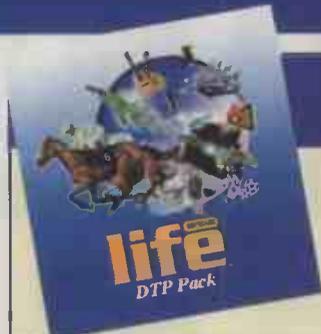
To receive a replacement product after 30 days, customers must confirm to Simply by fax or letter the date the product was received by Simply for repair, the returns number, and nature of the repair problem. Simply will deliver a replacement product as soon as possible. In the event of unavailable or 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. Fast Track returns and credits will be dealt with within 48 hours.

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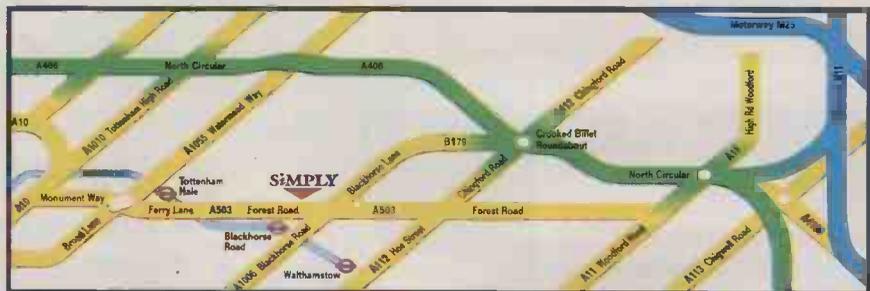
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HF0158	Fujitsu MPE3102AT	10.2GB	9.5ms	5400	512K	UDMA66	3	£57.00	£66.98
HF0159	Fujitsu MPE3102AH	10.2GB	8.5ms	7200	512K	UDMA66	3	£72.00	£84.60
HF0157	Fujitsu MPE3153AT	15.3GB	9.5ms	5400	512K	UDMA66	3	£78.00	£91.65
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HF0162	Fujitsu MPE3204AH	20.4GB	8.5ms	7200	512K	UDMA66	3	£106.00	£124.55
HF0142	Fujitsu MPE3273AT	27.3GB	9.5ms	5400	512K	UDMA66	3	£144.00	£169.20
HI0148	IBM DTLA307015 75GXP	15GB	8.5ms	7200	512K	UDMA100	3	£79.00	£92.83
HI0151	IBM DTLA305020 40GV	20GB	8.5ms	5400	2MB	UDMA100	3	£82.00	£96.35
HI0144	IBM DTLA-307030 75GXP	30GB	8.5ms	7200	2MB	UDMA100	3	£139.00	£163.33
HI0145	IBM DTLA-307045 75GXP	45GB	8.5ms	7200	2MB	UDMA100	3	£199.00	£233.83
HI0146	IBM DTLA-307060 75GXP	60GB	8.5ms	7200	2MB	UDMA100	3	£299.00	£351.33
HI0147	IBM DTLA-307075 75GXP	75GB	8.5ms	7200	2MB	UDMA100	3	£402.00	£472.35
HMA200	Maxtor DiamondMax VL30 31536U2	15.3GB	9.5ms	5400	512K	UDMA66	3	£69.00	£81.08
HMA201	Maxtor DiamondMax VL30 32049U3	20.4GB	9.5ms	5400	512K	UDMA66	3	£80.00	£94.00
HMA202	Maxtor DiamondMax VL30 33073U4	30.7GB	9ms	5400	512K	UDMA66	3	£104.00	£122.20
HQ0323	Quantum Fireball lct10 QML10200LB-A	10.2GB	8.9ms	5400	512K	UDMA66	3	£66.00	£77.55
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HQ0325	Quantum Fireball lct10 QML20400LB-A	20.4GB	8.9ms	5400	512K	UDMA66	3	£86.00	£101.05
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HS0153	Seagate U8 ST38410A	8.4GB	9ms	5400	512K	UDMA66	3	£55.00	£64.63
HS0221	Seagate U10 ST310212A	10.2GB	8.9ms	5400	512K	UDMA66	3	£57.00	£66.98
HS0225	Seagate Baracuda ST310210A	10.2GB	8.2ms	7200	2MB	UDMA66	3	£66.00	£77.55
HS0219	Seagate U8 ST313021A	13GB	9ms	5400	512K	UDMA66	3	£59.00	£69.33
HS0222	Seagate U10 ST315323A	15.3GB	8.9ms	5400	512K	UDMA66	3	£66.00	£77.55
HS0226	Seagate Baracuda ST315320A	15.3GB	8.2ms	7200	2MB	UDMA66	3	£99.00	£116.33
HS0220	Seagate U8 ST317221A	17.2GB	9ms	5400	512K	UDMA66	3	£68.00	£79.90
HS0223	Seagate U10 ST320423A	20.4GB	8.9ms	5400	512K	UDMA66	3	£112.00	£131.60
HS0227	Seagate Baracuda ST320420A	20.4GB	8.2ms	7200	2MB	UDMA66	3	£116.00	£136.30
HS0224	Seagate Baracuda ST330630A	30.6GB	8.2ms	7200	2MB	UDMA66	3	£134.00	£157.45
HW0139	Western Digital Caviar AC8400	8.4GB	10ms	5400	512K	UDMA66	3	£66.00	£77.55
HW0146	Western Digital Caviar AC10200	10.2GB	10ms	5400	512K	UDMA66	3	£78.00	£91.65
HW0142	Western Digital Caviar AC20400	20GB	10ms	5400	512K	UDMA66	3	£99.00	£116.33
HW0148	Western Digital WD205BA Expert	20.5GB	10ms	7200	512K	UDMA66	3	£121.00	£142.18

HARD DRIVES • TAPE STREAMERS

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Manufactured to the highest quality in Switzerland Vivastar CD-R & CD-RW media is available in jewel cases or the new space saving 'clip-tray' design.



**VIVASTAR**  
CD980/CDR **£0.85**  
~~£1.30~~  
CD981/CDR 10 PACK **£8.00**  
~~£9.40~~  
CD982/CDRW **£1.70**  
~~£2.00~~  
CD983/DIGITAL AUDIO **£1.70**  
~~£2.00~~

### DATAWISE DASH 6.0GB DISK

- 2.5" Portable Hard Drive. Not much bigger than a packet of cigarettes! A truly portable storage solution - take your data everywhere you go!
- 6.0Gb Capacity
  - No external power required
  - Choose PC Card, USB or parallel cable
  - Ideal for moving your data quickly and easily
  - Instant extra storage space



**DATAWISE**  
CD985/PP CABLE **£26.00**  
CD986/PCMCIA CABLE **£29.00**  
CD983/6GB **£275.00**

### PIONEER DVD-105S

Pioneer, the leading manufacturer of DVD technology now brings you their most advanced drive to date:

- 16X DVD-ROM/40X CD-ROM
- High speed transfer rate to 21.6MB/s
- Fast access time of 80 secs for CD-ROM & 95 for DVD-ROM
- ATAPI Interface
- Slot-in or tray mechanism



DVD018 **£108.00**  
~~£126.90~~

### MEMORY PLUS SOLO

Currently available in two colours, Silver & Pink. This IS the smallest MP3 player currently available. Utilises MultiMedia Cards (MMC) as its storage media.

- Users will need to buy a bundle to begin with consists of:
- Solo Player • Card Reader / Writer • 16MB MMC card
  - Additional / Optional Extras • Solo Player • 16MB MMC Card • 64MB MMC Card



SOLD BUNDLE **£85.00**  
~~£89.99~~  
MMC16 **£32.00**  
~~£37.90~~  
MMC64 **£128.00**  
~~£150.40~~

### MIRAI 'BURN-PROOF' CD-R/RW KIT

Now you can create CDs FIRST time EVERY time, and still access your desktop applications and the internet.

- 12X 4X 32X CD Rewritable Drive (2MB Buffer) • PCI-SCSI Controller • NERO CD Creation software • 1 x CD-R & 1 x CD-RW media • Driver disc, cable, screws • Water-based CD Marker Pen • Installation Guide



**MIRAI** **BURN-Proof**  
CD0150 **£229.00**

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8am-8pm Mon-Fri, 9am-5pm Sat

## IDOMEGA ZIPCD CD-RW 650MB 8X4X32

ZipCD CD-RW 650MB 8x4x32 internal drive is quick to install and easy to use

- A low cost, reliable solution from Iomega to archive, distribute and exchange data
- Writes to all standard CD-R and CD-RW discs and writes to CD-RW discs
- Includes the leading Adaptec Easy CD Creator, Adaptec DirectCD software and IomegaWare software. 1 CD-R disk
- Interface E-IDE (ATAPI)
- Compatible Windows 95, 98, 2000, NT4.0



**CD3368 IOMEGA ZIPCD**  
**£159.00**  
~~£186.83~~

## IOMEGA ZIP 250MB USB DRIVE

Introducing the new Zip 250MB USB drive from Iomega. Ultra Thin and portable with USB & PCMCIA, quick and easy connections for PC and Apple computers.

- Portable - use it with your laptop PC or desktop computer
- Sleek new design 50% smaller than Zip 250 PPT/SCSI drive
- System requirements PC Pentium 100 or higher with built in USB Controller, Windows 95/98 or NT 4.0
- For MAC users Power Macintosh G3 or iMac computer with built in USB Controller MacOS 8.1 or higher
- Notebook users PCMCIA cable sold separately, Win 98



**HZ0031**  
**£119.00**  
~~£139.83~~

## PLEXWRITER 12/4/32 CD-REWRITER

- Write: 12x
- Rewrite: 4x
- Read: 32x
- Interface: Ultra SCSI
- Data Buffer: 4MB
- Warranty period: 1 year

Package includes: 1 CD-R disk, 1 CD-RW disk, Recording software: WinOn CD + Packet CD + BackMeUp (Backup software), 12-language manual, Plextors own utility software "PlexTools"



**CD3371/INTERNAL**  
**£286.00**  
~~£247.05~~

**CD3372/EXTERNAL**  
**£246.00**  
~~£289.05~~



## PLEXWRITER 12/10/32A CD-REWRITER WITH

**BURN-Proof TECHNOLOGY**

- write: 12x
- rewrite: 10x
- read: 32x
- Interface: E-IDE (ATAPI)
- Data Buffer: 2MB with BURN-Proof Technology
- Warranty period: 1 year

Package includes: 1 CD-R disk, 1 CD-RW disk, Recording software: WinOnCD + PacketCD + BackMeUp (backup software), 12-language manual, Plextors own utility software "PlexTools"



**CD3373 PX-W1210M**  
**£199.00**  
~~£233.93~~



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Don't Expect Less. Expect More with Memorex. Cutting corners when saving data may cost your customers a fortune, it is better to be on the safe side Memorex applies the latest technologies which take better care of your data. [www.memorexlive.com](http://www.memorexlive.com)



**CD9033/CDR 10PK**  
**£8.50**  
~~£9.99~~

**CD9034/CDR 100PK**  
**£75.00**  
~~£88.13~~

**CD9036/700MB 50PK**  
**£47.00**  
~~£55.23~~

**CD9038/CDRW 10PK**  
**£8.00**  
~~£9.40~~

**CD9035/LABELKIT**  
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With the latest DVD ROM technology for your home PC, and the hottest DVD Films we have brought together the ULTIMATE DVD package.

- Cyberlinks PowerDVD Software
- Sci-Fi Bundle Includes: Armageddon, Blade, The Matrix
- Action/Drama Bundle Includes: Face Off, Heat, Pulp Fiction



**DV9994**  
**£131.00**  
~~£153.93~~

## HP CD-WRITER PLUS 8250i

HP CD-Writer Plus 8250i drive

- HP Fast Format
- Adaptec Direct CD 2.5
- Daptec Easy CD Creator 3.5
- Quick start placemat and install guide
- IDE Internal 4 x 4 x 24 x CD-RW Drive with 2MB Buffer
- Electronic users guide & Integrated install
- IDE Cable



**CD3363**  
**£105.00**  
~~£124.00~~



## HEWLETT PACKARD 8210E

- The new HP external CD-Writer for professional CD users
- External USB solution for all recording needs
- Windows 98\* CD-Writer all-in-one solution
- A high-end solution, with 4x write 4x re-write and 24x read power



**CD0218**  
**£165.00**  
~~£194.88~~

## FUJITSU IDE DRIVES

- Capacities form 8.4GB to 27GB
- UDMA-66 Interface
- 2MB Cache
- 9ms access time
- Optimised for audio-visual applications



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**£72.00**  
~~£84.80~~

**HFD157/15.3GB**  
**£78.00**  
~~£91.85~~

**HFD150/8.4GB**  
**£54.00**  
~~£63.45~~

**HFD161/20.4GB**  
**£83.00**  
~~£97.53~~

**HFD158/10.2GB**  
**£57.00**  
~~£66.98~~

**HFD162/20.4GB**  
**£106.00**  
~~£124.55~~



## ACCESSORIES

	Ex. VAT	Inc. VAT
HCM010 IDE Hard Drive Cable	£3.00	£3.53
HCM011 UDMA66 3 head (2 device) Cable	£8.00	£9.40
HCM000 Hard Drive Brackets	£4.00	£4.70
HCM005 Removable IDE Hard Drive Rack	£14.00	£16.45

## CASES

CA0013 InWin Desktop 2x5.25" 2x3.5" ATX 235W	£48.00	£56.40
CA0014 InWin Mini Tower 3x5.25" 2x3.5" ATX 235W	£55.00	£64.63
CA0016 InWin Full Tower 5x5.25" 7x3.5" ATX 250W	£89.00	£116.33
CA1026 250W CE Approved PSU Dual Outlet ATX Form Factor	£27.00	£31.73

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HZ0014 Iomega Zip 250MB Parallel Ext Inc Media	£95.00	£111.63
HZ0017 Iomega Zip Red 250MB Internal IDE Inc Media	£99.00	£116.33
HZ0018 Iomega Zip Pro Kit 250MB Parallel Port Drive, 4x250MB Disks	£125.00	£146.88
HZ0016 Iomega Zip 100MB USB	£79.00	£92.83
HZ0005 Iomega Zip 100MB Drive Parallel Ext	£69.00	£81.08
HZ0031 Iomega Zip Red 250MB USB Inc Media	£119.00	£139.83
HZ0019 Iomega Zip Kit 2000 - 100MB Parallel Port Drive, 4x100MB Disks	£69.00	£81.08
HZ0050 Iomega Zip Disk Pre-Formatted for PC (Single)	£7.00	£8.23
HZ0051 Iomega Zip Disk Pre-Formatted 3 Pack (Genuine for PC Inc QuickStart)	£23.00	£27.03
HZ0067 Iomega Zip Disk Pre-Formatted 6 Pack (Manufactured for PC Inc QuickStart)	£35.00	£41.13
HZ0062 Iomega 250MB Zip Disk Pre-Formatted for PC 4 Pack	£44.00	£51.70

## CD ROM DRIVES

CD0401 Teac CD540E 40x EIDE CD Rom Bare	£28.00	£32.90
CD0404 Sony 48x EIDE CD Rom Bare	£30.00	£35.25
CD0419 Asus CD500 50x EIDE CD Rom Bare	£36.00	£42.30
CD0423 Teac 52x EIDE CD Rom Bare	£27.00	£31.73
CD0421 Creative 52x EIDE CD Rom	£29.00	£34.08

## DVD ROM/RAM

DV9991 Simple Combo for DVD-RW/DVD In IDE Bare Inc Nero	£174.00	£204.45
DV0027 Creative Encore 12xDVD 40xCD DWR3 Board, Software	£159.00	£186.83
DV0018 Pioneer DVD 105S 16xDVD 40xCD Slot Bare	£108.00	£126.90
DV0019 Pioneer DVD 115 16xDVD 40xCD Tray Bare	£120.00	£141.00

## CD REWRITABLE DRIVES

CD0218 HP 8210e 4x4x24 USB Inc Software, 1xCDR, 1xCDRW	£165.00	£193.88
CD0202 Iomega ZipCD 4x4x6 USB Inc Software, Media	£176.00	£206.80
CD3363 HP 8250E 4x4x24 Int EIDE Inc Software, Media	£105.00	£123.38
CD0129 Simple 4x4x32 Int EIDE Retail Inc Software, 1xMedia	£133.00	£156.28
CD3351 Teac CD-52x4x6x32 Int EIDE Inc Software and Media	£109.00	£128.08
CD0130 Simple 8x4x24 Int EIDE Inc Software 12xMedia	£162.00	£190.35
CD3362 Yamaha 8x4x24 EIDE Retail Inc Software, Media	£147.00	£172.73
CD3356 Yamaha 8x4x24 SCSI Int Retail Inc Software, Media	£159.00	£186.83
CD3389 Creative Reto32 Studio MAX Inc Software, 1xCDR, 1xCDRW	£160.00	£188.00
CD3360 HP 9110 8x4x32 EIDE Int Inc Software, 1xCDR, 1xCDRW	£135.00	£158.63
CD3346 HP 9210 8x4x32 SCSI Int Inc Software, 1xCDR, 1xCDRW	£150.00	£176.25
CD3370 Plextor Rewriter Reto32 EIDE Int Inc Software, Media	£144.00	£169.20
CD3365 HP 9310 10x4x32 EIDE Int Inc Software, 1xCDR, 1xCDRW	£148.00	£173.90

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CD9056 Simply CDR 650MB Data 74Min	£0.85	£1.00
CD0223 Simply CDR 700MB Data 80Min	£0.95	£1.12
CD9059 Simply CDR 650MB 74Min Audio 100 Flat Packed	£44.00	£51.70
CD0921 MEMORE CD-R 650MB Data 74Min 10 Pack	£8.00	£9.40
CD9002 Philips CDRW 650MB 74Min Audio	£3.00	£3.53
CD9160 TDK CD-R 650MB 74min 10 Pack	£10.00	£11.75
CD9058 Teac CD-R 650MB Data 74min Audio	£0.95	£1.12
CD9071 Transdata Silver CDR 650MB 74Min 8 Speed	£0.84	£0.99
CD9070 Transdata Gold CDR 650MB 74Min 8 Speed	£0.90	£1.06

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MP0031 Absolute Outrageous SoundMaster 16MB Bundle	£68.00	£79.90
MP0012 Diamond Rio 500 MP3 Player 64MB	£169.00	£198.58
MP0021 TerraTec M3PO Stand Alone HiFi MP3 Player 2889	£289.00	£339.58

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TS0751 HP Colorado 5GB Ext P/Port Inc Media	£166.00	£195.05
TS2313 Orionem D80 1590E8 Int IDE Dose Inc Orionem Echo v/w	£144.00	£169.20
TS2314 HP Colorado 2.5GB/5GB Media	£17.00	£19.98
TS2336 30GB Advanced Digital Recording Data Cartridge 3 Pack	£64.00	£75.20

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MB1220 PSAB Abi Aladin 5 75-33MHz AGP 100MHz AT	£59.00	£69.33
MB1710 Gigabyte GA-5AA ALJ 3PCI 2ISA AGP 3DIMM AT	£51.00	£59.93
MB1301 Sun S190S V14 4PCI4ISA 3DIMM 2S c1MHz 100MHz AT	£63.00	£74.03
Super 7 Motherboards		
MB1221 Anasok PSA Abi Aladin 5 75-40MHz AGP 100MHz Bus ATX	£60.00	£70.50
MB1521 TMC15FGA V14 MP3/PCI AGP 3DIMM 2MB Onboard Audio ATX	£69.00	£81.08
PPGA 370 Motherboards		
MB1415 ABIT BP6 Dual PCI370 SPC 2ISA AGP 3DIMM ATX	£89.00	£104.58
MB1634 Supermicro 370SVM 810 PCI LAMR 2DIMM mATX	£66.00	£77.55

# MODEMS • VIDEO CONFERENCING

## MOTHERBOARDS CONT.

Slot Motherboards	Ex.VAT	Inc.VAT
MB1750 AMD Pro V4695A ATX ALP SP 21 40MM 133FSB ATX	£58.00	£68.15
MB1214 Asustek P2B PII BX 4PCI 3ISA 3DIMM ATX	£79.00	£92.83
MB1216 Asustek P2B-F PIII 4MBX 4PCI ISA 4DIMM ALP ATX	£91.00	£106.93
MB1219 Asustek K7V Sisa VIA SPC MR ALP 3DIMM PCI33 ATX	£118.00	£138.65
MB1225 Asustek K7V Sisa VIA SPC MR ALP 3DIMM PCI33 Audio ATX	£121.00	£142.18
MB3035 Gigabyte GA-6BXDS Dual PII 4PCI 3ISA LWF SCS ATX	£216.00	£253.80
MB7725 Gigabyte GA-6BXDM PIII BX 550MHz SPC 2SA ALP 4DIMM ATX	£77.00	£90.48
MB7726 Gigabyte GA-71X Sisa VIA 650MHz SPC 2SA 4DIMM ALP ATX	£78.00	£91.65
MB1607 Supramicro P68A Pentium III 4MBX 333-TIMM ATX	£74.00	£86.95
MB1636 Supramicro PII SIA 810E SPC 3ISA 2DIMM LDMACC ATX	£89.00	£104.58
MB1520 TMC TRMG4 PIII PIII VIA SPC ISA 1AMB ALP 4DIMM ATX	£59.00	£69.33
MB0155 Tyan S1854 Set I & P4350 VIA 6PCI ISA ALP 3DIMM ATX	£69.00	£81.08

## CPU'S

PLEASE CALL FOR TODAY'S CPU PRICES

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MB3245 AMD Duron 600MHz Socket A	£62.00	£72.85
MB3244 AMD Duron 650MHz Socket A	£78.00	£91.65
MB3246 AMD Duron 700MHz Socket A	£110.00	£129.25
MB3247 AMD Athlon 700MHz Socket A	£126.00	£148.05
MB3248 AMD Athlon 750MHz Socket A	£148.00	£173.90
MB3249 AMD Athlon 800MHz Socket A	£189.00	£222.08
MB3250 AMD Athlon 850MHz Socket A	£252.00	£296.10
MB3251 AMD Athlon 900MHz Socket A	£329.00	£386.58
MB3252 AMD Athlon 950MHz Socket A	£449.00	£527.58
MB3253 AMD Athlon 1GHz Socket A	£599.00	£703.83

### Intel Pentium III

MB3684 Intel Pentium III 750E MHz (256K cache) PCPA 100FSB	£209.00	£245.58
MB3673 Intel Pentium III 800E MHz (256K cache) 100FSB	£309.00	£363.05
MB3685 Intel Pentium III 800E MHz (256K cache) PCPA 100FSB	£236.00	£277.30

Intel CPU's include heatsink & fan and three year warranty

### Evergreen Processor Upgrades

MB5037 Spectra 333MHz Upgrade	£89.00	£104.58
MB5041 Spectra 400MHz Upgrade	£123.00	£144.53

## MEMORY

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ME8311 128MB (16x64) 3.3v 168 Pin DIMM 133MHz	£124.00	£145.70
ME8300 32MB (4x64) 3.3v 168 Pin DRAM DIMM 100MHz	£29.00	£34.08
ME8301 64MB (8x64) 3.3v 168 Pin DRAM DIMM 100MHz	£59.00	£69.33
ME8302 128MB (16x64) 3.3v 168 Pin DRAM DIMM 100MHz	£116.00	£136.30

### SIMM's

ME7010 8MB EDO Simms	£9.00	£10.58
ME7015 16MB EDO Simms	£31.00	£36.43
ME7040 32MB EDO Simms	£59.00	£69.33

## CONTROLLERS

II0005 IDE 2FDD/2HDD 2S, 1F, 1G ISA Controller	£10.00	£11.75
II1019 Promise ATA Ultra DMA 66 PCI Controller	£40.00	£47.00
II1010 Promise Ultra ATA 100	£36.00	£42.30

### Adaptec SCSI Kits

IS2026 AYA 2904 CD Kit	£28.00	£32.90
IS2067 AHA 2930U PCI Ultra SCSI Kit	£58.00	£68.15
IS2071 ASC 19160 32Bit PCI 160MB/s Desktop SCSI Kit	£146.00	£171.55
IS2072 ASC 29160N 32Bit PCI 160MB/s Entry Server SCSI Kit	£183.00	£215.03

## MODEMS

MD0001 Simply Internal ISA 56K V90 Modem	£29.99	£35.24
MD4150 Simply 56K Hardware PCI V90 (Rockwell)	£20.99	£24.66
MD0009 Systemax Internal 56K PCI V90 Software	£18.99	£22.31
MD0058 3Com Internal V90 56K PCI + Drivers / Manual/OFM	£29.99	£35.24
MD0206 Datanet Internal 56K V90 PCI Hardware Modem (Connect)	£21.49	£25.25
MD0347 Hayes Internal Accura 56k Voice/Data/Fax PCI Modem	£45.99	£54.04
MD0004 Simply External 56K V90 Modem	£38.99	£45.81
MD0391 Olivex External Smart Memory Pro 56K V90 Modem	£74.99	£88.11
MD1003 Creative External Modem Blaster Flash 56k Modem	£44.99	£52.86
MD6041 ELSA External MicroLink 56k Internet V90 + Communicat	£41.99	£49.54
MD0382 Zoom External 56K USB Fax Modem	£65.99	£77.54
MD6345 Premier PC Card 56k V90 PCMCIA Modem	£45.99	£54.04
MD4110 Xerox WinLocal PC Card Modem 56K V90 Cardbus	£69.99	£82.24

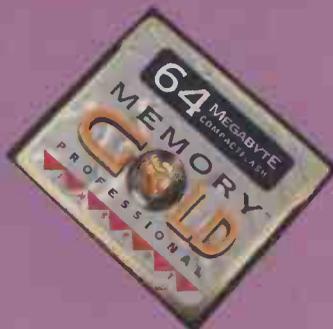
## ISDN TERMINAL ADAPTORS

MD5700 Simply Internal ISDN TA 128K PCI with RVS Con S/War	£24.49	£28.78
MD6152 BT Internal Speedway 128K PCI ISDN	£37.99	£44.64
MD6211 Eicon Internal Diva PCI ISDN Internal Card	£57.99	£68.14
MD0342 Hayes External Accura ISDN 128K BT Highway	£167.99	£197.39
MD5034 The Evox Mail Box Pro 4MB + 2x64K ISDN Mailbox + SU	£203.99	£239.69
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MemoryGOLD is a portfolio of FLASH technology products including PC Card Type II, CompactFlash and SmartMedia.

Designed from the outset to give optimum performance in Digital Camera's, Palm Top Computers, Laptops, MP3 Audio Players and other portable devices, this range of cards conforms to CFA (Compact Flash Association) standards. The technologies are available in a range of capacities and are complimented by a full range of card reader accessories.



MEMORY GOLD

FROM £27.00  
£31.75

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- Data/FAX
- Plug and Play
- Windows 95/98/NT
- High Quality Voice storage and playback (Sound card required)
- Password protection/ Multiple Storage of voicemails/ Easy Message Review
- Flash Memory upgrade
- Group 3 Fax Class 1
- Software and cables included
- 5 year warranty



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Lucant Technologies Ltd

NEW  
MDD339  
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£86.11

## HAYES ACCURA ISDN TERMINAL ADAPTER

The only choice for ISDN users who require fast Internet and Intranet access.

- Standard ISDN interface (RJ-45) for connection to Euro ISDN
- Two analogue ports (RJ-11) • DCE rates up to 128 Kbit/s - maximum throughput of 460 Kbit/s • V.110/V.120 rate adaption support • Caller ID • Flash ROM • CAPI 1.1A
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Hayes

MDD342  
£167.99  
£197.39

## GUILLENOT 3D PROPHET II GTS

The Ultimate Hardcore Gamers Cards!  
• 32/64 MB of ultra fast DDR Memory (Double Date Rate) based on the NVIDIA GeForce2 GTS chipset. The ultimate solution for Turbo boosted 2D/3D graphics.

- 200Mhz onboard processor • 4 dual texturing rendering engines • Support for resolutions up to 2048x1536 in 16m colours at 60hz • Per-pixel shading in real-time making 3D elements look and behave like their real-life counterparts
- Comes with TV Out and PowerDVD from Cyberlink.



MBO155  
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£81.08

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Dynamode

Dynamode modems voted No.1 by independent reviews in PC Adviser for exceptional performance, reliability and ease of use.

- High quality Rockwell chipset • Plug 'n' Play compliant (ISA optional jumper settings) • V.90 K56flex Dual mode - Auto Switchable (up to 56K download speeds) • Full Duplex functionality - Flash upgradeable to future standards • Microphone In and Speaker Out jacks (ISA and External models only)
- Voice/Fax/Data capability, Fax Class 1 • All modems supplied with cables, user guides, fax and internet software



MDD205 £21.49 £25.25  
MDD207 £39.99 £46.99  
MDD208 £48.99 £57.56  
MDD209 £39.99 £48.99

## ELSA MICROLINK™ 56k INTERNET SURF, SHOP OR CHAT ONLINE

The MicroLink™ 56k Internet modem is ideal for Internet access and email. Save valuable time, effort & money when browsing through web pages even faster using V.90 56k modem speed technology. Access your online banking account or pay your bills without the need to leave your home or office.



- Efficient, reliable internet connections at up to 56,000bps • Voice, data and fax operations, with flash memory upgrade support • Fun, smart, pocket-sized design, and is ideal for Windows 95\*, Windows\* 98, Windows\* 2000 and Windows\* NT

MDB041  
£41.99  
£49.34

## 3COM 56K FAXMODEM

- Great value 56Kbps V.90 Faxmodem.
- Ideal modem for Internet Access.
- Everything included, comes with data/fax software and cable.
- Full suite of Software included.
- Lifetime Warranty with free lifetime technical support hotline



3COM  
MDD008  
£53.99  
£63.03

## MEGAHERTZ 56K GLOBAL PCMCIA MODEM

- XJACK Connector - simply pops out of card when needed. Keep the modem in your PC all times.
- Global compatibility with country selector software.
- Lifetime Warranty & Free technical support hotline

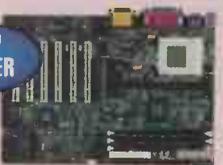


3COM  
MDD107  
£86.99  
£103.03

## TYAN TRINITY 400 S1854S

TOP SELLER

- VIA Apollo Pro 133A Chipset
- Single slot 1 and Socket 370
- Supports Celeron, Pentium III/II & FCPGA
- 66/100/133MHz FSB
- 1xISA, 6xPCI, 1xAGP
- 3 Dimm Slots
- ATX Form Factor



3 YEAR WARRANTY ON ALL TYAN BOARDS

MBO155  
£69.00  
£81.08

## CTX VL500

- 15" FST (Flatter squarer tube)
- 0.28mm Dot pitch
- Anti-glare coating
- 1024 x 768 @ 85 Hz
- 1280 x 1024 Max res.
- Digital control, Plug & Play
- CE, MPRII Safety regulations



**CTX**  
**MN0012**  
**£92.00**  
~~£108.00~~

3 Year on-site warranty with 24 hour swap out

## CTX PL7

- 17" FST (Flatter squarer tube)
- 15.7" Viewable area
- 0.27mm Dot pitch
- Anti-glare coating
- 1024 x 768 @ 85 Hz
- 1280 x 1024 Max res.
- CE, MPRII Safety regulations



**CTX**  
**MN0086**  
**£124.99**

3 Year on-site warranty with 24 hour swap out

## BELINEA 106030 19"

Perfect for DTP, CAD or power gaming and using the latest high contrast CRT, the 10 60 30 can deliver flicker free resolutions up to 1600 x 1200.

- 19" FST monitor
- 1600 x 1200 maximum resolution
- 0.26mm dot pitch
- 3 year swap out warranty
- TCO'99 compliant
- Easy to use on-screen menu



**Belinea**  
**MN0082**  
**£209.00**  
~~£249.50~~

3 Year on-site warranty with 24 hour swap out

## NEW IIYAMA S700JT1

- 17" FST (16" viewable)
- 0.28mm dot pitch, 110MHz bandwidth
- Maximum flicker free resolution of 1280x1024 @ 65Hz or 1024x768 @ 85Hz
- TCO 95
- 3 year on-site replacement warranty



**Iiyama**  
**NEW**  
**MN1679**  
**£149.00**

## 17" TAXAN VALUEVISION 1710 TCO 99

Designed for users who demand performance with affordability from a recognised manufacturer, Valuevision products deliver excellent functionality and great value for money.

- 17" FST (16" Viewable)
- 0.27 mm Dot Pitch
- Extensive OSD Controls
- TCO 99 Compliant
- Free 3 Year On Site Warranty



**TAXAN** **VALUEVISION**  
**MN0461**  
**£139.00**  
~~£169.00~~

## BROTHER HL-1250

- Professional Print Quality at 1200dpi Class
- 12 PPM
- 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.**  
 At your side.  
**PB0151**  
**£209.00**  
~~£249.00~~

## SAMSUNG NEW ML4500/4600

Quality personal A4 laser printing with cost saving convenience.

- 8ppm print speed
- True 600dpi or 1200dpi resolution
- 35MHz or 66MHz RISC processor
- 2MB or 4MB standard memory
- Toner save button
- Compact Design
- USB interface on 4600 model



**SAMSUNG**  
**PS7019/ML4600**  
**£154.99**  
**PS7018/ML4500**  
**£138.99**

## CANON BJC 2100

Affordable, fast, versatile and brilliant with colour - the Canon BJC-2100 is the ideal printer for the family home. Simple to use and offering superb media capabilities, it turns out excellent results every time, producing everything from quality school projects and letters to banners, T-shirt transfers, greeting cards and more, all in dazzling colour. The BJC-2100 is easily set up using either the parallel or USB port. Slick prints can be run out at up to 5 pages a minute using the optional BC-20 Mono only cartridge, delivering up to 50 pages at once from the Auto Sheet Feeder.



**Canon**  
**PC5026**  
**£64.00**

## HP DESKJET 840C/C200 CAMERA BUNDLE

The ideal printer for PC or Mac users with excellent photo-quality for whisper quiet home use

- Excellent photo quality printing
- 600 dpi black printing and enhanced PhotoRet II Precision Technology to give sharp black text and vibrant colour graphics on all papers. Optional 1200 dpi mode.

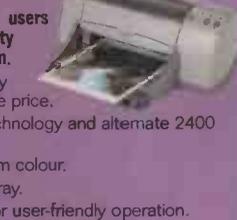


**hp**  
**invent**  
**TV227**  
**£279.00**

## 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 7.5ppm colour.
- Space saving fold up paper tray.
- Supports parallel and USB for user-friendly operation.



**hp**  
**invent**  
**PH1250**  
**£111.00**

## MONITORS

Simply Ex.VAT Inc.VAT

MN0001	14" Simply SVGA Monitor 1024x768 NT	£74.99	£88.11
MN0005	15" Simply SVGA Monitor 1024x768 NT	£86.99	£102.21
MN0007	17" Simply SVGA Monitor 1024x768 NT	£119.99	£140.99

Belinea

MN0055	14" Belinea Digital 1040x10 28 800x600 @ 85Hz	£75.00	£88.13
MN0077	15" Belinea Digital 1020x10 28 800x600 @ 85Hz	£83.99	£98.69
MN0085	17" Belinea Digital 1030x20 27 1024x768 @ 85Hz	£121.00	£142.18
MN0092	19" Belinea Digital 1060x30 26 1280x1024 @ 85Hz	£209.00	£245.58

CTX

MN0011	15" VL510 SVGA MPRII	£89.00	£104.58
MN0012	15" VL500 SVGA MPRII	£92.00	£108.10
MN0086	17" PL7 MPRII 0.27 1024x768 @ 85Hz	£124.99	£146.86
MN0021	17" VL700 MPRII 1.28 1280 x 1024	£129.00	£151.58
MN0019	17" VL710ST Short Length Tube 26 1600x1200	£182.00	£213.85
MN0134	17" PR711F 0.25dpi 1280x1024 @ 88Hz	£199.00	£233.83

Iiyama

MN1679	17" Iiyama S700JT1 1280x1024 @ 65Hz 0.28	£149.00	£175.08
MN1672	17" Iiyama Low Cost 17 404 S704HT 0.26ag	£224.99	£264.36
MN0683	17" Iiyama Vision Master Pro 410 A702HT (NF)	£235.00	£276.13
MN1693	19" Iiyama Vision Master 451 FST 0.26 S902JT	£329.00	£386.58
MN0646	19" Iiyama Vision Master Pro 450 A901HT 0.25	£379.00	£445.33
MN0662	21" Iiyama Vision Master 502 FST 0.27 S102GT	£598.99	£703.81
MN0684	22" Iiyama Vision Master Pro 510 FST 0.25ag A201HT (NF)	£627.99	£737.89

Sony

MN1648	Sony 17" G200 0.25 1600x1200 @ 78Hz	£257.99	£303.14
MN1669	Sony 17" E200E 0.25 1280x1024 @ 81Hz	£219.99	£258.49
MN5278	Sony 19" E400E	£439.99	£516.99
MN1619	Sony 19" CPD-G400 1600x1200	£428.99	£504.06
MN1618	Sony 21" Multiscan G500	£698.00	£820.15
MN0641	Sony 24" Multiscan W900 Superwide Monitor	£1164.99	£1368.86
MN1620	Sony CPD-M151 15.1" LCD Flat Panel	£737.99	£867.14
MN1621	Sony CPD-L181 18" LCD Flat Panel	£1845.99	£2169.04
MN1622	Sony 15" SDM-N50 LCD SuperSlim	£999.00	£1173.83

Taxan

MN0461	17" Taxan Valuevision 1710 TCO 99 0.27	£139.00	£163.33
MN1499	19" Taxan Valuevision 1910 TCO 99 0.26	£235.00	£276.13

## PRINTERS

Brother

PB0107	Brother HL 1030 2MB 600x600dpi 8ppm Laser	£159.00	£186.83
PB0150	Brother HL 1240 2MB 600x600dpi 10ppm Laser	£179.00	£210.33
PB0151	Brother HL 1250 4MB 1200x600dpi 10ppm Laser	£209.00	£245.58
PB0153	Brother HL 1270N 4MB 1200x600dpi 10ppm (P/Script)	£329.00	£386.58

Canon

PC0014	Canon BJC50 Colour Portable Printer	£202.00	£237.35
PC5547	Canon BJC-85 Colour Portable Printer	£169.00	£198.58
PC6010	Canon Colour Image Scanner Cart. For BJC 8050	£65.00	£76.38
PC0031	Canon BJC-1000 Bubblejet	£46.00	£54.05
PC5021	Canon BJC-2000 Bubblejet	£61.00	£71.68
PC5026	Canon BJC-2100 Bubblejet	£64.00	£75.20
PC5022	Canon BJC-3000 Bubblejet	£92.00	£108.10
PC0118	Canon BJC4650 A3 Bubblejet Printer	£211.00	£247.93
PC0095	Canon BJC4650 A3 with Scan head	£248.00	£291.40
PC0080	Canon BJC-5500 A2 Bubblejet Printer	£493.00	£588.78
PC0627	Canon BJC-6100 Bubblejet Printer	£139.00	£163.33
PC5027	Canon BJC-6200 Bubblejet Printer	£120.00	£141.00
PC5023	Canon BJC-6500 Bubblejet Printer	£215.00	£252.63
PC5548	Canon BJC-8200Photo Bubblejet Printer	£230.00	£270.25

EPSON

PE3257	EPSON Stylus Color 480	£59.00	£69.33
PE3163	EPSON Stylus Color 670	£74.00	£86.95
PE3155	EPSON Stylus Color 760	£103.00	£121.03
PE3164	EPSON Stylus Color 760 (Transparent Blue)	£111.00	£130.43
PE3148	EPSON Stylus Photo 875DC	£237.00	£278.48
PE3157	EPSON Stylus Color 860	£133.00	£156.28
PE3152	EPSON Stylus Photo 870	£177.00	£207.98
PE3057	EPSON Stylus Color 900	£207.00	£243.23
PE3159	EPSON Stylus Color 900N	£355.00	£417.13
PE4159	EPSON Stylus Color 1160	£266.00	£312.55
PE3151	EPSON Stylus Photo 1270	£296.00	£347.80
PE3043	EPSON Stylus Photo EX A3	£207.00	£243.23
PE3019	EPSON Stylus 1520 wide-carriage inkjet	£315.00	£370.13
PE3017	EPSON Stylus color 3000 (A2)	£792.00	£930.60
PE3044	EPSON Stylus Pro 5000 (A3+)	£1383.00	£1625.03
PE3147	EPSON Stylus Pro 9000	£6,680.00	£7,849.00
PE3145	EPSON Stylus Scan 2000	£161.00	£185.68
PE3146	EPSON Stylus Scan 2500	£224.00	£263.20

Hewlett Packard

PH0112	HP Deskjet 340 with 30 Page Sheetfeeder	£135.00	£158.63
PH0127	HP Deskjet 350C	£135.00	£158.63
PH0126	HP Deskjet 350Cxi	£153.00	£179.78
PH0123	HP Deskjet 610C	£59.00	£69.33
PH1924	HP Deskjet 640C	£59.00	£69.33
PH1255	HP Deskjet 840C	£78.00	£91.65
PH1256	HP Deskjet 930C	£111.00	£130.43
PH1257	HP Deskjet 950C	£149.00	£175.08
PH0058	HP Deskjet 8950xi	£149.00	£175.08
PH0078	HP Deskjet 9700xi	£186.00	£218.55
PH1258	HP Deskjet 1220C	£166.00	£192.55

# PRINTERS • CONSUMABLES

HP INK CARTRIDGES					HP PRINTERS & INK CARTRIDGES							
PRODUCT	CODE	INK CARTRIDGE	EX. VAT	INC. VAT	CODE	PRODUCT	EX. VAT	INC. VAT	CODE	INK CARTRIDGE	EX. VAT	INC. VAT
310, 320	PH0936	Black Cartridge (51633M)	£14.00	£16.45	PH0127	HP DESKJET 350C	£135.00	£158.63	PH0936	Black Cartridge (51633M)	£14.00	£16.45
820CXI/870CXI	PH0920	Black Cartridge (51645AE)	£17.00	£19.97	PH0920	Black Cartridge (51645AE)			PH0920	Black Cartridge (51645AE)	£17.00	£19.97
	PH0926	Tri-Color Cartridge (51641AE)	£17.00	£19.97	PH0926	Tri-Color Cartridge (51641AE)			PH0926	Tri-Color Cartridge (51641AE)	£17.00	£19.97
1600C/CM	PH0920	Black Cartridge (51645AE)	£17.00	£19.97	PH0126	HP DESKJET 350CBI	£153.00	£179.78	PH0936	Black Cartridge (51633M)	£14.00	£16.45
	PH0921	Cyan Cartridge (51640CE)	£19.00	£22.32	PH0920	Black Cartridge (51645AE)			PH0920	Black Cartridge (51645AE)	£17.00	£19.97
	PH0922	Magenta Cartridge (51640ME)	£19.00	£22.32	PH0926	Tri-Color Cartridge (51641AE)			PH0926	Tri-Color Cartridge (51641AE)	£17.00	£19.97
	PH0923	Yellow Cartridge (51640YE)	£19.00	£22.32	PH0058	HP DESKJET 895CXI	£149.00	£175.08	PH0920	Black Cartridge (51645AE)	£17.00	£19.97
OFFICEJET 590/630/700, DJET 660	PH0915	Black Cartridge (51629AE)	£18.00	£21.15	PH0095	Tri-Color Cartridge (C1823AE)			PH0095	Tri-Color Cartridge (C1823AE)	£22.00	£25.85
	PH0916	Tri-Color Cartridge (51649AE)	£19.00	£22.32	PH5239	Black Cartridge (C6615D)	£78.00	£91.65	PH5239	Black Cartridge (C6615D)	£14.99	£17.61
350, 400 COL SERIES, 500 COL SERIES	PH1012	Black Cartridge (51626AE)	£18.00	£21.15	PH5238	Tri-Color Cartridge (C1823AE)	£78.00	£91.65	PH5238	Tri-Color Cartridge (C1823AE)	£14.99	£17.61
	PH1011	Tri-Color Cartridge (51625A)	£17.00	£19.97	PH1256	HP DESKJET 930C	£111.00	£130.43	PH0920	Black Cartridge (51645A)	£16.99	£19.96
1200C/PS, 1600C/CM	PH0924	Black Cartridge (51640AE)	£18.00	£21.15	PH1078	Tri-Color Cartridge (C6578A)	£111.00	£130.43	PH1078	Tri-Color Cartridge (C6578A)	£20.00	£23.85
890C, 1100C	PH0095	Tri-Color Cartridge (C1823AE)	£22.00	£25.85	PH0078	HP DESKJET 970CXI	£186.00	£218.55	PH0920	Black Cartridge (51645A)	£16.99	£19.96
300/400L, 820CXI/870CXI, 890, 1100C, 1150C	PH0926	Tri-Color Cartridge (51641AE)	£17.00	£19.97	PH0095	Tri-Color Cartridge (C1823A)	£59.00	£69.32	PH0095	Tri-Color Cartridge (C1823A)	£22.00	£25.85
600, 670C, 690C, 590, 635, 695, 660	PH0916	Tri-Color Cartridge (51649AE)	£19.00	£22.32	PH0123	HP DESKJET 610C	£59.00	£69.32	PH0916	Tri-Color Cartridge (51649AE)	£19.00	£22.32
970CXI	PH1078	Tri-Color Cartridge (C6578A)	£29.00	£34.07	PH0179	HP DESKJET 1125C	£209.00	£245.58	PH0920	Black Cartridge (51645AE)	£17.00	£19.97
1200C, 1200C/PS, 1600C/CM	PH0921	Cyan Cartridge (51640CE)	£19.00	£22.32	PH0095	Tri-Color Cartridge (C1823AE)			PH0095	Tri-Color Cartridge (C1823AE)	£22.00	£25.85
	PH0922	Magenta Cartridge (51640ME)	£19.00	£22.32	PH0081	HP 2000C	£228.00	£267.90	PH0936	Black Cartridge (51633M)	£14.00	£16.45
	PH0923	Yellow Cartridge (51640YE)	£19.00	£22.32	PH0936	Black Cartridge (51633M)			PH0936	Black Cartridge (51633M)	£14.00	£16.45
1100C	PH0915	Black Cartridge (51629AE)	£18.00	£21.15	PH0936	Cyan Cartridge (C4844A)			PH0936	Cyan Cartridge (C4844A)	£21.00	£24.67
	PH0926	Tri-Color Cartridge (51641AE)	£17.00	£19.97	PH0936	Magenta Cartridge (C4844A)			PH0936	Magenta Cartridge (C4844A)	£21.00	£24.67
670C, 690	PH1141	Photo Cartridge (C1816A)	£21.00	£24.67	PH0936	Yellow Cartridge (C4844A)			PH0936	Yellow Cartridge (C4844A)	£21.00	£24.67
	PH1142	Photo Kit (C4584A)	£23.00	£27.02	PH0936	Black Print Head (C4800A)			PH0936	Black Print Head (C4800A)	£22.00	£25.85
610C	PH0916	Tri-Color Cartridge (51649AE)	£19.00	£22.32	PH0936	Cyan Print Head (C4801A)			PH0936	Cyan Print Head (C4801A)	£22.00	£25.85
	PH0969	Black Cartridge (C6614A)	£19.00	£22.32	PH0936	Magenta Print Head (C4802A)			PH0936	Magenta Print Head (C4802A)	£22.00	£25.85
DESIGNJET230/250/600/650	PH0940	Cyan Cartridge (51650C)	£27.00	£31.72	PH0936	Yellow Print Head (C4803A)			PH0936	Yellow Print Head (C4803A)	£22.00	£25.85
	PH0941	Magenta Cartridge (51650M)	£27.00	£31.72	PH0188	HP 2500 PRO	£674.00	£781.95	PH0969	Black Cartridge (C6614A)	£21.00	£24.67
	PH0942	Yellow Cartridge (51650Y)	£27.00	£31.72	PH0969	Cyan Cartridge (C4841A)			PH0969	Cyan Cartridge (C4841A)	£21.00	£24.67
	PH0945	Cyan Cartridge (51644C)	£28.00	£32.90	PH0969	Magenta Cartridge (C4843A)			PH0969	Magenta Cartridge (C4843A)	£21.00	£24.67
	PH0946	Magenta Cartridge (51644M)	£28.00	£32.90	PH0969	Yellow Cartridge (C4842A)			PH0969	Yellow Cartridge (C4842A)	£21.00	£24.67
	PH0947	Yellow Cartridge (51644Y)	£28.00	£32.90	PH0969	Black Print Head (C4800A)			PH0969	Black Print Head (C4800A)	£22.00	£25.85
DESIGNJET 750C/755C	PH0945	Cyan Cartridge (51644C)	£28.00	£32.90	PH0969	Magenta Print Head (C4802A)			PH0969	Magenta Print Head (C4802A)	£22.00	£25.85
	PH0946	Magenta Cartridge (51644M)	£28.00	£32.90	PH0969	Yellow Print Head (C4803A)			PH0969	Yellow Print Head (C4803A)	£22.00	£25.85
	PH0947	Yellow Cartridge (51644Y)	£28.00	£32.90	PH0084	HP 2500CM	£915.00	£1,075.13	PH0969	Black Cartridge (C6614A)	£21.00	£24.67

EPSON INK CARTRIDGES					EPSON PRINTERS & INK CARTRIDGES							
PRODUCT	CODE	INK CARTRIDGE	EX. VAT	INC. VAT	CODE	PRODUCT	EX. VAT	INC. VAT	CODE	INK CARTRIDGE	EX. VAT	INC. VAT
EPSON STYLUS COLOR, PRO	PE6035	Black Ink Cartridge	£9.00	£10.58	PE3154	EPSON STYLUS COLOR 460	£59.00	£69.33	PE6043	Black Ink Cartridge	£15.00	£17.63
	PE6037	3 Colour Ink Cartridge	£16.00	£18.80	PE6042	3 Colour Ink Cartridge			PE6042	3 Colour Ink Cartridge	£19.00	£22.33
EPSON STYLUS 820, COLOR IIS, II	PE6038	Black Ink Cartridge	£11.00	£12.93	PE3163	EPSON STYLUS COLOR 670	£74.00	£86.95	PE6043	Black Ink Cartridge	£15.00	£17.63
	PE6037	3 Colour Ink Cartridge	£16.00	£18.80	PE6042	3 Colour Ink Cartridge			PE6042	3 Colour Ink Cartridge	£19.00	£22.33
EPSON STYLUS 400, 800+, 1000	PE6005	Black Ink Cartridge	£7.00	£8.23	PE3151	EPSON STYLUS PHOTO 1270	£296.00	347.80	PE6043	Black Ink Cartridge	£15.00	£17.63
	PE6110	Black Ink Cartridge	£13.00	£15.28	PE6043	3 Colour Ink Cartridge			PE6043	3 Colour Ink Cartridge	£15.00	£17.63
	PE6037	3 Colour Ink Cartridge	£16.00	£18.80	PE6042	3 Colour Ink Cartridge			PE6042	3 Colour Ink Cartridge	£19.00	£22.33
EPSON STYLUS COLOUR 400, 600	PE6033	Black Ink Cartridge	£13.00	£15.28	PE3152	EPSON STYLUS PHOTO 870	£177.00	£207.98	PE6043	Black Ink Cartridge	£15.00	£17.63
	PE6048	3 Colour Ink Cartridge	£14.00	£16.45	PE6042	3 Colour Ink Cartridge			PE6042	3 Colour Ink Cartridge	£19.00	£22.33
EPSON STYLUS COLOUR 800, 1520	PE6049	Black Ink Cartridge	£14.00	£16.45	PE3155	EPSON STYLUS COLOR 760	£103.00	£121.03	PE6043	Black Ink Cartridge	£15.00	£17.63
	PE6048	3 Colour Ink Cartridge	£14.00	£16.45	PE5127	5 Colour Ink Cartridge	£103.00	£121.03	PE5127	5 Colour Ink Cartridge	£13.00	£14.10
EPSON STYLUS 1500	PE6180	Black Ink Cartridge	£27.00	£31.73	PE3057	EPSON STYLUS COLOR 900	£192.00	£225.60	PE6041	Black Ink Cartridge	£16.00	£18.80
	PE6037	3 Colour Ink Cartridge	£16.00	£18.80	PE6042	3 Colour Ink Cartridge			PE6042	3 Colour Ink Cartridge	£19.00	£22.33
EPSON 200	PE4040	Colour Kit	£32.00	£37.60	PE3159	EPSON STYLUS COLOR 900M	£340.00	£399.50	PE6043	Black Ink Cartridge	£15.00	£17.63
EPSON 820/1500	PE3005	Colour Kit	£29.00	£34.08	PE6042	3 Colour Ink Cartridge			PE6042	3 Colour Ink Cartridge	£19.00	£22.33
EPSON STYLUS COLOR 300	PE6079	Black Ink Cartridge	£15.00	£17.63	PE6043	3 Colour Ink Cartridge			PE6043	3 Colour Ink Cartridge	£15.00	£17.63
	PE6078	4 Colour Ink Cartridge	£14.00	£16.45	PE6042	3 Colour Ink Cartridge			PE6042	3 Colour Ink Cartridge	£19.00	£22.33
EPSON 400, 600, 800, 1520	PE6048	3 Colour Ink Cartridge	£14.00	£16.45	PE3017	EPSON STYLUS COLOR 3000 A2	£792.00	£930.60	PE6049	Black Ink Cartridge	£14.00	£16.45
EPSON 200, 500	PE6034	3 Colour Ink Cartridge	£18.00	£21.15	PE6048	3 Colour Ink Cartridge			PE6048	3 Colour Ink Cartridge	£14.00	£16.45
EPSON STYLUS COLOR, PRO, PRO XL	PE6036	3 Colour Ink Cartridge	£17.00	£19.98	PE6175	Black Ink Cartridge			PE6175	Black Ink Cartridge	£36.00	£42.30
	PE6035	Black Ink Cartridge	£9.00	£10.58	PE6178	1 Colour-Yellow Cartridge	£1383.00	£1625.03	PE6178	1 Colour-Yellow Cartridge	£34.00	£39.95
	PE6105	3 Colour Ink Cartridge	£18.00	£21.15	PE6177	1 Colour-Mag Cartridge			PE6177	1 Colour-Mag Cartridge	£34.00	£39.95
EPSON PRO XL+	PE6043	Black Ink Cartridge	£15.00	£17.63	PE6176	1 Colour-Cyan Cartridge			PE6176	1 Colour-Cyan Cartridge	£34.00	£39.95
	PE6042	3 Colour Ink Cartridge	£19.00	£22.33	PE3157	EPSON STYLUS 860	£133.00	£156.28	PE6175	Black Ink Cartridge	£36.00	£42.30
EPSON STYLUS 440	PE6043	Black Ink Cartridge	£15.00	£17.63	PE6182	2 Colour-Mag Cartridge			PE6182	2 Colour-Mag Cartridge	£36.00	£42.30
	PE6042	3 Colour Ink Cartridge	£19.00	£22.33	PE6181	2 Colour-Cyan Cartridge			PE6181	2 Colour-Cyan Cartridge	£36.00	£42.30
EPSON STYLUS 440	PE6043	Black Ink Cartridge	£15.00	£17.63	PE3147	EPSON STYLUS PRO 9000	£6680.00	£7849.83	PE6149	Black Ink Cartridge	£14.00	£16.45
	PE6042	3 Colour Ink Cartridge	£19.00	£22.33	PE6148	3 Colour Ink Cartridge			PE6148	3 Colour Ink Cartridge	£14.00	£16.45
EPSON STYLUS 760	PE6041	Black Ink Cartridge	£16.00	£18.80	PE6043	Black Ink Cartridge			PE6043	Black Ink Cartridge	£15.00	£17.63
	PE6042	3 Colour Ink Cartridge	£19.00	£22.33	PE6042	3 Colour Ink Cartridge			PE6042	3 Colour Ink Cartridge	£19.00	£22.33
EPSON STYLUS 850	PE6049	Black Ink Cartridge	£14.00	£16.45	PE6043	Black Ink Cartridge			PE6043	Black Ink Cartridge	£15.00	£17.63
	PE6048	3 Colour Ink Cartridge	£14.00	£16.45	PE6042	3 Colour Ink Cartridge			PE6042	3 Colour Ink Cartridge	£19.00	£22.33

**EPSON STYLUS COLOR 480**

The EPSON Stylus Color 480 is the ideal product for home users who wish to combine excellent print quality and good performance at an affordable price.

- Easy to use panel-free design
- 720dpi 4-colour printing
- Variable Sized Droplet Technology
- Print Speeds of 4ppm black and 2.6 ppm colour
- Photo Enhance 4 for image optimisation
- Parallel interface as standard
- Win 95, 98 2000 NT4.0

**NEW**

PE3257  
£59.00  
£89.99

**EPSON**

**EPSON STYLUS COLOR 670**

High quality colour printing for advanced first-time printer buyers

- 1440dpi Super Micro Dot 4-colour printing
- Variable Sized Droplet Technology
- Print Speeds of 5ppm black and 3.8ppm colour
- Photo Enhance 4 for image optimisation
- Parallel & USB interfaces as standard
- Win 95, 98, 2000, NT 4.0 & Mac drivers

**NEW**

PE3163  
£74.00  
£86.95

**EPSON**

**HP DESKJET 640C**

For easy, everyday black and colour printing - the ideal first printer. Crisp black text and vibrant colour deliver great results for everything you print

- Everything you need for great results - black and colour cartridges included. • Special projects made simple - greetings cards, envelopes and more.
- Get brighter, more vivid colour with ColorSmart III.
- Print excellent text and graphics on plain and special paper. • Print up to 6 pages per minute black and up to 3 pages per minute colour.

**NEW**

PH1024  
£59.00  
£89.99

**HP**

## THE EXPERIENCE OF A LIFETIME!

A complete high end digital recording and playback solution for your PC.

- Soundfont support and creation
- Internal Hardware Effects Engine
- MP3 Encoding/Decoding
- Internet Communication
- Environmental game playing
- includes: Sound Blaster Live Drive



£25 CASHBACK FROM CREATIVE

SD1169  
**£125.00**  
~~£149.99~~

**CREATIVE**  
www.creative.com

## THE GREATEST SOUND AROUND!

This is the affordable Environmental Audio card for the gamer, Internet and entertainment enthusiasts!

- Unlimited near CD quality MP3 ripping and playback
- Full environmental surround sound support
- Internet Communication
- Soft DVD playback



£15 CASHBACK FROM CREATIVE

SD1168  
**£48.00**  
~~£56.40~~

**CREATIVE**  
www.creative.com

## 3D BLASTER GEFORCE 2 GTS

New HyperText architecture delivers 1.6 gigatexels per second for staggering frame rates and high-performance anti-aliasing

- New NVIDIA Shading Rasterizer (NSR) delivers per pixel shading and lighting for rich, lifelike materials and cinematic effects
- Second generation transform and lighting engines deliver 25 million triangles per second for highest possible scene realism



V62817  
**£184.00**  
~~£216.20~~

**CREATIVE**  
www.creative.com

## CREATIVE FPS 1000

Create stunningly realistic multi-channel audio

- Four Channel Amplified Speaker System with Powered Subwoofer
- 320 PMPO
- Frequency response - 65hz - 20kHz
- Floor stands for rear speakers
- Perfect partner to the SB Live Platinum and SB Live Player 1024



£100 CASHBACK FROM CREATIVE

SD1546  
**£139.00**  
~~£183.33~~

**CREATIVE**  
www.creative.com

## DESKTOP THEATRE 2500 DIGITAL

The Most complete 5.1 Dolby Digital speaker system for movies and games

- 5.1 speaker system and high performance decoder-amplifier unit
- Supports Dolby Digital (AC3), Dolby Pro Logic, PCM (SPDIF),
- Creative multispeaker surround (CMSS)



£100 CASHBACK FROM CREATIVE

SD1546  
**£139.00**  
~~£183.33~~

**CREATIVE**  
www.creative.com

## VANTA PCI

The legendary TNT2 chipset plus 32MB of RAM combine to make one seriously powerful graphics card.

- 128-bit NVIDIA RIVA TNT2 graphics controller
- 32MB SDRAM & 300MHz RAMDAC
- Support for 32-bit colour (16.7m colours)
- Max resolution 1920 x 1440
- PCI 2.1
- Support for Win 95, 98, NT4.0 and 2000.



V62915  
**£57.00**  
~~£66.98~~

**CREATIVE**  
www.creative.com

## Videologic

### VIDEOLOGIC HOMECOM

- USB camera with integrated microphone
- Superb images due to latest 640 x 480 CCD sensor
- 7 full software applications included



TV1085  
**£54.99**

### SONICFURY

Next-Gen High Performance Sound Card

- DSP-accelerated MP3 playback, 3D audio or MIDI
- Six channel output for Dolby Digital, music and games
- Supports all major audio standards
- Extensive software bundle



S00115  
**£65.99**  
~~£76.38~~

### DVD PLAYER

DVD/MPEG2 decoder card for PC

- Stunning-quality, Superior to Software DVD
- Output to TV
- S/P-DIF output to Dolby Digital 5.1 decoder



V62183  
**£68.99**  
~~£81.06~~

### SIROCCO SPIRIT

High performance Active Speakers

- Two speakers with integrated 50w RMS amplifiers
- MDF wood cabinets with removable grilles
- Two inputs - play CD's & games



S09003  
**£109.99**  
~~£129.24~~

## STUDIO DV

Easy Creative DV Movie Making

- Preview capture mode lets you create high quality video tapes without using a lot of disk space
- Create RealVideo streaming video for your web pages n Over 100 transitions

(including 50 from Pixelan Video Spice Rack)

- Instant preview Window lets you try out different scenes, transitions, effects, background music and more, before the final edit - with no rendering required

- Create interactive CD's, DV tapes or AVI files for the Internet



TV1246  
**£127.00**  
~~£149.23~~

## UMAX 2200SU SCANNER

- Includes transparency cover (5" x 4")
- Interface: USB and SCSI
- Max Resolution: 9600x9600dpi
- Single-pass, colour, 36-bit
- Scan Area: 8.5" x 11.7"
- Windows 95, 98
- 3 button control
- Optical resolution 600 x 1200 dpi
- New 2 year swap out warranty



2 YR ON SITE REPLACEMENT WARRANTY WITH ALL ASTRA SCANNERS

SC9484  
**£126.99**  
~~£149.21~~

**UMAX**

## STUDIO DC10 PLUS

- Full Screen, full motion video capturing and editing
- Automatic scene detection of you footage n Easy cut-and-paste, drag and drop editing
- Instant preview without time-consuming rendering
- More than 100 different transitions

- Frame accurate editing n Output to video tape or digital media like CDR in SVHS quality



TV0241  
**£139.00**  
~~£163.33~~

**PINNACLE SYSTEMS**

## AGFA SNAPSCAN TOUCH

One Touch scanning from AGFA!

- Stylish landscape design flatbed button scanner
- 4 easy to use buttons
- Revolutionary system for scanning into Email, Fax or Printer.
- Interchangeable colour handles
- USB interface, 600ppi x 1200ppi optical resolution interpolated to 9,600ppi



LATEST FIA F1 '99 GAME FREE WITH EVERY SCANTOUCH

SC1196  
**£79.99**  
~~£93.99~~

**AGFA**

## PRINTERS CONT.

Hewlett Packard cont.		Ex.VAT Inc.VAT
PH1259	HP Deskjet 1220PS	£315.00 £370.13
PH0081	HP 2000C	£228.00 £267.90
PH0188	HP 2500 Pro	£674.00 £791.95
PH0084	HP 2500CM	£915.00 £1,075.13
PH0059	HP LaserJet 1100 Laser	£232.00 £272.60
PH1008	HP LaserJet 1100 Companion (Makes 1100 to an 1100A)	£89.00 £104.58
PH0049	HP LaserJet 1100A Scan/Copy/Print Laser	£285.00 £334.88

## SOUND CARDS

Creative Labs			
S09081	Sound Blaster 16 PCI	£21.00	£24.68
S01168	Sound Blaster Live Player 1024 PCI	£48.00	£56.40
S01169	Sound Blaster Live Platinum PCI	£125.00	£146.88
S01173	SB Live Player 1024 PCI & FPS1000 speakers bundle	£79.00	£92.83
Terratec			
S00012	Terratec Base 2 PCI Sound Card	£28.99	£34.06
S00015	Terratec Mulate Pro PCI Sound Card	£48.99	£57.56
S00018	Terratec EWS 64 XL Sound Card	£348.99	£410.06
S00014	Terratec XL Professional Audio Card	£298.99	£351.31
Turtle Beach			
S01132	Turtle Beach Pinnacle Sound Card	£228.99	£269.06
S01137	Turtle Beach Fiji Sound Card	£109.99	£129.24
S01134	Turtle Beach Monaco A3D/Stream PCI Sound Card	£45.99	£54.04
S01143	Turtle Beach Montego II	£55.00	£64.63
S01144	Turtle Beach Montego II Plus	£105.00	£123.38

## SPEAKERS

Busby			
S01260	Busby 50 Watt Speakers	£5.99	£7.04
S01261	Busby 160 Watt Speakers	£8.99	£10.56
S01262	Busby 240 Watt Speakers	£12.99	£15.26
S01263	Busby 320 Watt Speakers	£18.99	£22.31
S01264	Busby 160 Watt USB Speakers	£18.99	£22.31
S01265	Busby 240 Watt USB Speakers	£25.99	£30.54

Creative Labs			
S01548	SBS20 Speakers	£10.00	£11.75
S01543	Creative FPS1000 Speakers	£39.00	£45.83
S01545	Creative FPS2000 Speakers	£89.00	£104.58
S01546	Creative DTT2500 Digital Theatre Speakers	£139.00	£163.33

Labtec			
S01139	Labtec LCS- 2414 Edutainment Speakers	£39.99	£46.99
S01141	Labtec LCS- 2514 Edutainment Speakers (5 Piece)	£45.99	£54.04
S01107	Labtec APX- 4620 Edutainment Speakers, inc Sub	£67.99	£79.89
S01142	Labtec APX- 5820 Edutainment Speakers, Inc Sub	£99.99	£117.49

Logitech			
S09656	Logitech Soundman G1 speakers	£23.99	£28.19
S09657	Logitech Soundman X1 speakers	£39.99	£46.99
S09658	Logitech Soundman X2 speakers	£59.99	£70.49

Teac			
S01601	Powermax 500 Multimedia Sub-woofer System	£33.99	£39.94
S01603	Powermax 2000 Multimedia Digital System (5 Speakers)	£189.99	£223.24

Videologic			
S09003	Sirocco Spirit Speaker System	£109.99	£129.24
S09001	Digi Theatre Home Cinema Speaker System	£174.99	£205.61
S09002	Sirocco CrossFire Speaker System	£159.00	£186.83
S09000	Sirocco Speaker System	£165.00	£193.88

## SCANNERS

Agfa			
SC1299	Agfa e40 Scanner	£124.99	£146.86
SC1298	Agfa e50 Scanner	£164.99	£193.86
SC1196	Agfa ScanTouch	£83.99	£98.69
SC0201	Agfa 1212U USB Scanner	£74.99	£88.11
SC0202	Agfa 1212P Parallel Scanner	£63.99	£75.19
SC0203	Agfa 1236S SCSI Scanner	£129.99	£152.74

Canon			
SC1510	CanoScan FB 630 Parallel	£61.00	£71.68
SC1511	CanoScan FB 630U (Win98 Only)	£70.00	£82.25
SC1515	CanoScan FB 636U (Win98 Only)	£93.00	£116.33
SC1174	CanoScan FB 1200S	£308.00	£361.90
SC1513	CanoScan FB 1200SADF	£316.00	£366.30
SC1514	CanoScan FB 1200SFAU	£339.00	£351.83

EPSON			
SC1288	EPSON Perfection 610 USB Scanner	£90.00	£105.75
SC1249	EPSON Expression 1600 Scanner	£495.00	£581.63
SC1250	EPSON Expression 1600 Pro Scanner	£650.00	£763.75
SC1287	EPSON Perfection 1200U A4 Scanner	£134.00	£157.45
SC1290	EPSON Perfection 1200S A4 Scanner	£164.00	£192.70
SC1289	EPSON Perfection 1200 Photo A4 Scanner	£179.00	£210.33

Hewlett Packard			
SC1067	HP PhotoSmart S20 Scanner	£299.00	£351.33
SC0589	HP Scanjet 3300C USB	£63.00	£74.03
SC0588	HP Scanjet 3400C USB	£55.00	£64.63
SC0587	HP Scanjet 4300C USB (Win98 only)	£78.00	£91.65
SC1174	HP Scanjet 5300C Parallel & USB	£140.00	£164.50
SC1078	HP Scanjet 6300C	£220.00	£258.50
SC1079	HP Scanjet 6350C	£273.00	£320.78
SC1077	HP Scanjet 6390C (inc. Film Scann)	£489.00	£574.58

Umax			
SC0483	UMAX Astra 2000P	£55.00	£64.63
SC0480	UMAX Astra 2100U	£66.99	£78.71
SC0484	UMAX Astra 2200S/3600 (USB & SCSI) 600x1800 (inc. Trans)	£126.99	£149.21
SC0490	UMAX Astra 2400S 42bit Scanner (SCSI) (Bare)	£198.99	£233.81

# SOUND CARDS & VGA CARDS

## VIDEO CONFERENCING

		Ex. VAT	Inc. VAT
TV5587	3Com Home Connect Conferencing Camera USB	£89.00	£104.58
<b>Creative Labs</b>			
TV5164	Creative Labs VideoBlaster WebCam III USB	£45.00	£52.88
TV5167	Creative Labs WebCam Go Plus USB	£92.00	£106.10
<b>Dynanet</b>			
TV5241	Dynanet VCDX USB Digital Camera (Win98)	£33.99	£39.94
<b>Logitech</b>			
TV5031	QuickCam Express	£28.99	£34.06
TV5032	QuickCam Web	£54.99	£64.61
TV5029	QuickCam VC (Farr)	£46.99	£55.21
TV5027	QuickCam VC (USB)	£48.99	£57.56
TV5026	QuickCam Pro (USB)	£74.99	£88.11
<b>Videologic</b>			
TV1085	Videologic HomeCfm	£54.99	£64.61

## VGA CARDS

		Ex. VAT	Inc. VAT
<b>Simply</b>			
VG5234	Simply S5 1G/2X 4MB AGP 3D	£18.00	£21.15
VG5235	Simply Trident 9750 4MB PCI	£18.00	£21.15
<b>ASUS</b>			
VG7002	ASUS Riva TNT2 AGP 32MB	£99.99	£117.49
VG7003	ASUS Riva TNT2 AGP 32MB TV-out/Video-in	£115.99	£136.29
VG7004	ASUS Riva TNT2 ULTRA AGP 32MB TV-out/Video-in	£129.99	£152.74
VG7005	ASUS V6600 Deluxe 32MB TV In & out AGP	£179.99	£211.49
VG7006	ASUS V6800 Deluxe 32MB TV In & out AGP (DDR)	£209.99	£246.74
<b>ATI</b>			
VG0950	ATI Xpert98 8MB AGP (OEM)	£24.99	£29.36
VG0921	ATI Xpert 2000 16MB AGP (OEM)	£41.99	£49.34
VG0923	ATI Xpert 2000 32MB AGP (OEM)	£54.99	£64.61
VG0924	ATI Xpert 2000 32MB AGP TV out	£55.99	£65.79
VG0925	ATI Rage Fury Pro VIVO 32MB AGP	£67.00	£78.73
VG0926	ATI Rage Fury MAXX 64MB AGP (OEM)	£116.00	£136.30
VG0929	ATI Rage Fury MAXX 64MB AGP (OEM)	£111.00	£130.43
VG0918	ATI All in Wonder 128 16MB AGP (OEM)	£93.99	£110.44
VG0917	ATI All in Wonder 128 16MB AGP	£94.99	£111.61
VG0927	ATI All in Wonder 128 32MB PCI	£108.00	£126.90
VG0928	ATI All in Wonder 128 32MB AGP	£108.00	£126.90
<b>Creative</b>			
VG2914	3D Blaster GeForce 256 ANNIHILATOR PRO 32MB	£179.00	£210.33
VG2916	3D Blaster GeForce 256 Pro 32MB (OEM)	£125.00	£146.88
VG2917	3D Blaster GeForce 2	£184.00	£216.20
VG2915	3D Blaster TNT2 Vanta 32MB PCI	£57.00	£66.98
VG2911	3D Blaster TNT2 Riva M64 32MB	£69.00	£81.08
<b>Diamond</b>			
VG1038	Diamond Viper II 2200 AGP 32MB	£99.99	£117.49
VG1036	Diamond Viper II 2200 AGP 32MB OEM	£95.99	£112.79
VG1992	Diamond Stealth III S540 AGP 16MB (OEM)	£34.99	£41.11
VG1991	Diamond Stealth III S540 AGP 32MB (OEM)	£45.99	£54.04
VG1993	Diamond Stealth III S540 Xtreme AGP 32MB	£48.99	£57.56
VG1993	Diamond Speedstar 490 16MB (OEM)	£48.99	£57.56
<b>Elsa</b>			
VG7897	Elsa Erazor III Pro 32MB AGP	£89.99	£105.74
VG7898	Elsa Erazor III Pro Video 32MB AGP	£129.99	£152.74
VG7899	Elsa Erazor X 32MB (GeForce) AGP	£149.99	£176.24
VG7900	Elsa Erazor X2 32MB (GeForce) DDR AGP	£199.00	£233.83
VG6900	Elsa Gloria II 64MB AGP	£510.00	£609.83
VG6901	Elsa GLADIAC GeForce2 GTS 32MB AGP	£229.00	£269.08
<b>Guillemot</b>			
VG8566	Guillemot 3D PROPHECY GTS 64MB	£279.00	£327.83
VG8567	Guillemot 3D PROPHECY GTS 32MB	£229.00	£269.08
<b>Matrox</b>			
VG1451	Millennium G400 32MB AGP	£115.00	£135.13
VG1452	Millennium G400 MAX 32MB	£157.99	£182.14
VG1453	Millennium G400 16MB AGP OEM	£72.00	£84.60
VG1454	Millennium G400 16MB AGP OEM Dual	£73.99	£86.94
VG1456	Millennium G400 32MB AGP OEM	£89.00	£104.58
VG1457	Millennium G400 32MB AGP OEM Dual	£109.00	£128.08
VG1458	Marvel G400-TV AGP 16MB	£169.00	£198.58
VG1459	Matrox RT 2000 (Real Time Video Editing)	£799.00	£938.83
<b>3Dfx</b>			
VG3890	3Dfx Voodoo3 2000 16MB AGP OEM	£57.99	£68.14
VG3892	3Dfx Voodoo3 2000 16MB AGP	£57.99	£68.14
VG3895	3Dfx Voodoo3 2000 16MB TruReal AGP OEM	£69.99	£82.24
VG3897	3Dfx Voodoo3 2000 16MB TruReal AGP	£83.99	£98.69
VG3901	3Dfx Voodoo3 3500 TV 16MB AGP	£119.00	£139.83
VG3906	3Dfx Voodoo4 4500 32MB AGP	£115.00	£135.13
VG3905	3Dfx Voodoo4 4500 32MB PCI	£115.00	£135.13
VG3904	3Dfx Voodoo5 5000 32MB AGP	£159.00	£186.83
VG3907	3Dfx Voodoo5 5000 32MB PCI	£159.00	£186.83
VG3905	3Dfx Voodoo5 5500 64MB AGP	£195.00	£229.13
<b>Videologic</b>			
VG2199	Neon 250 PowerVR II card 32MB AGP	£98.99	£116.31
VG2198	Neon 250 PowerVR II card 32MB PCI	£98.99	£116.31
VG2163	Videologic DVD Player PCI	£68.99	£81.06

## MULTI-MEDIA CARDS

		Ex. VAT	Inc. VAT
<b>Simply</b>			
VG9989	Simply TV Tuner	£23.99	£28.54
<b>ATI TV Tuner</b>			
VG5898	ATI TV Tuner VE PCI OEM	£29.99	£35.24
<b>Hauppauge</b>			
TV1229	Hauppauge WinTV Go	£37.99	£44.64
TV1226	Hauppauge Primo FM PCI	£54.99	£64.61
TV1225	Hauppauge WinTV FM PCI	£71.99	£84.59
TV0138	Hauppauge WinTV OOD Camera Bundle	£113.99	£133.94
TV0092	Hauppauge WinTV Theatre	£88.99	£104.56
TV2135	Hauppauge WinTV USB (Win98)	£62.99	£74.01
TV2136	Hauppauge WinTV USB-FM (Win98)	£79.99	£93.99
TV0131	Hauppauge Cinema Pro	£188.99	£222.06
TV1227	Hauppauge USB-Live (Video Capture)	£41.99	£49.34
TV1232	Hauppauge WinTV DVBS	£199.00	£233.83
<b>lomega</b>			
TV0137	lomega BLZ	£614.99	£715.11
<b>miroVIDEO</b>			
TV1251	Studio PCTV Race (PCI)	£31.99	£37.59
TV0262	Studio PCTV (PCI)	£39.00	£45.83
TV1252	Studio PCTV (USB)	£68.00	£79.90
TV1246	MiroSTUDIO DV (PCI)	£127.00	£149.23
TV1247	MiroSTUDIO DV500 (PCI)	£499.00	£586.33
TV1251	Miro PCTV Race (PCD)	£31.99	£37.59
TV0241	miroVIDEO DC10 Plus (PCI)	£139.00	£163.33
TV0947	miroVIDEO DC30 Plus (PCI)	£255.00	£299.63
TV0840	miroVIDEO DV200 FireWire (PCI)	£255.00	£299.63
TV0830	miroSTUDIO 400 (Parallel)	£89.00	£104.58
TV0839	miroSTUDIO MP10 (PCI)	£179.99	£211.49
TV0948	miroVIDEO DC50 (PCI)	£1049.99	£1232.56



### RAGE FURY MAXX

- The Ultimate gaming board – high performance, true colour, high resolution – built for today's games!
- 64 MB of memory!
- Dual RAGE 128 Pro chips on board
- DVD video playback
- Fastest graphics card for today's gaming market
- Photorealistic gameplay
- Supports OpenGL and D3D
- AGP 2x and 4x

VG0926  
**£116.00**  
~~£136.30~~



### RAGE FURY PRO VIVO

- Amazing Features!
- 32 MB Memory, 32-bit true colour
- DVD Playback, Video Capture, TV out
- AGP 2x and 4x
- New Rage 128 Pro Chip

VG0925  
**£67.00**  
~~£78.73~~



### ALL-IN-WONDER 128 PRO

- RAGE 128 PRO powered 128-bit 3D graphics performance
- 50% more 3D power
- Intelligent TV-Tuner with Digital VCR
- 32-bit true color gaming
- Still image and MPEG-2 motion video capture
- Video editing
- Hardware DVD video playback
- Video output to TV or VCR
- 32 MB of memory
- AGP 4X/2X upgrade card

VG0939  
**£152.99**  
~~£178.76~~



### Voodoo5 5500 AGP/PCI

Voodoo5 from 3dfx is the next stage in the evolution of ultra-high resolution gaming. Utilising a revolutionary scalable architecture, the Voodoo5 5500 features dual 3dfx VSA-100 processors for more horsepower.

- 667-733 Megapixels/second
- 64MB of Graphics Memory
- 32-bit colour rendering
- Real-Time Full-Scene HW Anti-Aliasing
- Exclusive T-Buffer™ Digital Cinematic Effects



VG3903  
**£195.00**  
~~£220.13~~

### Voodoo3 3500TV AGP

Using the industries most powerful 2D and 3D graphics technology the Voodoo3 3500TV also includes innovative multimedia capabilities.

- 8 Million Triangles/sec
- TV Tuner
- MPEG-2 Capture and Editing
- 16MB
- 350MHz

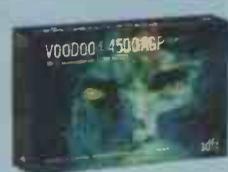


VG3901  
**£119.00**  
~~£139.83~~

### Voodoo4 4500 AGP/PCI

The Voodoo4 4500 delivers all the power and performance PC owners demand from 3dfx. Designed around the new 3dfx VSA-100c chip, the Voodoo4 4500 features a 3D engine capable of rendering over 333 Megapixels per second and a 350MHz RAMDAC for 2D resolutions as high as 2048x1536

- Fully-integrated 128-bit 2D/3D/Video Accelerator
- AGP 4x and PCI local bus support
- 32MB of Graphics Memory
- 32-bit colour rendering



VG3906  
**£115.00**  
~~£135.13~~

# SIMPLY VOTED NO.1 HARDWARE DEALER OF THE YEAR WITH PCW

## THE FUJIFILM MX-1200

The Fujifilm MX-1200 is a stylish, pocketable camera with a high quality lens, no-fuss controls and comes with a 2MB SmartMedia card. A 1.3m pixel CCD gives 1280 x 960 resolution while a refined RGB colour filter, intelligent auto white balance and programmed AE further enhance results. It has built in automatic flash, digital 2x telephoto mode and comes with 4 x AA batteries, serial cable and software for downloading.



TV1261  
**£179.00**  
~~£210.33~~

## FUJIFILM FINEPIX 1400 ZOOM

The FinePix 1400 Zoom is a simple, easy to use and elegant camera. The 1.3 million pixel CCD ensures sharp, quality images. Equipped with a high-performance 3 x optical zoom, the FinePix 1400 is ready for all shooting opportunities. Downloading images is very quick and easy with the camera's USB Interface. The kit includes a 4MB card, 4 AA batteries, a USB cable and software.



TV1260  
**£245.99**  
~~£269.04~~

## MILLENNIUM G400 MAX

Experience cutting-edge features and amazing display options that make this card the ultimate entertainment card to own.

- Versatile DualHead Display allowing you to explore new gaming possibilities
- 3D Environment-Mapped Bump Mapping and Vibrant Colour Quality2 for more realistic 3D gaming
- 3D resolutions up to 2048 x 1536 in 32-bit colour @ 85Hz
- 360 MHz UltraSharp DAC
- DualHead DVDMax and TV output



VG1452  
**£137.99**  
~~£162.14~~

## DYNAMODE VCOXO USB DIGITAL CAMERA

The VCOXO incorporates "plug and play" design and USB technology eliminating the clutter of excess power cables and lengthy set-up time. In minutes, under Windows98, you can be video conferencing with colleagues or capturing AVI movie clips and still images for that big presentation. With the Dynamode USB Digital Camera you won't be left behind in the new age of digital imaging.



**Dynamode**

TV5241  
**£33.99**  
~~£39.94~~

## HAUPPAUGE WINTV-USB-FM

Model 570

- Plugs directly into the USB port on your PC or Laptop for easy installation (external)
- Capture still & motion video images
- Receive Professional Teletext: print, copy and save teletext data & create live links to your spreadsheets
- Video conferencing by adding a video camera (included with WinTV CCD Camera Bundle)
- Now includes FM Radio
- Compatible with Windows98\* & 2000

**Hauppauge!**



TV2136  
**£79.99**  
~~£93.99~~

## HAUPPAUGE WINTV-DVB-S

Model 717

- Watch Digital Satellite TV.
- Listen to Digital Stereo Radio.
- Record and playback using MPEG2 compression.
- Composite video output for connection to a TV or VCR.
- Receive DVB data services (e.g. "Internet via Satellite"), for fast Internet downloads.
- Compatible with Windows95/98 and NT 4.0

**Hauppauge!**



TV1232  
**£199.00**  
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J00210	MS Sidewinder Force Feedback Pro	£65.99	£77.54
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J00198	MS Precision Racing Wheel	£31.99	£37.59
J00211	MS Sidewinder Freestyle Pro	£25.99	£28.19
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KE0028	Cherry G83-6105 Keyboard Soft with Win 95 keys (PS/2)	£14.99	£17.61
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TV0326	Powershot S20	£589.00	£692.06
TV0319	Powershot A50	£349.00	£410.08
TV0322	Powershot S10 2.11 MegaPixel	£447.99	£526.39
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DC0515	EPSON PhotoPC 650 Colour Digital Camera	£181.00	£212.66
DC0507	EPSON PhotoPC 800 Colour Digital Camera	£408.00	£479.40
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TV1261	Fujifilm MX-1200 Digital Camera	£179.00	£210.33
TV1293	Fujifilm MX-1700 Digital Camera	£272.00	£319.60
TV1256	Fujifilm MX-2900 Digital Camera	£424.99	£499.36
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TV9285	Kodak Digital Zoom Camera DC215	£189.99	£223.24
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TV1668	Olympus C-2020Z Digital Camera 1600x1200	£449.00	£527.58
TV1669	Olympus C-3030Z Digital Camera 2048x1534	£679.99	£798.99
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SBU016 Drive Image 3 Upg for W3.0/95/98/NT CD	£21.99	£25.84
SU5238 Lost and Found Win95/98 3.5"	£43.99	£51.69
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SCR372 Communicate 12000 95/98/NT/2000 CD	£151.99	£178.59
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SCR310 Phone Tools Suite	£61.99	£72.84
<b>Symantec</b>		
SCR150 PCAnywhere V9.2 Host & Remote	£111.99	£131.59
SCR151 PCAnywhere V9.2 Host Only	£67.99	£79.89
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SOP201 Sage Contact Manager V5 N/W	£299.99	£352.49
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SDA130 FileMaker Pro V5 W95/98 CD	£183.99	£216.19
SDA205 FileMaker Pro v5 on CD Win Upgrade	£113.99	£133.94
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SM4302 UK Info V2000 Standard	£38.99	£45.81
SM4303 UK Info V2000 Professional	£159.99	£187.99
SM4304 UK Info Power 2000	£228.99	£269.06
<b>Mathsoft</b>		
SD4041 INSTAbase V4.0 Web Ready	£25.99	£30.54
<b>Microsoft</b>		
SDA501 MS Access 2000	£232.99	£273.76
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SDA001 Ability Database W95/98/NT	£13.99	£16.44
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<b>Autodesk</b>		
CAD002 AutoCAD 14	Call	Call
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SCA031 AutoCAD LT 2000 for Win 95/2000/NT CD	£444.99	£522.86
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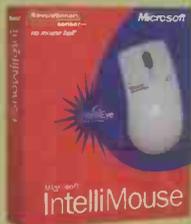
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Microsoft

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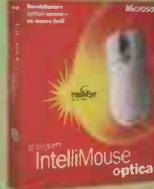
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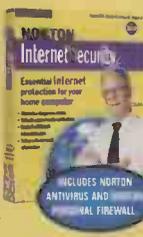


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Watershed in the information age in Britain  
The Independent

This is a sublime piece of software  
Evening Standard

- NEW – Now includes InfoMap Street Atlas with Geocoding, allowing postcodes to be plotted on a street map of the UK
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SG5203	CorelDRAW 9.0 Win 95 & NT4 CD	£264.99	£311.36
SG5201	CorelDRAW 9.0 Windows Upp CD	£138.99	£161.31
SG5220	CorelDRAW 9.0 Office Edition Win 95 & NT4 CD	£184.99	£217.36
SG5221	CorelDRAW 9.0 Office Edition Upp Win 95 & NT4 CD	£103.99	£122.19
SG5210	Draw V9.0 Premium Color Edition	£424.99	£499.36
SG5211	Draw V9.0 Premium Color Edition Upp	£319.99	£375.99
SG5230	Photopaint V9 CD	£199.99	£234.99
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SGD171	CorelDRAW Classic	£53.99	£63.44
SG2100	PaintShop Pro V6 for Win 95/98/NT CD	£76.99	£90.46
SD3010	Image Robot 1.2 Win 95/98/NT CD	£67.99	£79.89
SG5066	PhotoDraw 2000 V2 W95 CD	£77.99	£91.64
SG5068	PhotoDraw 2000 V2 Upp W95 CD	£33.99	£39.94
SD4000	Visio 2000 Technical Edition	£252.99	£297.26
SD4001	Visio 2000 Technical Edition Upp	£137.99	£162.14
SD4004	Visio 2000 Professional Edition	£292.99	£345.49
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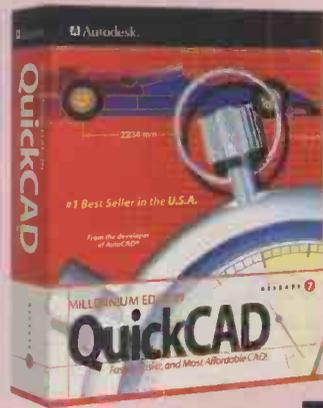
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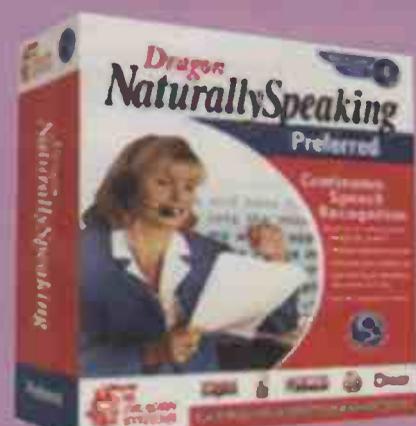
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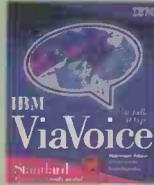


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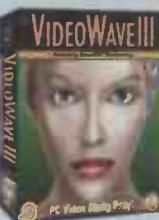


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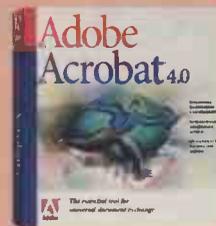


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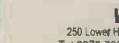
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- 8Mb SG VRAM ATI 3D Rage Pro Graphics
- 3D Sound System with built-in speakers & mic
- Intelligent Li-Ion Battery\*
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- Ports: USB, IrDA, Serial, Parallel, External Monitor, TV-Out, PS/2, Port replicator



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- 6.4Gb ATA-33 EIDE Hard Drive
- Integrated 24X CD ROM (DVD Optional)
- 3.5" 1.44Mb Drive (LS-120, Iomega ZIP, 2nd HDD Optional)
- 8Mb SG VRAM ATI 3D Rage Pro Graphics
- 3D Sound System with built-in speakers & mic
- Intelligent Li-Ion Battery\*
- 2 x PCMCIA Type II slot, supports Zoom Video
- Ports: IEEE Firewire, USB, IrDA, Serial, Parallel, External Monitor, TV-Out, PS/2, Port exp licator



**Dimensions:**  
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Upgrade from 6.1Gb to 10Gb Hard Disk	£59	8900P Car adaptor	£39	Aries PCMCIA Ethernet Card 100 BaseT (BNC/UTP)	£39
Upgrade from 6.1Gb to 12.1Gb Hard Disk	£89	Port Replicator	£99	Additional Mains Adapter for 5300C	£69
RAM upgrade from only £1.10 per Mb		5300 - Lithium Ion Smart Battery Pack	£99	Additional Mains Adapter for 5300B/3300C	£69
Upgrade from 32Mb to 64Mb	£59	8900P - Lithium Ion Smart Battery Pack	£159	ARIES PCMCIA Fax/Modem (56K)	£59
Upgrade from 64Mb to 128Mb	£89	3300B/3300C - Lithium Ion Smart Battery Pack	£99	Xircrom 100BaseT Ethernet/Fax Modem Card	£195
DVD ROM Drive + MPEG2 Software	£179	8900P - LS120 Drive (120Mb)	£129		
5300C Car adaptor	£39	8900P - IOMEGA ZIP Drive (100Mb)	£159		

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- Intel® 810 3D Sound & Graphics
- Aries Hi-Fi Stereo Speakers
- Mini Tower Case
- Aries 56K WinSoft PCI Modem

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- 10/100 Fast Ethernet Controller
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- 50x MAX CD ROM drive
- 15" Aries digital monitor
- Intel® 810 3D Sound & Graphics
- Aries Hi-Fi Stereo Speakers
- Slimline Desktop Case
- 10/100 Fast Ethernet Controller
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- Maxxtro 3D Surround Sound System
- USB WebCam Camera
- Mid Tower Case
- 10/100 Fast Ethernet Controller
- Aries 56K WinSoft PCI Modem

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£1173.83 Inc VAT

## PROCESSOR UPGRADES

Intel® Celeron™ Upgrades	Ex. VAT
Celeron 533MHz to 566MHz	£10
Celeron 566MHz to 600MHz	£10
<b>Intel® Pentium® III Upgrades</b>	
Pentium PIII 650MHz to 700MHz	£50
Pentium PIII 700MHz to 750MHz	£80
Pentium PIII 750MHz to 800MHz	£40
Pentium PIII 800MHz to 850MHz	£100
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Example: to upgrade 500MHz to 566MHz :-  
Add £15 + £10 = £25 Ex Vat



Students - Upgrade to Microsoft Office 2000 Pro for only £88 when you purchase an Aries PC\*\*

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- AMD Athlon Processor 700MHz
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- Mini Tower Case
- Aries 56K WinSoft PCI Modem



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- DVD/CD DVD ROM drive
- 17" Aries digital monitor
- 32MB nVidia GeForce Graphics
- Creative Sound Blaster Live! 1024 Sound Card
- Creative Labs FourPointSurround speakers
- Mini Tower Case
- Aries 56K WinSoft PCI Modem



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ONLY

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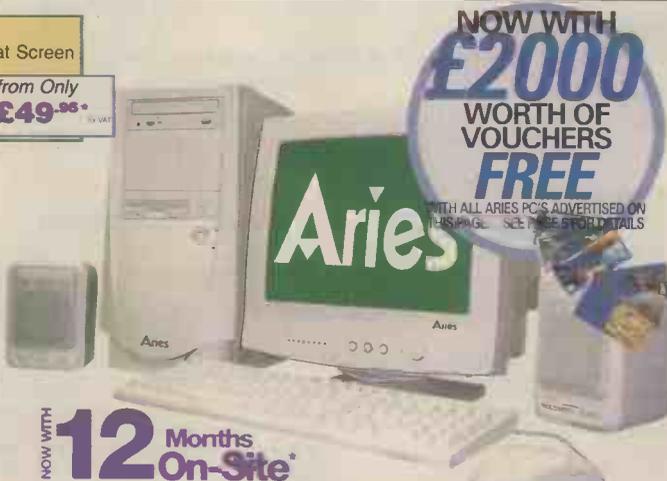
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NOW WITH **12 Months On-Site\***

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All Aries PCs advertised on this page, come with a **6 YEAR WARRANTY**, including 12 months on-site parts & labour - 5 years return to base, labour only. (Warranty valid within mainland UK only. Excluding Monitors & Software) Monitors come with a 3 Year On-Site Swap Out warranty.

## ALL ARIES PC'S INCLUDE

- Enhanced Dual Channel Fast IDE
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PAY FEBRUARY 2001  
see page 5 for details

\*Software installed for customers convenience, no disks will be provided.

\*\*When purchased with any aries PC. Please Note: If you or any of your family (5 years plus) are in full or part-time education you qualify for this money saving offer. Product is supplied on CD ROM only, with on-line documentation, via voucher redemption.

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- £30 Up to £30 off annual travel insurance

For full terms and conditions see page 2. \*Offer excludes the Aries Lite range.

## The Aries™ HOME/OFFICE PC Solution

- Intel® Pentium® III Processor 700MHz
- Intel® 810 Chipset
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- 20.1Gb Hard Disk
- DVD ROM Drive 8x
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- Intel® 810 3D Sound
- V90 56K Fax/Internet Modem
- Midi Tower case
- 3.5" Floppy Drive
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- Mouse

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- 50X CD ROM Drive
- Intel® 810 3D Graphics
- Intel® 810 3D Sound
- V90 56K WinSoft Fax/Internet Modem
- Midi Tower case
- 3.5" Floppy Drive
- Keyboard
- Mouse

**NOW WITH PIII 550MHz Processor**

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- AMD Athlon 700MHz Processor
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- nVidia TNT2 32Mb
- M64 Graphics Accelerator
- Creative Labs PCI 128 Sound Card
- V90 56K WinSoft Fax/Internet Modem
- Midi Tower case
- 3.5" Floppy Drive
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Aries EnergyPro 17"	£129 ExVat	£151.58 IncVat
Aries EnergyPro 19"	£209 ExVat	£245.58 IncVat

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19230	ST38410A	8.4Gb	Ultra ATA	8.9ms	5400RPM	£56.00	£65.80
24486	ST310212A	10.2Gb	Ultra ATA	8.9ms	5400RPM	£59.00	£69.33
24487	ST315323A	15.3Gb	Ultra ATA	8.9ms	5400	£72.00	£84.60
21909	ST317221A	17.2Gb	Ultra ATA	8.9ms	5400RPM	£78.00	£91.65
24488	ST320423A	20.4Gb	Ultra ATA	8.9ms	5400RPM	£81.00	£95.19
24353	ST320621A	30.6Gb	Ultra ATA	8.9ms	5400RPM	£129.00	£151.58
24354	ST340823A	40.8Gb	Ultra ATA	8.9ms	5400RPM	call	call
23630	ST310220A	10.2Gb	Ultra ATA	9.5ms	7200RPM	£69.00	£81.08
24352	ST315320A	15.3Gb	Ultra ATA	9.5ms	7200RPM	£79.00	£92.83



P/C	MPC	Capacity	Interface	Access	RPM	Ex VAT	Inc VAT
21720	AC310100	10.2Gb	Ultra ATA	9.5ms	5400RPM	£59.00	£69.33
24489	WD153AA	15.3Gb	Ultra ATA	9.5ms	5400RPM	£65.00	£76.38
23834	AC320400	20.4Gb	Ultra ATA	9.5ms	5400RPM	£75.00	£88.13
23668	WD272AA	27.2Gb	Ultra ATA	10ms	5400RPM	£115.00	£135.13
23669	WD307AA	30.7Gb	Ultra ATA	10ms	5400RPM	£129.00	£151.58
24542	WD450AA	45Gb	Ultra ATA	10ms	5400RPM	£159.00	£186.83
23670	WD1029A	10.2Gb	Ultra ATA	9ms	7200 RPM	£79.00	£92.83
24490	WD153BA	15.3Gb	Ultra ATA	9ms	7200RPM	£82.00	£96.35
22835	WD205BA	20.5Gb	Ultra ATA	9ms	7200RPM	£109.00	£128.08



P/C	MPC	Capacity	Interface	Access	RPM	Ex VAT	Inc VAT
23811	91021U2	10.2Gb	Ultra DMA	9ms	5400rpm	£59.00	£69.33
23812	91531U3	15.3Gb	Ultra DMA	9ms	5400rpm	£69.00	£81.08
23814	92041U4	20.4Gb	Ultra DMA	9ms	5400rpm	£79.00	£92.83
24643	31536U2	15.3Gb	Ultra DMA	9ms	5400rpm	£69.00	£81.08
24644	32049U3	20.4Gb	Ultra DMA	9ms	5400rpm	£79.00	£92.83
24645	33073U4	30.7Gb	Ultra DMA	9ms	5400 rpm	£105.00	£123.38
23864	93073U6	30.7Gb	Ultra DMA	9ms	5400 rpm	£105.00	£123.38
23816	94098U8	40.9Gb	Ultra DMA	9ms	5400 rpm	£145.00	£170.38
23858	51024U2	10.2Gb	UDMA66	9ms	7200RPM	£69.00	£81.08
23857	51536U3	15.3Gb	UDMA66	9ms	7200RPM	£79.00	£92.83
23856	52049U4	20.4Gb	UDMA66	9ms	7200RPM	£103.00	£121.03
23855	53073U6	30.7Gb	UDMA66	9ms	7200RPM	£129.00	£151.58
23854	54098U8	40.9Gb	UDMA66	9ms	7200RPM	£169.00	£198.58
24845	94098U6	40Gb	UDMA66	9ms	5400RPM	£139.00	£163.33
24846	96147U8	61.4Gb	UDMA66	9ms	5400RPM	£205.00	£240.88



P/C	MPC	Capacity	Interface	RPM	Ex VAT	Inc VAT
22421	305020	20.5Gb	EIDE/Ultra ATA	5400RPM	£75.00	£88.13
24844	307015	15.0Gb	EIDE/Ultra ATA	7200RPM	£89.00	£104.58
24347	307030	30.2Gb	EIDE/Ultra ATA	7200RPM	£139.00	£163.33
24348	307045	45.2Gb	EIDE/Ultra ATA	7200RPM	£219.00	£257.33



P/C	MPC	Capacity	Interface	Access	RPM	Ex VAT	Inc VAT
20527	NPD3084AT	8.4Gb	Ultra DMA	11ms	5400rpm	£51.00	£59.93
20528	MPE3102AT	10.2Gb	Ultra DMA	11ms	5400rpm	£58.00	£68.15
22224	MPE3136AT	13.6Gb	Ultra DMA	11ms	5400rpm	£64.00	£75.20
24495	MPF3153AT	15.3Gb	Ultra DMA	11ms	5400rpm	£69.00	£81.08
22420	MPE3172AT	17.0Gb	Ultra DMA	11ms	5400rpm	£71.00	£83.43
23436	MPE3204AT	20.4Gb	Ultra DMA	9.6ms	5400rpm	£75.00	£88.13
23437	MPE3273AT	27.3Gb	Ultra DMA	9.6ms	5400rpm	£135.00	£158.63
24036	MPF3102AT	10.2Gb	Ultra DMA	9.6ms	7200rpm	£59.00	£69.33
23617	MPE3136AH	13.6Gb	Ultra DMA	9.0ms	7200rpm	£78.00	£91.65
24843	MPF3153AH	15.3Gb	Ultra DMA	9.0ms	7200rpm	£69.00	£81.08



P/C	MPC	Capacity	Interface	Access	RPM	Ex VAT	Inc VAT
24570	Fireball lct	10.51Gb	UDMA66	8.9ms	5400	£59.00	£69.33
24172	Fireball lct	10.2Gb	UDMA66	8.9ms	5400	£61.00	£71.68
24168	Fireball lct	15Gb	UDMA66	8.9ms	5400	£74.00	£86.95
24000	Fireball lct	20Gb	UDMA66	8.9ms	5400	£79.00	£92.83
24170	Fireball lct	30.0Gb	UDMA66	8.9ms	5400	£105.00	£123.38
24173	Fireball lct	10.2Gb	UDMA66	8.5ms	7200	£69.00	£81.08
24174	Fireball lct	15.0Gb	UDMA66	8.5ms	7200	£79.00	£92.83
24175	Fireball lct	20.5Gb	UDMA66	8.5ms	7200	£105.00	£123.38
24176	Fireball lct	30.0Gb	UDMA66	8.5ms	7200	£149.00	£175.08

PC COMPONENTS

### 3.5" SCSI HARD DISK DRIVES

FUJITSU	Ex Vat	Inc Vat
21070	MAE3091LP 9.1Gb AV 8ms Ultra Wide	£149.00 £175.08
22744	MAE3182LP 18.2Gb AV 8ms Ultra Wide	£219.00 £257.33
24354	MAF3364LP 36.4Gb AV 8ms Ultra Wide	£522.00 £613.35
23073	IBM 18.2Gb Ultra 2 Wide SCSI HDD LVD	£239.00 £280.83
23074	IBM 36.0Gb Ultra 2 Wide SCSI HDD LVD	£525.00 £616.88
<b>QUANTUM</b>		
24396	Atlas V 9.1Gb 6.9ms 4Mb Cache SCSI Ultra Wide 7200RPM	£169.00 £198.58
24397	Atlas V 18.4Gb 6.9ms 4Mb Cache SCSI Ultra Wide 7200RPM	£249.00 £292.58
24398	Atlas V 36.7Gb 6.9ms 4Mb Cache SCSI Ultra Wide 7200RPM	£489.00 £574.58
24012	Quantum 18.2Gb Atlas 10K U2W SCSI	£349.00 £410.08
<b>SEAGATE</b>		
22842	ST39140LW Medalist Pro 9.1Gb ULTRA WIDE 10ms 7200RPM 512K Cache	£155.00 £182.13
24491	ST392136LW Barracuda 9.2Gb ULTRA WIDE 10ms 7200RPM 2Mb Cache	£165.00 £193.88
24492	ST318463LW Barracuda 18.4Gb ULTRA WIDE 7ms 7200RPM 2Mb Cache	£205.00 £240.88
22845	ST136475LW Barracuda 36.4Gb ULTRA WIDE 7ms 7200RPM 512K Cache	£549.00 £645.08
<b>WESTERN DIGITAL</b>		
23076	Enterprise 9.1Gb UltraWide SCSI LVD 68 Pin 2M Ram 1000RPM	£249.00 £292.58
21914	Enterprise 18.3Gb 8ms 7200RPM Ultra Wide 2	£379.00 £445.33

### MOTHERBOARDS KITS

	Ex Vat	Inc Vat
24182	k6 2 3D-50+ Fan + MotherBoard+ 64Mb Memory	£129.00 £151.58
24772	Celeron533 + Fan + MotherBoard+ 64Mb Memory	£169.00 £198.58
24572	Intel PIII 650 + Fan + MotherBoard+ 128Mb Memory	£295.00 £346.63



**Upgrade your PC today**

**AMD 500+ Motherboard + 64MB Memory + Fan**

Images for illustrative purposes only



From Ex Vat £129  
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### MOTHERBOARDS

ABIT	Ex Vat	Inc Vat
24567	Pentium II 810e ATX Motherboard WX6	£66.00 £77.55
24566	Pentium II BX440 ATX Motherboard BF6	£67.00 £78.73
23169	Pentium II BX440 ATX Motherboard BE6	£79.00 £92.83
24568	Slot A AMD Athlon ATX Motherboard KA7	£95.00 £111.63
<b>ASUS</b>		
23075	440BX Pentiumm ATX Format P3B-F	£87.99 £103.39
20402	440BX Pentium II ATX Format P2B-S	£210.00 £246.75
20587	ALI Aladin 5 AGP 100MHz Socket 7 P5A-B (AT)	£59.00 £69.33
20594	ALI Aladin 5 AGP 100MHz Socket 7 P5A (ATX)	£59.00 £69.33
	VIA KX133 Slot A ATX Format KV7	£115.00 £135.13
24857	VIA KX133 Socket A ATX Format AV7	£125.00 £146.88
<b>GIGABYTE</b>		
21526	GA-5AA Pentiumm 100mhz Socket 7 AT	£49.00 £57.58
20515	GA-SAX Pentiumm 100mhz Socket 7 ATX	£51.99 £57.58
24360	GA-6BX7 Motherboard Socket 370 PIII ATX	£59.00 £69.33
20554	GA-686BXDS Dual Motherboard 440BX PII ATX	£229.00 £269.08
24045	GA-686BX2000+ Motherboard 440BX PII ATX	£79.00 £92.83
22882	Gigabyte GA-7K Athlon ATX Motherboard Socket 2000	£87.99 £103.39
15919	GA-6VXE + Pentiumm II VIA693 ATX	£55.00 £64.63
23543	GA-6WMM 810 Slot 1 with Audio & Graphics M.ATX	£79.00 £92.83
23346	GA-6WMM7 810 Socket 370 with Audio & Graphics M.ATX	£75.00 £88.13
20105	GA-686BDX Dual Processor 440BX ATX	£107.99 £126.89

### PROCESSORS - CPU

INTEL	Ex Vat	Inc Vat
24021	Pii Celeron "A" 533MHz Processor (Socket 370)	£65.00 £76.38
24355	Pii Celeron "A" 566MHz Processor (Socket 370)	£75.00 £88.13
24356	Pii Celeron "A" 600MHz Processor (Socket 370)	£89.00 £104.58
24357	Pii Celeron "A" 633MHz Processor (Socket 370)	£109.00 £128.08
24358	Pii Celeron "A" 667MHz Processor (Socket 370)	£129.00 £151.58
24362	Pii Celeron "A" 700MHz Processor (Socket 370)	£145.00 £170.38
23574	Pentium III 700MHZ RETAIL Slot 1	£179.00 £210.33
23905	Pentium III 750MHZ RETAIL Slot 1	£245.00 £287.88
24017	Pentium III 650MHZ RETAIL F PGA (100mhz)	£145.00 £170.38
23745	Pentium III 677MHZ RETAIL F PGA (133mhz)	£149.00 £175.08
24016	Pentium III 700MHZ RETAIL F PGA (100mhz)	£179.00 £210.33
23908	Pentium III 733MHZ RETAIL F PGA (133mhz)	£189.00 £222.08
24015	Pentium III 750MHZ RETAIL F PGA (100mhz)	£245.00 £287.88
24427	Pentium III 800MHZ RETAIL F PGA (100mhz)	£279.00 £327.83
23903	Pentium III 800MHZ RETAIL F PGA (133mhz)	£279.00 £327.83
24573	Pentium III 850MHZ RETAIL F PGA (100mhz)	£399.00 £468.83
24574	Pentium III 866MHZ RETAIL F PGA (133mhz)	£405.00 £475.88
24575	Pentium III 933MHZ RETAIL F PGA (133mhz)	£519.00 £609.83
21528	Processor Converter Card from Slot 1 to Socket 370 / F PGA	£12.00 £14.10
<b>AMD</b>		
23043	AMD K6-2 [3D] 500	£39.00 £45.83
24098	AMD K6-2 [3D] 550	£49.00 £57.58
24851	Duron 550	£50.00 £58.75
24852	Duron 600	£61.00 £71.68
24853	Duron 650	£76.00 £89.30
24854	Duron 700	£110.00 £129.25
24855	Duron 750	£134.00 £157.45
23507	AMD Athlon 700 Mhz Processor	£124.00 £145.70
23835	AMD Athlon 750 Mhz Processor	SAVE £10 £149.00 £175.08
24252	AMD Athlon 800 Mhz Processor	SAVE £13 £186.00 £218.55
24359	AMD Athlon 850 Mhz Processor	£269.00 £316.08
24563	AMD Athlon 900 Mhz Processor	SAVE £18 £331.00 £388.93
24564	AMD Athlon 950 Mhz Processor	SAVE £14 £445.00 £522.88
24565	AMD Athlon 1Gig Processor	£609.00 £715.58

### PC CASES

	Ex Vat	Inc Vat
18682	Aries AT Midi	£19.99 £23.49
13875	Full Tower Case	£49.00 £57.58
10134	Multimedia Desktop Case (with Stereo Speakers)	£45.00 £52.88
10166	Workstation Case (ISA)	£15.00 £17.63
17470	Desktop Case for ATX motherboards	£41.00 £48.18
17977	Midi Tower Case for ATX motherboards	£39.00 £45.83
17978	Full Tower Case for ATX motherboards	£59.00 £69.33
21365	Elegant - Full Tower Case (7 Bay ATX)	£39.00 £45.83
21375	Elegant - Midi Tower Case (3 Bay ATX)	£26.50 £31.14
23009	Athlon Mini Tower Case + PSU ATX	£49.00 £57.58

#### POWER SUPPLY (PSU) FOR PC CASES

10146	200W PSU for AT Motherboard	£15.00 £17.63
19475	230W PSU for ATX Motherboard	£25.00 £29.38

### Crystal Series

Year 2000 Mini Tower Cases with iMac® Image to Brighten your Environment



- Multi Colour Mini Tower Cases
- 4 x 3.5" bay
- 2 x 5.25" bay
- 5x replaceable coloured front panel

Ex Vat £56  
Part Code: 23054  
£65.80 Inc Vat

### CPU COOLING FANS

	Ex Vat	Inc Vat
17635	Cyrix 6x86 Fan and Heat Sink	£5.00 £5.88
17635	AMD K2/K3 Fan and Heat Sink	£5.00 £5.88
22883	Athlon CPU Cooling Fan and Heatsink 500 - 650 mhz	£9.00 £10.58
19394	Pentium II Fan and Heatsink	£9.00 £10.58
20151	Pentium II Celeron Fan and Heatsink	£8.00 £9.40

### FLOPPY DRIVES & ACCESSORIES

	Ex Vat	Inc Vat
10305	3.5" 1.44Mb Internal Floppy Drive	£10.50 £12.34
17162	LS 120Mb 3.5" Floppy Disk Drive	£49.00 £57.58

MEMORY

MEMORY - SIMMS		
	Ex Vat	Inc Vat
10609 4M x 9, 30pin 3chip	£9.00	£10.58
10620 2M x 32, 8Mb 72pin	£10.99	£12.91
10622 4M x 32, 16Mb 72pin	£24.00	£28.20
13604 8M x 32, 32Mb 72pin	£52.00	£61.10
10617 2M x 36, 8Mb 72pin	£15.00	£17.63
10613 4M x 36, 16Mb 72pin	£35.00	£41.13
13621 8M x 36, 32Mb 72pin	£79.00	£92.63
10626 2M x 32, 8Mb EDO	£9.00	£10.58
10627 4M x 32, 16Mb EDO	£30.00	£35.25
10644 8M x 32, 32Mb EDO	£59.00	£69.33
18270 16M x 32, 64Mb EDO SDRAM 3V3	£129.00	£151.58
18273 32Mb 168 Pin (4 x 64)	£32.00	£37.60
18573 64Mb 168 Pin (8 x 64)	£57.00	£66.98
19086 128Mb 168 Pin (16 x 64)	£119.00	£139.83
20120 32Mb 168 Pin for 100MHz Bus	£29.00	£34.08
20121 64Mb 168 Pin for 100MHz Bus	£49.00	£57.58
20122 128Mb 168 Pin for 100MHz Bus	£92.00	£108.10
22775 256Mb - 169pin for 100MHz Bus	£199.00	£233.83
23850 64Mb 168 Pin for 133MHz Bus	£52.00	£61.10
23851 128Mb 168 Pin for 133MHz Bus	£99.00	£116.33
24195 256Mb 168 Pin for 133MHz Bus	£195.00	£229.13
20383 16Mb 144 Pin SO EDO	£25.00	£29.38
20384 32Mb 144 Pin SO EDO	£42.00	£49.35
20385 64Mb 144 Pin SO EDO	£88.00	£103.40

UPS

AMERICAN POWER CONVERSION		
	Ex Vat	Inc Vat
24143 BackUPS 300MI - 300VA	£49.00	£57.58
24144 BackUPS 500MI - 500VA	£60.00	£70.50
24145 BackUPS 650MI - 600VA	£102.00	£119.85
14156 BackUPS Pro 280 PnP - 280VA	£85.00	£99.88
15273 BackUPS Pro 420 PnP - 420VA	£109.00	£128.08
14149 BackUPS Pro 650 PnP - 650VA	£145.00	£170.38
18725 SmartUPS Value Server 420 - 420VA	£125.00	£146.88
<b>BELKIN</b>		
21272 UK SurgeMaster, Home Office Grade, 1 Way Cube, 3 Line 13500 Amps	£5.94	£6.98
21273 UK surgeMaster, Home Office Grade, 2 Way Cube, 1 Line 2500 Amps	£8.50	£9.99
21274 UK surgeMaster, Home Office Grade, 4 Way Strip, 2m, 3 Line total 13,500 Amps + EMU/RFI	£13.60	£15.98
21275 UK SurgeMaster, Home Office Grade, 6 Way Strip, 2m, 3 line total 13,500 Amps + EMU/RFI	£17.01	£19.99
22281 Maximum Grade 5 Way Surge Protector	£34.03	£39.99
22282 Maximum Grade 5 Way Surge Protector with Telephone protection	£38.28	£44.98
22283 Maximum Grade 5 Way Surge Protector with Telephone protection & 5m cable	£42.54	£49.98
<b>PK ELECTRONICS</b>		
19320 PK Blackout Buster 500VA UPS	£85.00	£99.88
19321 PK Blackout Buster Powerpack	£69.00	£81.08
19322 PK Blackout Buster Smartpack	£45.00	£52.88
19323 PK Blackout Buster Micropack	£15.71	£18.46

CABLES & ACCESSORIES

**Cable Ties from £3.50 Ex Vat**

	Ex Vat	Inc Vat
10924 5 Head Dual PC FDD Interface Cable	£5.00	£5.88
12006 Single 40w - 40w IDE Internal Cable 30cm	£2.50	£2.94
12020 Dual 40w - 40w IDE Internal Cable 50cm	£2.99	£3.51
12005 Single 50w - 50w SCSI Internal Cable	£3.00	£3.53
12026 Dual 50w - 50w SCSI Internal Cable	£4.00	£4.70
12133 Triple 50w - 50w SCSI Internal Cable	£5.00	£5.88
12134 Four 50w - 50w SCSI Internal Cable	£7.00	£8.23
12009 External 50w - 50w SCSI Cable	£8.00	£9.40
12008 External 25w D Male - 50w SCSI Cable	£6.00	£7.05
12069 External 50w D Male - 50w SCSI 2 Cable	£10.00	£11.75
10927 Centronics 50w to 25w D Male	£6.00	£7.05
19741 External 50w HD Male to 25w D Male	£9.99	£11.74
19975 Centronics 50w to 68 D Male	£15.00	£17.63
24380 Case Logic 6 Black Cable Ties	£3.50	£4.11
24381 Case Logic 8 Multi-Coloured Cable Ties	£3.50	£4.11
24382 Case Logic 4 Jumbo Multi-Coloured Cable Ties	£4.25	£4.99

SCSI CARDS

SCSI KITS		
	Ex Vat	Inc Vat
19131 1480 PCMCIA SCSI Kit	£100.99	£118.66
22233 2904CD CDR-CDRW SCSI Kit	£27.00	£31.73
21252 Hot Connect 8920 (hotspot) Card	£155.00	£182.13
23838 Adaptec SCSI Controller Card 19160	£142.00	£166.85
23839 Adaptec SCSI Controller Card 29160	£199.00	£233.83
23840 Adaptec SCSI Controller Card 29160N	£183.00	£215.03
23841 Adaptec SCSI Controller Card 39160	£223.00	£262.03
<b>ADVANSYS</b>		
23674 ABP3925 Fast PCI Card (7 Devices)	£31.00	£36.43
23675 ABP940 Ultra PCI Card (7 Devices)	£59.00	£69.33
19750 ABP940 Ultra Card (15 Devices)	£119.00	£139.83
23676 ABS940U2W Ultra 2 SCSI	£115.00	£135.13
24399 ABS3950U2W Ultra 2 SCSI	£205.00	£240.88

OVERDRIVE

EVERGREEN		
	Ex Vat	Inc Vat
22685 P75 - PR333 MMX Upgrade	£99.00	£116.33
22764 Spectra 233 Processor Upgrade	£57.00	£66.98
22690 Evergreen Spectra 333 Processor Upgrade	£85.00	£99.88
22765 Spectra 400 Processor Upgrade	£119.00	£139.83

\*All Savings shown against last advertised price - Greenpages July 2000 Issue.

NOTEBOOK COMPONENTS

EXTERNAL PCMCIA CD-ROM

	Ex Vat	Inc Vat
24725 Amacom Baby CD RW 4x4x20 PCMCIA Drive	£229.00	£269.08
24726 Amacom Baby CD RW USB/Mains Cable Kit	£26.00	£30.55
24727 Amacom Baby CD RW Parallel Kit	£31.95	£37.54
23002 Amacom EZCD RW 2x2x24 CD RW	£182.00	£213.85
23003 Amacom EZCD RW 4x4x24 CD RW	£215.00	£252.63
23658 Freecom Traveller 4x4x20x Portable CD RW Ext	£245.00	£287.88

PCMCIA CD-ROM DRIVES

	Ex Vat	Inc Vat
21592 Amacom - Baby CD 24x Speed CD-Rom	£98.00	£115.15
23498 Amacom - Baby CD USB Cable Kit	£31.95	£37.54
24724 Amacom EZCD PCMCIA CD Rom 48x	£110.00	£129.25
23656 Freecom Traveller Lite 24x Portable Ext PCMCIA CDROM Full Kit	£89.00	£104.58
23657 Freecom Traveller 24x Portable CDROM External Kit	£115.00	£135.13

2.5" IDE HARD DRIVES

HITACHI		
	Ex Vat	Inc Vat
21912 DK228A65 6.0Gb 12ms 512k Cache	£115.00	£135.13
23975 DK23AA-12 12Gb 12ms 512k Cache	£185.00	£217.38
<b>TOSHIBA</b>		
24221 MK1214GAP 12Gb IDE Hard Drive 12.5mm High	£165.00	£193.88

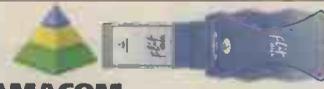
MODEMS/ISDN

FAX MODEMS		
	Ex Vat	Inc Vat
119470 Aries K56 PCMCIA Fax Modem	£39.00	£45.83
17664 Aries K56 V90 Internal ISA Fax/Data/Voice Modem	£28.99	£34.06
17665 Aries K56 56.6 Internet/Comms Pack - External	£39.00	£45.83
23443 Aries K56 55.6 Internal PCI PnP Modem	£15.00	£17.63
24832 Aries K56 55.6 External USB Modem	£27.00	£31.73
23847 Creative Modem Blaster 56K external	£45.00	£52.88
19951 Diamond Supra Express 56K Pro	£40.00	£47.00
20943 Diamond Supra Express 56K Pro	£28.00	£32.90
23495 Diamond SupraExpress 56K Memory	£57.99	£68.14
23497 Diamond SupraMax 56K USB	£40.00	£47.00
24822 Elsa MicroLink 56K Fun v90 Serial External	£34.00	£39.95
22237 Elsa MicroLink 56K Internet v90 External	£40.00	£47.00
22238 Elsa MicroLink 56K v90 External USB	£55.00	£64.63
22236 Elsa MicroLink 56K PCI Internal	£30.00	£35.25
22239 Elsa MicroLink 56K MC v90 PCMCIA	£99.00	£116.33
12195 Elsa MicroLink 56KOffice External	£114.00	£133.95
17499 Hayes Accura 56K Voice Modem - Internal	£59.99	£70.49
17500 Hayes Accura 56K Voice Modem - External	£74.99	£88.11
21078 Hayes Optima Business 56K Modem - External	£139.00	£163.33
18944 Psion Dacom Goldcard GSM 56k + Fax .SAVE £30	£115.00	£135.13
22490 Psion Dacom NetGlobal 56K + 10/100 CardBus	£170.00	£199.75
20028 Psion Dacom Goldcard GSM Upgrade to Nokia 2110	£85.00	£99.88
22477 Psion Dacom Goldcard ISDN Upgrade	£159.00	£186.83
24826 Tixi Mail Box V90/56K Flex	£89.00	£104.58

ISDN		
	Ex Vat	Inc Vat
16863 Elsa MicroLink ISDN USB	£67.00	£78.73
23158 Elsa MicroLink ISDN 2 - A / B	£110.00	£129.25
16761 Teles ISDN PCI Card	£52.00	£61.10
20785 Teles 2port PBX ISDN Card Internal	£79.00	£92.83
23505 Teles 4port PBX ISDN Card Internal	£139.00	£163.33
17783 Teles PNP ISDN ISA 1/2 Card	£52.00	£61.10
21421 Teles 128k PCMCIA TA	£159.00	£186.83
20277 Zyxel Omni.net D data only ISDN TA	£96.99	£113.96
20279 Zyxel Omni.net plus 128k TA with 2 x Analogue ports	£119.00	£139.83
20278 Zyxel TA 128 - 2x Serial Port	£155.00	£182.13
20280 Zyxel Omni.net LCD + M 128k TA with V90 built in modem	£259.00	£304.33
20281 Zyxel Omni.net LCD plus 128k TA USB & Serial	£149.00	£175.08
21280 Draytek Vigor 128 External TA USB	.SAVE £35 £54.00	£63.45
23529 Draytek Vigor 204 128k TA USB + 4 Analogue Ports	£189.00	£222.08
24826 Tixi Mail Box ISDN 2x 64Kbps + RVS Com	£99.00	£116.33

PCMCIA/PARALLEL DRIVES

	Ex Vat	Inc Vat
22530 Iomega Click! PC Card Drive	£119.00	£139.83
22531 Iomega Click! Plus Mobile Drive	£169.00	£198.58
19792 Amacom Flip Disk 4.0/8.0Gb Portable PCMCIA Hard Drive	£275.00	£323.13
20190 Amacom Flip Disk 6.4/12.8Gb Portable PCMCIA Hard Drive	£299.00	£351.33
21584 Amacom Flip Disk 10.0/20.0Gb Portable PCMCIA Hard Drive	£375.00	£440.63
24041 Amacom Flip Disk 12-24Gb Portable PCMCIA Hard Drive	£425.00	£499.38
24042 Amacom Flip Disk 18-36Gb Portable PCMCIA Hard Drive	£499.00	£586.33
24042 Amacom Flip Disk USB-IDE Cable kit	£31.95	£37.54
21884 Amacom Flip Disk P-IDE + K/B kit	£29.95	£35.19
21153 Amacom NovaDisk Software	£11.95	£14.04



**AMACOM**

AMACOM Portable Hard Drive 4 - 18Gb

- PCMCIA Interface-Plug & Play
- Can be used to instantly upgrade storage or back-up data
- No power or interface cables required
- Now with USB
- Transfer data between laptop & desktop\*

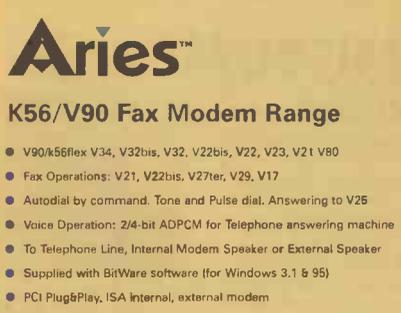
From Ex Vat £275

Part Code 19792

£323.13 Inc Vat

\* Requires optional USB & parallel port cables

MODEMS/ISDN



**Aries™**

K56/V90 Fax Modem Range

- V90/k56flex V34, V32bis, V32, V22bis, V22, V23, V21 V90
- Fax Operations: V21, V22bis, V27ter, V29, V17
- Autodial by command, Tone and Pulse dial, Answering to V25
- Voice Operation: 2/4-bit ADPCM for Telephone answering machine
- To Telephone Line, Internal Modem Speaker or External Speaker
- Supplied with BitWare software (for Windows 3.1 & 95)
- PCI Plug&Play, ISA Internal, external modem

From Ex Vat £15

Part Code 23443

£17.63 Inc Vat



**Tixi**

Always online. Even offline.

**TIXI-MAIL BOX**

- V.90/56K Flex Fax Modem or ISDN Terminal Adapter. Ideal for high speed Internet access and online banking
- Automatic E-mail collection & fax retrieval
- Flash Upgradable E-mail & Fax memory (2-34MB)
- Inc. FREE Internet access and latest Fax & E-mail software

From Ex Vat £89

Part Code 24828

£104.58 Inc Vat

See Pg 9 for network versions



**DroyTek** SAVE £35

**ZyXEL**

isdn VIGOR128

- External USB device with bus-powered
- Ease of Installation and Use
- On-the-fly Plug'n Play function
- High Speed transmission between PC and ISDN TA (12 Mbps)
- 32/16 bits CAPI 2.0 drivers and Fax/Voice support

Ex Vat £89

Part Code 21280

£104.58 Inc Vat

Omni.net LCD Plus isdn TA

- 64/128K BOD TA
- USB & Serial Ports
- 2 x Analogue Ports
- LCD Display for Caller ID & Caller History
- ISDN & Analogue Faxing

Ex Vat £149

Part Code 20281

£175.08 Inc Vat

CDR/DVD/BACK-UP



## PX-W8432Ti

- Retail Internal IDE
- 8x Write / 4x Rewrite / 32x Read
- Interface: IDE / Atapi
- 4MB Buffer
- Writes a CD in less than 10 minutes
- Compatible with Windows 9x and Windows NT
- Multi-Read Compatible
- Access time 179MS



SAVE £10  
 Ex £ 139  
 Part Code 23637  
**£163.33** Inc Vat



## MP9060A

STORE YOUR BEST IDEAS, FAAAAAST!

- CD-RW and DVD-ROM are together in one unit.
- Extra large 2 MB buffer memory assures smooth DVD title playback.
- Dust-proof design assures stable operation.
- Drive meets demanding audio requirements by supporting S/PDIF digital sound output and Digital Audio Extraction (DAE) at 24x



SAVE £12  
 Ex £ 159  
 Part Code 23672  
**£186.82** Inc Vat



## CD4804

- Reading speed: 3,600 KB/s (24X max speed)
- Writing speed: 600 KB/s (4X speed)
- Rewriting speed: 600 KB/s (4X speed)
- Access Time 220ms typical
- Recording method: Disc at once, track at once, multi-session
- Supports International Computer Standards and formats; including ISO 9660, CD extra and CD Text
- ATAPI Enhanced IDE Interface



Ex £ 109  
 Part Code 23063  
**£128.08** Inc Vat



## CDRW800

- Create a CD in 9 minutes
- Best compatibility removable storage
- Up to 32X max CD RW read back speed
- Inner dust proof sealing
- Digital Audio out



SAVE £12  
 Ex £ 123  
 Part Code 24035  
**£144.53** Inc Vat



## CRX145E-RP 10x4x32x

- The new CD-ReWritable drive kits from Sony are ideal for home or studio use. ATAPI is the first choice for home users; SCSI is the preferred option for professional studios.
- But whichever Sony CRX145 drive you choose, you'll enjoy incredible performance and a powerful software bundle. WinOnCD lets you drag & drop AVI and MPEG files to CD, making VideoCD production easy. Videompresion is another creative movie tool, enabling you to capture images, create storyboards and add transitions, text and sound. Data software.CeQuadrat
- ATAPI Internal 10x4x32x CD-RW drive
  - Buffer Size 4 Mb
  - Dimensions 146 x 42 x 203mm

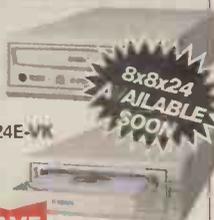


Ex £ 159  
 Part Code 24245  
**£186.83** Inc Vat



## THE NEW CRW8424E-VK

- The new Yamaha CRW8424E-VK the ultimate tool for multi-media applications
- 8x recording
  - 4x rewriteable
  - 24x reading speed
  - Interface - EIDE
  - Complete with Media Audio cable & Adaptec Easy CD Creator + Direct CD s/w



8x8x24 AVAILABLE SOON!  
 SAVE £18  
 Ex £ 127  
 Part Code 23516  
**£149.22** Inc Vat



## Zip®CD-RW 4x4x6 USB

- Drive is the perfect complement to any hard drive. It reads, writes or rewrites most types of CD formats, making it an ideal storage solution.
- Multi-read compatible drive capable of writing to any standard
  - 4x Write/4x ReWrite/6x Max Read.
  - Includes drive, two CD-R discs, USB data cable, power supply, and Welcome Packet containing: CD-ROM with install software, step by-step install CD Tour, label making templates, and owner's manual.



SAVE £12  
 Ex £ 165  
 Part Code 23408  
**£193.88** Inc Vat



## CD Writer Plus 8250i 4x4x24x

- The low cost CD-Writer solution
- IDE Internal 4x4x24x CD-RW drive
  - One Software CD with Adaptec Direct CD 2.5 Adaptec Easy CD Creator 3.5 and electronic user's guide
  - One blank CD-R Disc
  - Install Guide
  - IDE Cable and Screws



Ex £ 105  
 Part Code 24062  
**£123.38** Inc Vat



## TapeStor Travan 8

- Seagate's TapeStor™ Travan product family provides cost-effective and reliable data protection.
- Available in 8- and 20-Gbyte capacities using software or hardware data compression, these Travan tape drives feature backup speeds up to 120 Mbytes per minute, self-cleaning heads, an ATAPI or SCSI interface and a two-year limited warranty.



Ex £ 129  
 Part Code 24517  
**£151.58** Inc Vat



## TOMORROW'S MEMORY TODAY Certified up to 12x

- CD-R74 10 Pack Ex £ 6.95 Part Code 21781 **£8.17** Inc Vat
- CD-R80 10 Pack Ex £ 8.50 Part Code 22732 **£9.99** Inc Vat

### BACK-UP STORAGE DEVICES

	Ex Vat	Inc Vat
22318 HP Colorado - 8Gb Tape Drive (No media)	£126.00	£148.05
22321 HP Colorado 14Gb Internal IDE (No media)	£158.00	£185.65
24034 HP Colorado 20Gb Internal IDE Incl. Tape	£180.00	£211.50
20948 HP Surestore T20 Internal Tape Streamer	£253.00	£292.28
22319 HP Colorado - 8Gb Tape Drive (with media)	£173.00	£203.28
24515 Seagate Hornet 8 - 4/8 Gb Internal IDE STT28000A-M	£116.00	£136.30
24517 Seagate Tapstor Travan 8 4/8 Gb Internal IDE STT28000A-RFT	£129.00	£151.58
24739 Seagate Tapstor Travan 8 4/8Gb SCSI-2 STT28000NRFT	£143.00	£168.03
22223 Seagate TapeStor DAT 24 Drive 12Gb Internal SCSI (DDS-3)	£559.00	£656.83
24741 Seagate DDS2 DAT Drive 8Gb SCSI-2 STD2800N-RFT	£422.00	£495.85
21887 Sony SDT-9000 24Gb DAT SCSI Drive Internl	£435.00	£511.13
22471 Castlewood - ORB SCSI 2.2Gb External Drive PC	£155.00	£182.13
22472 Castlewood - ORB Disk Media PC Format single	£32.00	£37.60
23662 Freecom DAT - 4/8GB DDS2 SCSI Internal Full Kit	£442.00	£519.35

### STORAGE MEDIA

15599 4mm DDS Tape Cleaning Cartridge	£6.00	£7.05
18580 HP Colorado 5Gb Data Cartridge Single C4429A	£18.00	£21.15
18581 HP Colorado 5Gb Data Cartridge 5 pack	£89.00	£104.58
22327 HP Colorado 14Gb Data Cartridge 5 pack	£107.00	£125.73

### CD-ROM DRIVES

IDE CD-ROM DRIVES		
22831 Ames 50x EIDE CD ROM Drive	£26.50	£31.14
SCSI CD-ROM DRIVES		
23635 Plextor PX-40TSL Internal SCSI - Retail	£55.00	£64.63
23636 Plextor PX-40TSE External SCSI - Retail	£93.00	£109.28
23951 Plextor PX-40NTSL CD 40x SCSI Int Retail	£59.00	£69.33
EXTERNAL PARALLEL CD-ROM DRIVES		
24723 Amacom EZCD 48x	£95.00	£111.63
24090 Freecom Desktop 48x Portable CD-ROM External Kit	£65.00	£76.38

### READ/WRITE CD-ROM DRIVES

22483 Amacom EZCD-RW 2x2x24 External pp CDWR drive	£179.99	£211.49
23001 Amacom EZCD-RW 4x4x24 External pp CDWR Drive	£195.00	£229.13
23844 Creative CD-RW Blaster Studio Max Plus 8x4x32x	£149.00	£175.08
24089 Freecom 4x4x32x IDE Internal CDWR kit	£119.00	£139.83
24091 Freecom 4x4x20x SCSI External CDWR kit	£185.00	£217.38
24086 Freecom PCMCIA Converter Cable	£29.00	£34.08
24087 Freecom Parallel Converter Cable	£25.00	£29.38
23655 Freecom 8x2x20x SCSI External CDWR kit	£299.00	£351.33
23661 Freecom Desktop 4x4x20x Portable CDWR External Kit	£179.00	£210.33
24062 HP Surestore 8250i CD-RW Internal	£105.00	£123.38
22956 HP Surestore 8210e CD-RW External USB	£165.00	£193.88
22957 HP Surestore 9210i CD-RW Internal SCSI	£150.00	£176.25
23137 HP Surestore 9210e CD-RW External SCSI	£202.00	£237.35
23138 HP Surestore 9110i CD-RW Internal IDE	£135.00	£158.63
24151 HP Surestore 9310i CD-RW Internal	£148.00	£173.90
23799 iomega ZipCD 650 4x4x6x CD-RW USB Drive	£165.00	£193.38
24765 iomega ZipCD 650 8x4x32x CD-RW E-IDE (ATAPI) Drive	£145.00	£170.88
23063 Mitsumi CR4804 CD-RW 4x4x24x Internal Eide	£109.00	£128.08
24035 Philips PCRW804K 8x4x32x Internal CDWR SAVE £12	£123.00	£144.53
23037 Philips PCRW404K4x4x32x Int IDE CDWR - SAVE £6	£113.00	£132.78
23826 Philips PCRW484K 6x4x4x USB External CDWR	£192.00	£225.60
23638 Plextor PX-T8220e 20xR 8xRW 2W Ext SCSI Retail	£215.00	£252.63
23637 Plextor PX-W8432Ti 8xW 4xRW 32XR - SAVE £10	£139.00	£163.33
23966 Plextor PX-W124TSL CD-RW 4xRW 12xW 32xR USCSI Int Retail	£199.00	£233.83
23967 Plextor PX-W124TSE CD-RW 4xRW 12xW 32xR USCSI Ext Retail	£245.00	£287.88
23201 Ricoh MP7060S CD-RW 6x 4x 24Internal SCSI kit	£135.00	£158.63
24078 Ricoh MP7080A CD-RW 8x 4x 32 Internal IDE Kit	£135.00	£158.63
23564 Sony Internal 8x4x32x - IDE (CRX-140E-RP)	£149.00	£175.08
24245 Sony Internal 10x4x32x - ATAPI (CRX-145E-RP)	£159.00	£186.83
23516 Yamaha CRW8424E-VK 8x4x24 CDWR EIDE Int Drive Kit	£127.00	£149.23
23515 Yamaha CRW8424SX 8x4x24 CDWR SCSI Ext Drive Kit	£174.00	£204.45
23514 Yamaha CRW8424S 8x4x24 CDWR SCSI Int Drive Kit	£155.00	£182.13
CDRW / DVD (All in one unit)		
23672 Ricoh MP9060A CD-RW/DVD IDE Internal Kit	£159.00	£186.83
24292 Toshiba CDRW / DVD 4x4x4x24x IDE Internal Drive	£165.00	£193.88

### DIGITAL VIDEO DRIVES

DVD-ROM		
23064 Amacom Baby DVD 5x 24x - PCMCIA	£179.00	£210.33
24728 Amacom Baby DVD USB/Mains cable kit	£31.95	£37.54
24748 Creative DVD Player 12x Encore	£152.00	£178.60
23970 Creative DVD Encore 8x	£125.00	£146.88
24770 Hitachi DVD 8x Int Bare Drive ATAPI - GD7000	£89.00	£104.58
21089 Videologic DVD / MPEG 2 Decoder PC Card	£65.00	£76.38
DVD-RAM		
20565 Panasonic LF-D101E Internal SCSI Drive	£322.00	£378.35
20566 Panasonic LM-D826 2.6Gb DVD-RAM Disk	£12.99	£15.26
20567 Panasonic LM-D852 5.2Gb DVD-RAM Disk	£19.99	£23.49
24142 Hitach DVD RAM	£499.00	£586.33
24377 Case Logic - CD Media Case (Holds 14 DVD's)	£6.00	£7.05

### CD MEDIA & ACCESSORIES

21780 Hi-Space Writable Blank CD Media (CD-R Discs)	£0.72	£0.85
21781 Hi-Space Writable Blank CD Media (CD-R Discs) 10 Pack	£6.95	£8.17
21782 Hi-Space Writable Blank CD Media (CD-R Discs) 50 Pack	£32.00	£37.60
21537 Hi-Space 80min - CD-R Blank Media CD (Single)	£0.89	£1.05
22732 Hi-Space 80min - CD-R Blank Media CD (10 pack)	£8.50	£9.99
24190 Hi-Space Travel Pack	£16.00	£18.80
22041 Kodak 80min CDR Silver Media 10 Pack	£7.90	£9.28
24386 Kodak 80min CDR Silver Media 10 Pack	£8.90	£10.46
23423 Ricoh 74 Min CDR Blank Media 10 Pack	£7.50	£8.81
19928 Sony Writable Blank CD Media (CD-R Discs)	£0.81	£0.95
19938 Sony Writable Blank CD Media (CD-R Discs) 10 Pack	£8.10	£9.52
18016 Hi-Space ReWritable Blank CDRW Media	£1.70	£2.00
20827 Hi-Space ReWritable Blank CDRW Media 10 Pack	£15.20	£17.86
16348 Press-it CD Labelling Kit	£18.00	£21.60
17251 Press itPack of 50 White Labels	£5.95	£6.99
19903 Press it Pack of 30 Multi Colour Labels	£6.95	£8.17
19774 Press it Pack of 30 Gold/Silver Labels	£9.95	£11.69
17257 Press it Pack of 30 Clear Labels (Laser Printer)	£9.95	£11.69
17258 Press it Pack of 30 Clear Labels (Inkjet Printer)	£9.95	£11.69
21471 Press-it CD Repair Kit	£5.00	£5.88
24378 Case Logic - CD-R Wallet (holds 24)	£6.80	£7.99
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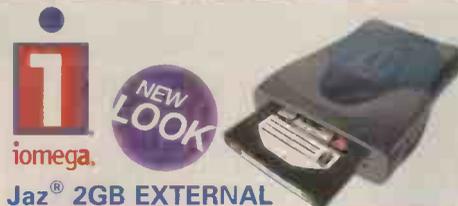
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13186 1Gb Jaz Disk	£59.33	£69.33
17154 1Gb Jaz Disk 3-Pack	£155.00	£182.13
19425 2Gb Jaz Disk	£65.00	£76.38
19422 2Gb Jaz Disk 3 Pk	£159.00	£186.83
13983 ZIP 100Mb Disk	£6.95	£8.17
14001 ZIP 100Mb Disk 6-Pack Colour	£39.99	£46.99
19429 ZIP 100Mb Disk 10-Pack Colour	£55.99	£65.79
21348 Zip 250Mb Disk Single Media	£12.50	£14.69
21350 Zip 250Mb Disk 4 Pack media	£44.00	£51.70
24346 Zip 250Mb 2 Pack Pc Formatted	£32.00	£37.60
24375 Case Logic - Zip Disk Storage Case (holds 10)	£11.00	£12.93
22583 iomega Click! Media 2 pack	£18.00	£21.15
22584 iomega Click! Media 4 pack	£28.00	£32.90
22585 iomega Click! Media 10 pack	£55.00	£64.63

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	Ex Vat	Inc Vat
19212 Jaz 2Gb External SCSI	£228.00	£267.90
19211 Jaz 2Gb Internal SCSI	£228.00	£267.90
20123 Jaz Jet Interface PCI	£62.00	£72.85
22821 Zip 2000 kit	£69.00	£81.08
24786 Zip 100Mb USB Starter Kit	£84.00	£98.70
18166 Zip 100Mb EIDE Internal	£55.00	£64.63
10787 Zip 100Mb Parallel Port	£62.99	£74.01
21159 Zip 100Mb USB External Drive	£79.00	£92.83
22820 Zip 250 Pro kit	£119.00	£139.83
23132 Zip 250Mb USB External Tape Drive	£119.00	£139.83
24787 Zip 250 USB FireWire Adapter	£59.00	£69.33
23133 PCMCIA Cable for Zip250Mb USB Drive	£25.00	£29.38
21346 Zip 250Mb Zip SCSI External Tape Drive	£99.00	£116.33
21347 Zip 250Mb Parallel External Tape Drive	£99.00	£116.33
22541 Zip 250Mb EIDE Atapi Internal Drive	£99.00	£116.33

**VIDEO CONFERENCING**

	Ex Vat	Inc Vat
22442 Arias USB Digital Desktop Camera	£35.00	£41.13
23448 Creative Labs Video Blaster WebCam Go Plus	£92.90	£109.16
23448 Creative Labs Video Blaster WebCam Go	£83.00	£97.53
20573 Hauppauge! WinTV CCD TV Card & Camera Pack 681	£99.00	£116.33
24077 Intel Proshare Video System 500	£442.00	£519.35
23927 Kodak DVC325	£55.00	£64.63
22827 Logitech Quickcam Express	£28.00	£32.90
22829 Logitech Quickcam Web	£54.00	£63.45
21487 Logitech QuickCam VC (Win95/98) Parallel	£46.00	£54.05
20946 Logitech Video Conferencing Kit	£49.00	£57.58
22280 Microtek Digital Video Camera Kit	£89.00	£104.58
23527 Philips Vesta USB PC Video Conferencing PCVC675K	£39.00	£45.83
23528 Philips Vesta Pro USB PC Video Conferencing PCVC680K	£45.00	£52.88
22997 Videologic HomeCam USB	£56.00	£64.63

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20761 Excel NE2000 Compatible BNC/RJ45 ISA Card	£7.99	£9.39
20762 Excel NE2000 Compatible BNC/RJ45 PCI Card	£8.50	£9.99
23572 Excel Network 10Mbps BNC/RJ45 PCMCIA Card	£29.00	£34.08
17287 3Com 3C509B ISA TP only	£42.00	£49.35
11446 3Com 3C509B ISA BNC/TP	£45.00	£52.88
17345 3Com 3C900 PCI TP only	£34.00	£39.95
17288 3Com 3C589D PCMCIA TP only	£86.00	£101.05
18201 Dink DE220PCT ISA BNC/TP	£10.00	£11.75
20048 Dink DE220CT PCI BNC/TP	£12.00	£14.10
18202 Dink DE660CT PCMCIA BNC/TP	£35.99	£42.29
11456 Genius GE2000 III ISA BNC/TP	£10.00	£11.75
12123 Genius GE2500 III PCI BNC/TP	£12.00	£14.10
11638 Genius LE3000 PCMCIA BNC/TP	£33.00	£38.78
23069 Psion Dacom NetGlobal PCMCIA	£49.00	£57.58
23070 Psion Dacom NetGlobal 10/100 PCMCIA	£75.00	£88.13

**FAST ETHERNET ADAPTERS**

	Ex Vat	Inc Vat
16763 3Com 3C905TX PCI 10/100	£47.00	£55.23
20763 Excel 10/100 TX PCI 32bit	£11.99	£14.09
16552 Bay Netgear FA310TX PCI 10/100	£14.00	£16.45
24561 Bay Netgear FA410 10/100 PCMCIA	£55.00	£64.63
21241 Dink DFE30TX PCI 10/100	£16.99	£19.96
18203 Dink DFE65TX PCMCIA 10/100 BNC/TP	£72.99	£85.76
12116 Genius GF100TX PCI 10/100 TP only	£15.00	£17.63
15624 Intel EtherExpress Pro/100+ PCI	£52.00	£61.10
18713 Intel EtherExpress Pro/100 PCI Server Adapter	£199.00	£233.83

**ETHERNET STARTER KIT**

	Ex Vat	Inc Vat
21952 Excel 4 Station ISA Starter Kit (4 ISA LAN card+8 port hub+Leads)	£49.00	£57.58
21953 Excel 4 Station PCI Starter Kit (4 PCI LAN card + 8 port hub + Leads)	£59.00	£69.33
20073 Dink DE905 network Starter Kit	£49.99	£58.74
21790 Dink DFE905 network Starter Kit 10/100	£78.99	£92.81
20074 Sophomore 2 station PCI Starter Kit ND782A	£61.99	£72.84

**ETHERNET HUBS**

	Ex Vat	Inc Vat
20764 Excel 8 Port Mini Hub 8xTP,1xBNC	£24.99	£29.36
16556 BAY Netgear EN104 4 x 10Mb + BNC 4 Port Mini Hub	£29.00	£34.08
20950 BAY Netgear FE108 8 x 10Mb 8 Port Hub	£77.00	£90.48
20950 3Com 3C16704 OfficeConnect TP4 4xTP	£28.95	£34.02
20950 3Com 3C16704 OfficeConnect 8TP 8xTP	£51.50	£60.51
20052 3Com 3C16701 OfficeConnect 8TPC 8xTP,1xBNC	£60.00	£70.50
18214 Dink DE805TP Mini Hub 5xTP	£24.00	£28.20
18215 Dink DE809TP Mini Hub 8xTP + Link Port	£42.00	£49.35
12168 Genius GH4080 Mini Hub 8xTP,1xBNC	£25.00	£29.38
20053 HP J3128A AdvanceStack 85 8xTP,1xBNC	£86.50	£101.64
15634 HP J2610B AdvanceStack 8U 8xTP	£99.00	£116.33
18709 HP J3302A AdvanceStack 24 24xTP	£305.00	£340.88
20054 Intel SH1075 InBusiness Mini Hub 5xTP	£32.00	£37.60
20055 SMC 3807AC InBusiness Mini Hub 8xTP,1xBNC	£55.00	£64.63
20057 SMC 3807AC InBusiness Mini Hub 8xTP,1xBNC	£55.00	£64.63

**10/00 (FAST) ETHERNET HUBS cont.**

	Ex Vat	Inc Vat
18710 HP J3234A AdvanceStack 12TX 12xTP	£499.00	£596.33
20062 Intel SH100TX8+ InBusiness Mini Hub 8xTP + Link	£159.00	£186.83

**SWITCHES**

	Ex Vat	Inc Vat
20063 3Com 3C16732 OfficeConnect Switch 280 2x100,8x10	£279.00	£327.83
20069 Cisco 1601 Desktop 1x10Mbps, 1xSerial, 1xWAN	£718.00	£844.83
18708 Dink DES1008 Switch 18" Rack 8x10/100	£148.00	£175.08
19795 HP J2500B JetDirect MIO TP Internal	£189.00	£222.08
18719 Intel SS110TX8 InBusiness Switch 8x10,2x10/100	£428.00	£504.08
18247 Ringdale FastPort 10/100 Packet TP 1xP	£190.00	£223.25

**E-MAIL SERVER FOR WINDOWS & NOVELL NETWORKS**

	Ex Vat	Inc Vat
24829 Txi Mail Box Network Edition V9056K Flex + 5 Client Licenses	£199.00	£233.83
24827 Txi Mail Box Network Edition 2x 64Kbps + 5 Client Licenses + RVS Com	£199.00	£233.83
Txi Mail Box Pro V9056K Flex Inc. E-mail Firewall + 5 Client Licenses	£219.00	£257.33
Txi Mail Box Pro ISDN Inc. E-mail Firewall + 5 Client Licenses	£219.00	£257.33

**ACCESSORIES**

	Ex Vat	Inc Vat
CAT 5 UTP PATCH		
12040 1 METRE	£0.95	£1.12
12043 2 METRE	£1.20	£1.41
12047 5 METRE	£2.50	£2.94
12049 10 METRE	£4.25	£4.99
12033 15 METRE	£6.80	£7.99
17327 300 METRE	£38.00	£44.65

**CONNECTORS**

	Ex Vat	Inc Vat
12140 BNC Crimp Plug	£0.65	£0.76
12141 BNC T Piece	£1.21	£1.42
12142 BNC Terminator	£0.55	£1.12
12144 BNC Terminator + Earth Lead	£1.35	£1.59
12084 RJ45 Crimp Tool HT 201N	£11.95	£14.04

**USB PCI UPGRADE CARDS**

	Ex Vat	Inc Vat
22736 Xircop PC Upgrade - 2 Port USB PCI Card	£23.00	£27.03
22737 Xircop PC Upgrade - 4 Port USB PCI Card	£29.00	£34.08
22757 Belkin USB Busport Card	£34.00	£39.95

**USB HUBS**

	Ex Vat	Inc Vat
22258 Belkin 4 Port Express Hub	£37.00	£43.48
22259 Belkin 7 Port Express Hub	£69.00	£81.08
22260 Xircop 4 Port USB Hub	£36.00	£41.13
22261 Xircop 7 Port USB Hub	£65.00	£76.38
22738 Xircop Multi Function Hub - 6 Port	£119.00	£139.83

**USB CONVERTERS**

	Ex Vat	Inc Vat
22265 Belkin USB to Serial Converter	£85.00	£99.88
22266 Belkin USB to Ethernet Converter	£85.00	£99.88
22267 Xircop USB to Parallel Printer Converter	£33.00	£38.78
22268 Xircop USB to Serial (9 Pin) Converter	£34.00	£39.95

**USB ACCESSORIES**

	Ex Vat	Inc Vat
22273 USB A-B Cable, 20/28 AWG, 5.0m	£8.50	£9.99
22274 USB A-A Extension Cable, 20/28 AWG, 1.8m	£10.20	£11.99
22275 USB A-A Extension Cable, 20/28 AWG, 5.0m	£11.90	£13.98
22276 USB ExpressBus 4 Port Hub	£42.50	£49.94
22277 USB Parallel Adapter	£42.50	£49.96

**USB SIMPLE NETWORKS**

	Ex Vat	Inc Vat
22743 Xircop USBnet Host to Host Kit	£59.57	£69.99

**10/00 (FAST) ETHERNET HUBS cont.**

	Ex Vat	Inc Vat
18710 HP J3234A AdvanceStack 12TX 12xTP	£499.00	£596.33
20062 Intel SH100TX8+ InBusiness Mini Hub 8xTP + Link	£159.00	£186.83

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Txi Mail Box Pro ISDN Inc. E-mail Firewall + 5 Client Licenses	£219.00	£257.33

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22757 Belkin USB Busport Card	£34.00	£39.95

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22259 Belkin 7 Port Express Hub	£69.00	£81.08
22260 Xircop 4 Port USB Hub	£36.00	£41.13
22261 Xircop 7 Port USB Hub	£65.00	£76.38
22738 Xircop Multi Function Hub - 6 Port	£119.00	£139.83

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	Ex Vat	Inc Vat
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22266 Belkin USB to Ethernet Converter	£85.00	£99.88
22267 Xircop USB to Parallel Printer Converter	£33.00	£38.78
22268 Xircop USB to Serial (9 Pin) Converter	£34.00	£39.95

**USB ACCESSORIES**

	Ex Vat	Inc Vat
22273 USB A-B Cable, 20/28 AWG, 5.0m	£8.50	£9.99
22274 USB A-A Extension Cable, 20/28 AWG, 1.8m	£10.20	£11.99
22275 USB A-A Extension Cable, 20/28 AWG, 5.0m	£11.90	£13.98
22276 USB ExpressBus 4 Port Hub	£42.50	£49.94
22277 USB Parallel Adapter	£42.50	£49.96

**USB SIMPLE NETWORKS**

	Ex Vat	Inc Vat
22743 Xircop USBnet Host to Host Kit	£59.57	£69.99

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24343 Casio QV3000EX Digital Camera; 3.3 Mega Pixel	£425.00	£499.38
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24299 Fujifilm FP-1400 Digital Camera	£249.00	£292.53
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24301 Fujifilm MX-1200 Digital Camera	£179.00	£210.33
23432 Fujifilm MX1700 Digital Camera	£272.00	£319.60
22901 Fujifilm MX 2900Z Digital Camera	£425.00	£499.38
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20749 JVC GC-S5 Digital Still Camera	£399.00	£468.83
21683 JVC GR-DVL 9500 Digital Video Camera	£995.00	£1,169.13
22846 Kodak DC215 Plus	£189.99	£223.24
24139 Kodak DC215 Digital Camera & PM100 Digital Printer	£254.00	£298.45
21917 Kodak DC240	£249.00	£292.58
24387 Kodak DC240 (Blueberry) - 1347590	£293.00	£344.28
22847 Kodak DC280	£309.00	£363.08
23144 Kodak DC290	£445.00	£522.88
24805 Kodak DC4800	£575.00	£675.63
24806 Kodak DC5000	£435.00	£511.13
23886 Nikon CoolPix 800	£499.00	£586.33
22175 Nikon CoolPix 950	£589.00	£692.08
21560 Olympus C-830L	£265.00	£311.38
24312 Olympus C-960Z Camedia Digital Camera	£309.00	£363.08
24820 Olympus C-990 Zoom Digital Camera	£399.00	£468.83
24313 Olympus C-2020Z Camedia Digital Camera	£468.00	£549.90
23146 Reisisys Dimeria 1311 Digital Camera (LCD display)	£169.00	£198.58
20217 Reisisys Silver Fox Dimeria 3500 Camera	£89.00	£104.58
23147 Sanyo DigiCam 360 Megapixel Digital Camera	£249.00	£292.58
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24390 Sony Mavica F085	£415.00	£487.63
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- USB interface
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21975 Plustek OPTIC PRO 1212u USB	£55.00	£64.63
23616 Plustek OPTIC PRO P12	£49.00	£57.58
20808 Plustek OPTIC PRO 9636T Includes Transparencie	£69.00	£81.08
23429 Plustek OPTIC PRO UT12 36Bit USB Scanner	£67.23	£79.00
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24531 Agfa E40 1200 x 2400 dpi USB	£135.00	£158.63
24532 Agfa E50 1200 x 2400 dpi USB	£165.00	£193.88
20897 Agfa Snapscan 1212p	£63.99	£75.19
20898 Agfa Snapscan 1212z	£74.99	£88.11
23033 Agfa Snapscan 1236U	£98.99	£116.31
22953 Agfa SnapScan Touch Scanner	£84.99	£99.86
24556 Agfa Duo Scan Hi	£1,499.00	£1,761.33
21745 Agfa Duo Scan T1200 scanner	£444.99	£522.86
<b>CANON</b>		
23034 Canon CanoScan FB630P	£61.00	£71.68
23035 Canon CanoScan FB630U	£70.00	£82.25
24648 Canon CanoScan FB630U	£109.00	£128.08
23036 Canon CanoScan FB1200S	£308.00	£361.90
23187 Canon CanoScan FB1200ADF (with Auto Document Feeder)	£516.00	£606.30
<b>EPSON</b>		
22856 Epson Perfection 610 Flatbed Scanner	£90.00	£105.75
22857 Epson Perfection 1200 U	£134.00	£157.45
22858 Epson Perfection 1200 S	£164.00	£192.70
22859 Epson Perfection 1200 Photo	£179.00	£210.33
23804 Epson Expression 1600	£495.00	£586.33
23805 Epson Expression 1600 Pro	£650.00	£763.75
22716 Epson GT-10000-A3 Flatbed Scanner	£688.00	£808.40
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22717 HP ScanJet 3300C Colour Scanner	£63.00	£74.03
24754 HP ScanJet 3400C (Parallel/USB)	£55.00	£64.63
24661 HP ScanJet 4300C	£78.00	£91.65
23777 HP ScanJet 5300C	£101.00	£118.68
24662 HP ScanJet 5370C	£140.00	£164.50
22934 HP ScanJet 6300C	£220.00	£258.50
22935 HP ScanJet 6350C	£273.00	£320.78
22936 HP ScanJet 6390C	£490.00	£575.75
21959 HP PhotoSmart S20 Scanner	£299.00	£351.33
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24106 Microtek ScanMaker 3600 USB	£64.00	£75.20
24632 Microtek Lightlid Adapter for 3600	£30.00	£35.25
22692 Microtek ScanMaker X6 USB	£108.00	£126.90
22877 Microtek ScanMaker X6 SCSI	£99.00	£116.33
22695 Microtek ScanMaker X6 Silver - SCSI	£149.00	£175.08
22769 Microtek ScanMaker X6 Silver - USB	£139.00	£163.33
22696 Microtek ScanMaker X6 Advanced - SCSI	£149.00	£175.08
22770 Microtek ScanMaker X6 Advanced - USB	£139.00	£163.33
24107 Microtek ScanMaker X6 Advanced Silver - USB	£169.00	£198.58
23612 Microtek ScanMaker V6JUSL - USB & SCSI	£99.00	£116.33
24181 Microtek ScanMaker X12JUSL (USB & SCSI)	£185.00	£217.38
24656 Microtek ScanMaker X12JUSL Pro - inc. TMA/Softiver	£275.00	£323.13
22698 Microtek ScanMaker 4 Silver - SCSI	£399.00	£468.83
24334 Microtek Scanmaker 6400XL	£634.99	£746.11
24335 Microtek Scanmaker 9600XL	£974.99	£1,145.61
23185 Microtek Scanmaker 35T Plus - SCSI	£289.00	£339.58
23184 Microtek Artixscan 4000T - SCSI	£975.00	£1,145.63
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20489 Nikon Super Coolscan SCSI with Nikon Scan 3.0 (LS2000)	£995.00	£1,169.13
20490 Nikon Super Coolscan with Photoshop LE (LS2000)	£1,115.00	£1,310.13
20491 Nikon SF200 Auto Slide Feeder for LS2000	£425.00	£499.38
20635 Nikon Coolscan III External - With Nikon Scan 2.1	£499.00	£586.33
20636 Nikon Coolscan III External - With Nikon Scan 2.1 + Adapter 1605E SCSI Card	£515.00	£605.13
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23182 Reisisys Eclipse 1200U - 800 x 1200dpi USB Scanner	£59.00	£69.33
14555 Reisisys Scorpio A4 Colour SCSI Scanner	£69.00	£81.08
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16110 Genius Mouse Dear Serial or PS/2	£5.00	£5.88
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20002 MS WheelMouse Serial & PS/2	£14.00	£16.45
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10169 Aries 105 Key Windows 95 Keyboard	£8.00	£7.05
17206 Cherry G80-3000 Click Action Win 95 PC Keyboard	£39.00	£45.83
22823 Logitech Cordless Desktop Iouch	£55.00	£64.63
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22945 Microsoft Internet Keyboard	£16.00	£18.80
22946 Microsoft Natural Keyboard Pro	£29.00	£34.08
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24711 Wacom Graphire A6 (Lime) Win 98 W2003	£72.00	£84.60
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13920 Aries 16 Bit 3D PnP Sound Card (SB Compatible)	£9.00	£10.58
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22954 Creative Labs Sound Blaster Live Player 1024	£44.00	£56.40
22955 Creative Labs Sound Blaster Live! Platinum	£125.00	£146.88
21929 Creative Labs Sound Blaster 16 PCI	£21.00	£24.68
23687 Terratec SoundSystem Base 2	£28.99	£34.06
21925 Videologic Sonic Vortex2 PCI Pro	£35.00	£41.13
24850 Videologic SonicFury PCI	£65.00	£76.38

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21789 Diamond Rio MP3 Audio Storage Device	£98.00	£103.40
23160 Diamond Rio 500 Audio Storage Device	£158.00	£185.65
23513 Terratec M3PO	£279.00	£327.83
24466 Modular Soulmate 48Mb MP3 Portable Audio Player	£49.00	£57.58

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20713 Creative CSW-100 100W Speakers PC Works	£25.00	£29.38
22336 Creative FPS2000 Four Point Surround	£89.00	£104.58
21726 Maxxro SPKA16 - 120w Amplified Speaker	£15.95	£18.74
16846 Typhoon Desktop Adjustable Microphone	£5.00	£5.88
23468 Videologic Sirocco Spirit	£112.00	£131.60
23470 Videologic Sirocco Pro	£449.00	£527.58
21271 Videologic Sirocco Speaker System 100W RMS	£173.00	£203.28
21749 Videologic Sirocco CrossFire Speaker System	£179.00	£210.33
23161 Videologic DigiTheatre Decoder	£117.00	£137.48
23991 Yamaha YSTMB8 5W Speakers	£22.00	£26.85
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22806 3DFX V3500 Voodoo 3 AGP Graphics Card (Retail)	£139.00	£163.33
24497 3DFX V4500 Voodoo 4 AGP Graphics Card	£119.00	£139.83
24499 3DFX V5000 Voodoo 5 PCI Graphics Card	£153.00	£179.78
24501 3DFX V5500 Voodoo 5 AGP Graphics Card	£179.00	£210.33
24099 3D LABS Oxygen GVX1 AGP 32Mb Gamma	£529.00	£621.58
19633 Aries 4Mb SVGA 64 BIT DRAM PCI Graphics Card	£19.99	£23.49
21126 ASUS V3400 - 16Mb AGP RivaTNT with TV	£49.00	£57.58
24395 ASUS V3800 Pro - 32Mb AGP Nvidia TNT2 Pro	£85.00	£99.88
20096 ATI 3D Charger AGP 4MB (OEM)	£15.00	£17.63
23927 ATI 3D Charger AGP 8MB (OEM)	£19.00	£22.33
20530 ATI Xpert 98 8Mb AGP 2D/3D (OEM)	£23.00	£27.03
24161 ATI Xpert 98 Pro AGP 8MB (OEM)	£23.00	£27.03
24162 ATI Xpert 2000 16Mb AGP (OEM)	£39.00	£45.83
24163 ATI Xpert 2000 16Mb AGP TV Out (OEM)	£45.00	£52.88
23192 ATI Xpert 2000 32MB AGP (OEM)	£46.00	£54.05
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24825 ATI Xpert 2000 Pro 32MB AGP (OEM)	£53.00	£62.28
23791 ATI Rage Fury Maxx 64MB (OEM)	£116.00	£136.30
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22446 ATI All-in-Wonder 128 PCI 16MB (OEM)	£99.00	£116.33
22447 ATI All-in-Wonder 128 AGP 16MB (OEM)	£93.00	£109.28
23194 ATI All in Wonder 128 AGP 32MB (OEM)	£106.00	£126.90
24735 ATI All in Wonder 128 Pro AGP 32MB (OEM)	£93.00	£116.33
23944 Creative Blaster 3D TNT2 Vanta	£57.00	£66.98
23504 Diamond Viper II 2200 AGP 4x/2x 32MB	£95.00	£111.63
23056 Elsa Erazor III Lite 32MB	£53.00	£62.28
24743 Guillemot 3D Prophet 2 GTS 32Mb (Retail)	£212.00	£249.10
24744 Guillemot 3D Prophet GF 256 OEM 32Mb	£134.00	£157.45
24745 Guillemot 3D Prophet DDR (Retail)	£179.00	£210.33
18609 Hercules S3318TV 8Mb Stringray 128		
3D Video PCI + TV Output	£89.00	£104.58
23152 Matrox Marvel G400 - TV	£181.00	£212.68
22331 Matrox 16Mb Millennium G400 oem (Dual output)	£72.00	£84.60
22332 Matrox 32Mb Millennium G400 oem (Dual output)	£102.00	£119.85
22333 Matrox 32Mb Millennium G400 Max Retail	£129.00	£151.58
22436 Videologic Grafistar 650 AGP (OEM)	£27.00	£31.73
24185 Videologic Grafistar 670 AGP (OEM)	£39.00	£45.83
24326 Videologic Grafistar 670 PCI (OEM)	£39.00	£45.83
21751 Videologic 32Mb Neon 250 PCI	£99.00	£116.33
21772 Videologic 32Mb Neon 250 AGP	£99.00	£116.33

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24147 Hauppauge WinTV PRIMIO FM	£55.00	£64.63
22219 Hauppauge WinTV Theatre	£89.00	£104.58
23153 Hauppauge WinTV Go	£38.00	£44.65
23511 Hauppauge WinTV USB	£63.00	£74.03
24344 Hauppauge WinTV USB FM	£80.00	£94.00
24668 Hauppauge WinTV USB FM LIVE	£42.00	£49.35
24345 Hauppauge WinTV DVB-s	£199.00	£233.83
24308 Pinnacle Studio PCTV RAVE PCI	£32.00	£37.60
22805 Pinnacle Studio MP10	£189.00	£222.08
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32MB High Speed, High Resolution 2D/3D Accelerator

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- 3dfx FXT1™ and Microsoft DXTC™ Texture Compression
- 350MHz RAMDAC for resolutions up to 2048x1536
- 333-367 Megapixels/second
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64MB Dual-Chip SLI 2D/3D Accelerator

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- 667-733 Megapixels/second
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- Easy to set up and use
- Colour faxing
- Convenience of an ADF

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- Paper size up to A4
- Supports all media types
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- Up to 16ppm B/W
- Paper size up to A4
- Plain and special papers, transparency, envelopes & labels + card
- 1-year return to HP Warranty
- Bi-directional parallel interface
- Specified work group printer
- Higher input & network versions available

Ex £ **741**  
Part Code 22165  
£ **870.68** Inc Vat

**HP SUPPORT PACK** £178 inc vat £209.15 inc vat Part Code 14080

**HP LaserJet 1100A**

INDIVIDUAL BUSINESS USER IN ANY SIZE OFFICE WHO WANTS TRUE LASER PRINT QUALITY, SPEED, PAPER HANDLING AND COPYING AT THEIR DESK

- Fast, reliable personal laser printing
- Easy to set up and use
- Copy documents on paper or to your PC at the push of a button

Ex £ **285**  
Part Code 22840  
£ **334.88** Inc Vat

**HP SUPPORT PACK** £80 inc vat £94 inc vat Part Code 12518

**HP DeskJet 840C**

The ideal printer for PC or Mac users with excellent photo-quality for whisper quiet home use

- Excellent photo quality printing
- 600 dpi black printing and enhanced PhotoRet II Precision Technology to give sharp black text and vibrant colour graphics on all papers. Optional 1200 dpi mode.
- Up to 8ppm black printing and 5 ppm colour printing
- Very quiet operation
- Supports parallel and USB ports for user friendly operation

**SPECIAL CAMERA BUNDLE OFFER**  
ONLY £209 EX. VAT  
DJ840C + C200  
Part code: 23950

Ex £ **78**  
Part Code 24157  
£ **91.65** Inc Vat

**HP SUPPORT PACK** £40 inc vat £47.00 inc vat Part Code 12513

**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.

Ex £ **111**  
Part Code 23947  
£ **130.43** Inc Vat

**HP SUPPORT PACK** £40 inc vat £47.00 inc vat Part Code 12513

**HP DeskJet 950C**

THE IDEAL PRINTER FOR PC OR MAC USERS WHO REQUIRE HIGH PERFORMANCE PRINTING WITH EXCEPTIONAL PHOTO QUALITY

- High speed output for home and business use.
- Ultimate photo-quality with HP PhotoRet III Precision Technology and alternate 2400 dpi mode.
- Up to 11ppm black printing and 8.5ppm colour.
- Intelligent paper handling - A4 or 4"x6" photo paper, two sided printing with optional duplex unit.
- Supports parallel and USB ports for user friendly operation.

Ex £ **149**  
Part Code 23948  
£ **175.08** Inc Vat

**HP SUPPORT PACK** £40 inc vat £47.00 inc vat Part Code 12513

**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 2400 dpi mode
- Incredible speed up to 12ppm black printing and 10ppm colour
- Very quiet operation
- Unmatched versatility - automatic two-sided printing
- Supports parallel and USB ports, also network capable via JetDirect EX

Ex £ **186**  
Part Code 22899  
£ **218.55** Inc Vat

**HP SUPPORT PACK** £40 inc vat £47.00 inc vat Part Code 12513

**HP DeskJet 120C**

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 2400 dpi mode.
- Fastest in its class - up to 11ppm (A4)/7ppm (A3) black printing and 9.5ppm (A4)/6.4ppm (A3) Colour Unmatched versatility.
- Media width sensor.
- Convenient time saving features like; low ink warning, cancel print button, smart software features and long cartridge life.

Ex £ **266**  
Part Code 23949  
£ **312.55** Inc Vat

**HP SUPPORT PACK** £40 inc vat £47.00 inc vat Part Code 12513

	Ex vat	Inc vat
23933 Brother HL-1030	£159.00	£186.83
23015 Brother HL1240	£179.00	£210.33
23016 Brother HL1250 4MB	£209.00	£245.58
23176 Brother HL1270N 8Mb	£329.00	£386.58
23198 Brother HL1660E 16Mb 16ppm	£549.00	£645.08
20894 Brother HL2060 16Mb	£599.00	£703.83
24197 Brother HL2400Ce 32Mb	£1,129.00	£1,328.58
24272 Brother HL3400CN 64Mb - 11212	£2,250.00	£2,644.75
23447 Canon LBP800 Laser Printer	£175.00	£205.63
20445 Canon LBP1760 17ppm	£655.00	£769.63
23611 Epson EPL-5700L 8ppm	£169.00	£198.58
20019 Epson EPL-5700 7ppm	£221.00	£259.68
24341 Epson EPL-5800	£236.00	£277.30
21632 Epson EPL N1600	£456.00	£535.50
23806 Epson EPL-N2050	£772.00	£907.10
21698 Epson EPL- N2700	£1,187.00	£1,394.73
21225 HP LaserJet 1100 C4224A 6ppm	£232.00	£272.80
21307 HP LaserJet 2100 Printer (C4170A)	£423.00	£497.03
21308 HP LaserJet 2100M Printer (C4171A)	£480.00	£564.00
23774 HP LaserJet 3150	£382.00	£448.85
22165 HP LaserJet 4050 16ppm	£741.00	£870.68
20962 HP LaserJet 4500	£1,500.00	£1,762.50
19567 HP LaserJet 5000	£960.00	£1,128.00
19924 HP LaserJet 8000	£1,477.00	£1,735.48
24162 HP LaserJet 8550	£2,966.00	£3,485.06
23202 Kyocera Ecosys FS-680 8ppm	£229.00	£269.08
20243 Kyocera Ecosys FS-400 8ppm	£309.00	£363.08
21662 Kyocera Ecosys FS-400N	£499.00	£586.33
23202 Kyocera Ecosys FS-1200	£448.00	£527.58
23205 Kyocera Ecosys FS-1750	£599.00	£703.83
23208 Kyocera Ecosys FS-3750	£789.00	£927.08
23079 Kyocera 5900C-N Colour Laser A4 Printer 4ppm	£1,999.00	£2,348.83
21113 Kyocera Ecosys FS-6700 12ppm	£1,029.00	£1,209.08
21784 Kyocera Ecosys FS-7000+ 18ppm A4/A3	£1,749.00	£2,065.08
21785 Kyocera Ecosys FS-9000	£1,999.00	£2,348.83
21130 Oki OL10ex 10ppm	£221.00	£259.68
22247 Oki OL10ex 10ppm	£269.00	£316.08
14040 Panasonic KXP6300 6ppm	£159.00	£186.83

**INKJET PRINTERS**

	Ex vat	Inc vat
21454 Canon BJC2000 BubbleJet Printer	£61.00	£71.68
24546 Canon BJC2100 Inkjet Printer	£63.99	£75.19
23818 Canon BJC-3000 BubbleJet Printer	£92.00	£108.10
19650 Canon BJC4650 Colour A3 InkJet Printer	£211.00	£247.93
23038 Canon BJC5100	£116.00	£136.30
16997 Canon BJC5500 Colour	£143.00	£168.78
23177 Canon BJC6100 Inkjet Printer	£139.00	£163.33
24647 Canon BJC6200 Inkjet Printer	£120.00	£141.00
23018 Epson Stylus 460 Colour	£59.00	£69.33
24714 Epson Stylus 480 Colour	£59.00	£69.33
24196 Epson Stylus 670 Colour Inkjet	£74.00	£86.95
23019 Epson Stylus 760 Colour	£103.00	£121.03
24264 Epson Stylus 760 Colour Transparent Blue	£111.00	£130.43
23020 Epson Stylus 860 Colour	£133.00	£156.28
21468 Epson Stylus 900 Inkjet Printer	SAVE £15 £192.00	£225.60
23465 Epson Stylus 1160 Colour	£266.00	£312.55
14295 Epson Stylus 1520 Colour	£315.00	£370.13
17843 Epson Stylus 3000 Colour A2	£792.00	£930.60
19835 Epson Stylus Pro 5000	£1,363.00	£1,601.53
24022 Epson Stylus Photo 870	£177.00	£207.98
24539 Epson Stylus Photo 875DC	£237.00	£278.48
19629 Epson Stylus Photo EX A3	£207.00	£243.23
24002 Epson Stylus Photo 1270	£296.00	£347.80
24716 Epson Stylus Photo 2000P	£592.00	£695.60
15370 HP DeskJet 340 Colour	£136.00	£159.80
19709 HP DeskJet 340 CBI (Infra Red)	£154.00	£180.95
24536 HP DeskJet 350Cxi	£154.00	£180.95
24660 HP DeskJet 640C	£90.00	£107.50
24157 HP DeskJet 840C	£79.00	£93.83
23947 HP DeskJet 930C	£112.00	£131.60
23948 HP DeskJet 950C	£150.00	£176.25
20902 HP DeskJet 895Cxi Colour	£180.00	£212.75
22899 HP DeskJet 970 Cxi Colour	£157.00	£187.73
22928 HP PhotoSmart 1000	£210.00	£246.75
22929 HP PhotoSmart 1100	£247.00	£290.23
19552 HP DeskJet 1120C Colour	£210.00	£246.75
24819 HP DeskJet 1125C	£210.00	£246.75
23949 HP DeskJet 1220C	£267.00	£313.73
20338 HP 2000C	£229.00	£269.08
22489 Lexmark Z11	£55.00	£64.83
24856 Lexmark Z42	£99.00	£116.33
24704 Lexmark Z32 Inkjet Printer	£72.00	£84.60
24705 Lexmark Z52	£108.99	£128.06

**MULTIFUNCTIONAL PRINTERS**

23934 Brother HL-P2500 MultiFunctional Laser Printer	£239.00	£280.83
22208 Brother MFC 9050 Laser print/ fax/ scanner	£379.00	£445.33
24504 Canon MultiPass C70	£217.99	£256.14
24505 Canon MultiPass C80	£294.99	£346.61
23021 Epson StylusScan 2000	SAVE £37 £140.00	£164.50
23022 Epson StylusScan 2900	£122.00	£146.85
22686 HP OfficeJet 710 - C6661A	£199.00	£233.83
24158 HP OfficeJet G55	£305.00	£358.38
24159 HP OfficeJet G85	£382.00	£448.85
22931 HP OfficeJet R45	£232.00	£272.60
22933 HP OfficeJet T45	£232.00	£272.60
20740 HP LaserJet 1100a	£265.00	£313.88
24664 HP Fax 925	£145.00	£170.38
24818 HP Colour Copier 920	£296.00	£347.80

**PORTABLE PRINTERS**

21796 Brother MP21C Portable Printer	£97.00	£113.98
20435 Canon BJC55	£202.00	£237.35
23817 Canon BJC85	£169.00	£198.58

**DOT MATRIX PRINTERS**

13372 Epson LX300 80col	£97.00	£113.98
13367 Panasonic KXP1150 80col	£101.00	£118.68
10035 Epson LQ300 80col	£112.00	£131.60
24540 Epson LQ580 80 col	£209.00	£245.58
14418 Epson LQ670	£202.00	£237.35
13363 Panasonic KXP2023 80col	£124.00	£145.70

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PRINTERS

**EPSON**

P/Code	PRINTER	EX	INC
<b>EPSON - INK CARTRIDGE</b>			
20689	460/660/670/750	£13.00	£15.28
20690	460/660/670/740/760/860/1160/2000/2500	£14.00	£16.45
20691	740/760/860/2000/2500	£14.00	£16.45
16405	850/1520/750/1200	£14.00	£16.45
16404	850/1520	£13.00	£15.28
24261	870/1270/875	£13.00	£15.28
21512	900	£22.00	£25.85
23456	1160	£14.00	£16.45
18437	3000	£34.00	£39.95
18439	3000	£34.00	£39.95
18440	3000/5000	£34.00	£39.95
18436	3000/5000	£32.00	£37.60
13772	EX A3	£13.00	£15.28
20689	1200	£13.00	£15.28
<b>EPSON - TONER CARTRIDGE</b>			
20394	EPL-5700	£55.00	£64.63
23695	EPL-2400	£39.00	£45.83
23554	EPL-8000/8200	£44.00	£51.70
23696	EPL8000/8200	£79.00	£92.83
23697	EPL8000/8200	£79.00	£92.83
23698	EPL8000/8200	£79.00	£92.83

**HEWLETT PACKARD**

P/Code	HP - INK CARTRIDGE	EX	INC
11400	DJ-340	£16.00	£18.80
22455	DJ-610	£21.00	£24.68
11495	DJ-710/720/895/970/1120/1220	£19.00	£22.33
19488	DJ-815/895	£21.00	£24.68
23541	DJ-970/930/970/1220	£20.00	£23.50
23450	DJ-1120	£16.00	£18.80
20365	DJ-2000/2500	£23.00	£27.03
20366	DJ-2000/2500	£23.00	£27.03
20367	DJ-2000/2500	£23.00	£27.03
20368	DJ-2000	£22.00	£25.85
23701	PhotoSmart 1000/1100	£25.00	£29.38
11495	OfficeJet 710	£19.00	£22.33
22522	OfficeJet 710	£22.00	£25.85
11495	R65/45/T65/45	£19.00	£22.33
22522	R65/45/T65/45	£22.00	£25.85
<b>HP - TONER CARTRIDGE</b>			
21310	Officejet 1100A	£33.00	£38.78
11537	Officejet 3100	£34.00	£39.95
21868	LJ-2100	£49.50	£58.17
18817	LJ-4050	£52.00	£61.10
21302	LJ-4500	£53.00	£62.28
21303	LJ-4500	£63.00	£74.03
21304	LJ-4500	£64.00	£75.20
21305	LJ-4500	£63.00	£74.03
20355	LJ-5000	£87.00	£102.23
11426	LJ-8000	£89.00	£104.58
22441	LJ-8100	£117.00	£137.48
21817	LJ-8500i	£64.00	£75.20
21818	LJ-8500	£94.00	£110.45
21819	LJ-8500	£94.00	£110.45
21820	LJ-8500	£94.00	£110.45

**BROTHER**

P/Code	BROTHER - TONER CARTRIDGES	EX	INC
17645	HL-820	£13.00	£15.28
23552	HL-1240/1250/1270/1030	£29.00	£34.08
22608	HL-1660/2060	£69.00	£104.58
19504	HL-2400	£89.00	£104.58
19505	HL-2400	£69.00	£81.08
19506	HL-2400	£69.00	£81.08
19507	HL-2400	£69.00	£81.08
17645	P2000	£13.00	£15.28
22887	MFC-740	£9.00	£10.58
22888	MFC-740	£5.00	£5.88
22889	MFC-740	£5.00	£5.88
22890	MFC-740	£5.00	£5.88

**CANON**

P/Code	CANON - TONER CARTRIDGE	EX	INC
18406	LBP-660	£32.00	£37.60
23549	LBP-880/800	£28.00	£32.90
23550	LBP-1760	£66.00	£77.56
23721	LBP-2460	£79.00	£92.83
23722	LBP-3260	£79.00	£92.83
<b>CANON - INK CARTRIDGE</b>			
15322	BJC-1000	£14.00	£16.45
18828	BJC-2000/2100/4400/4650/5100/5500	£25.00	£29.38
11407	BJC-2000/2100/4400/4650/5500	£18.00	£21.15
21114	BJC-6100	£19.00	£22.33
11404	BJC-8500/4400/4650/5100/5500	£27.00	£31.73
22003	BJC-6000/6100/6200	£21.00	£24.68
22002	BJC-6000	£6.99	£8.21
22005	BJC-6000	£5.99	£7.04
23910	BJC-3000	£41.99	£49.34
23924	BJC-8200	£74.99	£88.11
19494	BJC-7100	£20.00	£23.50
19493	BJC-7100	£21.00	£24.68

**KYOCERA**

P/Code	KYOCERA - TONER CARTRIDGES	EX	INC
14503	FS-680/800	£30.00	£35.25
23217	FS-1200	£40.00	£47.00
18471	FS-1700/3750	£49.00	£57.58
18471	FS-1750/3700	£45.00	£52.88
14505	FS-7000	£69.00	£81.08
23560	FS-9000	£95.00	£111.63

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\*All Savings shown against last advertised price - Greenpages June 2000 Issue

**EPSON**

**EPSON STYLUS COLOR 480**

The Ideal printer for home users who wish to combine excellent print quality and good performance at an affordable price.

- Easy to use panel-free design
- 720dpi 4-colour printing
- Variable Sized Droplet Technology
- Print Speeds of 4ppm black and 2.6 ppm colour
- Photo Enhance 4 for image optimisation
- Parallel interface as standard
- Win 95, 98 2000 NT4.0



Ex £59  
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Inc Vat  
**£69.33**

**EPSON COVER+**

£25 EX VAT £32.38 INC VAT Part Code 15072

**EPSON STYLUS COLOR 760**

IDEAL FOR ADVANCED HOME AND BUSINESS USERS

- 1440dpi Micro Piezo Four colour printhead
- Print speeds up to 7ppm mono & 6.8ppm colour
- Photo Enhance 4 for automatic image optimisation\*
- New improved easy to use driver Interface
- Parallel & USB interfaces
- Win 3.1, 95, 98, NT 4.0 & Mac drivers
- 1440dpi on plain paper
- 1 year call out warranty
- EPSON CoverPlus three year extended warranty available



Ex £103  
Part Code 23019  
Inc Vat  
**£121.03**

**EPSON COVER+**

£25 EX VAT £32.38 INC VAT Part Code 15072

**EPSON STYLUS PHOTO 870**

FASTEST A4 PHOTO PRINTER FOR PHOTO ENTHUSIASTS AND HOME USERS

- 10 years light fastness - with premium Photo Glossy Paper
- 9.0ppm black / 8.8ppm colour
- Edge to Edge Printing
- Paper Roll holder as standard in the box
- iMac, G3 & G4, PC support straight from the box
- New Stepper Motor for quieter printing



Ex £177  
Part Code 24022  
Inc Vat  
**£207.98**

**EPSON COVER+**

£35 EX VAT £41.13 INC VAT Part Code 15180

**EPL-5800 LASER PRINTER**

High Quality, Compact, 10ppm, A4 Laser Printer

- Compact 10ppm A4 Laser Printer
- True 1200dpi resolution
- Standard USB and IEEE 1284 parallel interface
- Windows and Macintosh (8.1-) drivers included
- PCL5e/PCL6 emulation
- 133MHz High Performance RISC Processor
- Standard 16MB memory upgradable to 256MB
- Flexible paper handling with standard 150 sheet Universal Paper Cassette
- Optional - Large Capacity Paper Unit (500Sheet), Adobe® PostScript®3™, 10/100 Base TX or 10Base2/10BaseT
- Network Print Server



Ex £236  
Part Code 24341  
Inc Vat  
**£277.30**

**EPSON COVER+**

£58 EX VAT £68.15 INC VAT Part Code 24455

**KYOCERA FS-680**

- Compact 8ppm laser printer
- 50MHz RISC Processor, 4MB memory, 150 sheet cassette & straight paper path
- ECOSYS cartridge-free technology
- High quality - 600dpi laser technology (1200dpi KIR2)
- Flexibility - options for additional 250 sheet cassette, network connectivity, additional memory & PostScript emulation
- Standard, twin-cassette, network-ready and workgroup models all available\*
- Ideal for single users or small workgroups



LESS THAN 1p per page!  
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Inc Vat  
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**EPSON COVER+**

£35 EX VAT £41.13 INC VAT Part Code 15180

**brother HL-1660e**

- Up to 16ppm Print Speed
- Up to 1200 x 600dpi Print Resolution
- 100 MHz RISC Processor
- 16mb Standard Memory - Upgradeable to 72mb
- Interactive help CD Included
- Duplex Option - Automatic Double-Sided Printing
- PCL6 Emulation
- Flexible Paper Handling with 650 Sheet Paper Input
- Internet E-Mail Printing



Ex £549  
Part Code 23195  
Inc Vat  
**£645.08**

**EPSON STYLUS COLOR 670**

HIGH QUALITY COLOUR PRINTING FOR ADVANCED FIRST-TIME BUYERS

- 1440dpi Super Micro Dot 4-colour printing
- Variable Sized Droplet Technology
- Print Speeds of 5ppm black and 3.8 ppm colour
- Photo Enhance 4 for image optimisation
- Parallel & USB interfaces as standard
- Win 95, 98, 2000, NT 4.0 & Mac drivers



Ex £74  
Part Code 24196  
Inc Vat  
**£86.95**

**EPSON COVER+**

£25 EX VAT £32.38 INC VAT Part Code 15072

**EPSON STYLUS PHOTO 875DC**

THE ULTIMATE INKJET PRINTER FOR DIGITAL CAMERA USERS

- PCMCIA card slot (CompactFlash PCMCIA card adapter supplied)
- 10 years light fastness - with Premium Glossy Photo Paper and Matte Paper-Heavyweight
- Edge to Edge Printing on 100 mm x 8m Premium Glossy Photo Paper Roll
- Print Speeds of 9ppm black and 8ppm colour for demanding users
- Paper Roll holder as standard in the box
- Win 98 & iMac, G3 and G4 compatible via USB interface
- 1 year call-out warranty with optional 3 year extended warranty



NEW  
Ex £237  
Part Code 24539  
Inc Vat  
**£278.48**

**EPSON COVER+**

£58 EX VAT £68.15 INC VAT Part Code 24455

**EPSON STYLUS PHOTO 1270**

THE IDEAL PRODUCT FOR PROFESSIONAL PHOTOGRAPHERS AND PHOTO ENTHUSIASTS

- 10 year light fastness - with premium Photo Glossy Paper
- Edge to edge printing
- Ultra Micro Dot - 4pl droplets combined with 6 colour technology for true photographic quality
- iMac, G3 & G4, PC support straight from the box
- Optional Paper roll holder
- New Stepper Motor for quieter printing



Ex £296  
Part Code 24002  
Inc Vat  
**£347.80**

**EPSON COVER+**

£59 EX VAT £69.33 INC VAT Part Code 15181

**STYLUS SCAN 2500**

HIGH QUALITY PRINTER & SCANNER COMBINED

- Print, Copy, Fax\*, Scan to e-Mail\*, Scan to disk from one device
- Photo-real printer and flatbed scanner in a single space saving device
- 1440dpi, 6pl MicroPiezo™ with variable sized dot 9600dpi, 36-bit flatbed scanning technology
- SmartPanel™ software suite
- Multi-function stand-alone colour copy facility
- USB & Parallel interfaces
- Windows & Mac compatible
- 1 year call-out warranty
- EPSON CoverPlus three year extended warranty available



Ex £222  
Part Code 23022  
Inc Vat  
**£260.85**

**EPSON COVER+**

£35 EX VAT £41.13 INC VAT Part Code 15180

**brother HL-3400**

The Brother HL-3400CN range of colour laser printers can comfortably deal with up to Oversize A3 allowing for full bleed and crop marks plus a host of unique printing capabilities.

- Up to 2400dpi Class Colour Printing
- Up to 12ppm in Colour
- Up to 24ppm in Mono
- Postscript Level 2 Language Emulation
- 64mb Standard Memory - Upgradeable to 320mb
- Forms and Font Storage on Optional PCMCIA Card
- Advanced Network Features



From Ex £2250  
Part Code 24272  
Inc Vat  
**£2643.75**

**brother HL-1240**

Our New entry level 12ppm business laser printer provides a high speed output with a small footprint, making it the obvious low cost choice.

- 12ppm
- 600 x 600 dpi
- 2mb Memory
- 250 Sheet Input Tray
- USB Port as standard
- Two Toner Options
- Optional NW connectivity with full management capabilities
- 12 months on site warranty



Ex £179  
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## MONITORS

### EnergyPro 15"

Our #1 best selling colour monitor gives you high quality at a very low price

- Tube type: CRT Flat screen
- Dot pitch: 0.26mm
- Max. resolution: 1280 x 768 Hz
- Frequency: 30 - 68kHz
- (horizontal) 50 - 120Hz (vertical)
- Digital control with 7 user programmable modes
- Anti-static, anti-glare
- 3-year (On-site Swap Out warranty)
- Digital controls with 12 user programmable modes

Ex £86  
Vat  
Part Code 10075  
£101.05 Inc Vat

### EnergyPro 17"

Offers state of the art quality at a very low price

- Tube type: CRT
- Agbras dark tint screen
- Dot pitch: 0.28mm
- Max. resolution: 1024 x 1280
- Frequency: 30 - 85kHz (horizontal) 50 - 130Hz (vertical)
- Digital control
- 3-year (On-site Swap Out warranty)
- Anti-static, anti-glare

Ex £125  
Vat  
Part Code 21934  
£146.88 Inc Vat

### EnergyPro 19"

Offers state of the art quality and design for the serious user.

- CRT 19" Diagonal Short Gun
- Display size: 340mm x 250mm
- Dot pitch: 0.26mm
- Max. resolution: 1600 x 1200
- Frequency: 30 - 95kHz (horizontal) 50 - 150Hz (vertical)
- Non-glare, silica coating, anti-static
- 3-year (On-site Swap Out warranty)

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## PHILIPS

### 105S11 15" MONITOR

- 15-inch (M.D. VSI) color monitor for use with MACs and PCs
- Maximum resolution of 1280 x 960 with flicker free display of 800 x 600 at up to 96 Hz
- Flat Square CRT with high-resolution 0.28mm dot pitch (0.24 mm hdp)
- Smallest footprint in its class
- Multimedia Base and USB option
- MPRI, NUTEK, EPA, FCC, CE and ISO9241 certified



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### CTX PR705F

- 17" FD Trinitron CRT
- Perfectly Flat Image
- Ultra High Contrast Tube
- 0.24 Aperture Grille
- Recommended Res. 1280x1024 @ 78Hz
- Max Res. 1600x1200
- TCO99

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### A702H

- 17" FST CRT, 0.28dp
- Max resolution 1280 x 1024 @ 65Hz
- Compatible with all PC & MAC graphics standards
- Anti static, Anti Reflect Screen coating
- 3 yrs on-site warranty
- TCO 95 compliant.



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## ADI The Display Company

### MICROSCAN G710 Colour Monitor

- 17" FD "Trinitron" pure flat screen monitor
- 0.24mm aperture grille pitch
- Max. res. 1600 x 1200 @75Hz
- TCO99 media options
- MCO '99 certified
- 3 year on-site warranty on ALL monitors



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## Hansol

### 710A Monitor

- 17" Tube (16" viewable area)
- 0.27mm dot pitch
- 1280 X 1024 @ 60Hz Resolution Max.
- 5 language on screen display
- Plug & Play compatible
- 3 years warranty in all EU Countries



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£146.88 Inc Vat

### 900P Monitor

- 19" tube (18.0" viewable area)
- 0.26mm dot pitch
- Maximum Resolution 1600 x 1200 @ 75Hz
- Optimum Resolution 1280 x 1024 @ 85Hz
- Plug and play compatibility under Windows
- 3 year on-site warranty in all EU countries



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## PROJECTORS



### EzPro610H

- Ultra Bright! 1100 ANSI Lumens
- High Portability! Only 4.0kgs
- True SVGA, 800x600 Addressable Pixels
- Luxurious carrying case with detachable wheels and handle
- Advanced Electronic Keystone Correction Function
- User-Friendly Multilingual On-Screen Menu Adjustment



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### UltraLight LX1+

- XGA (1024 x 768) resolution shows off your most detailed images with clarity
- 900 ANSI lumens of brightness lets you present in well-lit environments
- 4000-hour lamp life means low cost of ownership and approximately 10 years\* of use
- a lightweight 3.7kgs makes it easy to take your high-resolution presentations with you
- 13:1 zoom lens gives you the flexibility to set up anywhere in the room
- comes with a remote control



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### EzPro710

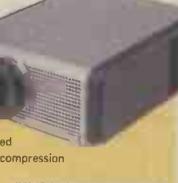
- 2.3kg
- 800 ANSI Lumens
- Data and Video
- True XGA DLP
- SXGA Compression
- Picture in Picture
- 2600hr 120w UHP lamp
- Full remote control
- Auto image adjustment
- Plug and play
- Full OSD



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## PHILIPS XG20I HOPPER

- 1250 ANSI Lumens, 2000 Hour lamp life
- Instant Shut Off (No standby time)
- Low Power Consumption
- Philips Limaco Technology - all resolutions handled from VGA(640x480) to SXGA(1280x1024) without compression
- Pal/Secam/NTSC 3,85, 4,43
- Monitor Loop through, RS232 control
- Ceiling Mountable
- First Choice Warranty - 24/48 hour loan swap replacement in Europe, USA and Canada
- Free toll-free technical support
- Remote Mouse Control



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£3871.63 Inc Vat

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24691 ADI ProVista E44 15" Colour Monitor	£95.00	£111.63
24692 ADI ProVista E55 17" Colour Monitor	£135.00	£158.63
24694 ADI MicroScan G500 15" Colour Monitor	£255.00	£299.63
24695 ADI MicroScan G500 15" Colour Monitor	£127.00	£149.23
24696 ADI MicroScan G700 17" Colour Monitor	£205.00	£240.88
24699 ADI MicroScan G56 19" Colour Monitor	£285.00	£334.88
24700 ADI MicroScan G1000 21" Colour Monitor	£555.00	£652.13
24701 ADI MicroScan 9L 18" TFT LCD Panel	£1,845.00	£2,167.88
24702 ADI MicroScan A600 15" TFT LCD Panel	£599.00	£703.83
21449 Belinea 10 20 10 15"	£82.00	£96.35
22179 Belinea 10 20 20 15"	£98.00	£103.40
23531 Belinea 10 30 30 17"	£154.00	£180.95
21450 Belinea 10 30 40 17"	£142.00	£166.85
21458 Belinea 10 15 30 15" TFT LCD	£639.00	£750.83
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24165 CTX PL 17 17"	£116.00	£136.30
24731 CTX VL700SL 17"	£129.00	£151.58
18883 CTX VL710T 17"	£165.00	£193.88
20078 CTX VL 950T 19"	£229.00	£269.08
21939 CTX VL710ST 17" 0.26dp	£182.00	£213.85
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23653 Nokia 446 Pro 19" Flat Trinitron	£365.00	£428.88
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18935 Philips 201B10 21"	£607.99	£714.39
24049 Philips 150B Brilliance - 15.1" LCD Monitor	£655.00	£769.63
22507 Sony 110est 15" Trinitron	£129.00	£151.58
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As you can probably tell from this month's front cover, I can't tell you how delighted I am that jungle.com are promoted as the UK's top internet site by Shelley Taylor Associates in a recent report that they commissioned. Shelley Taylor are a leading research company, who after analysing 200 of the world's top e-tailers, voted us 4th overall when considering ease of navigation, the shopping experience and site content. Indeed we were the only UK site in the top 5 and we're proud to fly the flag for Britain! What a performance and well done to the team here who have worked so hard over the last few months.

So what's been happening here in the jungle - well loads. In June we took over 6000 Castleford Tigers fans down to London to watch their team play the London Broncos. After a tight game the Tigers were victorious and we won 26 - 20. That week also saw round the world yachtsman Tony Bullimore and TV Celebrity Lenny Henry depart on a jungle.com sailing experience which will be screened on TV later this year. Keep an eye out for that, or for those of you with four wheels in mind - jungle.com racing sees us sponsoring one of the fastest dragsters in Europe this year.

On the business front, we've now launched [jungleBusiness.com](http://jungleBusiness.com) for small to medium business and revamped our corporate site at [corpdirect.co.uk](http://corpdirect.co.uk). Visit either site for all of your IT needs or call the team now on 0845 20 20 330. Remember, we're THE Internet Company you can talk to.

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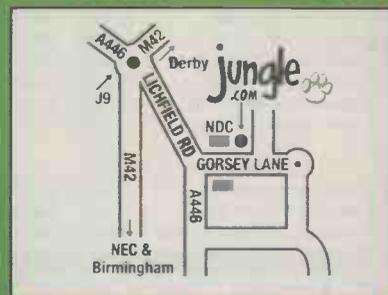
Steve Bennett  
CEO and founder of jungle.com

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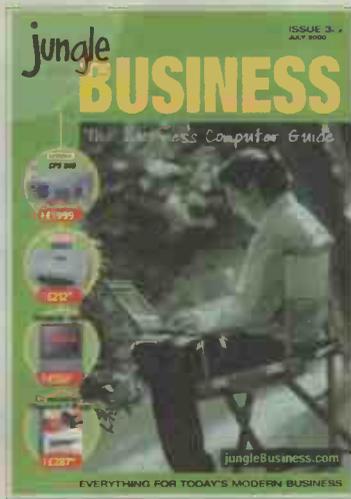


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TOS033	ATTORNEY CARRY CASE	£90.99	£106.91
TOS244	MODEM CABLE FOR 4070	£12.99	£15.26
TOS036	COURIER CARRY CASE	£22.99	£27.01
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TOS194	PORTEGE CARRY CASE	£84.99	£99.86
TOS054	BATTERY PACK SAT/PRO'S	£122.99	£144.51
TOS079	CARDSTATION III	£236.99	£278.46
TOS210	PORT REPLICATOR 403/6/8/0	£105.99	£124.54
TOS218	CARDSTATION III SPACER	£52.99	£62.26
TOS245	PORTEGE 3110 LI-ON BAT	£112.99	£132.76
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TOS039	SATELLITE BATTERY PACK	£89.99	£105.74
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TOS150	CD-ROM DOCK FOR PORTEGE	£260.99	£306.66
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TOS182	HIGH CAP BATT FOR 7010	£137.99	£162.14
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	EX VAT	INC VAT
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AMA066	BABY ZIP USB CABLE KIT	£29.10 £34.19
AMA059	BABY CD X24 PCMCIA	£99.15 £116.50
AMA067	SLIM DVD 5X24X PCMCIA	£179.50 £210.91
AMA068	BABY CD/DVD USB CABLE KIT	£32.10 £37.72
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AMA077	Amacom Baby CD-RW Cable K	£25.15 £29.55
AMA078	Baby CD-RW cable KIT USB	£25.15 £29.55
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AMA079	FLIPDISK 6.0/12.0GB	£300.00 £352.50
AMA054	FLIPDISK 10/20GB HARD DRI	£376.00 £441.80
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AMA074	FlipDisk 18-36GB PCMCIA N	£500.00 £587.50
AMA051	PARALLEL FLIPDISK CABLE	£30.10 £35.37
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\*the processor may be reduced to a lower operating speed when operating on battery power

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TOS309	SATELLITE PRO4270 C500 w9	£1,380.00	£1,723.77
TOS312	SATELLITE PRO 4280 11A	£1,557.00	£1,829.49
TOS314	SATELLITE PRO 4280 13.3	£1,510.00	£1,774.11
TOS315	SATELLITE PRO 4320 P3-600	£1,847.00	£2,170.22
TOS317	SATELLITE PRO 4280 PIII500	£1,384.00	£1,626.22
TOS353	SATELLITE PRO 4320 PIII600	£1,652.00	£1,941.11
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### AMACOM

## Zip 100 Baby Drive

### Portable PCMCIA Zip Drive

#### Features

- Powered directly from your computer
- Uses standard Iomega 100MB Zip disks
- PCMCIA connection or optional Parallel port cables/USB cables
- No specific drivers required (Win 95), real plug & play
- 16 bit data transfer - Up to 3.3MB/sec



**FROM**  
**£135<sup>13</sup>** inc VAT  
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Stock code AMA052



## Baby CD + DVD + CD-RW

### Ultra slim portable CD or DVD player or CDRW

#### Features

- CD and DVD powered straight from your computer, CD-RW supplied with mains adaptor
- Ultra light and compact (400G)
- True Plug & Play - no specified drivers required (windows 95/98)
- PCMCIA Connector \*Optional USB Cables for all, Optional Parallel Cable for CD-RW



**FROM**  
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## EZ CD-RW & EZ CD-ROM

### Portable Drives Parallel Port & PCMCIA

#### Features

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4

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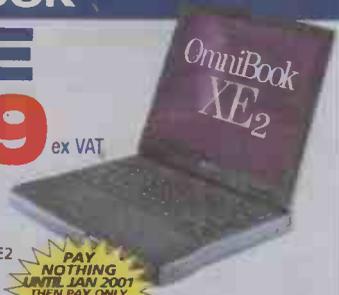
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Now also available with the new K6/2 AMD 500MHz processor

Code	Processor	RAM	HDD	CD ROM	Modem	Display	OS	Ex VAT	RRP
F2062W	K6/2 AMD 500MHz	32MB	5GB	24XCD/FDD	56 Kbps	12.1"HPA	W98	£769	£903.58
F2051WT	Celeron™500MHz	32MB	5GB	24XCD/FDD	56 Kbps	12.1"HPA	W98	£799	£938.83
F2053WT	PIII® 500MHz	64MB	5GB	24XCD/FDD	56 Kbps	12.1" TFT	W98	£1069	£1256.08
F2053K	PIII® 500MHz	64MB	5GB	24XCD/FDD	56 Kbps	12.1" TFT	W2000	£1349	£1585.08



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Everything You Need in One, Totally Reliable Brand-New Corporate Notebook PC

The HP OmniBook 6000 Notebook PC combines all the best features of the current product line with an entirely new design for high-performance business computing.

Code	Processor	RAM	HDD	Drive	Modem	Display	OS	Ex VAT	RRP
F2072WT	Cel™ 550MHz	64MB	5GB	24XCD/FDD	Software Only	14.1" TFT	W95	£1349	£1585.08
F2090W	PIII® 700MHz	128MB	18GB	6XDVD/FDD	Mini PCI /NIC	15" TFT	W95	£2889	£3394.58



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The Notebook 100 is a convenient, all-in-one product with built in FDD, 24XCD & Hard Disk. It is based on the Mobile AMD-K6-2P/475MHz Processor, choice of two 12.1" displays and a 5.0GB hard drive. This low cost portable also offers an integrated 56K modem, Touchpad pointing device & basic docking capabilities. It can be purchased with either Word 2000 or Office SBE pre-installed and is shipped with Windows 98 SE ONLY.

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- Flexible high performance portable computing solution
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## ActionBook 246T UMAX

- Features
- Intel Celeron 466MHz Processor
  - 64MB Memory
  - 6.4GB Hard Drive
  - 10.4" TFT Screen
  - 24X External CD
  - 56k Internal Modem
  - 2MB Video
  - Windows 98 Operating System
  - 3 Yrs Warranty



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## ActionBook 347T

- Features
- AMD K6-2 475MHz Processor
  - 64MB Memory
  - 6.0GB Hard Drive
  - 12.1" HPA Screen
  - 24X CD
  - 56k Internal Modem
  - 4MB Video
  - Win 98 Operating system
  - 3 Yrs Warranty



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## ActionBook 653T 860T

- Features
- Intel Celeron 533MHz Processor
  - 64MB Memory
  - 6.0GB Hard Drive
  - 14.1" XGA TFT Screen
  - 24X-CD
  - 56k Internal Modem
  - 4MB AGP Video
  - Win 98 Operating system
  - 3 Yrs Warranty



- Features
- Intel Pentium III 600MHz Processor
  - 64MB Memory
  - 12.0GB Hard Drive
  - 14.1" TFT XGA Screen
  - 24X-CD
  - 56k Internal Modem
  - 8MB AGP Video
  - Win 98 Operating system
  - 3 Yrs Warranty

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75844	100TFT K6-475 5GB 64MB CDS 12.1 D W98 56K	£892.77	£1049.00
63299	V300 C466MHz - 13" HPA 6GB 32MB CD M W95/98	£1029	£1209.08
01M476	V300 C466MHz - 14.1" TFT 4.3GB 64MB CD M W95/98	£1399.99	£1644.99
52549	M300 500MHz - 11.3" TFT 6GB 64MB LAN/M W95/98	£1596	£1875.30
01M516	M300 500MHz - 11.3" XGA12GB 64MB LAN/M W95/98	£1676	£1969.30
01M952	M700 450MHz - 14.1" TFT 6.0GB 64MB CD LAN/M W95/98	£2199	£2583.83
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Notebook delivery £19.95 + VAT. E&OE. All prices exclude delivery, see page 61 for terms & conditions. Above prices available from 1st July 2000

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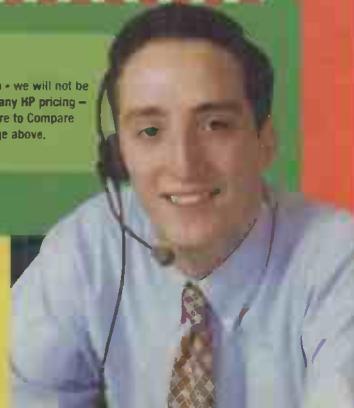
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CA5042 CASSIOPEIA E15 WIN CE 16M	£190.49	£223.83
CA5051 Cassiopeia E-115 32MB TFT	£395.00	£464.13
<b>Compaq</b>		
170294 iPaq H3630 Pocket PC 32MB	£340.00	£399.50
170540 AERO 1550 16MB MONO	£230.00	£270.25
<b>Hewlett Packard</b>		
F1813A HP JORNADA 690, 32MB	£539.00	£633.33
F1817A AC ADAPTER - JORNADA 540	£27.15	£31.90
F1818A STYLUS PENS - JORNADA 540	£9.00	£10.58
F1824A HP JORNADA 545, 16MB	£299.00	£351.33
F1825A HP JORNADA 548, 32MB	£359.00	£421.83
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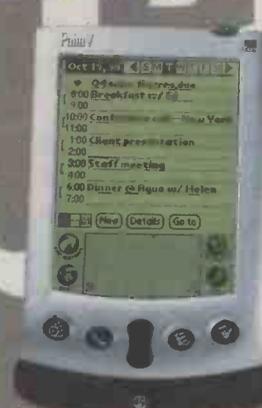
Keep your handheld in sync with favourite applications. Intellisync has a rich database of applications for your PC and Palm organisers. It automatically synchronises e-mail, information management and groupware applications.

### Key Features

- Easy, one-step synchronisation
- Works with popular PC applications
- Optimised for Microsoft Outlook
- Powerful filtering
- Full conflict resolution
- Complete customisation

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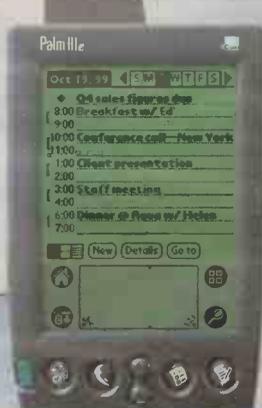
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Ultra sleek. Ultra slim. Ultra stylish. And it stores more than ever before.

Wrapped in look & rugged protection, the Palm Vx™ has a look & feel that is more professional, memory and faster access to information and business information and add-on features. Its advanced display features razor-sharp clarity, and its rechargeable lithium-ion batteries supply up to a month of power. Slip it into its synchronisation cradle and it recharges while you back up and exchange data with your computer. Access your email while on the go with just a touch of a button. Through your local network or a modem HotSync operation you can download, write and send e-mails. AvantGo's web channel manager for off-line browsing of favourite web pages included. Thousands of applications available online.

\*Links and software sold separately.

The versatile connected organiser now features a high-quality, colour display

### Key Features

- High contrast liquid crystal display
- Back-up and exchange information with desktop PC and popular Palm OS™ (touch of a button)
- Rechargeable battery (full charge will last up to two weeks)
- Infrared beaming capability
- 8MB RAM (10K addresses, 5 yrs appointments, 3000 memos and to do lists, 400 emails)
- Includes colour applications, PowerOne, Gammon
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- Thousands of applications available online

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- Trendier, younger, transparent
- High contrast liquid crystal display (LCD)
- New line of accessories
- PalmOS™ 3.1 (English)
- Longer battery life (2 AAA lasts 8-12 weeks)
- Infrared beaming capability
- 2MB RAM (6K addresses, 5 yrs appointments, 1500 memos and to do lists, 200 emails)
- Thousands of applications available online

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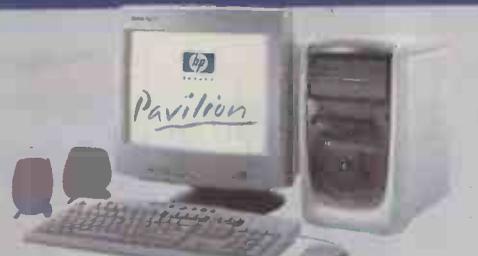
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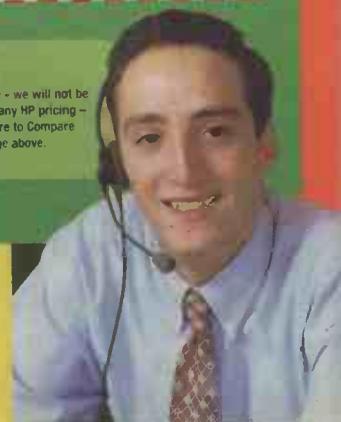
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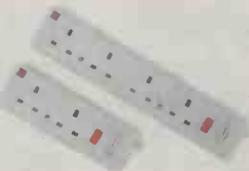


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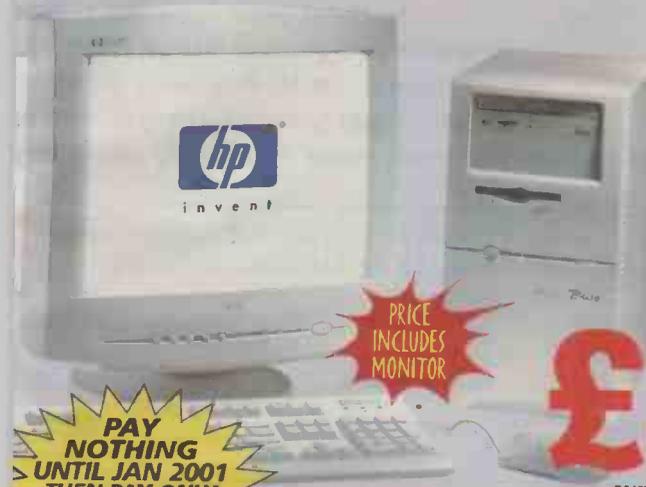
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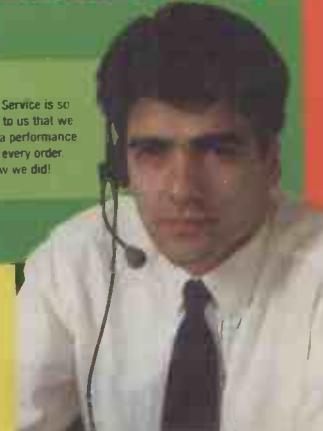
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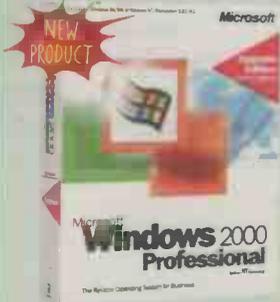
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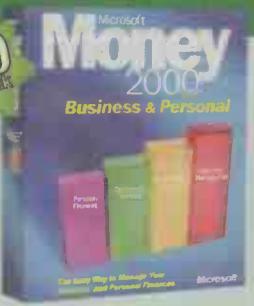
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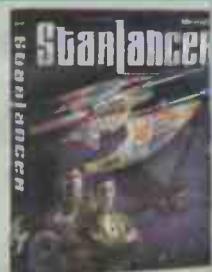
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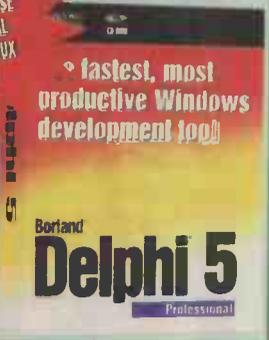
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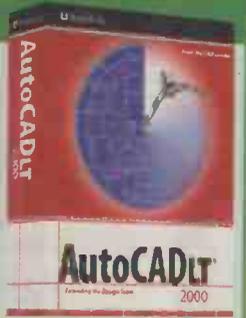
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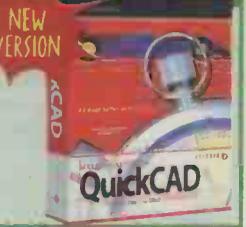
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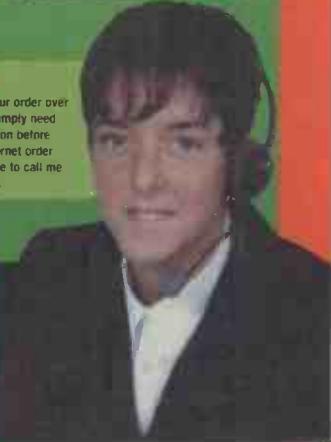
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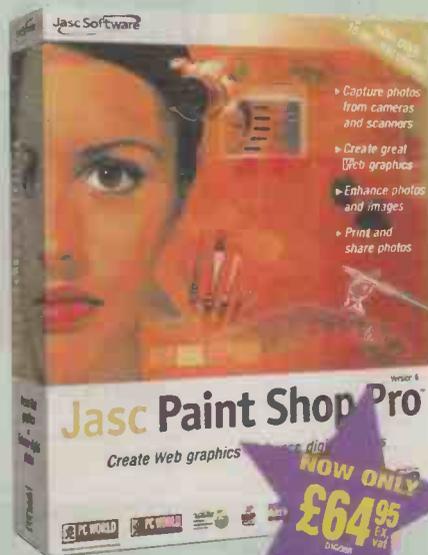
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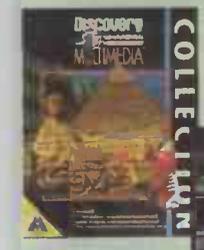
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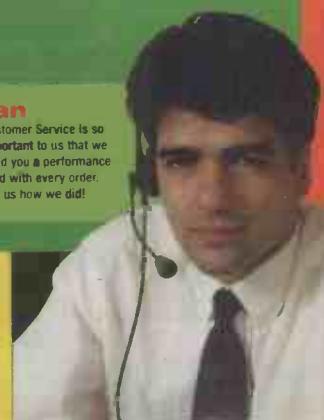
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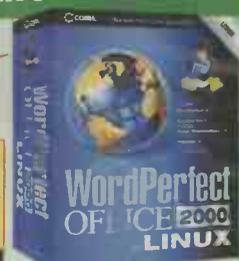
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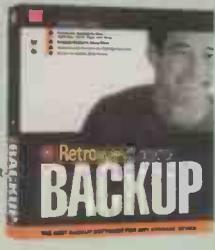
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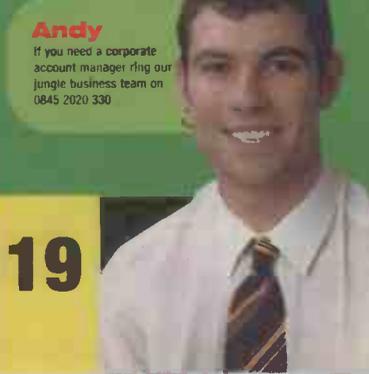
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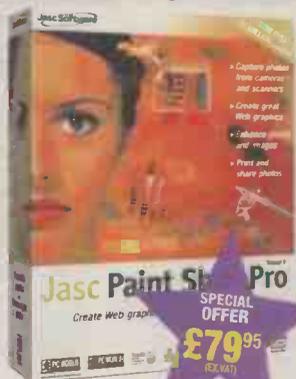
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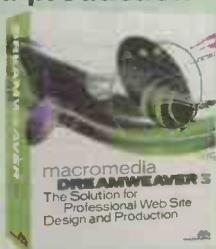
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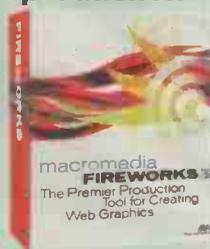


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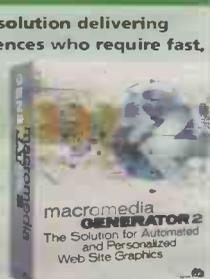


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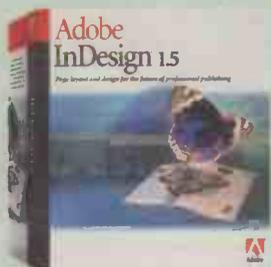
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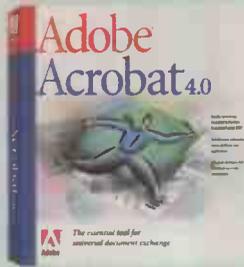
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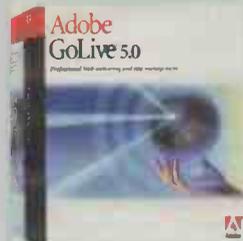


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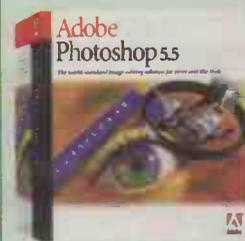
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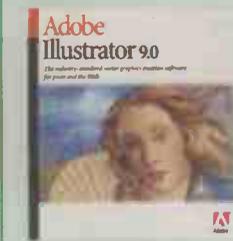
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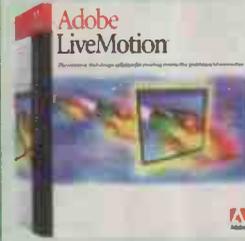
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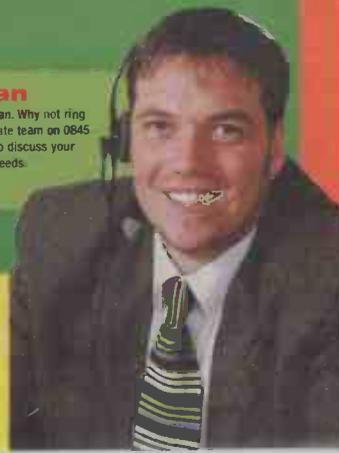
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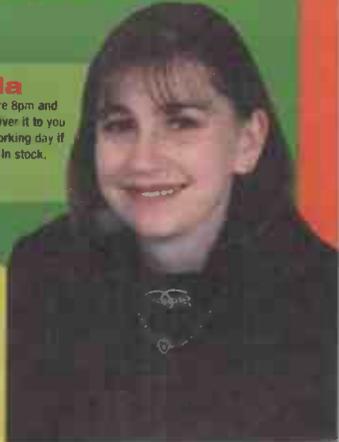


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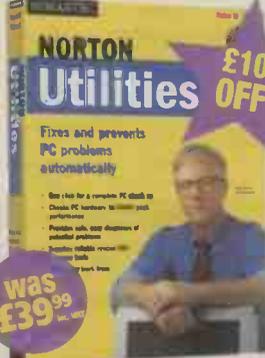
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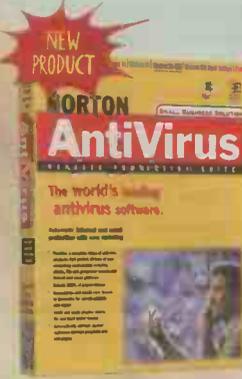
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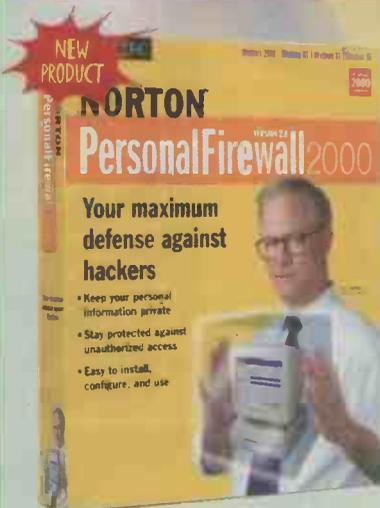
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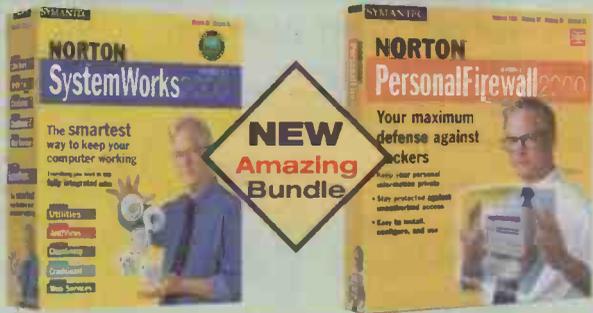
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- Search hardware diagnostics, memory, CPU, hard drive, modem, and other peripheral device diagnosis for potential problems

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- The Best Way To Clean Messy Internet Build-Up**
- Removes unneeded Internet files
  - Gives your computer a one-click cleanup.
  - Removes files safely and easily
  - Features a new easier-to-use design

### Norton Internet Security 2000

- Includes NortonAntivirus
- Guards your computer files against unauthorised access
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- Protects children from inappropriate sites
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Do you lose it when you have problems with your computer? A fully integrated suite that sorts out PC problems from crashes to viruses and prevents them occurring.

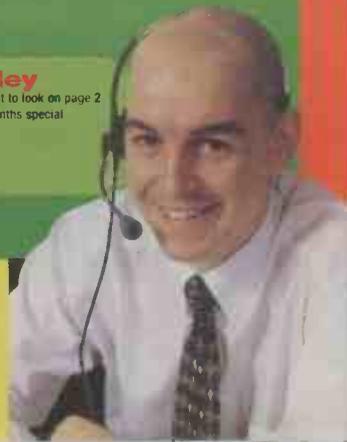
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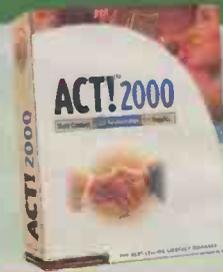
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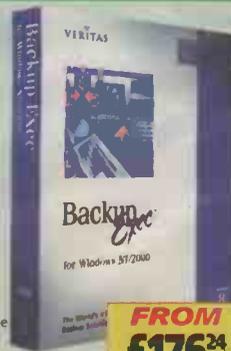
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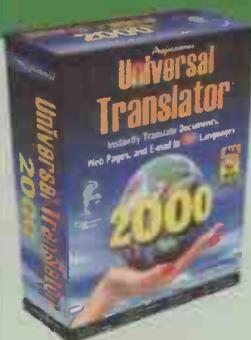
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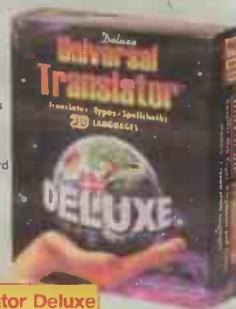
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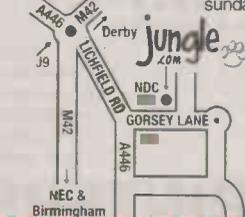


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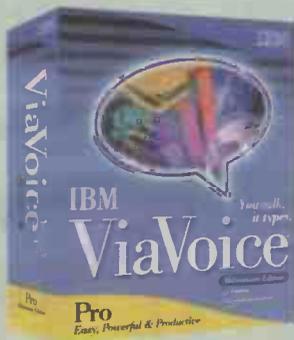
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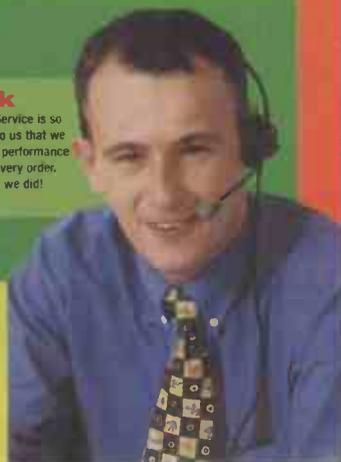
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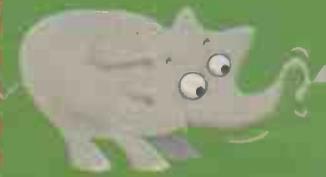
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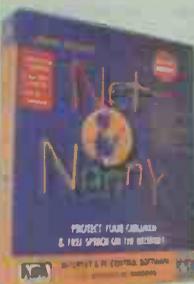
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- select places to avoid - beat the roadworks & traffic jams
- display the shortest/quickest route on a detailed map and print it in colour
- print a full itinerary
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- 1.6 million postcodes can be located on the map
- **ROUTE EDITOR**
- add your own one way streets & access restrictions
- the only product with editable routing
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## TaxCalc 2000

NEW TaxCalc 2000 makes Self Assessment tax simple!

TaxCalc 2000 from Which? Software is the stress-free way to manage your tax affairs quickly and accurately. Simply enter your personal and financial details, and TaxCalc 2000 will calculate your tax liability for the 1999-2000 tax year, and make sure that there are no costly mistakes in your return. It will also tell you if you are entitled to a rebate, and offers over 40 tax-saving tips to help you improve your financial position. When you're finished, TaxCalc 2000 will even print out an Inland Revenue-approved return form (plus any Supplementary pages) - all you need to do is check it, sign it and send it off!

TaxCalc 2000 is also ready for the internet - not only will the program help you to claim a £10 discount by allowing you to file your tax return online\*, but there's also a FREE 30-day trial to Which? Online included with every copy of TaxCalc 2000.

### Key Features

- An easy-to-use Windows interface
- Comprehensive Help files, written in plain English by Which? tax experts
- Full user support (by phone/fax/email) from a dedicated team at Which?

### Platform:

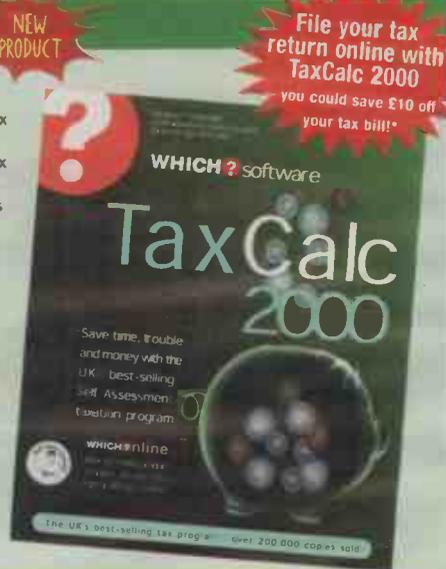
PC (Pentium) and 100% compatibles, CD-ROM, Windows 95/98/2000/NT, SVGA graphics (screen resolution 800x600, 256 colours), 16Mb RAM and 30Mb hard disk space.

### Praise for TaxCalc 99

from users and journalists:

"I have just been credited £820 by the Inland Revenue purely due to TaxCalc!" - Patrick Wyatt  
"The answer to all your tax problems!" - PC Format magazine, July 99 (Gold Award winner).

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- Improved Format Retention - recognition of spreadsheets, tables and columns have all been further improved in OmniPage Pro 10.0
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- New "Text to Speech" Function - Check your OCR results by having OmniPage read them back to you!



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### Fast and accurate address generation

up to 80% key stroke savings. By just typing in the postcode and number you can open an entire Royal Mail approved address and paste it to your application, with no spelling errors.

### Contains 1.6 million UK postcodes.

The Postcode Address File is maintained by the Royal Mail and contains every UK address. The PAF data has been compressed to an amazing 6Mb and annual updates are available.

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QuickAddress Lite loads right out of the box, & comes with its own simple configuration utility.

### Hotkey pop-up from any Windows application

QuickAddress Lite works with any Windows application

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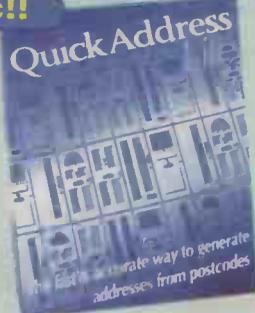
any format or structure can be applied to the addresses you generate so that they can be pasted back to your existing database or word processor.

### Full on-line help included

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QuickAddress Lite includes a one user license valid for 12-months, documentation and media, Updated PAF data is supplied with the annual licence renewal.

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- Up to 8ppm black printing & 5 ppm colour printing
- Very quiet operation
- Supports parallel and USB ports for user friendly operation



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- Camera**
  - 2x digital zoom
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- Get brighter more vivid colour with ColourSmart III
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- PC and Mac compatible
- Easy to set up and use



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The HP DeskJet 350C/cbi is specifically designed to meet the needs of professionals on the move.

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- 30 page automatic sheet feeder
- HP ColourSmart II - a HP technology which optimises imaging capabilities
- Infrared adapter for wireless printing anywhere (CBI only)



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The idea printer for PC or Mac users who want high performance with exceptional print quality

- High speed output for home and business use
- Superior photo printing performance with improved HP PhotoRet II Precision Technology, even on plain paper and 600 dpi black
- Up to 11ppm black printing and 8.5ppm colour
- Very quiet operation
- Supports parallel and USB ports, also network capable via JetDirect EX



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### DeskJet 1125C

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- Fast printing with no compromise of quality - up to 7ppm black and 5.5ppm colour.
- Up to 3000 pages/month duty cycle for robust printing.
- Mac and Windows compatible
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- 600 dpi resolution
- Parallel and USB interfaces



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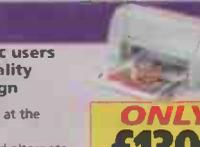


**ONLY £267<sup>90</sup>** Inc VAT  
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### DeskJet 930C

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- 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



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### DeskJet 950C

The ideal printer for PC or Mac users who require high performance printing with exceptional photo quality

- High speed output for home and business use
- Ultimate photo-quality with HP PhotoRet III Precision Technology and alternate 2400 dpi mode
- Up to 11 ppm black printing and 8.5ppm colour
- Intelligent paper handling - A4 or 4"x6" photo paper, two sided printing with optional duplex unit
- Supports parallel and USB ports for user friendly operation



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### DeskJet 970CXi

The NEW DeskJet 970CXi printer is designed for demanding professional-level home and office users who want the very best in print quality, speed and versatility.

- Ultimate photo quality with HP PhotoRet III Precision Technology
- Unrivalled quality for everyday text and graphics printing
- High performance - up to 12 ppm black and 10ppm colour
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- Compact design and quiet operation
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### DeskJet 1220C

The ideal printer for PC users who require Versatility printing with ultimate photo-quality

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- Media width sensor



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- Brilliant photo quality colour with HP PhotoRet II (up to A3 oversize)



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The HP LaserJet 4050 printer is the new standard office printer, offering more printing solutions, great looking output, compatibility, reliability and effortless management.

- Input capacity 1 x 100, 1 x 500
- 8MB RAM
- Network capable with optional HP JetDirect Print Server
- Easy installation, configuration and management
- Ultra Precise Toner Cartridge which maximises the performance of ProRes 1200 and FastRes 1200.
- 1200 dpi at 16 pages per minute
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HWP665 HP LaserJet 4050T **FROM** £948<sup>inc VAT</sup> **£807** <sup>ex VAT</sup>

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HWP666 HP LaserJet 4050N **FROM** £1105<sup>inc VAT</sup> **£941** <sup>ex VAT</sup>

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The Versatile Family of Printers That Grow With Your Needs

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The A3 Performance Printer

As the replacement for the HP LaserJet 4V, the HP LaserJet 5000 is a superior 16ppm A3 printer that offers a series of new performance features at a much better price.

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- 1200 dpi prints without performance sacrifice
- Full-bleed A3 output
- PostScript for free
- Double sided printing
- Paper trays optional

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### HP Colour LaserJet 4500

Affordable HP Colour LaserJet printer for the corporate workgroups

- Fast printing speed 16ppm (mono), 4ppm (colour)
- High definition colour printing out of the box via sRGB colour matching, automatic colour calibration and matching colour from device to device
- Leadership in cost per page via long life toner cartridges, duplex printing (DN Only)
- On-line help for easy troubleshooting

### HP LaserJet 3150

Exceptional Printer/Fax/Copier/Scanner all in one compact box

- 600 x 600dpi
- 6ppm printing
- Easy to set up and use
- Networkable printing, faxing and scanning
- Professional quality, laser output
- Economic toner

C4256A HP LaserJet 3150 **FROM** £448<sup>inc VAT</sup> **£382** <sup>ex VAT</sup>

### HP OfficeJet 710

The HP OfficeJet 710 makes it easier to do your work and communicate.

ALL-IN-ONE. ALL IN COLOUR

- Highest colour performance in each function
- Print at 600 x 600 dpi in black and 600 x 300 dpi in colour.
- 1200 dpi enhanced scanning
- 5ppm black, 2ppm colour
- Convenient full colour copying

HWP769 HP OfficeJet 710 **FROM** £233<sup>inc VAT</sup> **£199** <sup>ex VAT</sup>

### HP OfficeJet G55

Home and office users who want to print, scan and copy - with great performance.

- Space, time and money savings of an All in One
- Based on the multiple award winning 2400dpi DeskJet 970 printer
- Excellent scan resolution
- Easy to set up and use
- 12 ppm black, 10 ppm colour printing
- 600 x 600 dpi black printing

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### HP OfficeJet G85

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- Space, time and money savings of an All in One
- 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

**FROM**  
**£448<sup>85</sup>**  
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### HP OfficeJet G95

Business users who want a network ready printer, scanner, copier, fax and colour fax with advanced functionality

- Space, time and money savings of an All in One
- Based on the multiple award winning 2400dpi DeskJet 970 printer
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- Easy to set up and use
- Colour faxing
- Convenience of an ADF
- JetDirect included
- Automatic two sided printing

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See page 61 for terms and conditions.

## HP PRINTERS

Colour Laser	EX VAT	INC VAT
HWP513 COLOUR LASERJET 8550DN	£4,767.00	£5,601.23
C7096A COLOUR LASERJET 8550 32MB	£3,300.00	£3,877.50
C7834A Colour Laserjet 8550MFP	£6,863.00	£8,064.03

## DeskJet

HWP356 DESKJET 1120C A3 PARALLEL	£210.00	£246.75
HWP001 HP DESKJET 340 COLOUR	£135.50	£159.21

## LaserJet

HWP534 HP LASERJET 8100 32ppm A3	£1,859.99	£2,185.49
HWP535 HP LASERJET 8100DN 32ppm	£2,300.95	£2,703.62

## OfficeJet

C6694A OFFICEJET T45 8MB 9PPM	£233.00	£273.78
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## HP CONSUMABLES

### Inkjet Supplies

	EX VAT	INC VAT
51625A HP 340/400/5XX COLOR CART	£18.14	£21.31
51629A HP 600 SERIES BLK INK CAR	£17.14	£20.14
51641A 820/870/1150 PRO COLOR IN	£18.14	£21.31
51649A HP 600 SERIES COLOR CART	£18.14	£21.31
C18230 DJ710/720/890C/895cx3COL	£19.14	£22.49
C6578A HP 970CX3 COLOUR INK	£40.14	£47.16
C6578D COLOUR 970CX INK	£20.14	£23.66
C6614D BLACK 28ML DESKJET 610C	£17.14	£20.14
C6615D BLACK INK DJ610/630/840	£17.14	£20.14
C6625A COLOUR INK FOR DJ840C	£18.14	£21.31
HWP060 820/50/70/90 BLK INK 42ML	£17.14	£20.14
HWP136 DJ 690C/695C PHOTO CART	£19.14	£22.49
HWP499 HP 2000C BLACK INK 69ML	£20.14	£23.66
HWP501 HP 2000C YELLOW INK CART	£20.14	£23.66
HWP502 HP 2000C MAGENTA INK CART	£21.14	£24.84
HWP686 DJ 500/400L BLK CART 40ML	£17.14	£20.14

### Laser Supplies

HWP050 HP 5L/6L/3100 TONER CART	£31.14	£36.59
HWP051 HP 5P/MP 6P/MP TONER CART	£50.14	£58.91
HWP547 HP LJ 1000/1100 TONER	£40.14	£47.16
HWP595 HP 2100 ULTRAPRECISE TONE	£51.14	£60.09

### Paper

HWP080 500 SHEETS BRIGHT WHITE A4	£6.99	£8.21
HWP177 PHOTO PAPER A4 20 SHEETS	£5.99	£7.04
HWP692 GLOSSY GREETING CARD 20PK	£5.99	£7.04

## Buy & Try

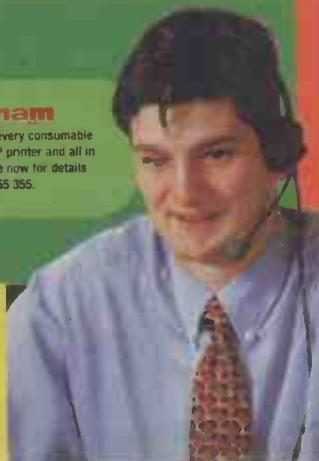
If you are not happy with the DeskJet 350C/CBi within 30 days of purchase it may be sent back to Hewlett Packard for a full refund.

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# PRINTERS

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## EPSON PRINTERS

	EX VAT	INC VAT
<b>Dot Matrix</b>		
EPS023 LX-300 9 PIN 80 COLUMN	£97.15	£114.15
EPS031 LQ300 24 PIN 80 COLUMN	£112.50	£132.19
EPS204 FX-880 9PIN 80 COLUMN	£247.00	£290.23
EPS467 LQ580 24 PIN 80 COLUMN 10	£210.00	£246.75

	EX VAT	INC VAT
<b>Inkjet</b>		
EPS139 EPSON STYLUS 1520 A2	£316.00	£371.30
EPS244 STYLUS COLOUR 850 1440DPI	£115.50	£135.71
EPS246 STYLUS PHOTO EXA3 14400P	£208.00	£244.40
EPS292 STYLUS COLOUR 900 12PPM	£208.00	£244.40
EPS305 STYLUS PHOTO 1200 5ppm A3	£267.00	£313.73
EPS365 STYLUS COLOUR 760	£103.49	£121.60
EPS366 STYLUS COLOUR 460 A4	£57.14	£67.14
EPS367 STYLUS COLOUR 860 USB/PAR	£133.50	£156.86
EPS388 STYLUS COLOUR 1160 A3+ PA	£267.00	£313.73
EPS433 Stylus Photo 870 inkjet p	£173.96	£204.40
EPS434 Stylus Photo 1270 A3+	£297.00	£348.98
EPS446 Stylus Color 670 1440dpi	£73.35	£86.19
EPS468 STYLUS PHOTO 875 INKJET	£238.00	£279.65
EPS483 STYLUS PHOTO 2000P A3 USB	£593.00	£696.78

	EX VAT	INC VAT
<b>LaserJet</b>		
EPS445 EPL 5700L 2MB 1200DPI USB	£169.50	£199.16
EPS462 EPL5800 A4 10ppm USB Lase	£237.00	£278.48

	EX VAT	INC VAT
<b>Multifunction</b>		
EPS366 STYLUS SCAN 2000 USB/PARA	£140.50	£165.09
EPS369 STYLUS SCAN 2500	£223.00	£262.03

## EPSON CONSUMABLES

	EX VAT	INC VAT
<b>Inkjet Supplies</b>		
005011 STYLUS COLOR 900 COL INK	£19.14	£22.49
007401 PHOTO1270/870 BLACK CART	£12.14	£14.26
007402 1270/870 TWIN BLACK INK	£19.14	£22.49
008401 STYLUS 870 COLOUR INK CAR	£9.99	£11.74
009401 EPSON 1270 COLOUR CART	£13.14	£15.44
015401 BLACK INK PHOTO 2000P	£19.14	£22.49
016401 COLOUR INK PHOTO 2000P	£22.14	£26.01
020089 COLOUR INK 4/6/8/850/1520	£13.14	£15.44
020093 STLU 400/500/600/PHOTObk	£12.14	£14.26
020108 STYLUS 800/850/1520 BLACK	£13.14	£15.44
020110 STYL PHOTO 5 COL INK CART	£9.99	£11.74
020138 STYLUS COLOR 300 COL/BLAC	£9.99	£11.74
020187 440/640/750/1200 BLK CART	£12.14	£14.26
020189 STYLUS 740/760/86 BLK INK	£13.14	£15.44
020191 STYLUS 440/640/740 COL IN	£13.14	£15.44
020193 STYLUS PHOTO 750 COL CART	£9.99	£11.74
020208 STYLUS 440/640 BLK INK 2P	£19.14	£22.49
020209 STYLUS 740 INK CART 2PK	£22.14	£26.01
EPS300 BLACK INK CART 900	£15.14	£17.79

	EX VAT	INC VAT
<b>Paper</b>		
EPS051 A4 PHOTO QUAL 100 720dpi	£6.99	£8.21
EPS181 A4 PHOTO Q GLOSS PAP 20SH	£4.99	£5.96
EPS183 PHOTO CARDS 4" x 6" 20 SHTS*	£4.99	£5.96
EPS281 A4 PHOTO PAPER (20 SHTS)	£5.99	£7.04
EPS317 PREMIUM INKJET PAPER 250	£3.99	£4.69

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### EPSON EPSON Stylus Color 480

Easy to Use Colour Inkjet Printer for the Home

- Easy to use panel-free design
- 720dpi 4-colour printing
- Variable Sized Droplet Technology
- Print Speeds of 4ppm black & 2.6 ppm colour
- Photo Enhance 4 for image optimisation
- Parallel interface as standard
- Win 95, 98, 2000 and NT4.0



**ONLY £69<sup>33</sup>** INC VAT  
**£59** EX VAT  
Stock code: EPS489

### EPSON EPSON Stylus Color 670

High quality colour printing for advanced first-time printer buyers

- 1440dpi Super Micro Dot 4-colour printing
- Variable Sized Droplet Technology
- Print Speeds of 5ppm black and 3.8 ppm colour
- Photo Enhance 4 for image optimisation
- Parallel & USB interfaces as standard
- Win 95, 98, 2000, NT 4.0 & Mac drivers



**JUST £86<sup>95</sup>** INC VAT  
**£74** EX VAT  
Stock code: EPS446

### EPSON EPSON Stylus Color 760

Ideal Colour Inkjet Printer for Advanced Home and Business Users

- 1440dpi Micro Piezo Four colour printhead
- Print speeds up to 7ppm mono and 6.8ppm colour
- Parallel, & USB interfaces
- Win 3.1, 95, 98, NT 4.0 & Mac drivers
- 1 year call-out warranty
- EPSON CoverPlus three year extended warranty available



**ONLY £121<sup>03</sup>** INC VAT  
**£103** EX VAT  
Stock code: EPS365

### EPSON EPSON EPL-5800

High Quality 1200dpi, 10ppm, Laser Printer

- Compact 10ppm A4 Laser Printer
- True 1200dpi resolution
- Standard USB and IEEE 1284 parallel interface
- Windows and Macintosh (8.1-) drivers included
- PCL5e/PCL6 emulation (Optional Adobe PostScript level 3)
- 133MHz High Performance RISC Processor
- Standard 16MB memory upgradable to 256MB
- Flexible paper handling with standard 150 sheet Universal Paper
- Optional:- Large Capacity Paper Unit (500Sheet), Adobe, PostScript, 3%, 10/100 Base TX or 10Base2/10BaseT Network Print Server



**FROM £277<sup>30</sup>** INC VAT  
**£236** EX VAT  
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### EPSON EPSON Stylus Photo 870

The ideal product for Photo enthusiasts and Soho users

- 10 years light fastness- with premium Photo Glossy & Matte - Heavyweight Paper
- Edge to Edge Printing
- Print Speeds of 9ppm black and 8.8ppm colour for demanding users
- Ultra Micro Dot - 4pl droplets combined with 6 colour technology for true photographic quality
- Paper Roll holder as standard in the box
- iMac, G3 & G4, PC support straight from the box
- New Stepper Motor for quieter printing



**ONLY £207<sup>98</sup>** INC VAT  
**£177** EX VAT  
Stock code: EPS433

### EPSON EPSON Stylus Color 860

Ideal Colour Inkjet Printer for Business and Home Office User

- Print Speeds of up to 9.5ppm mono & up to 9.2ppm colour
- High Quality 1440dpi 4-colour printouts
- Parallel and USB interfaces as standard
- 1440dpi on plain paper for low cost printing requirements
- 1 year collect, repair, return warranty
- EPSON CoverPlus three year extended warranty available



**JUST £156<sup>28</sup>** INC VAT  
**£133** EX VAT  
Stock code: EPS367

### EPSON EPSON Stylus Color 900

Performance comparable to laser printers but for a fraction of the cost.

- High speed printing - Monochrome 12ppm and 11.5ppm colour
- EPSON Ultra MicroDot™ - at 3 picolitres, the world's smallest ink droplet in black and colour
- 1440dpi print resolution with enhanced EPSON Variable-Sized Droplet Technology (6 variable dot sizes supported)
- High capacity dual ink cartridges for volume printing
- 1440dpi printing on plain paper
- EPSON PhotoEnhance™ for instant Image Enhancement
- Parallel, USB, Mac Serial & optional Interface slot for flexible connectivity
- Standard 100 Base Tx Ethernet connectivity with Stylus Color 900N



**FROM £225<sup>60</sup>** INC VAT  
**£192** EX VAT  
Stock code: EPS292

### EPSON EPSON Stylus Color 1160

A3+ Colour Inkjet Printer for Advanced Business Solutions

- A3+ printing capability
- High quality 1440dpi 4-colour printouts
- Print speeds of up to 9.5ppm mono and up to 9.2ppm colour
- Quiet printing mechanism
- Parallel, USB interfaces
- Easy to driver interface
- Win 3.1, 95, 98, NT 4.0 and Mac drivers
- 1440dpi on plain paper reducing the cost of ownership
- 1 year collect, repair, return warranty
- EPSON CoverPlus three year extended warranty available



**ONLY £312<sup>55</sup>** INC VAT  
**£266** EX VAT  
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### EPSON EPSON Stylus Scan 2000

The Complete Partner for your Computer in the Home or Office

- Print, Copy, Fax\*, Scan to e-Mail\*, Scan to disk from one device
- Convenient space saving design
- 1440dpi, 6pl MicroPiezo™ with variable sized dot
- 'SmartPanel' software suite
- Integrated colour copy capability
- USB and Parallel interfaces
- Windows and Mac compatible
- Interchangeable iMac coloured lid
- 1 year collect, repair, return warranty
- EPSON CoverPlus three year extended warranty available



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### 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

- 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



NEW PRODUCT

BR0139 Brother HL-1030  
incVAT **£186<sup>83</sup>** exVAT **£159**

### 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
- Internet Printing
- Fax modem support
- 64Mb Memory - Upgradeable to 320Mb



NEW PRODUCT

BR0150 Brother HL-3400CN  
incVAT **£2,643<sup>75</sup>** exVAT **£2,250**

### 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 2 Language Emulation
- 167MHz RISC Processor
- 32mb Standard Memory - Upgradeable to 288mb



NEW PRODUCT

BR0140 Brother HL-2400Ce  
incVAT **£1326<sup>88</sup>** exVAT **£1129**

BR0145 Brother HL-2400CeN  
incVAT **£1556<sup>88</sup>** exVAT **£1325**

### 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



NEW PRODUCT

BR0126 Brother HL-1270N  
incVAT **£363<sup>00</sup>** exVAT **£309**

### Brother HL-1660e

High speed that's matched by the highest quality. A laser printer which more than meets the demands for quality and speed in the office.

#### Key Features

- 16 pages per minute
- 1200 x 600 dpi resolution, with microfine toner
- Fast 100mhz RISC Processor
- 8Mb Standard Memory with data compression



BR0130 Brother HL-1660e (16MB)  
incVAT **£645<sup>08</sup>** exVAT **£549**

BR0156 Brother HL-1660eN 100 (16MB)  
incVAT **£880<sup>08</sup>** exVAT **£749**

BR0157 Brother HL-1660eN 100 (40Mb)  
incVAT **£938<sup>83</sup>** exVAT **£799**

### Brother HL-2060

High speed, workgroup printing with outstanding paper management options.

Because the HL-2060 has the ability to offer features such as personal mailboxing, sorting and collation, it can vastly improve office productivity.

#### Key Features

- True 1200 x 1200dpi
- Up to 20 ppm
- Job re-print function
- Multiple paper handling configurations
- 1 year on-site warranty
- Upgradeable to 72Mb Memory



BR0131 Brother HL-2060  
incVAT **£750<sup>83</sup>** exVAT **£639**

## KYOCERA PRINTERS

### FS-680

Ideal personal laser printer and can be easily upgraded for workgroup use

- 8 page per minute print speed
- 600dpi resolution enhanced to 1200dpi (KIR2)
- 150-sheet cassette and manual feed standard paper input
- Flexibility - options include 250 sheet cassette, network options and PostScript Level 2 compatible upgrade
- Twin cassette and network ready models available
- 2 year return to base standard warranty



\*Less than 1p per page

based on 5% coverage at RRP  
KY0113 Kyocera FS-680  
incVAT **£280<sup>83</sup>** exVAT **£239**

### FS-1750/3750 A4 Laser Printers

Ideal for high performance and higher volume network and workgroup printing

- 14 page per minute print speed (FS-1750)
- 18 page per minute print speed (FS-3750)
- True 1200dpi resolution
- PCL 6 and PostScript Level 2 emulations
- 250 sheet cassette and 100 sheet multi-purpose feed standard paper input
- Wide variety of pre-configured models available (twin cassette and network ready models)
- Flexibility through the comprehensive range of paper handling and network options available
- 2 year return to base standard warranty



\*Less than 1p for 3 pages

based on 5% coverage at RRP  
KY0130 Kyocera FS-1750  
incVAT **£703<sup>83</sup>** exVAT **£599**

KY0134 Kyocera FS-3750  
incVAT **£927<sup>08</sup>** exVAT **£789**

## MINOLTA QMS Magicolor<sup>2</sup> A4 Colour Laser

- A4 colour laser
- Up to 2400 x 600 dpi (EX version)
- 16ppm mono, 4-8ppm colour
- Ethernet standard (10 base T)
- Automatic Duplex (optional)
- From 3p per page colour printing



Includes 1 Year on site warranty

QMS009 magicolor<sup>2</sup> desklasers  
incVAT **£1244<sup>32</sup>** exVAT **£1059**

QMS042 magicolor<sup>2</sup> desklasers duplex  
incVAT **£1880<sup>00</sup>** exVAT **£1600**

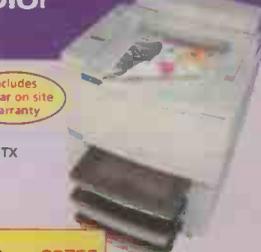
QMS045 magicolor<sup>2</sup> CXE  
incVAT **£1878<sup>83</sup>** exVAT **£1599**

QMS048 magicolor<sup>2</sup> EXD  
incVAT **£3171<sup>33</sup>** exVAT **£2699**

FROM **£1244<sup>32</sup>** exVAT **£1059**  
Stock code QM1009

## MINOLTA QMS Magicolor 6100

- Up to 1200 x 1200 dpi
- Up to 24 ppm
- Prints oversize A3 full bleed
- Up to 1250 paper input
- Ethernet standard 10BaseT/100Base TX
- Up to 384MB RAM
- Automatic duplexing available
- Digital scanning/copying capability



Includes 1 Year on site warranty

QMS049 magicolor6100 N  
incVAT **£3237<sup>13</sup>** exVAT **£2755**

QMS050 magicolor6100 GN  
incVAT **£3561<sup>83</sup>** exVAT **£3031**

QMS051 magicolor6100 EN  
incVAT **£4210<sup>03</sup>** exVAT **£3583**

QMS052 magicolor6100 DP  
incVAT **£5757<sup>00</sup>** exVAT **£4900**

FROM **£3237<sup>13</sup>** exVAT **£2755**  
Stock code QMS049

## BROTHER CONSUMABLES

Inkjet Supplies	EX VAT	INC VAT
BR0061 MC3000 BLACK CARTRIDGE	£13.14	£15.44
BR0062 MC3000 CYAN INK CARTRIDGE	£5.99	£7.04
BR0063 MC3000 YELLOW INK CARTRIDGE	£4.99	£5.86
BR0064 MC3000 MAGENTA INK CARTRIDGE	£5.99	£7.04
BR0101 BLACK INK CART MFC740	£8.99	£10.56
BR0102 CYAN INK CART MFC740	£5.99	£7.04
BR0103 MAGENTA INK CART MFC740	£5.99	£7.04
BR0104 YELLOW INK CART MFC740	£5.99	£7.04
BR0110 BLACK/CYAN CART MP21C	£14.14	£16.61
BR0111 MAGENTA/YELLOW INK MP21C	£14.14	£16.61

Laser Supplies	EX VAT	INC VAT
BR0007 HL-630/660/631 TONER	£17.14	£20.14
BR0010 720-760/800PP/MFC TONER	£13.14	£15.44
BR0011 HL720-760/MFC900 DRUM KIT	£67.14	£78.89
BR0045 HLT060/50/40/820 TONER	£12.14	£14.26
BR0052 HLB20/1020-1070 DRUM UNIT	£64.14	£75.36
BR0074 BLACK TONER HL 2400C	£84.14	£98.86
BR0136 HL-1200 SERIES 3K TONER	£30.14	£35.41
BR0137 HL-1200 SERIES 6K TONER	£42.14	£49.51
BR0138 HLT200 SERIES DRUM UNIT	£76.14	£89.46

## QMS SUPPLIES

Laser Supplies	EX VAT	INC VAT
QMS012 MAGICOLLOUR 2 BLACK TONER	£97.14	£114.14
QMS018 MAGICOLOR 2 YELLOW TONER	£83.14	£97.69
QMS019 MAGICOLOR 2 MAGENTA TONER	£84.14	£98.86
QMS020 MAGICOLOR 2 CYAN TONER	£74.14	£87.11
QMS031 MAGICOLOR 2 DL CYAN TONER	£83.14	£97.69
QMS056 BLACK TONER QMS 6100	£97.14	£114.14

## KYOCERA CONSUMABLES

Laser Supplies	EX VAT	INC VAT
KY0007 1550/1600/34/3600 TONER	£35.14	£41.32
KY0008 FS-400 TONER CARTRIDGE	£12.14	£14.28
KY0035 FS1700/3700 HYIELD TONER	£43.14	£50.73
KY0107 F800 TONER KIT	£20.14	£23.68
KY0122 FS/600/680/800 TONER CART	£26.14	£30.74
KY0149 FS-1200 TONER CARTRIDGE	£38.14	£44.85
KY0155 KYOCERA FS3750 DUPLEX KIT	£346.99	£408.06

Paper	EX VAT	INC VAT
KY0023 FS600/800 ETHERNET OPTION	£105.49	£124.06
KY0138 PAPER FEEDER A5 500SH MIN	£177.49	£208.73
KY0139 SHEET FEEDER A4 500SH UNI	£200.49	£235.78



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## LEXMARK CONSUMABLES

Add-Ons	EX VAT	INC VAT
LEX203 IBM 4224 Printer Ribbon	£10.85	£12.51
<b>Inkjet Supplies</b>		
LEX008 2070 BLACK INK CARTRIDGE	£22.14	£26.01
LEX009 COLOR INK CART 2070	£24.14	£28.36
LEX037 5700/7000/C40/45 BLK INK	£19.14	£22.49
LEX038 3200/5700/7000 COLOUR INK	£22.14	£26.01
LEX039 2030/50/55/3000 PHOTO INK	£23.14	£27.19
LEX040 3200/5700/7000 PHOTO COLO	£24.14	£28.36
LEX048 LEXMARK 1000-3000/WWRITE	£21.14	£24.84
LEX054 1000-3000/WWRITE150c BLK	£19.14	£22.49
LEX093 BLACK INK CARTRIDGE 4079	£12.14	£14.26
LEX094 1020/2030/2050/3000 COLOR	£21.14	£24.84
LEX097 CYAN INK CARTRIDGE 4079	£16.14	£18.96
LEX098 MAGENTA INK CART 4079	£16.14	£18.96
LEX099 YELLOW INK CART 4079	£16.14	£18.96
LEX139 OPTRA COLOR 40/45 BLK INK	£23.14	£27.19
LEX140 OPTRA COL. 40/45 COLOR INK	£26.14	£30.71
LEX144 Z51 COLOUR INK CARTRIDGE	£22.14	£26.01
<b>Laser Supplies</b>		
LEX020 OPTRA S RANGE PREBA 17.6K	£116.49	£136.88
LEX022 OPTRA S RANGE 17.6K CARTR	£140.49	£165.08
LEX032 OPTRA S RANGE 7.5K TONER	£113.49	£133.35
LEX096 OPTRA S 7.5K PREBATE TONE	£97.14	£114.14
LEX148 LEXMARK E310 TONER CART	£61.14	£71.84

## CANON CONSUMABLES

Inkjet Supplies	EX VAT	INC VAT
CAN017 BJ10/20/150/200/200-S0BLK	£13.14	£15.44
CAN024 BJC4000 SERIES BLK CART	£17.14	£20.14
CAN025 BJC150/210/240/250 COLOR	£15.14	£17.79
CAN031 BJC5000 BLACK CARTRIDGE	£18.14	£21.31
CAN032 BJC4000/5000 INK TANK BLK	£4.99	£5.86
CAN033 BJC4000/5000 COLOR CART	£9.99	£11.74
CAN036 BJC-30/50/70/80 BLACK INK	£8.99	£10.56
CAN041 600 RANGE BLACK INK CART	£4.99	£5.86
CAN042 CANON 600 RANGE CYAN CART	£4.99	£5.86
CAN044 BJ 600 RANGE YELLOW CART	£4.99	£5.86
CAN045 BJC 50/70/80 COL TANK 3PK	£11.14	£13.09
CAN050 BJC240/250 PHOTO COL CART	£14.14	£16.61
CAN051 BJC50/70/80 BLK TANK 3PK	£5.99	£7.04
CAN053 BJ-30/50/70/80 BLACK CART	£20.14	£23.66
CAN057 BJC-4220 PHOTO CARTRIDGE	£15.14	£17.79
CAN073 BJC-7000/7100 BLK CART	£19.14	£22.49
CAN087 BJC-4000/5500 COLOR CART	£26.14	£30.71
CAN121 BJC 6000 PHOTO CARTRIDGE	£21.14	£24.84
CAN122 BJC 6000 CYAN INK TANK	£5.99	£7.04
CAN123 BJC 6000 YELLOW INK TANK	£5.99	£7.04
CAN124 BJC 6000 MAGENTA INK TANK	£4.99	£5.86
CAN125 BJC 6000 BLANK INK TANK	£6.99	£8.21
CAN130 PRINT HEAD BJC50/70/80	£22.14	£26.01
<b>Paper</b>		
CAN155 PHOTO GLOSSY A4 20SHEETS	£6.99	£8.21

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DUE TO DAILY FLUCTUATIONS & ONLINE DISCOUNTS.

## 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
- Faithful colour reproduction - in detail and tones
- Mac and PC compatible
- USB and Parallel
- Job finishing features for professional results - duplex, posters, booklets and multi up

LEX190 **Lexmark Z52**  
INC VAT **£128<sup>90</sup>** EX VAT **£109**



NEW PRODUCT

## Lexmark Optra E312

Small Size, Small Price, Big Performance

### Features

- 10ppm Mono Laser Printer
- 67 Mhz Processor with 4Mb Ram
- 6K cartridge with 10K monthly duty cycle
- Small footprint, lightweight & low noise
- USB, PS2 & PCL6 as standard



LEX194 **Lexmark Optra E312**  
INC VAT **£257<sup>33</sup>** EX VAT **£219**

## Lexmark Z11

Redefining the standard!

### Features

- 1200x1200 dpi Photo-Quality
- Up to 4ppm Black 2.5 ppm Colour
- 1 Click Install, intuitive Drivers
- Accufeed paper handling system: No Jams!!
- Includes Disney Print Studio, Toy Story™



LEX142 **Lexmark Z11**  
INC VAT **£63<sup>45</sup>** EX VAT **£54**

## Lexmark Z32

Premium Quality for Photos & Text

### Features

- Photo Quality printing - 1200 x 1200 resolution
- High Speed Printing
- Pigmented black ink for super sharp text
- Easy to use and install
- Mac and PC compatible



LEX202 **Lexmark Z32**  
INC VAT **£86<sup>95</sup>** EX VAT **£71**

## Canon • Canon • Canon • Canon • Canon

## BJC 1000

The Perfect Companion for the Home PC

- Compact Colour Bubble Jet printer
- Image Optimiser technology improves quality of low resolution images
- Fast mono output up to 4.0 pages per minute
- Produces photo-realistic images using optional Photo cartridge
- Banner printing capability
- One Year On-Site Warranty



LOW PRICE  
**£54<sup>05</sup>** INC VAT  
**£46** EX VAT  
Stock code: CAN116

## 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 use!
- Optional IS-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



NEW PRODUCT  
**£76<sup>38</sup>** INC VAT  
**£65** EX VAT  
Stock code: CAN213

## BJC 6200

The Advanced Printer for Business Use

- 10ppm mono and 7ppm colour printing
- Separate ink tanks for all colours
- 1440 dpi resolution
- Six colour photo system
- IS-32 scan cartridge transforms printer into high quality scanner
- Manual feed handles A4 + sheets and media up to 550gsm
- Ink level detection prevents ink running out whilst printing
- Auto head alignment ensures maintenance free operation
- Works with Windows 95/98, NT 4.0, Mac-OS (iMac and G3/G4) and Windows 2000



NEW PRODUCT  
**JUST £141** INC VAT  
**£120** EX VAT  
Stock code: CAN214

## BJC 8200 Photo

The Photo Printer for Imaging Professional

- Microfine Droplet Technology™, advanced software and Professional Photo Paper deliver prints indistinguishable from conventional photographs
- Separate, individually replaceable ink tanks allow cost efficient printing and minimise ink wastage
- Innovative new printhead delivers highspeed 1200dpi output
- 6 colour photo system reduces graininess and provides more natural prints
- Colour Image Scanner Cartridge (optional), transforms printer into a full colour A4 sheet-fed image scanner, saving money and space



NEW PRODUCT  
**£270<sup>25</sup>** INC VAT  
**£230** EX VAT  
Stock code: CAN193

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### HP PhotoSmart P1000 Printer

The ideal printer for home users and digital camera owners

- Direct printing capability from most digital cameras
- Fast downloading of camera memory to PC
- Ultimate photo quality with HP PhotoREt III Precision Technology and alternative 2400 dpi mode
- Up to 11ppm black printing and 8.5ppm colour
- Additional 20-sheet photo paper tray



HP797 HP Photosmart 1000 printer **INC VAT £245.58** **EX VAT £209**

### HP PhotoSmart P1100 Printer

The ultimate printer for all your digital camera and PC printing needs

- Wireless printing from a wide range of digital cameras
- Ultimate photo quality with PhotoRet III Precision Technology
- Two-sided printing
- 12ppm black, 10ppm colour
- Network capable with optional HP Jetdirect print servers



C6744 HP Photosmart 1100 **INC VAT £289.95** **EX VAT £246**

### HP PhotoSmart S20 Photo Scanner

The specialist scanner designed for photography enthusiasts & business users who want to manipulate images from a wide range of media

- Ease of installation through USB interface
- Optical resolutions of 2400 dpi shots & negatives, and 300 dpi prints with up to 36 bit colour depth
- 35mm positive film, mounted slides, mounted negatives, strips of positives
- Photographs up to 13 x 18cm
- Full control of imaging process
- HP S20 scanning software & Microsoft Picture It 99



HVP663 HP Photosmart S20 Scanner **INC VAT £351.33** **EX VAT £299**

### Flash-Media

Code	MB	Product Description	Ex VAT	Inc VAT
MEM036	8MB	SMARTMEDIA	£13.80	£16.22
MEM037	16MB	SMARTMEDIA	£32.20	£37.84
MEM038	32MB	SMARTMEDIA	£49.99	£58.74
MEM039		SMARTMEDIA ADAPTER	£24.84	£29.19
MEM029	8MB	COMPACT FLASH MEMORY	£23.58	£27.70
MEM030	16MB	COMPACT FLASH CARD	£34.50	£40.54
MEM031	24MB	COMPACT FLASH CARD	£48.88	£57.43
MEM032	32MB	COMPACT FLASH CARD	£56.35	£66.21
MEM033	48MB	COMPACT FLASH CARD	£89.70	£105.40
MEM034	64MB	COMPACT FLASH CARD	£110.40	£129.72
MEM035		COMPACT FLASH ADAPTER	£5.99	£7.04
MEM041		COMPACT FLASH READER P/PORT	£34.99	£41.11
MEM042		COMPACT FLASH READER USB	£39.99	£46.99

### Exclusive Kodak Bundle Offer!

The perfect digital picture making kit! Includes Kodak's top-selling DC215 digital camera and their PM100 colour inkjet printer. Ideal for those new to digital photography.

#### Features

- Capture up to 59 images using your Kodak DC215
- Insert memory card into the printer
- Press Print! - No need for a PC
- Crop/Edit and preview your pictures inside the printer
- Optional Zip drive allows for storing even more images



K0070 DC215 + PM100 Bundle **INC VAT £298.45** **EX VAT £254**

### EPSON THE NEW EPSON ULTRA-PORTABLE RANGE

Fully featured multi media projectors designed for the mobile presenter

#### EPSON EMP 710/500

**EMP710**  
**£4531.98** **INC VAT**  
**£3857** **EX VAT**  
Stock code EPS431



#### Features

- Ultra-portable 2.6Kg and only a Super Slim 72mm high for true mobility.
- Ultra modern silver finish.
- High bright 1000 ANSI lumens
- True XGA resolution with Digital Active Resizing (DAR) technology for high quality VGA, SVGA, SXGA and UXGA display.

EMP500

- True SVGA resolution
- 800 ANSI lumens
- Ultra-portable 2.6Kg

EPS429 Epson EMP500 **INC VAT £2643.75** **EX VAT £2250**

EPS430 Epson EMP700 **INC VAT £3960.95** **EX VAT £3371**

### EPSON DESKTOP RANGE

Stunningly bright, versatile range of projectors. Ideal for all boardroom or small auditorium presentations

#### EPSON EMP 5350

**EMP5350**  
**£3812.88** **INC VAT**  
**£3245** **EX VAT**  
Stock code EPS370



#### Features

- 1600 ANSI lumens
- New 150W UHE Lamp to increase brightness
- 6.2kg
- True SVGA resolution
- New digital comb filter to improve video colour processing
- Electronic digital keystone correction (±20°) corrects the angle, aspect ratio and shape of the projected image whilst retaining its quality
- On-screen menu System with 'Help' function for easy set-up

EPS372 Epson EMP7250 **INC VAT £4933.83** **EX VAT £4199**

EPS371 Epson EMP7350 **INC VAT £5873.83** **EX VAT £4999**

### Optoma PORTABLE/DESKTOP RANGE

#### Optoma EzPro610H

**ONLY**  
**£2584** **INC VAT**  
**£2199** **EX VAT**  
Stock code CTX061



#### Features

- Ultra bright 1100 ANSI lumens
- Lightweight and compact at only 4kgs
- True SVGA resolution - 800 x 600 pixels
- Advanced electronic keystone correction function
- Real plug and play with auto image function
- User friendly multi lingual on-screen menu adjustment
- Luxurious carrying case

#### HITACHI CP-S220

**ONLY**  
**£2348.83** **INC VAT**  
**£1999** **EX VAT**  
Stock code HIT060



#### Features

- True SVGA 800 x 600 resolution - using the new sophisticated LSI software to give a perfect picture whatever the source
- 800 ANSI - offering the level of light output you expect from larger projectors
- Ultra portable 2.35kg - weighs less than a portable PC
- Less than 32db, making it ideal for small presentation rooms and offices

- Advanced Features include: zoom lens, digital keystone correction, digital magnification, picture freeze, built-in internal speakers, high quality video, convenient lens cover and remote control.

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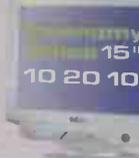
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## MONITORS

	EX VAT	INC VAT
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ADI019 ADI 15" PROVISTA E44 30SW	£97.15	£114.15
ADI023 PROVISTA E55 17" 0.28	£129.50	£152.16
ADI024 MICROSCAN 19" 0.26 G66	£280.00	£329.00
ADI037 MICROSCAN G910 19" HIGH R	£340.00	£399.50
<b>Belinea</b>		
BEL441 15" FST 0.28MM 3YR OSW	£89.15	£104.75
BEL456 15" FST 0.28MM 30-69KHZ	£94.15	£110.63
BEL448 17" FST TCO 95 0.28+	£139.50	£163.91
BEL738 17" FST MPRH 0.28 3YR OS	£128.50	£150.99
BEL741 BELINEA 17" TCO 99 0.26MM	£146.49	£172.13
BEL742 BELINEA 17" FST 0.26DP TCO	£211.00	£247.93
BEL411 19" CRT 1600x1200 0.26MM	£280.00	£329.00
BEL743 19" CRT 1600x1200 0.26MM	£222.00	£260.85
<b>Compaq</b>		
COM258 V500 15" CRT 28 85Hz MPR	£109.50	£128.66
COM533 S510 15" CRT 28 85Hz MPR	£109.50	£128.66
154499 S710/17" FST 28 85Hz 102	£169.50	£199.16
<b>CTX</b>		
CTX064 15" 28MM 1280x1024NI 60HZ	£152.50	£179.19
CTX008 CTX 1769MS 17" MS700	£250.95	£294.87
CTX010 CTX 1769SE 17" VL700	£126.50	£148.64
CTX054 PR711F 17" TRT 24 1200DP	£201.00	£236.18
CTX063 PR960F 19" FD TRT 24 110	£320.99	£377.16
<b>Hansol</b>		
HANO13 710A 0.28MM 1024x768 85Hz	£128.15	£150.58
HANO16 HANSOL 710D 17" DYNAFLAT	£167.45	£196.75
HANO17 HANSOL 710P 17" FST 0.26	£138.45	£162.68
<b>Hewlett Packard</b>		
D2828A HP 52 15" DISPLAY MONITOR	£105.50	£123.96
PAV003 15" M50 MONITOR	£144.33	£169.5
D8901A HP 71 17" COLOUR MONITOR	£165.50	£194.46
PAV004 17" M70 MONITORPAV001	£229.94	£270.18
HWP660 HP 90 19" MONITOR	£330.21	£388.00
<b>Iiyama</b>		
IIV039 VMASTER PRO 410 17" A702HT	£260.00	£305.50
<b>LG Electronics</b>		
LGE025 17" FLATRON 0.24MM PURE F	£200.49	£235.58
LGE030 15.1" TFT LCD SCREEN	£600.00	£705.00
<b>Nokia</b>		
NOK025 4492A 15" FST 0.28 TCO-99	£109.50	£128.66
<b>Philips</b>		
PH021 PHILIPS 104B 14" MONITOR	£79.14	£92.99
<b>Sony</b>		
SON177 15" TRINITRON CRT 110EST	£129.50	£152.16
SON354 G200 17" TRT 24 120HZ TC	£282.00	£331.35
SON356 17" CPD-E200E FD TRINITR	£250.00	£293.75
<b>Video 7</b>		
VID095 15" 0.28MM 1280x1024 70KH	£84.14	£98.86
VID095 17" MONITOR 3YR WARRANTY	£127.50	£149.81
VID096 19" 0.26MM 1600x1200 95KH	£205.99	£242.04

## Belinea Monitors - Now No.1 in the UK



**15"**  
15" FST monitor, ideal for home or general office use.

**10 20 10 Monitor**

**ONLY £104<sup>58</sup> £89** (EX VAT) (INC VAT)

Stock code BEL441

**Features**

- 15" FST monitor
- 1024 x 768 maximum resolution
- 0.26mm dot pitch
- 3 year swap out warranty
- MPR II compliant
- Easy to use on-screen menu



**17"**  
17" FST monitor, an ideal upgrade from a 15" screen.

**10 30 20 Monitor**

**JUST £150<sup>40</sup> £128** (EX VAT) (INC VAT)

Stock code BEL738

**Features**

- 17" FST monitor
- 1280 x 1024 maximum resolution
- 0.27mm dot pitch
- 3 year swap out warranty
- MPR II compliant
- Easy to use on-screen menu



**17"**  
The ultimate 17" FST monitor, for the user who needs image perfection.

**10 30 50 Monitor**

**JUST £246<sup>75</sup> £210** (EX VAT) (INC VAT)

Stock code BEL742

**Features**

- 17" FST monitor
- 1600 x 1200 maximum resolution
- 0.26mm dot pitch
- 3 year swap out warranty
- TCO'99 compliant
- Easy to use on-screen menu



**17"**  
17" FST monitor, perfect for any multimedia application.

**10 30 30 Monitor**

**FROM £189<sup>18</sup> £161** (EX VAT) (INC VAT)

Stock code BEL737

**Features**

- 17" FST monitor
- 1280 x 1024 maximum resolution
- 0.27mm dot pitch
- 3 year swap out warranty
- TCO'99 compliant
- Easy to use on-screen menu
- Belinea sound system including 4W sub-woofer



**19"**  
19" FST monitor, ideal for DTP, CAD or power gaming!

**10 60 30 Monitor**

**FROM £259<sup>68</sup> £221** (EX VAT) (INC VAT)

Stock code BEL743

**Features**

- 19" FST monitor
- 1600 x 1200 maximum resolution
- 0.26mm dot pitch
- 3 year swap out warranty
- TCO'99 compliant
- Easy to use on-screen menu



**18"**  
18" TFT LCD multimedia monitor. 1280 x 1024 resolution

**10 18 10 Monitor**

**FROM £2152<sup>60</sup> £1832** (EX VAT) (INC VAT)

Stock code BEL744

**Features**

- 18" TFT LCD monitor
- 1280 x 1024 resolution
- 300:1 contrast ratio
- 3 year swap out warranty (including backlights)
- TCO'99 compliant
- Automatic set-up
- Built-in stereo speakers, microphone and USB

## ADI Monitors

**ADI ProVista E44/55**

**Features**

- 0.28mm Dot pitch 15"/17" FST CRT's
- Capable of flicker free resolutions of up to 1024 x 768
- Intelligent On Screen Display for Image Control
- Attachable Speaker Option
- 3 Years On Site next day Replacement Warranty

**ADI019 ADI ProVista E44 (17")** INCVAT **£113<sup>00</sup>** EXVAT **£97**

**ADI023 ADI ProVista 55 (17")** INCVAT **£151<sup>00</sup>** EXVAT **£129**

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**MicroScan G700**

**Features**

- 17" High Resolution Multi Scanning Colour Monitor
- 0.24mm AG Pure Flat Trinitron CRT
- 30-86 kHz Horizontal Frequency
- 50-160 Hz Vertical Frequency
- Maximum Resolution 1600 x 1200 Non-interfaced
- Built in Microphone, suitable for UH200C and SP3000 Speakers

**ADI038 ADI MicroScan G700 (17")** INCVAT **£240<sup>88</sup>** EXVAT **£205<sup>00</sup>**

**ADI026 ADI ProVista E66 (19")** INCVAT **£293<sup>74</sup>** EXVAT **£249<sup>99</sup>**

---

**MicroScan G66**

**Features**

- A high quality 19" 0.26mm Short length FST CRT
- Desktop foot print smaller than a 17" monitor
- Full 18" viewable area
- Flicker free resolutions of up to 1600 x 1200
- Intelligent On-Screen display image controls
- Built in Microphone, USB Hub and attachable speaker option
- TCO'99 approval
- 3 years On-Site next day replacement warranty

**ADI024 ADI MicroScan G66 (19")** INCVAT **£327<sup>81</sup>** EXVAT **£278**

## 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

**HANS015 Hansol 500F** INCVAT **£704<sup>84</sup>** EXVAT **£599<sup>00</sup>**

---

**Hansol 710D**

**Features**

- 17" Dynafat (16" visible) CRT
- 100% flat faced CRT screen
- 1600 x 1200 @ 75Hz max resolution
- TCO 99 standard
- 0.25mm dot pitch
- 3-years on site warranty included
- Stop saving Up!

**HANS016 Hansol 710D** INCVAT **£196<sup>17</sup>** EXVAT **£166<sup>00</sup>**

---

**Hansol 710P**

**Features**

- 17" FST screen (16" visible)
- 1600 x 1200 @ 75Hz
- 0.26mm dot pitch
- 5 language OSD
- 3-years on site warranty included

**HANS017 Hansol 710P** INCVAT **£162<sup>09</sup>** EXVAT **£137<sup>00</sup>**

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## HP ScanJet 3300C

The affordable scanner that makes it easy to scan and copy

- Easy set up and fast operation with USB (Win 98 only)
- Quick results with colour copy and scan buttons
- Includes HP ScanJet Copy Utility, Adobe PhotoDeluxe Home Edition, HP PrecisionScan LT
- Scans directly to your favourite application
- 4 easy steps to scanning success with HP PrecisionScan LT
- 4 x 6 colour photo - 90 seconds
- Hardware - 600 x 1200dpi
- Enhanced - 9600dpi
- Scan and copy button
- USB cable included
- USB Only



**ONLY**  
**£74<sup>03</sup>** Inc. VAT  
**£63** Ex. VAT  
Stock code HWP785

## 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 & 98 compatible
- Web Page creation utility
- HP copy utility
- Adobe Activeshare
- USB and Parallel cable included
- 600 x 1200dpi hardware resolution
- 9600dpi enhanced resolution



**ONLY**  
**£64<sup>63</sup>** Inc. VAT  
**£55** Ex. VAT  
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 color
- Parallel & USB interface
- Win 95, 98, & 2000 compatible
- Corel Print House 2000
- Web Page creation utility
- Adobe Activeshare
- HP copy utility
- USB and Parallel cable included



**ONLY**  
**£91<sup>65</sup>** Inc. VAT  
**£78** Ex. VAT  
Stock code C7737A

## 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



**ONLY**  
**£118<sup>67</sup>** Inc. VAT  
**£101** Ex. VAT  
Stock code C7697A

## 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 adapter offers top-quality results, scans multiple 35mm negatives or slides and up to 12.7 x 12.7 cm transparencies



**ONLY**  
**£164<sup>05</sup>** Inc. VAT  
**£140** Ex. VAT  
Stock code C847 A

## HP ScanJet 6300C

The multi-purpose scanner for advanced business needs - with automatic document feeder

- USB or SCSI (optional card), Windows 95/98 and NT
- One button to scan, copy, e-mail fax or file documents
- Up to five pages per minute scanning of multi-page documents with (optional) automatic document feeder
- HP PrecisionScan 2.0, Caere PageKeeper Standard 3.0, Adobe Photo Deluxe Business Edition 1.1, Adobe PageMill
- Hardware - 1200 x 2400dpi
- Enhanced - unlimited dpi
- 35mm slide adaptor included
- USB cable included
- Scan photos in as little as 9 seconds
- Supports Win 95, 98 & NT4 using SCSI interface
- Win 98 only for USB connection



**ONLY**  
**£258<sup>50</sup>** Inc. VAT  
**£220** Ex. VAT  
Stock code HWP786

## Pagis Scanworks & Kai Soap V.1 Bundle



## entrega. technologies inc. Entrega USBHub



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AGF036 SNAPSCAN TOUCH USB A4	£85.15	£100.05
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AGF052 SNAPSCAN E40 1200x2400dpi	£149.50	£175.66
<b>Canon</b>		
CAN177 FB 630P PARALLEL A4 36BIT	£61.15	£71.85
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<b>Epson</b>		
EPS269 GT-7000 COLOR SCANNER SCSI	£147.50	£173.31
EPS378 PERFECTION 1200S 1200x240	£164.50	£193.29
EPS307 GT-7000 USB 600dpi A4	£112.50	£132.19
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EPS380 PERFECTION 1200U A4 USB	£134.50	£158.04
EPS381 PERFECTION 610 A4 USB	£90.15	£105.93
<b>Genius</b>		
GEN093 COLOR PAGE VIVID III PARA	£40.14	£47.16
<b>Hewlett Packard</b>		
C7697A SCANJET 5300C PARALL/USB	£140.50	£165.09
HWP786 SCANJET 6300C USB/SCSI A4	£221.00	£259.68
HWP787 HP SCANJET 6350C USB/SCSI	£274.00	£321.95
HWP792 SCANJET 6390C USB & SCSI	£491.00	£576.93
C7737A SCANJET 4300C PARALLEL/US	£78.15	£91.83
<b>IBM</b>		
IBM179 IDEALSCAN A4 600DPI 36BIT	£65.10	£76.49
<b>Microtek</b>		
SCA025 SCANMAKER X6 SCSI A4	£98.86	£116.16
MCR032 SCANMAKER X6 USB A4	£109.50	£128.66
MCR050 SCANMAKER 3600 600x1200dp	£69.15	£81.25
MCR051 SCANMAKER X12 USL 1200x24	£185.50	£217.96
SCA022 PHANTOM 336CX USB	£63.10	£74.14
MCR048 SCANMAKER V6 USL SCSI+USB	£149.50	£175.66
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<b>Primax</b>		
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UMA076 UMAX 2000P SCANNER	£59.15	£69.50
UMA077 UMAX 2200SU USB INC TRANS	£127.50	£149.81
UMA078 UMAX 4000U USB+ UTA 4000	£300.00	£352.50
UMA082 UMAX ASTRA 2100U 600x1200	£76.15	£89.48

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## Umax Astra & Powewrlook Range

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UMAX Astra 4000U colour scanners from Umax are possibly the easiest scanners you'll ever use.

With Vistascan automated scanner control software just place your image on the scanner and in one simple step it's in your computer and ready to go. High quality is assured with true 36 bit output, with B.E.T technology and all at super quick speed. The UMAX Astra also includes Magic Match, an automatic colour calibration profile and Kodak colour management system for consistent colours from scan, display to print.

### Umax Astra 2100U

The smarter single touch scanner that makes scanning simple.

- Push button scanning
- True 600 x 1200 dpi superior CCD resolution
- 36-bit colour, provides more rich, vibrant colours
- USB interface, supports Windows 95, Windows 98, iMac and Macintosh
- Optional Transparency cover

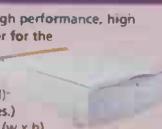


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### Umax Astra 4000U

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- 216 x 356mm scan area (w x h)
- 42 bit with BET
- USB interface
- Optional Transparency Adapter
- Software - Vistascan, MagicMatch, Adobe Photoshop 5.0LE, Pagemanager, Ominpage LE.



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### Umax Astra 2000P

- Parallel scanner
- Single-pass, colour CCD
- True 36-bit, billions of colours
- Optical resolution: 600 x 1,200 dpi
- Maximum resolution: 9,600 x 9,600 dpi
- Scan area up to 8.5" x 11.7" (A4)
- Dimensions: 471 x 312 x 99mm
- 6 m line for Linear/Greyscale



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### Powerlook III Graphic Scanner

The Powerlook III is the compact A4 Multi-format scanner offering high quality print ready scans. The Powerlook III will provide colour rich images with Unmatchable texture and sharpness.



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- With MagicScan, Adobe Photoshop LE v5 & Transparency Adaptor

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- Single-pass, colour CCD
- Optical resolution: 600 x 1200 dpi
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- Scan area up to 8.5" x 11.7"
- 417mm x 312mm x 99mm
- Windows 95, 98, and Mac OS 7.1 & later
- Interface - SCSI and USB connections and cables
- Includes transparency cover (5" x 4") negatives and transparency's
- 3 push button control



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### Umax Astra 2400S

- Single-pass, colour CCD
- 42-bit, billions of colours, using UMAX's unique BET.
- Optical resolution: 600 x 2,400 dpi
- Maximum resolution: 9,600 x 9,600 dpi
- Scan area up to 8.5" x 11.7"
- 13.2in. x 23.3in. x 5.9in.
- Windows 95, 98, NT and Mac OS 7.1 & later
- Optional Automatic document feeder and Transparency Adapter



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## Improve Your Image

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### ScanMaker 3600

- A4 flatbed scanner for reflective media
- 600 x 1200 dpi optical resolution
- 9600 x 9600 dpi interpolated
- 42 bit (d.o.t.) colour depth
- USB interface (iMac & PC)
- Comprehensive software package included
- Complete 'out of box' solution including all cables
- Options: Lightlid 35 (35mm scanning adaptor)



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### ScanMaker X6 Advanced

- A4 flatbed scanner for reflective and transparent media
- 600 x 1200 dpi optical resolution
- 9600 x 9600 dpi interpolated
- 36 bit colour depth
- 'Go' button launches application software
- SCSI interface (Mac & PC)
- Includes TMA (Transparent Media adaptor)
- Complete 'out of box' solution including all cables & SCSI card



SCA044 ScanMaker X6 Advanced INC VAT £175<sup>00</sup> EX VAT £149

### ScanMaker X6

- A4 flatbed scanner for reflective media
- 600 x 1200 dpi optical resolution
- 9600 x 9600 dpi interpolated
- 32 bit colour depth
- 'Go' button launches application software
- SCSI interface (Mac & PC)
- Comprehensive software package included
- Complete 'out of box' solution including all cables & SCSI card



SCA025 ScanMaker X6 INC VAT £116<sup>18</sup> EX VAT £98<sup>00</sup>

### ScanMaker X12 USL

- 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 box' solution including all cables & SCSI card



MCR051 ScanMaker X12 USL INC VAT £217<sup>30</sup> EX VAT £185

### Total Support

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**KEY FEATURES**

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- High quality 600 x 2400 dpi optical resolution with Micro Step Drive (15300 pixel CCD)
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- EPSON start button for easy one touch scanning
- Easy to use Plug & Play USB interface
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### EPSON® Perfection 1200U

High Speed and Quality home and office scanner, 1200 x 2400dpi optical resolution with Micro Step Drive

**KEY FEATURES**

- High Quality 1200 x 2400 dpi optical resolution with EPSON Micro Step Drive
- Maximum interpolated resolution 9600 x 9600dpi
- Twin CCD for improved quality scanning
- 36bit Internal scanning capability
- EPSON start button for easy one touch scanning
- Ultra fast scanning - a leader in it's class
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- Amazing selection of software included
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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
- Three sets of alternative covers and handles in tasty translucent colours blue, graphite and orange



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The new snapscan touch with a revolutionary simple to use push button system for scanning directly into email, fax or printer!

**KEY FEATURES**

- Landscape flatbed scanner
- True optical resolution of 600 ppi x 1200ppi
- Max. 9600 ppi interpolated
- Sample depth: 36 bits per pixel
- Scanning area of 216mm x 297mm (A4)
- 4 buttons: Launch ScanWise and Preview, Scan to Copy, Scan to E-mail, Scan to OCR
- 7 interchangeable colour handles included
- PC (Win 98 only) and Mac OS with USB port



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### Canon FB630P

One of the most compact and lightest scanners in the world

**Key Features**

- Fast, Silent Scanning
- High quality scans at 600dpi
- 36 bit input
- Parallel connection allows simple installation and set up
- FREE Ulead PhotoExpress SE 2.0 software
- FREE Caere OmniPage LE 5.1 OCR software
- Supports Windows 95/98/NT4.0 (2000)



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### Canon FB630U

One of the most compact and lightest scanners in the world

**Key Features**

- High quality scans at 600dpi
- 36 bit colour scanning
- USB interface means there is no need for an AC adapter - the scanner takes its power from the USB port of a PC or iMac.
- FREE Ulead PhotoExpress SE 2.0 software
- FREE Caere OmniPage LE 5.1 OCR software
- FREE Adobe Photo Deluxe 2.0 software
- Supports Windows 98 (2000) and Mac OS 8.5 upwards



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<b>Logitech</b>		
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<b>Memorex</b>		
MEM048 105 KEY KEYBOARD PS2	£6.99	£8.21
<b>Microsoft</b>		
MS1326 MS NATURAL K/B + ECU SYMB	£23.14	£27.19
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MS3337 INTERNET KEYBOARD PS/2	£15.14	£17.79
MS3338 NATURAL KEYBOARD PRO PS/2	£30.14	£35.41
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MIT067 ERGO KEYBOARD 105 AT W95	£5.99	£7.04
MIT073 MITSUMI PS/2 KEYBOARD	£4.99	£5.86
<b>Zye</b>		
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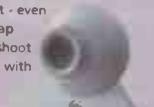


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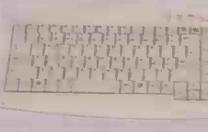
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ZYE028 **Natural Pen**

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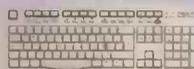
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### Net Board Pro

The NET BOARD PRO combines the power of both Multimedia and Internet functionality to offer the most comprehensive and affordable Windows® '95/'98 compatible keyboard



### Net Board

The NET BOARD is not just another standard Windows® '95/'98 compatible keyboard, but the only keyboard of its class to provide Internet functionality with the addition of 15 Internet function keys.



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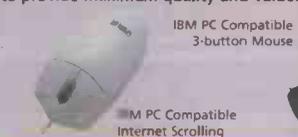
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- Both PC and Macintosh compatible
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MS3615 MS IntelliMouse Optical incVAT £31<sup>00</sup> exVAT £27<sup>10</sup>

### Microsoft® Cordless Wheel Mouse

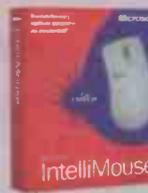
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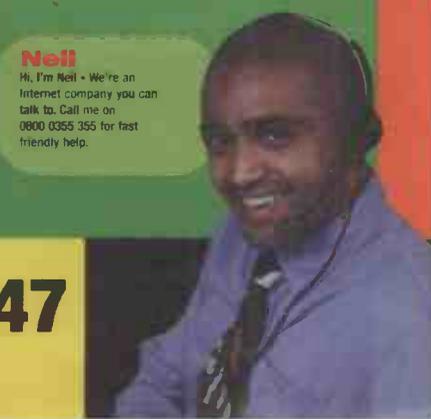
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INT362	P3 800MHZ FCPGA 256K 100MHZ SOCKET	£315.99	£371.29
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INT341	P3 800MHZ SECC2 256K 133MHZ SOCKET	£317.99	£373.64
INT363	P3 800MHZ FCPGA 256K 133MHZ SOCKET	£417.99	£491.14
INT364	P3 850MHZ FCPGA 256K 100MHZ SOCKET	£450.99	£529.91
INT342	P3 850MHZ SECC2 256K 100MHZ SLOT 1	£451.99	£531.09
INT365	P3 866MHZ FCPGA 256K 133MHZ SOCKET	£457.99	£538.14
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EVE384	486/586 242 5Pack	£225.00	£264.38
EVE200	MXPRO 200MHz	£49.00	£57.58
EVE233	SPECTRA 233MHz	£57.00	£66.98
EVE234	SPECTRA 233MHz S PACK	£280.00	£329.00
EVE333	SPECTRA 333MHz	£89.00	£104.58
EVE008	SPECTRA 333MHz S Pack	£435.00	£511.13
EVE400	SPECTRA 400MHz	£123.00	£144.53
EVE405	SPECTRA 400MHz S Pack	£600.00	£705.00
EVE500	PERFORMA 500MHz Slot 1	£169.00	£198.58

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	MS-6340	MS-6330	MS-6191	MS-6195	MS-5189
Chipset	VIA KT-133	VIA KT-133	AMD Irongate	AMD Irongate	Aladdin V
Form Factor	MICRO ATX	ATX	MICRO ATX	ATX	ATX
CPU Socket Type	Socket A	Socket A	Slot-A	Slot-A	Super Socket 7
Bus Speeds (MHz)	133/	133/	100	100	66 & 100
Ultra ATA	100	100	66	66	66
LAN	On Board	On Board	NO	NO	NO
DIMM Slots	2	3	3	2	3
Sound	On Board	On Board	On Board	NO	NO
Max. Memory	1GB	1.5GB	768MB	512GB	768MB
AMR Slot	-	-	-	-	-
ISA / AGP / PCI	0, 1, 3	1, 1, 6	0, 1, 5,	1, 1, 6	3, 1, 4
Price exVAT	£99 exVAT	£99 exVAT	£98 exVAT	£88.99 exVAT	£51.99 exVAT
Price incVAT	£116.33 incVAT	£116.33 incVAT	£115.15 incVAT	£104.52 incVAT	£61.09 incVAT
Code	MCS013	MCS014	MCS012	MCS008	MCS002

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Providing all the speed and reliability needed by high-performance desktop system users, these latest Medalist and Barracuda ATA drives from Seagate offer capacities upto 30GB for mainstream and high performance desktop applications. Efficient and fast, these drives also lead their class in performance and whisper quiet acoustics. The true value of server class storage must be measured in transactions per second or I/Os per second. Seagate is already a proven market leader in this sector having shipped more 10,000RPM drives than all its competitors combined.

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HD E/IDE	SEA290	Medalist 8.4GB ATA66 8.9MS 5400RPM 512KB	ST38410A	£57.99	£68.14
HD E/IDE	SEA316	Medalist 10.2GB UATA66 9MS 5400RPM 512KB	ST310212A	£59.99	£70.49
HD E/IDE	SEA292	Medalist 13GB ATA66 8.9ms 5400RPM 512kb	ST313021A	£61.99	£72.84
HD E/IDE	SEA363	Medalist 15.2GB UATA66 9MS 5400RPM 512KB	ST315323A	£66.99	£78.71
HD E/IDE	SEA289	Medalist 17.2GB UATA66 9MS 5400RPM 512KB	ST317221A	£71.99	£84.59
HD E/IDE	SEA294	Medalist 20GB UATA66 8.9MS 5400RPM 512KB	ST320423A	£77.99	£91.64
HD E/IDE	SEA379	Barracuda 15.3GB ATA66 7200rpm 8.2MS 512Kb	ST315320A	£89.99	£105.74
HD E/IDE	SEA364	Barracuda 20.4GB ATA66 7200RPM 8.2MS 512Kb	ST320420A	£104.99	£123.36
HD E/IDE	SEA365	Barracuda 30.6GB ATA66 7200rpm 8.2ms 512Kb	ST330630A	£129.99	£152.74
HD SCSI ULTRA 50 PIN	SEA307	Barracuda XL 9.2GB 50Pin 5.9ms 2mb 7200RPM 5yrs	ST39216N	£155.99	£183.29
HD SCSI ULTRA 50 PIN	SEA311	Barracuda XL 18.4GB 50Pin 5.9MS 2MB 7200RPM 5Years	ST318416N	£229.99	£270.24
HD SCSI UW/LVD 68 PIN	SEA377	Medalist Pro 9.1GB LVD-68Pin 7200rpm	ST39140LW	£123.99	£145.69
HD SCSI UW/LVD 68 PIN	SEA309	Barracuda XL 9.2GB U160 68PIN 5.9MS 2MB 7200RPM	ST39236LW	£152.99	£179.76
HD SCSI UW/LVD 68 PIN	SEA308	Barracuda XL 9.2GB 68Pin 5.9ms 2mb 7200rpm 5yrs	ST39216W	£155.99	£183.29
HD SCSI UW/LVD 68 PIN	SEA312	Cheetah 18XL 9.2GB U160 68PIN 10000RPM	ST39204LW	£189.99	£223.24
HD SCSI UW/LVD 68 PIN	SEA313	Barracuda XL 18.4GB 68Pin 5.9MS 2MB 7200RPM 5Years	ST318416W	£225.99	£265.54
HD SCSI UW/LVD 68 PIN	SEA314	Barracuda XL 18.4GB U160 68Pin 5.9MS 2MB 7200RPM	ST318436W	£231.99	£272.59
HD SCSI UW/LVD 68 PIN	SEA374	Cheetah 18XL 18GB 68Pin 10k rpm	ST318404LW	£289.99	£340.74
HD SCSI UW/LVD 68 PIN	SEA361	Cheetah 36GB U160 68Pin 5.4MS 10000RPM 4MB	ST336704LW	£449.99	£528.74
HD SCSI UW/LVD 68 PIN	SEA372	Cheetah 72.8GB LVD 68Pin 7.5MS 10000RPM	ST173404LW	£849.99	£998.74
HD SCSI LVD/SCA 80 PIN	SEA227	Medalist Pro 9.1GB LVDSCA 7200rpm	ST39140LC	£152.99	£179.76
HD SCSI LVD/SCA 80 PIN	SEA310	Barracuda XL 9.2GB Ultra160 80PIN 5.9MS 2MB 7200RP	ST39236LC	£159.99	£187.99
HD SCSI LVD/SCA 80 PIN	SEA376	Cheetah 18XL 9.2GB 80Pin	ST39204LC	£178.99	£210.31
HD SCSI LVD/SCA 80 PIN	SEA315	Barracuda XL 18.4GB U160 80PIN 5.9MS 2MB 7200RPM	ST318436LC	£236.99	£278.46
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FUJ142 8.4GB UDMA66 5400RPM 9.5M	£60.14	£70.66
FUJ143 PICOBIRD 14 13 6GB UDMA66	£70.14	£82.41
FUJ145 PICOBIRD 14 20 4GB UDMA66	£85.14	£100.04
FUJ146 PICOBIRD 14 27 3GB UDMA66	£144.49	£169.78
FUJ147 13.6GB UDMA66 2MB 7200RPM	£87.14	£102.39
FUJ148 20.4GB UDMA66 2MB 7200RPM	£117.49	£138.05
FUJ149 27.3GB UDMA66 2MB 7200RPM	£160.49	£188.58
FUJ180 17GB 5400RPM 9.5MS 2MB	£86.14	£101.21
FUJ181 15.3GB 5400RPM 9.5MS 2MB	£77.14	£90.64
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IBM	EX VAT.	INC VAT
IBM500 30GB UDMA66 8.5MS 2MB 720	£174.49	£205.03
IBM501 45GB UDMA66 8.5MS 2MB 720	£240.99	£283.16
IBM502 60GB UDMA66 8.5MS 2MB 720	£321.99	£378.34
IBM503 75GB UDMA66 8.5MS 2MB 720	£400.99	£471.16
IBM535 DESKSTAR 40GV 20.5GB ATA-	£110.49	£129.83
IBM544 DESKSTAR 75 GXP 15GB UDMA	£115.49	£135.70

Quantum	EX VAT.	INC VAT
QUA171 FIREBALL LCT 8.4GB ATA66	£71.14	£83.59
QUA181 LCT10 5.1GB 9.5MS 5400RPM	£58.14	£68.31
QUA182 FIREBALL LCT10 10.2GB 9.5	£66.14	£77.71
QUA183 FIREBALL LCT10 15GB 9.5MS	£84.14	£98.86
QUA184 FIREBALL LCT10 20.4GB 9.5	£89.14	£104.74
QUA185 FIREBALL LCT10 30GB 9.5MS	£136.49	£160.38
QUA186 FIREBALL+ LM 10.2GB 7200R	£82.14	£96.51
QUA187 FIREBALL+ LM 15GB 7200RPM	£100.14	£117.66
QUA188 FIREBALL+ LM 20.5GB 7200R	£114.49	£134.53
QUA189 FIREBALL LM 30GB 7200RPM	£174.49	£205.03

Western Digital	EX VAT.	INC VAT
WES076 WD 6.4GB UDMA66 9.5MS 540	£65.14	£76.54
WES078 WD 10.0GB UDMA66 9.5MS 54	£66.14	£77.71
WES079 WD 20.0GB UDMA66 9.5MS 54	£90.14	£105.91
WES082 WD 27.2GB UDMA66 9.5MS 54	£130.49	£153.33
WES085 WD 10.2GB 10MS RETAIL KIT	£80.14	£94.16
WES087 WD 20GB 5400RPM KIT	£111.13	£130.58
WES089 WD 30.7GB 10MS HARD DRIVE	£135.49	£159.20
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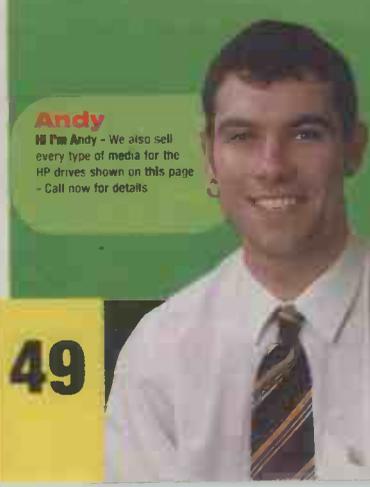
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MAX110	DiamondMax 7200 20.4GB UDMA66 9MS 2MB 7200RPM Kit*	ST1592000U	£104.99	£123.36
MAX130	DiamondMax 7200 30GB UDMA66 9MS 2MB 7200RPM Kit*	ST1593000U	£131.99	£155.09
MAX131	DiamondMax 7200 40.0GB UDMA66 9MS 2MB 7200RPM Kit*	ST1594000U	£168.99	£198.56
*Retail Kits include MaxBlast install SW, mounting kit and instructions for easy upgrades				
MAX155	DiamondMax Plus 40 10.2Gb 7200rpm 2Mb Cache ATA100	51024H2	£70.99	£83.41
MAX152	DiamondMax Plus 40 20.4Gb 7200RPM 9MS 2MB ATA100	52049H4	£105.99	£124.54
MAX153	DiamondMax Plus 40 30.7GB 7200RPM 9.5MS 2Mb ATA100	53073H6	£132.99	£156.26
MAX154	DiamondMax Plus 40 40.9GB 7200RPM 9.5MS 2Mb ATA100	54098H8	£171.99	£202.09
MAX119	DiamondMax VL20 10.2GB UDMA66 9.5ms 512Kb 5400rpm	91021U2	£58.99	£69.31
MAX118	DiamondMax VL20 15.3Gb UDMA66 9.5ms 512kb 5400Rpm	91531U3	£67.99	£79.89
MAX116	DiamondMax VL20 20.4Gb UDMA66 9.5ms 5400rpm 512kb	92041U4	£74.99	£88.11
MAX133	DiamondMax VL30 15.3GB 5400RPM 9.5ms 512Kb UATA66	31536U2	£76.99	£90.46
MAX134	DiamondMax VL30 20.4GB 5400RPM 9.5ms 512Kb UATA66	32049U3	£86.99	£102.21
MAX135	DiamondMax VL30 30.7GB 5400RPM 9.5ms 512Kb UATA66	33073U4	£108.99	£128.06
MAX115	DiamondMax 40 40.9GB UATA66 9ms 5400rpm 2mb	94098U8	£151.99	£178.59
MAX151	DiamondMax 60 40.9Gb UDMA66 5400rpm 2Mb Cache	94098U6	£148.99	£175.06
MAX137	DiamondMax 60 61.4GB 5400RPM 9ms 2MB UATA66	96147U8	£203.99	£239.69

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DEL013 DELTA 48X INT IDE CD ROM	£25.14	£29.54
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MEM049 CD 48X SPEED INT IDE	£30.14	£35.41
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TEA024 40X INTERNAL EIDE BARE CD	£29.14	£34.24
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Adaptec Easy CD Creator	✓	✓		✓	✓	✓
Adaptec Direct CD	✓	✓		✓	✓	✓
HP Fast Format	✓	✓	✓	✓	✓	✓
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Broderbund MM Organiser (Deluxe)		✓	✓		✓	✓
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ACID Music Creation		✓		✓	✓	✓
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- CD-RW

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Code	Description	Inc Vat	Ex Vat
YAM056	8X8X24 SCSI Internal Retail Kit	£199.74	£169.99
YAM057	8X8X24 SCSI Int. Ret. Kit inc 2930C 1 will SCSI Card	£164.49	£139.99
YAM059	8X8X24 SCSI External Retail Kit	£241.49	£209.99
YAM060	8X8X24 SCSI External Retail Kit inc Mac Cable	£258.49	£219.99
YAM061	8X8X24 SCSI External Kit inc Cable & SCSI Card	£275.99	£239.99
YAM055	8X8X24 IDE Internal Retail Kit	£164.49	£139.99

## Ricoh 8x4x24 CD-RW Drives

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RIC043	Ricoh CDR Media 74 Min 10 PK	inc VAT	£7 <sup>04</sup>	ex VAT	£5 <sup>99</sup>
RIC041	Ricoh CD-RW MEDIA 74 Min 4X 5PK	inc VAT	£10 <sup>52</sup>	ex VAT	£8 <sup>95</sup>
RIC042	CD-RW 8x4x32x Internal IDE Retail Kit	inc VAT	£164 <sup>98</sup>	ex VAT	£139 <sup>98</sup>

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PHI040	CD/RW 74 MIN MEDIA 1x-4x	£2.93	£2.49
PHI039	CD/R 74 MIN Audio	£2.34	£1.99

## CD RE-WRITERS IDE

	EX VAT	INC VAT	
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CRE099	CD-RW STUDIO 4424 4X4X24	£115.50	£135.71
<b>Freecom</b>			
FRE063	CD-RW 4X4X32 INT EIDE KIT	£102.12	£119.99
FRE077	8X4X32 IDE INTERNAL RETA	£119.50	£140.41
<b>Hewlett Packard</b>			
C44598	CDRW PLUS 91101 IDE 8x4x3	£139.50	£163.91
C44648	CD-WRITER+ 82501 4X4X24 I	£105.50	£123.96
C4933A	HP 93101 INT CDRW 10X4X32	£148.50	£174.49
<b>LG Electronics</b>			
LGE029	CDRW 8X4X32 IDE RETAIL KI	£129.50	£152.16
<b>Memorex</b>			
MEM057	TRIMAXX 2000 4xCD-RW+DVD	£196.24	£230.58
<b>Mitsumi</b>			
MIT078	CDRW 4X4X24 INT EIDE KIT	£115.49	£135.70
<b>Philips</b>			
PHI093	8X4X32 SPEED CDRW INTERNA	£130.49	£153.33
<b>Plextor</b>			
PLE021	CD R/W INT EIDE 8X4X32	£160.49	£188.58
<b>Ricoh</b>			
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RIC042	8X/4X/32X CD-RW INTERNAL	£140.49	£165.08
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YAM048	CDRW 8X4X24 INT EIDE KIT	£140.49	£165.08
YAM055	CDRW 8X8X24 IDE INT RETAI	£158.16	£185.84

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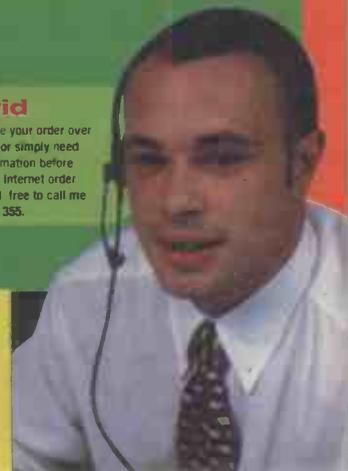
	EX VAT	INC VAT	
<b>Amacom</b>			
AMA069	EZCD R/W 4X4X24 PARALLEL	£194.50	£228.54
<b>Freecom</b>			
FRE044	CD-RW 4X4X20 EXT PAR/SCSI	£256.00	£300.80
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<b>Hewlett Packard</b>			
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<b>Imega</b>			
IOM117	ZIPCD USB Ext 4x4x6 CD-RW	£185.50	£217.96

## CD RE-WRITERS SCSI

	EX VAT	INC VAT	
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<b>Yamaha</b>			
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Get started with a Zip® parallel port PLUS three 100MB Zip® disks



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- Compatible with over 300 million Zip disks sold

**lomega ZipCD CD-RW 8x4x32 Internal Drive**

Introducing the easy to use ZipCD CD-RW 650MB 8x4x32 internal drive

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  - Video conferencing by adding a video camera (included with WinTV CCD Camera Bundle).
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- Graphics Controller: RAGE 128 PRO GL
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- KEY FEATURES**
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  - Memory: 64MB
  - Memory Interface: 128-bit
  - Bus Type: AGP 2X or 4X
  - RAMDAC: 300MHz
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- Environmental game playing
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Introducing the worlds first per pixel shading GPU

**FEATURES**

- New HyperTexel architecture delivers 1.6 gigatexels per second for staggering frame rates and high-performance anti-aliasing
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NEW PRODUCT

CRE103 **3D Blaster GeForce 2 GTS**  
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**FEATURES**

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Speaker 5

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- PCI 2.1
- Support for Win 95, 98, NT4.0 and 2000



CRE097 **3D Blaster TNT2 Vanta PCI**  
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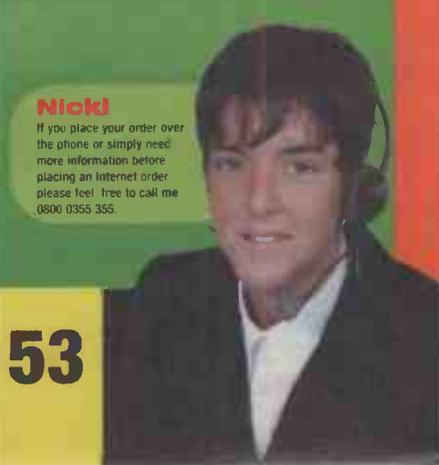
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3CM125 56K PRO MESSAGE V90 EXT	£90.10	£105.87
3CM217 56K VOICEFAX/MODEM PCI INT	£45.10	£52.99
3CM221 SPORTSTER EXT 56K DATAFAX	£56.10	£65.92
3CM228 MESSAGE + MODEM V90 56 EXT	£80.14	£94.16
USR051 56K V90 VOICE/FX INT ISA	£63.14	£74.19
<b>Creative</b>		
CRE091 MODEMLASTER 56K V90 EXT	£45.15	£53.05
<b>Diamond</b>		
DIAD62 SUPRAEXPRESS 56E PRO V90	£50.10	£58.87
DIAD63 SUPRAEXPRESS 56I PRO BARE	£30.10	£35.37
DIAD81 SUPRAEXPRESS 56I PRO PCI	£40.14	£47.16
<b>Dynanet</b>		
DYN036 56K PCI MODEM LUCENT	£18.99	£22.31
DYN038 DYNANET 56K EXT MODEM	£39.10	£45.94
DYN039 56K INT PCI V90 ROCKWELL	£25.10	£29.49
DYN043 EXT USB 56K MODEM	£40.14	£47.16
<b>Elsa</b>		
ELS016 MICROLINK 56 EXT INTERNET	£39.89	£46.87
<b>Euro Serv</b>		
EUR137 V90 ROCKWELL PCI FDV	£19.10	£22.44
EUR143 V90 ROCKWELL SOFT FAX/DA	£14.27	£16.77
<b>Modulartec</b>		
MOD010 MT 56K EXT V90 MODEM	£34.44	£40.47
MOD011 MT 56K INT PCI V90 MODEM	£22.14	£26.01
<b>Olitec</b>		
OLI027 OLITEC Self Mem 2000 4Mb	£50.10	£58.87
<b>Tahiska</b>		
TAS025 TASHIKA 56K Flex External	£39.15	£46.00
TAS342 TASHIKA 56K PCI INT/MODEM	£21.99	£25.84

## ISDN CARDS

	EX VAT	INC VAT
<b>BT</b>		
BT0014 BT SPEEDWAY ISDN EXTERNAL	£80.10	£94.12
BT0015 BT SPEEDWAY ISDN PCI	£40.10	£47.12
BT0016 BT EXPRESSLANE 128 TA PCI	£40.10	£47.12
<b>Dynanet</b>		
DYN041 ISDN INTERNAL PCI CARD +	£22.14	£26.01
<b>Eicon</b>		
EIC007 DVA TA ISDN MODEM EXTERN	£147.49	£173.30
<b>Elsa</b>		
ELS023 MICROLINK ISDN USB EXT	£66.97	£78.69
<b>Euro Serv</b>		
BIL001 USB ISDN EXTERNAL TA WITH	£50.10	£58.87
ISDN01 BILLION PCI ISDN TA	£25.10	£29.49
<b>Hayes</b>		
HAY034 ACCURA ISDN TA HOME HIGH	£170.49	£200.33

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DUE TO DAILY FLUCTUATIONS & ONLINE DISCOUNTS.

## Universal Self Memory Pro

### Key Features

- 56K, V.90 modem compatible with PC and Mac
- USB & Serial ports give even greater flexibility
- Works independently of the PC as a modem, fax, answerphone via a single telephone line!
- Automatically retrieves emails according to a pre-set schedule, which can be read on the LCD display
- 4MB flash memory can save up to 20 minutes of voice messages, 100 faxes and emails and also protects memory if a power cut occurs



ONLY  
**£81<sup>25</sup>** INC VAT  
**£69<sup>15</sup>** EX VAT  
Stock code OLI029

## WaveMemory

All the functions of Olitec Memory Modems but with cordless capabilities!

### Key Features

- Connect base station to telephone line and up to 7 additional PCs can connect to the Internet without the need for extra wires (up to 200 metres)
- Based on Interference-free DECT technology



COMPLETE KIT  
**£147<sup>40</sup>** INC VAT  
**£125<sup>45</sup>** EX VAT  
Stock code OLI026

## Connectivity - fast and simple

Gold Port range is perfect for today's market where the average computer user has more complex set of requirements. A notebook user will need access to the same peripherals in many different locations, for example at home or in the office. The Gold Port range of USB Plug & Play products provide cross platform solutions, hot swappability and ultimate flexibility.

## Gold Port USB Range Gold Port Hub

### KEY FEATURES

- This Hub is the heart of any USB purchase. Connect multiple devices easily and simply
- Expansion opportunities for 'power' users needing to connect many devices, for example mouse, screen, printer, keyboard, modem, digital camera, scanner etc



PSH27 Gold Port Hub INC VAT **£55<sup>39</sup>** EX VAT **£47<sup>14</sup>**

## Gold Port ISDN

### KEY FEATURES

- The Gold Port ISDN terminal adapter is the ideal product for users who require access to higher speeds that the digital network offers
- Connection speeds of up to 128Kbits and supports all major ISDN protocols



PSH28 Gold Port ISDN INC VAT **£105<sup>91</sup>** EX VAT **£90<sup>14</sup>**

## Gold Port Ethernet

### KEY FEATURES

- The Gold Port Ethernet Terminal Adapter gives a user the ability to network computers and peripherals quickly and simply with little networking experience
- Launched in 10Mb initially with 100Mb capabilities to be added as USB technology evolves

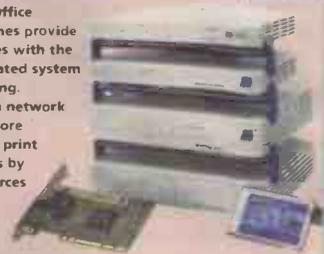


PSH29 Gold Port Ethernet INC VAT **£55<sup>39</sup>** EX VAT **£47<sup>14</sup>**

2 year warranty - Lifetime support is available via online registration at [www.pSIONconnect.com](http://www.pSIONconnect.com)

## Office Connect Hubs & Switches

Specifically designed for small businesses and offices, Office Connect hubs and switches provide cost-conscious businesses with the foundation of an integrated system of small-office networking. By installing a local area network (LAN), users can work more effectively with file and print sharing and reduce costs by sharing expensive resources such as printers.



### KEY FEATURES

- Easy to install and use. Offers plug-and-play simplicity. All hubs ship with OfficeConnect Network Assistant CD-ROM.
- Simple troubleshooting. Diagnostic and Alert LEDs on the front panel and OfficeConnect Network Assistant CD-ROM provide excellent support.
- Compact design. Unique form factor and small size saves valuable space in small offices.
- Lifetime limited warranty. Guarantees OfficeConnect hubs and switches, including the power adapter, for life.

FROM  
**£37<sup>72</sup>** INC VAT  
**£32<sup>10</sup>** EX VAT  
Stock code KXX

CODE	DESCRIPTION	EX. VAT	INC. VAT
3CM103	OC Hub TP4 - 3C16708A	£32.10	£37.72
3CM048	OC Hub TP8 - 3C16709	£31.14	£62.44
3CM149	OC Dual Speed Hub 8 - 3C16750B	£193.37	£227.21
3CM205	OC Dual Speed Hub 16 - 3C16751B	£154.91	£182.02
3CM290	OC Dual Speed Switch 8 - 3C16734B	£136.99	£160.96
3CM291	OC Dual Speed Switch 16 - 3C16735B	£258.99	£304.31
3CM111	OC ISDN LAN Modem - 3CB91A	£260.00	£305.50
3CM260	OC Internet Firewall 25 3C16770	£400.00	£470.00

## SMC8034TX-56K Multifunction PC Card

SMC NETWORKING MADE EASY  
The new Fax/Modem card is the perfect solution for your LAN/WAN applications in one PC card. This card allows trouble-free access to the internet and intranet providing two detachable interface connectors for real convenience of two cards in one!

### FEATURES

- 10Mbps or 10Mbps data rate (Ethernet)
- auto-negotiation
- V.90 or K56Flex mode (Modem) auto-sensing
- Dongle-less - No more broken or misplaced dongles
- Hot swappable and Full Duplex
- Menu-driven installation utility and LAN diagnostics program included
- Drivers for most popular Operating systems including:- Win 2000,98,95, NT,4.X/3.X
- Limited Lifetime Warranty



SMC058 SMC8034TX-56K Multifunction PC Card INC VAT **£105<sup>75</sup>** EX VAT **£90<sup>14</sup>**

## SMC1211TX/WL

SMC's 10/100 PCI Network Card is among the most affordable Fast Ethernet cards on the market today.

### FEATURES

- Interfaces to 32-bit PCI bus maximise throughput
- Bus-master operation reduces CPU utilisation
- Supports full-duplex operation at both line speeds
- Supports remote LAN wakeup
- Auto-negotiation
- Single RJ-45 connector for operation at either 10Mbps or 100Mbps
- Limited Lifetime Warranty
- Free pre and post purchase technical support



SMC023 SMC1211TX/WL INC VAT **£17<sup>75</sup>** EX VAT **£15<sup>14</sup>**

Code	Description	Ex Vat	Inc Vat
<b>10/100 Adapter Cards</b>			
SMC023	SMC1211TX/WL-EZ Card 10BASE-T/100-BASE-TX RJ-45	£15.14	£17.79
SMC022	SMC1211BTX/WL- PCI 10/100 RJ-45 with BNC	£33.14	£38.94
<b>10/100 Dual-Speed Hubs</b>			
SMC028	SMCS602S - EZ Hub - 4 port Dual Speed	£53.14	£62.44
SMC029	SMCS608S - EZ Hub - 8 port Dual Speed	£101.49	£119.25
SMC030	SMCS612DS - EZ Hub - 12 port Dual Speed	£231.99	£272.59
SMC055	SMCS616DS - EZ Hub - 16 port Dual Speed	£220.99	£269.66
SMC032	SMCS624DS - EZ Hub - 24 port Dual Speed	£350.99	£412.41
SMC056	SMCS208DS - EZ Stack - 8 port Dual Speed Stackable	£140.49	£165.08
SMC057	SMCS216DS - EZ Stack - 16 port Dual Speed Stackable	£350.99	£412.41
<b>10/100 Fast Ethernet Switches</b>			
SMC035	SMCE2108DT - EZ Switch 10/100 - 8 port Switch	£110.99	£129.83
SMC033	SMCE21016DT - EZ Switch 10/100 - 16 port Switch	£230.99	£271.41
SMC034	SMCE21024DT - EZ Switch 10/100 - 24 port Switch	£360.99	£424.16

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## TECHWORKS

TechWorks (UK) Ltd is part of Melco Inc., its global, leading manufacturer of PC Components and peripherals. TechWorks markets a full range of memory upgrades, networking products and multimedia products. Buffalo is a registered trademark of Melco Inc.

## BUFFALO

### 8 & 16 Port Switches

Forget the Hub. SWITCH to the future.

Making no compromises on specification, the award winning Buffalo range of switches bring ultimate network performance at a competitive price.

- FEATURES**
- Uses the Broadcom BCM5308 Controller chip
  - 16 Port 2MB SDRAM, 8 Port 512KB SDRAM
  - Up to 4.2Gb Backplane for optimum data performance
  - Up to 32,768 Self-Learning Mac Address Table
  - Optional user configuration available using DIP switches
  - Fully 10Base-T (802.3) and 100Base-TX (802.3u) compliant
  - Internal world-wide auto-switching power supply
  - 25 year warranty



TECO13	8 Port Switch LSW10/100-8H	INC VAT	£152 <sup>16</sup>	EX VAT	£129 <sup>00</sup>
TECO20	16 Port Switch LSW10/100-16H	INC VAT	£232 <sup>00</sup>	EX VAT	£197 <sup>50</sup>

### PCMCIA NIC

Designed to work with any network the PCMCIA NIC is ideal for the mobile user. It's fully hot swappable providing complete freedom to the user.

- FEATURES**
- Type II credit-card size (5.0 mm)
  - Complies with IEEE 802.3u (10Base-TX) and 802.3 (10Base-T) protocols.
  - 3 LED's indicate Link, 10/100 and Active
  - Supports 10/100 Mbps Full/Half Duplex
  - Supports hot swap card insertion and removal
  - Up to 200 Mbps data throughput
  - Supports 10/100 Auto Negotiation
  - Supports all major operating systems
  - 75 year warranty



TECO16	PCMCIA NIC LPC3-TX	INC VAT	£46	EX VAT	£39 <sup>15</sup>
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### 8 & 16 Port Smart Hub

Compact and easy to use, the Buffalo range of Smart Hubs, enable you to set up your network quickly.

- FEATURES**
- 8 port has 8 x 10Base-T connectors
  - 16 port has 16 x 10Base-T and 1 x BNC connectors
- BOTH HUBS**
- Supports category 3 or higher twisted pair cable
  - Uplink connector for further network expansion
  - Port partitioning to isolate network failure
  - Compact design
  - 25 year warranty

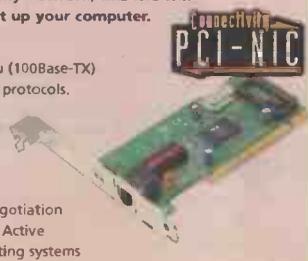


TECO14	8 Port Smart Hub LGH-MBL	INC VAT	£37 <sup>75</sup>	EX VAT	£32 <sup>10</sup>
TECO15	16 Port Smart Hub LGH-M16L	INC VAT	£61 <sup>75</sup>	EX VAT	£52 <sup>15</sup>

### PCI NIC

Designed to work with any network, this NIC will enable you to quickly set up your computer.

- FEATURES**
- Complies with IEEE802.3u (100Base-TX) and IEEE802.3 (10Base-T) protocols.
  - One RJ-45 connector
  - Supports 10/100 Full/Half Duplex
  - Up to 200 Mbps data throughput
  - Supports 10/100 Auto-Negotiation
  - 2 LED's indicate Link and Active
  - Supports all major operating systems
  - 75 year warranty



TECO18	PCI 10/100 NIC LCV-PCI-TXL	INC VAT	£20 <sup>14</sup>	EX VAT	£17 <sup>64</sup>
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### The Belkin BusStation™

- Features**
- 7 Port standard modular configuration
  - M4 Port base with three removable modules each having one USB port.
  - Customizable. Add and subtract components from a complete selection of modules
  - Works with the complete Belkin selection of modules that cover virtually every possible configuration
  - Compatible with Windows 95® rev. B, Windows 98®, Windows 2000® & Mac OS 8.1® or higher.

- Includes 4.0 Amp power supply to provide true 500ma per-port downstream current
- Per-port over current protection prevents damage to your computer and device
- Fully compliant with current USB specifications
- LEDs indicate power and port status
- Supports all high-speed & low speed USB devices
- Lifetime Warranty



BEL720	BusStation 7 port	INC VAT	£74 <sup>14</sup>	EX VAT	£63 <sup>10</sup>
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### USB DockStation™

- Features**
- Multifunction USB Hub. Connect up to 8 peripherals
  - Printer port supports virtually all standard and IEEE 1284 parallel printers
  - Connect two PS/2 keyboards or mice
  - Four USB ports for connection to any USB device
  - Serial port supports digital cameras, modems, PDAs, scanners, graphic tablets and all other serial devices



BEL760	USB DockStation™	INC VAT	£104 <sup>75</sup>	EX VAT	£89 <sup>10</sup>
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### PC USB Parallel Printer Adapter

- Connect your parallel printer to your computer's USB port
- Print faster
- Plug-and-Play
- Supports virtually any standard or IEEE 1284 parallel printer
- Compatible with Windows 95® rev. B, Windows® 98 and Windows® 2000



BEL294	USB Parallel Printer Adaptor	INC VAT	£35 <sup>37</sup>	EX VAT	£30 <sup>10</sup>
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### 4-Port USB Hub PC and MAC



- Features**
- Connect up to 4 USB devices to a single USB port on your computer
  - Plug-and-Play installation
  - Includes a power supply to provide true 500mA per-port downstream current
  - Supports all high-speed and low-speed USB devices
  - Lights in front indicate power and port activity
  - Includes a 1.8m Belkin Pro Series USB Cable

Colored Sleeves provided with 4 Port Hub for Macintosh®

BEL724	4-Port USB Hub	INC VAT	£44 <sup>70</sup>	EX VAT	£38 <sup>10</sup>
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### USB BusPort™ Mobile

- Features**
- Add USB capabilities to your Notebook PC or Apple PowerBook® quickly and easily
  - Instant connect USB devices such as USB printers, modems, speakers, scanners and hundreds of other devices
  - Provide 2 USB Type A ports
  - Easy drop-in and user friendly Plug-and-Play installation

The BusPort™ Mobile provides two 1284 USB ports.



BEL772	USB BusPort™ Mobile	INC VAT	£69 <sup>95</sup>	EX VAT	£59 <sup>63</sup>
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### PC USB Serial Adapter

- Features**
- Works with digital cameras, modems, PDAs & handheld PCs, scanners, printer, graphics tablets and all other standard serial devices
  - Requires no IRQs or other system resources
  - Supports both hardware and software serial handshaking
  - Supports serial communications up to 230kbps
  - Compatible with Windows® 95 Rev. B and Windows® 98



This is a perfect solution for anyone who needs to setup an Ethernet network quickly and easily.

BEL726	PC USB Serial Adaptor	INC VAT	£58 <sup>67</sup>	EX VAT	£50 <sup>10</sup>
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### ETHERNET CARDS

	EX VAT	INC VAT
<b>3Com</b>		
3CM139 E'LINKII 3C900B PCI RJ45	£35.14	£41.29
<b>Dlink</b>		
DLK056 PCI 10BASE RJ45/BNC NIC	£13.14	£15.44
<b>Dynanet</b>		
DYN003 32BIT PCI ETHERNET RJ45	£6.99	£8.21
DYN004 32BIT PCI ET/NET BNC/RJ45	£7.99	£9.39
<b>Mayflex</b>		
PLA020 PCI BNC/RJ45 NETWORK CARD	£9.99	£11.74

### ETHERNET HUBS

	EX VAT	INC VAT
<b>3Com</b>		
3CM048 OFF/CONNECT HUB 8PRT 10BT	£53.14	£62.44
3CM103 OFFICECONNECT HUB 4PT 10B	£32.10	£37.72
<b>Dlink</b>		
DLK011 DLINK 5 PORT 10BASET HUB	£22.14	£26.01
<b>Dynanet</b>		
DYN009 8 PORT STACK RJ45/BNC/AUI	£21.14	£24.84
<b>Mayflex</b>		
PLA014 8 PORT 10 BASE T HUB	£33.14	£38.94
<b>Techworks</b>		
TECO14 8 PORT SMART HUB 10BASET	£32.15	£37.78
TECO15 16 PORT SMART HUB 10BASET	£52.15	£61.28

### FAST ETHERNET CARDS

	EX VAT	INC VAT
<b>3Com</b>		
3CM226 FAST ELINKXL PCI 10/100TX	£53.14	£62.44
<b>Accton</b>		
ACC033 FAST E/NET PCI100BASET/TX	£12.14	£14.26
<b>Dlink</b>		
DLK056 10/100 NIC RJ45 PCI	£16.14	£18.96
<b>Dynanet</b>		
DYN005 10/100TX PCI RJ45 NETWORK	£9.99	£11.74
<b>Tashika</b>		
TAS036 TASHIKA 10/100Mbps PCI RJ45	£12.14	£14.26
<b>Techworks</b>		
TECO18 PCI 10/100 NETWORK CARD	£17.14	£20.14

### FAST ETHERNET HUBS

	EX VAT	INC VAT
<b>3Com</b>		
3CM087 4-PORT 100BASE-TX	£70.14	£82.41
3CM114 SS II 3300 24 PORT SWITCH	£1,051.99	£1,236.09
3CM129 SSII 24PORT SWITCH 10/100	£667.00	£771.98
3CM149 8 PORT 10/100 AUTO HUB	£142.49	£167.43
3CM231 SSII SWITCH 100BASE FX MO	£271.99	£319.59
<b>Nortel</b>		
NOR056 NETGEAR HUB 10/100 8 PORT	£90.14	£105.91
<b>SMC</b>		
SMC028 4 PORT 10/100BASETX	£58.14	£68.31

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BusStation™**



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**£13<sup>14</sup>**  
ex. VAT



**USB Mouse**



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inc. VAT  
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Serial adapter code

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## NEW The Regulator™ Pro Series NEW

### LINE INTERACTIVE UNINTERRUPTABLE POWER SUPPLIES

The Regulator Pro Gold Series UPS with Automatic Voltage Regulation provides surge protection and battery support to your electronic sensitive devices. The Regulator Pro UPS monitors the input power and the AVR regulates any voltage or frequency variations to maintain a clean and consistent power output. Should there be a total loss of power, the line interactive UPS will support your PC for up to 41 minutes, and gracefully shut down all your applications before powering down your PC.

### DATA RECOVERY WARRANTY

Your computers hard drive is vulnerable to damaging effects caused by power failures. Belkin protects against this threat of lost data by providing professional data recovery services at absolutely **NO COST**.

### KEY FEATURES

- Automatic Voltage Regulation (AVR)
- Data Recovery Warranty
- Connected recovery Warranty up to £60,000
- 4 Full Time Surge Protected Outlets
- 4 Full Time Back-up and Surge Protected Outlets

- Telephone/Fax/Modem/Network Surge Protection
- Hot Swappable User Replacable Batteries
- Intelligent Sentry Bulldog Shutdown Management Software for Windows® 98, Windows® NT V4 or higher and Windows® 2000

CODE	DESCRIPTION	EX. VAT
BEL761	REGULATOR PRO GOLD SERIES 325VA WITH AVR, CEW £30,000	£65.15
BEL762	REGULATOR PRO GOLD SERIES 425VA WITH AVR, CEW £40,000	£80.15
BEL763	REGULATOR PRO GOLD SERIES 525VA WITH AVR, CEW £50,000	£95.15
BEL764	REGULATOR PRO GOLD SERIES 625VA WITH AVR, CEW £60,000	£110.50



## AVR TECHNOLOGY UPS BATTERY BACK-UP



Cable management

## IEEE 1284 Parallel Printer Cables



Printer Manufacturers recommend using a IEEE 1284 Printer Cable with their printers, Belkin's LifeTime Warranty ensures that your purchase will stay with you for ever - without faults - GUARANTEED!

BEL125	1.8 metre Gold Series	£17 <sup>99</sup>	£15 <sup>14</sup>
BEL126	3.0 metre Gold Series	£20 <sup>14</sup>	£17 <sup>14</sup>
BEL025	1.8 metre Pro Series	£9 <sup>99</sup>	£8 <sup>99</sup>
BEL026	3.0 metre Pro Series	£17 <sup>99</sup>	£15 <sup>14</sup>

## Serial / Connection Cables



Belkin's LifeTime Warranty ensures that your purchase will stay with you for ever - without faults - GUARANTEED! So when you need a Serial / Connection Cable insist on Belkin from Software Warehouse - Call for more details on the full range of Belkin Cables.

BEL030	LapLink Hydra Serial 3.0m	£17 <sup>99</sup>	£15 <sup>14</sup>
BEL028	DirectConnect Parallel 3.0m	£15 <sup>14</sup>	£13 <sup>14</sup>
BEL031	Serial Printer DB25 M/F 3.0m	£11 <sup>14</sup>	£9 <sup>99</sup>
BEL032	Serial Printer 3.0m DB25M/9F	£11 <sup>14</sup>	£9 <sup>99</sup>

## Network Cables

Colour Cables:- Category 5 UTP	90cm cables	3 Metre Snagless cables	5 Metre cables	15 Metre cables
Orange	BEL318	BEL110	BEL246	BEL322
Grey	BEL361	BEL113	BEL112	BEL321
Blue	BEL356	BEL116	BEL363	BEL310
White	BEL364	BEL119	BEL303	BEL271
Red	BEL395	BEL309	BEL362	BEL407
Price inc VAT	£2.50 £2.94	£3.50 £4.11	£4.50 £5.29	£12.95 £15.22

All Belkin Category 5 Network Cables come with a lifetime replacement guarantee.

## Bitronics Data Switch Kit

Allows any Parallel Port to share either 2 or 4 Parallel Devices at the same time - or 2 or 4 PC's to share one Parallel Port Device. Full bi-directionality ensures that information is passed complete between PC and connected devices.

### Features

- Works with HP PhotoSmart Photo Printers, Deskjets, Laserjets, and any other Parallel Devices
- Includes One IEEE 1284 Cable for Connection to computer

BEL183	Manual Bitronics Switch Kit	£36 <sup>99</sup>	£31 <sup>14</sup>
BEL287	2 Port Reversible Autoswitch	£42 <sup>99</sup>	£36 <sup>14</sup>
BEL314	4 Port Reversible Autoswitch	£74 <sup>99</sup>	£63 <sup>14</sup>

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SurgeMaster™ 8 WAY F8C208U4-tel3  
£30,000 WARRANTY!!!  
£38.29 ex. VAT £49.99 Inc VAT

### SUPERIOR GRADE £20,000 !!! EQUIPMENT WARRANTY

SurgeMaster™ 5 WAY  
Under Monitor F5C100U  
£20,000 WARRANTY!!!  
£42.50 ex. VAT £49.99 Inc VAT

### HOME OFFICE GRADE £3,000 TO £10,000 EQUIPMENT WARRANTY

SurgeMaster™ 5 WAY F5C205U2  
£10,000 WARRANTY  
£21.27 ex. VAT £24.99 Inc VAT  
720 Joule Energy rating

Stock Code	Description	Grade	Protection	Warranty	Ex.VAT	Inc.VAT
BEL709	1 way Surgmaster	Home Office	Socket/Tel/Fax	£6,000	£11.20	£13.16
BEL710	4 way Surgmaster	Home Office	Socket	£3,000	£14.60	£17.16
BEL711	5 way Surgmaster	Home Office	Socket/Tel/Fax	£10,000	£25.65	£30.14
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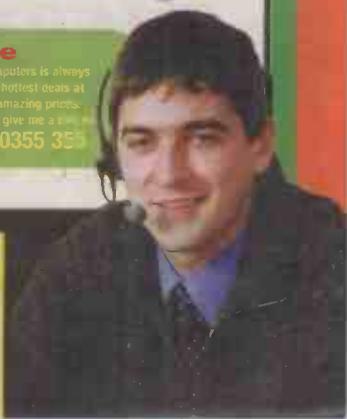
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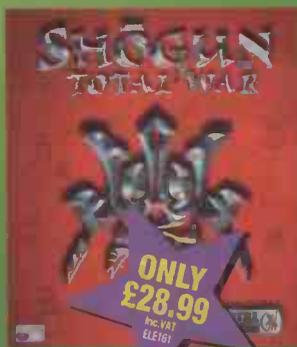
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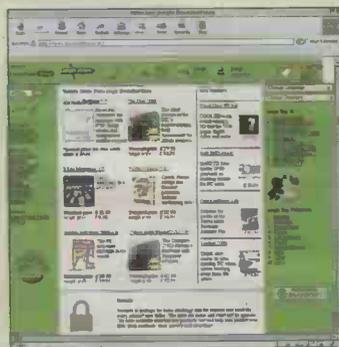
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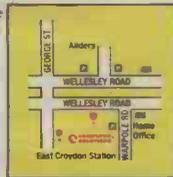
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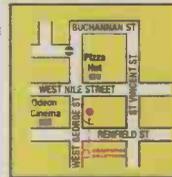
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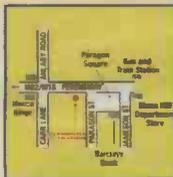
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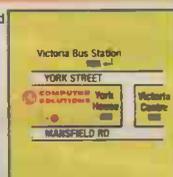
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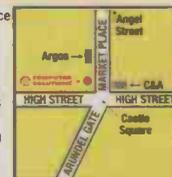
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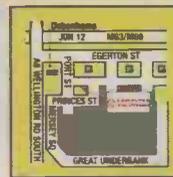
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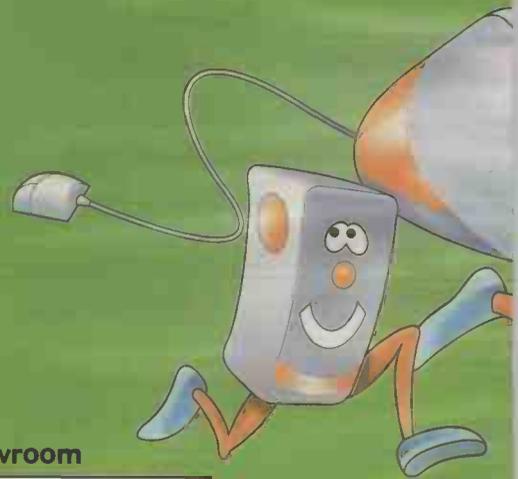
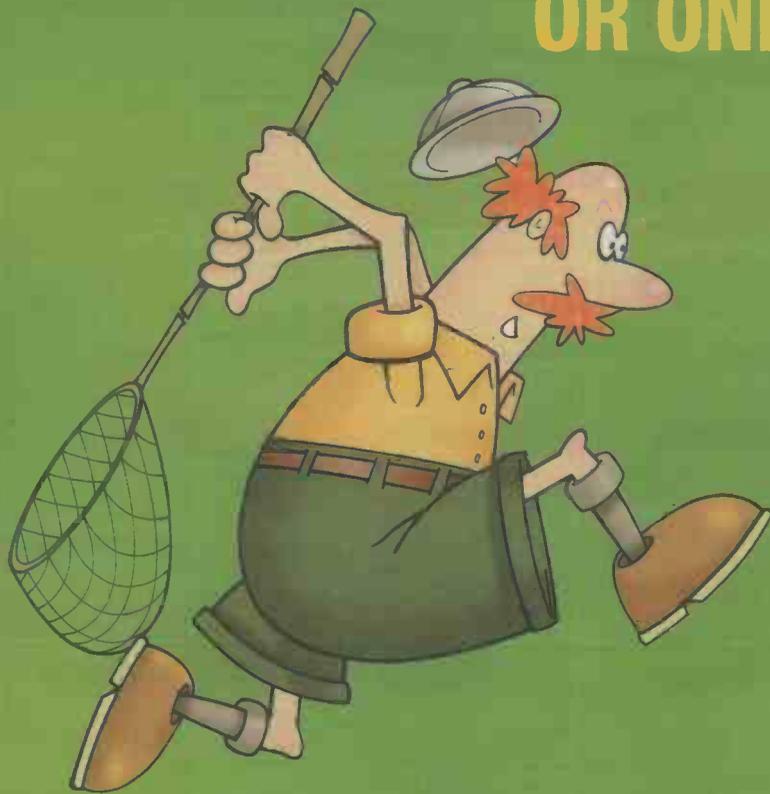
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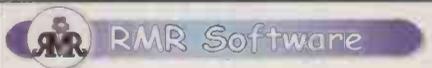
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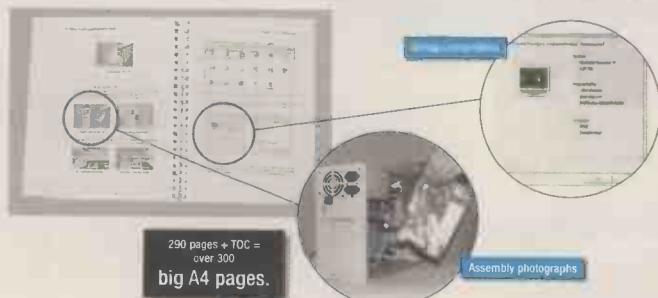
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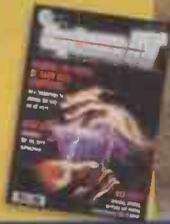
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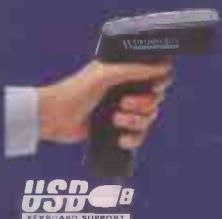
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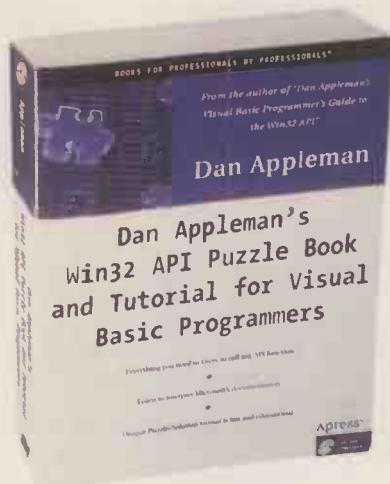
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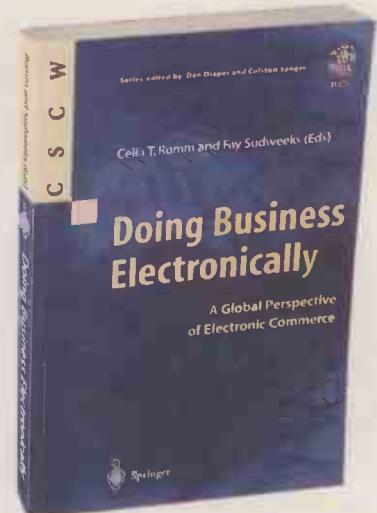
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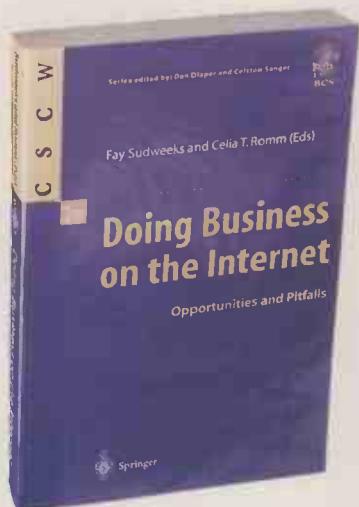
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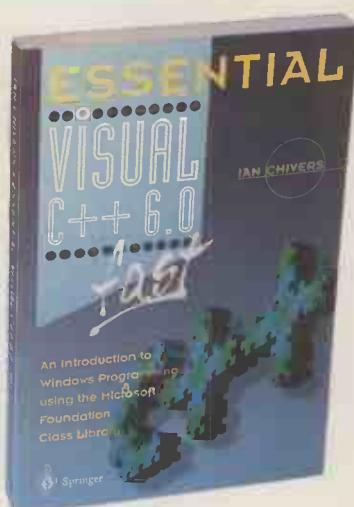
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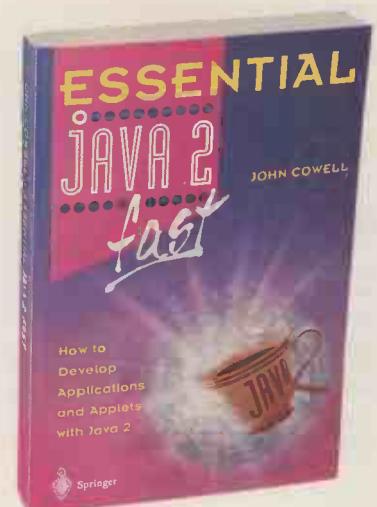
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## Max Payne

Usually, when talk turns to third-person games, a vision of Lara Croft clad in tight tops and hotpants springs to mind. Enter Max Payne, protagonist in a title from developers Remedy and 3D Realms, to be published in the UK by Take 2. Taking its lead from film noir, Max Payne brings third-person gameplay kicking and screaming into a darker, more modern era.

In development for three years and with no fixed release date as yet, Max Payne is powered by Remedy's in-house MAX-FX 3D engine, which allows spectacular levels of graphical realism. With both skeletal and skinning animation, the models and their textures present an incredibly accurate representation of movement. This, along with the 'radiosity' lighting system, which uses surface reflection of light instead of ambient lighting, makes for a very realistic environment indeed.

Set in a bleak present-day New York, you play the eponymous Max, a DEA agent by trade, although he has recently



been framed for the murder of his boss and has just had his family brutally murdered by junkies. Needless to say, he's not a happy man. So he's on the run and out for revenge. Certainly not kids' stuff, but then the developers are going for an adult audience with this title.

Reminiscent of *The Matrix*, Max Payne also sports an interesting replay feature that allows you to watch your more stylish kills in camera-revolving slow motion. With a bullet cam, for that added bit of macabre cinematic fun, Max Payne promises to be spectacular.

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

SCOTT MONTGOMERY

## Republic: The Revolution

The Revolution will be televised! Well at least played out on your PC with Elixir Studios' title Republic: The Revolution, due for release some time next year. Republic is one of the most ambitious titles currently in the pipeline and so far looks to be a ground-breaking leap for the simulation/strategy genre.

The game uses the most advanced graphics engine ever seen: 'Totality'. This engine seems too good to be true, as it is capable of rendering scenes comprising an unlimited number of polygons and in real time. This throws the door open for buildings and characters of unprecedented detail, creating a living,



breathing cityscape. The graphics engine also allows incredible versatility, such as zooming from a satellite-like image right down to a window box on a building, where even the petals on a flower are rendered in immaculate detail.

Elixir also plans to create a rich simulation environment by using revolutionary AI techniques to allow up to one million non-player characters, with their own beliefs, emotions and loyalties, to inhabit the city.

The synopsis of the plot is that you are a powerful faction leader who is charged with 'ousting the President of the Republic of Novistrana... by any means'. You must build up nationwide support for your faction in order to complete your task. If Elixir can deliver the goods, Republic: The Revolution will be stunning.

[www.elixir-studios.co.uk](http://www.elixir-studios.co.uk)

SCOTT MONTGOMERY

# Diablo II

The next episode of the Diablo epic is **ready for your delectation** and it's a class act.

Just as the games industry was settling in for the summer slump, Diablo II has finally arrived. The long-awaited sequel to Blizzard's best-selling, multi-player, fantasy adventure looks set to send sales spiralling, as role-playing game fans are asked to tackle evil once again.

The original Diablo cast you as a wandering warrior, rogue or sorcerer with a mission to destroy the evil deity Diablo. Unfortunately, he proved to be stronger than anyone imagined.

Diablo II continues the story with the wanderer, now possessed by Diablo, on a mission to free the demon's brothers Baal and Mephisto. The evil has returned to Tristram and a new hero is needed to deal with things once and for all. This time you can choose to be a holy Paladin, a seductive Sorceress, an athletic Amazonian, a nefarious Necromancer or a beefy Barbarian.

As before, each character has a different set of skills available and the role you choose greatly determines the way the game unfolds. The Paladin, for example, is a holy knight who can call on the power of his god to help strike down his enemies. The Barbarian is the only character who can wield two weapons at once, while the Sorceress has more than a few tricks up her sleeve. Perhaps the most interesting is the Necromancer, who can raise the souls of the dead to do his bidding for him.

As before, each adventurer starts out at a basic level and, as their experience grows through battle and quests, so does their power. That said, changes have been made to the way you learn new skills. Instead of reading books to gain magical knowledge, this time you are given a point to invest in skills for every experience level. There are 30 levels in all,

so you get a maximum of 30 points throughout the game to invest. The great thing here is that, because of this, two players can choose the same class of character and have completely different abilities, depending on what they choose to master.

There are a raft of new skills and

can benefit everybody in the party.

Not all the improvements are as obvious. For a start, while the mouse-controlled interface has been refined and

the graphic engine updated to include support for 3D accelerators and some amazing parallax perspective scrolling, you are limited to running at a resolution of 640 x 480. Yes, the

graphics look good, but they would look much better at higher resolutions. Stranger is the fact that the game switches to 800 x 600 for menu screens. Limiting the resolution may make it easier to port the game to other platforms, but it seems plain daft on today's PCs.

However, it's easy to overlook things like this once you get into the action and especially the multi-player games. These can be played over a network or via

Blizzard's Battle.Net over the Internet and they add a whole new dimension to the game. The only downside is that you still need a copy of the game per player. Allowing two players to use the same disc would be good. You also need to type in the host's TCP/IP address on network games, which is a tad annoying.

With detailed graphics and atmospheric audio complete with Dolby Surround sound, Diablo II looks set to be the role-playing adventure of the year.

CHRIS CAIN



spells to be learned, thousands of items to collect and plenty of nasties to defeat. You'll see some old faces, too, with the return of blacksmith Griswald, although he's not quite the man he used to be. The world in Diablo II has grown. Whereas the first game had a single town and its underground catacombs, Diablo II has four realms to explore.

Another nice twist is that you can hire other people to join you on your quest, increasing your chances of success. And some skills – such as the Paladin's ability to heal himself –

## DETAILS

★★★★★

PRICE £34.99 inc VAT

CONTACT Havas Interactive 0118 9209100

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

**SYSTEM REQUIREMENTS** Pentium 233MHz, 32MB of RAM, Windows 95, 650MB of hard disk space, four-speed CD-ROM, Direct X-compatible video card

# MDK 2

Janitor turned superhero Kurt Hectic returns in this **deranged third-person shoot 'em up**.

**M**DK was a surprise success a couple of years back, combining terrifically violent gun-toting with comic-book characters and oddball humour. So MDK 2 has been a much-anticipated release. The wait has been well worth it.

In MDK 2 the character of Kurt Hectic, transformed from a simple janitor to sniper superhero by Doctor Fluke Hawkins, is back to save the world when news reaches him of an alien

invasion. Kurt's mentor and guru, Doctor Hawkins, has built him a coil suit, complete with ribbon chute, enabling him to float large distances. He's also got a chain gun and a sniper scope that lets him pick off his enemies from a mile off.

You get to play both characters, as well as Max, another of Doctor Hawkins' inventions. Max is a robotic dog with four arms, so you can use multiple weapons, and a jet-pack. Hawkins is the weakest of the player characters and has an extremely limited and ostensibly useless arsenal, consisting of household items such as a toaster, a loaf of bread, or a pile of dirty towels. Beware, though, when you're

playing the inventive Doctor you can try different combinations of items in his left and right hands to varying effect.

Gameplay itself feels a bit staggered. Although there is a linear plot that holds the whole thing together, each stage is like a challenge in the Crystal Maze. All the pieces are there and you just have to locate them and use them in the right manner to pass on to the next. The game does, however, retain the humour of the original, with your alien opponents pulling faces while you're training your

sniper rifle on them, or laughing callously as they slice you in two. Even so, when you finish one of them off they collapse and die with a suitable gurgle of slime.

Movement is great in this game. As with all third-person shooters, the viewpoint is vital, both in order to see your own

bouncing bullet and an invisible cloak.

Max, on the other hand, has a pure killer instinct. No special weapons here, but you start off with double the health, get to use multiple weapons and play a robotic four-armed canine, so who's complaining?

The AI of the aliens isn't really an issue either. They may prefer shooting the dummy and don't take the game seriously, but they'll still whip you if you're not careful.

The environments you explore are magnificent, with vast swirling organic arenas and deep twisting vaults. Truly the work of the deranged.

The movies between each stage of the game are wacky to say the least, although they don't stand up to much repeated viewing. And on our 466MHz Celeron test

machine, the best we could get was an 800 x 600 display, which gave these movies a blocky look at times. The rest of the game was fine, however.

In all, as Max might say, we think this game is the mutt's nuts in terms of giving the third-person shooter a new lease of life. With beautifully conceived graphics, a narrative that sweeps you along and enough mindless killing to keep diehard fraggers on their toes, this is a game that will fly off the shelves.

MATT WHIPP



character and to get a good view of his surroundings.

Hitting the enemy with your gun is also more difficult because of this, as there is no cross-hair through which to aim. Having said that, most of the target work with Kurt is done through the sniper scope. When you enter sniper mode, a whole new arsenal of powerful and accurate weapons becomes available and you can zoom in and out effectively. Kurt also has a few other tricks up his sleeve, such as a dummy decoy, a

## DETAILS

★★★★★

PRICE £34.99 inc VAT

CONTACT Interplay 020 7551 0000

[www.interplay.com/mdk2](http://www.interplay.com/mdk2)

SYSTEM REQUIREMENTS Pentium

233MHz (300MHz recommended), Windows 95/98, 24MB of RAM, 250MB of hard disk space, 8MB graphics card



# Vampire: The Masquerade

This age-old tale of **revenge and bloodsucking** gives you the opportunity to play the storyteller.

Vampires have always had a big following in film and literature, and a game based around them has more scope for an intelligent storyline than zombiefests such as *House of the Dead*. *Vampire: The Masquerade* has one up on the competition, as it is based on an already popular role-playing game and has a wealth of background information to fill in the history behind the undead. The plot takes place among warring clans of bloodsuckers and follows a gory trail across the centuries and through four cities – medieval Prague and Vienna, and then modern-day London and New York.

The game mixes its styles to set the exploratory gameplay of *Diablo* in the 3D environment of *Quake*. The character is moved using the cursor to point and click in the desired direction, with the view panning around as you move the mouse. This system is a lot easier than the clunky controls of *Tomb Raider*. But, unlike Lara,

you're not going to die by falling off the edge as the game makes you keep to the path. This makes it easier to navigate, but it also makes you feel as if you are not really in control and are just following a set route.

The narrative follows an 18-year-old soldier called Christof, who is wounded fighting an unholy war and falls in love with the nun who nurses him back to health. But dark forces and the forbidden nature of their relationship keep them apart.

It's the age-old story of boy meets

nun, boy becomes vampire, vampire seeks revenge across 800 years and half the globe. The story opens with him defending Prague against the undead



with swords, bows and arrows. But when it moves forward in time the weapons become more high-tech and

you're more likely to be touting a flamethrower or an assault rifle.

The manual kicks off with a well-crafted tale of Christof's life in the crusades, but this isn't carried through into the game. There are also some odd quirks: when Christof meets some fellow Knights of St John they tell him in an English accent how good it is hear another French accent. He replies in his vaguely Irish accent while standing before them in his tunic emblazoned with the red cross of St George.

As you progress through the single-

player game you can pick up allies to add to your coterie (the vampire word for a group of undead working together for mutual ends). Your characters will also gain in experience and you can add to their physical attributes, such as learning new disciplines, which are vampire powers similar to magical abilities.

The most interesting aspect of the game, however, is the Storyteller mode, which allows one player to create and run an adventure of their own over the Internet or LAN. Using the tools in the Vampire software developers' kit,

Embrace, storytellers will be able to manipulate the game and create their own levels, chronicles and objects. Commands include in-game manipulation to further the story, such as adding or deleting creatures, objects or props and taking control of any character, whether they are actual players or are controlled by the computer.

Overall, the game is extremely playable and even

those unfamiliar with Vampire's role-playing roots should enjoy it, as there is plenty of background material in the manual. And if the storytelling aspect takes off, you could be starring in a different vampire flick every night.

MATT CHAPMAN

## DETAILS

★★★★

PRICE £29.99 inc VAT

CONTACT Activision 01895 456 700

[www.activision.com/games/vampire](http://www.activision.com/games/vampire)

SYSTEM REQUIREMENTS Pentium II

233MHz, 64MB of RAM, DirectX 7.0-

compatible graphics card and sound card,

720MB of hard disk space plus 80MB of swap

file space, Windows 95/98

# Shogun – Total War

Honour, politics and war in 16th Century Japan takes 3D strategy games to new heights.

You can almost hear the melodramatic American growl of the voiceover as visions of sword and sorcery appear on the screen: 'Many years ago, in a far off land, warring clans did battle for supremacy.' Now change that voice to one with a Far Eastern accent and the place to historically accurate Japan, circa 1530. Creative Assembly's Shogun – Total War has one of the most refreshing and impressive intros we have ever witnessed, and is an apt prelude to the best of the current crop of strategy games, mixing realtime out-and-out warfare using a great 3D engine with turn-based resource management and strategic manoeuvres.

The start menu offers you several choices. It would be unwise to skip the tutorial and head straight for the campaign mode, as it's a slowish game with a lot of controls and skills to master.

If you feel like skipping the turn-based element you can play out historical conflicts using the realtime 3D engine only, or load the odds in your favour with the custom battle option.

In the campaign you begin as a Daimyo, controlling a number of provinces and with the ambition to conquer the rest. Not surprisingly there are many ways to accomplish this based on strategic alliances or battles. The turn-based element incorporates training troops and placing them on the map.

There is a huge variety of troops at your disposal. Those on the battle field brought no surprises: spearmen, cavalry, archers and such. But you can also muster some more interesting individuals, ranging from emissaries and spies to priests, Ninja and the most deadly assassin of all: the Geisha. Place

these in your enemy's province and let them do their work.

To afford these troops you must pay for them in Koku, the rewards of the annual harvest. Harvests are reaped once every four turns and the rewards can be increased by

which you can make your decisions.

However, more often than not, we felt like getting stuck in there in the battle mode. The realtime strategy 3D engine opens up vistas below you of rolling hills dotted with castles and encampments, wildlife and small woods. Both the terrain and the weather affect your troops' performance, so use them wisely.

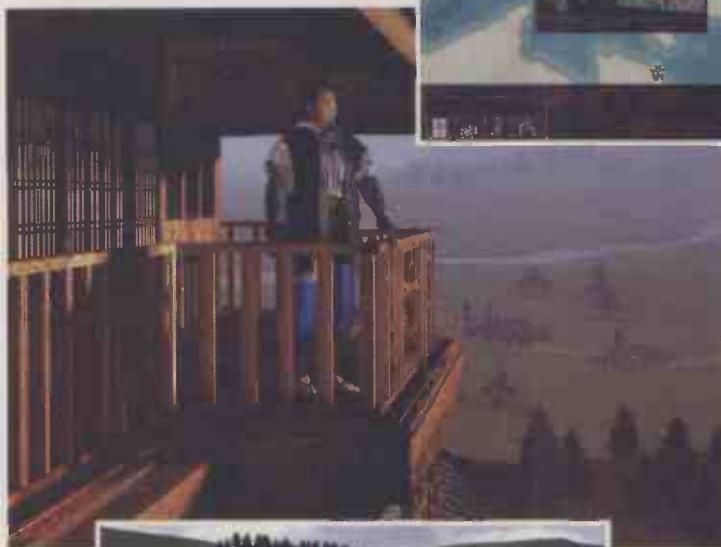
Your troops can assume many formations and you can view the options by clicking on their flag.

One thing that did impress us here was the sound. As you move your viewpoint around, for example, you can hear the thunder of horses' hooves and battle cries grow louder as you pass over a troop of mounted samurai.

Honour and morale are important concepts in the game and, should you manage to take out the enemy leader, the honour and morale of his troops will droop and you'll rout or make mincemeat out of them. Similarly, if you march your troops uphill for too long they'll flag.

So to sum up, Shogun seems impervious to faults. There is a lot to learn in order to get the most out of it, but you can get by on the basics without disrupting the flow of the game. It simply exudes class, from its astounding attention to detail to its playability.

MATT WHIPP



irrigation or building mines and gaining more territory. One way or another, you'll want as much as you can get, so guard your harvest carefully.

To get the more advanced units you'll also need to start building such constructions as Tea Houses enabling provincial trade, watch towers, temples and Ninja Houses. You'll also need a castle, if only as a stronghold to fall back to and hold out in during a siege.

To find out the latest news or consider or propose alliances you must visit the throne room where your trusty advisor will dole out the advice from

## DETAILS

★★★★★

PRICE £34.99 inc VAT

CONTACT Electronic Arts 01932 450 000

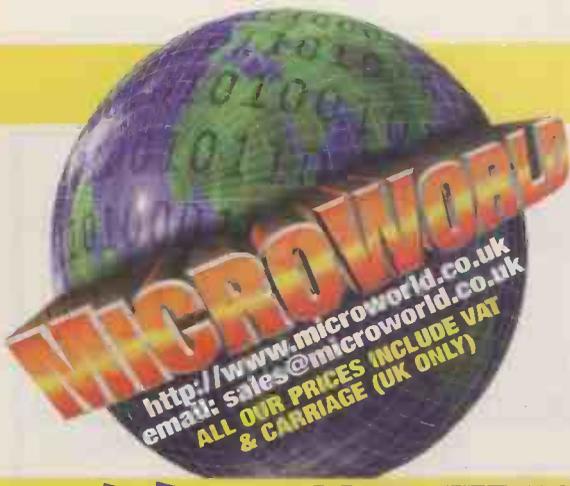
www.totalwar.com

SYSTEM REQUIREMENTS Pentium 233MHz, Windows 95/98, 500MB of hard disk space, 4MB DirectX 7-compatible graphics card, four-speed CD-ROM





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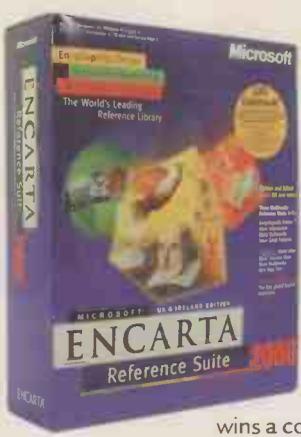
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NO SURCHARGE



**Dawn chorus**

This month's brainteaser is certainly not for the birdbrained among you. All you have to do is insert a letter into each of the 14 blank squares so that you can trace out the nine birds listed below. To trace out a word you may start from any square, but each move to a letter must be to an adjacent square - horizontally, vertically or diagonally. You may use a letter as many times as you

like, even within the same word.

- AUK
- KAKA
- KIWI
- REDWING
- SERIN
- SILKTAIL
- SOLAN
- SWAN
- WAGTAIL

			D	

Find the solution to this puzzle for a chance to win a copy of Microsoft Encarta Reference Suite 2000.

Send the answer, along with your name and an address where you would like the prize to be mailed, on a postcard to: PCW Prize Puzzle (September 2000), VNU House, 32-34 Broadwick Street, London W1A 2HG, or by email to: [letters@pcw.co.uk](mailto:letters@pcw.co.uk).

Answers should arrive no later than 20 August 2000. Please note that we DO NOT open attachments.

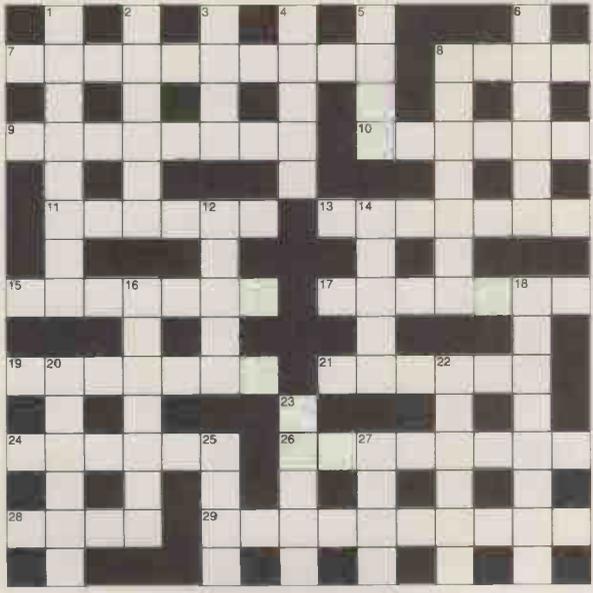
**June's Prize Puzzle answer**

The solution to our Once is enough puzzle in the June issue is below.

C Hodgson from Stockport was the first reader out of the hat and wins a copy of Encarta Reference Suite. Congratulations, your prize is on its way.

2	6	3	4	1	5
5	1	4	3	2	6
4	5	6	1	3	2
1	2	5	6	4	3
6	3	1	2	5	4
3	4	2	5	6	1

# prize crossword



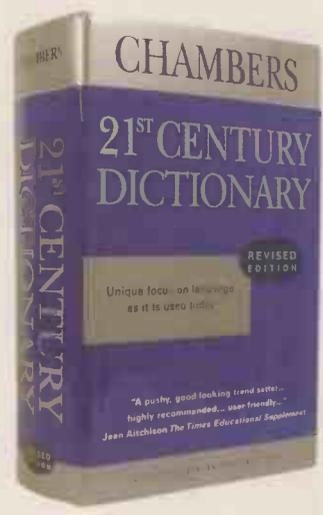
29 File appended to an e-mail (10)

**DOWN**

- 1 Having poetic rhythm (8)
- 2 Piece by Ravel (6)
- 3 Chrysalis (4)
- 4 Large stream (5)
- 5 Taverns (4)
- 6 Buy back (6)
- 8 Orange-coloured fruit (7)
- 12 Bury (5)
- 14 Overweight (5)
- 16 Respects (7)
- 18 Attractive (8)
- 20 Non-transparent (6)
- 22 Notoriety (6)
- 23 Flood (5)
- 25 Marine mammal (4)
- 27 Curved entrance (4)

**ACROSS**

- 7 Image sharpness (10)
- 8 Reference lines on a graph (4)
- 9 Gratis software (8)
- 10 and 24 across  
Moving images for idle monitors (6, 6)
- 11 Packet of personal details (6)
- 13 Fashionable internet companies (3, 4)
- 15 Computers served by servers (7)
- 17 The C of CPU (7)
- 19 Devices for directing data between networks (7)
- 21 Port that's not parallel or USB (6)
- 24 See 10 across
- 26 Computer's underlying structure (8)
- 28 Program's defects (4)



Each month, one lucky PCW Crossword entrant wins a copy of the Chambers 21st Century Dictionary. The winner of July's crossword puzzle is: **D Medrow from Sussex**. This time, it could be you. Send your completed crossword to: 'PCW September - Prize Crossword', VNU House, 32-34 Broadwick Street, London W1A 2HG, to arrive no later than **20 August 2000**.  
 • Please state clearly on your entry if you do not wish to receive promotional material from other companies.

**Solutions to August's crossword**

ACROSS: 7 Basic 8 Font 9 Read 11 Bounce 12 Firewall 13 Demo 15 URL 16 Error 19 History 20 Retried 23 Cells 25 Exe 26 Spam 28 Protocol 30 System 32 HTML 33 User 34 Media  
 DOWN 1 Halo 2 Signpost 3 Norfolk 4 Stem 5 Brewer 6 Bawl 10 Require 14 Exile 17 Opera 18 Release 21 Resisted 22 Replied 24 Little 27 Scrub 29 Rate 31 Epic

# WIN 3 great Philips Brilliance monitors

**W**e have three stunning monitors to give away this month, thanks to award-winning manufacturer Philips. Three lucky PCW readers have the chance to win a great 17in, 19in or 21in monitor from the Philips Brilliance range. Brilliance, Philips' line of professional displays, offers high-performance products that, with the help of ICE technology, deliver excellent performance. The monitors are incredibly easy to use thanks to Customax monitor control software connected via USB.

The 17in Brilliance 107P has a VESA flicker-free display of 1,024 x 768 at a refresh rate up to 85Hz, and a maximum resolution of 1,920 x 1,440, and its dual inputs allow simultaneous connection to two computers.

Philips' 19in 109P offers a maximum resolution of 1,920 x 1,440 with a flicker-free display of 1,280 x 1,024 at up to 85Hz. An exclusive Auto Calibrate feature is included that guarantees consistent performance and extends by a third the useful life of the monitor.

Finally the Brilliance 210p has a stunning 21in display with a staggering horizontal frequency of 121KHz, a maximum resolution of 2,048 x 1,536 and a VESA flicker-free display of 1,600 x 1,200 at up to 85Hz. It also benefits from the Auto Calibrate feature mentioned above.

■ *For a chance to win one of these Philips monitors, just answer the question and follow the 'How to enter' instructions opposite.*



The Brilliance 107P's maximum resolution is:

- 1) 1,024 x 768
- 2) 1,920 x 1,440
- 3) 1,600 x 1,200

#### Packard Bell and ATi winners

Nigel Massen of Surrey is the winner of July's competition for a Packard Bell Spirit PC. The runners up, who win an ATi All-in-Wonder graphics card, are Mr Gooch of Letchworth, T Campbell of Leicester, and Alan White of Bath.

#### How to enter

Fill in the coupon and send it to the following address by 30 August 2000:  
 Personal Computer World  
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Please state in your email if you DO NOT wish to receive information about other products and services from VNU Business Publications Ltd, and if you DO want your details to be passed to other carefully selected companies for marketing purposes.  
 ♦ Competition open to UK residents only.

### PCW September 2000 competition entry form

Name: \_\_\_\_\_

Email address: \_\_\_\_\_

Daytime telephone number: \_\_\_\_\_

Address: \_\_\_\_\_

Answer: The Brilliance 107P's maximum resolution is: .....

• Please tick here if you DO NOT want to receive information about other products and services from VNU Business Publications Ltd

• Please tick here if you DO want your details to be passed on to other carefully selected companies for marketing purposes

#### Rules of entry

This competition is open to UK readers of *Personal Computer World*, except for employees (and their families) of VNU Business Publications, and Philips. PCW's Editor is the sole judge of the competition, and his decision is final. No cash alternative is available in lieu of prizes.

## The Micro Chess Championship, a modular PC and the imminent launch of Windows 95.

### 20 YEARS AGO September 1980



With chess very much flavour of the month, *PCW* asked the question, 'Who'll be World Micro Chess Champ?' This was in reference to the first official World

Microcomputer Chess Championship that was to be staged at the forthcoming 3rd *PCW* Show. To set the scene, Kevin O'Donnel looked back at chess micros, including the famous late 18th Century Automaton Chess Player. This was a life-sized figure, sat behind a chest in readiness to defeat any challengers. It was all the rage, but you have to feel sorry for the tiny chess expert crammed inside the chest.

In keeping with the chess theme, *Computer Games* by David Levy, quoted the findings of Claude Shannon. This mathematician calculated that there are some 10,120 possible games of 40 moves (the average length in a masters game), and analysing this at the rate of one game per microsecond would take a computer 1,090 years to make its first move. These heady figures led to the development of Shannon's evaluation function - a theoretical estimate of who had the upper hand, obtained by assigning importance and positional values to each chess piece.

Up for bench testing, was the long-awaited Commodore SuperPET. With built in IEEE-488 interface and parallel port, it was aimed at the business market interested in cross-computer comms.

Finally, back in the chess world, Sargon 2.5 was a program devised by husband and wife team Dan and Kathe Spracklen. It eventually found its way into the Sargon chess console, which had 8K of ROM and could out-manoeuvre the average chess club member.

### 15 YEARS AGO September 1985



Inexplicably, a rather pale Charlie Chaplin graced this month's cover, draped around our lead review product: ACT's Apricot F10, priced at a humbling £2,295.

Our man at the scene, Peter Bright, peeled off the flimsy casing to find the same Intel 8086 chip, driven at 4.7MHz

as on the earlier Apricot F1. Significantly, though, the RAM had been doubled to 512KB and a 10MB drive had been added. The monitor impressed, too. A Sony FD Trinitron screen blazed away in four colours and, to this day, we still prefer the aperture-grille flavour of the Trinitrons over their shadow-mask brethren, as seen in our monitors group test on page 186 of this issue.

The other exciting news this month was the eighth *Personal Computer World* show at Olympia. The list of major names gracing the floor of the National Hall reads like the past few months of our Retro column: Amstrad, Acorn, BBC and Sinclair were all showing off their latest machines. And for the first time in the UK, Atari brought us its 520ST (as 'reviewed' in our Retro column overleaf). Who knows how many boffins browsing that stall turned out to be the drum 'n' bass icons of today? Finally, Psion pre-empted today's PDA-crazy world with its *Organiser*.

### 10 YEARS AGO September 1990



A decade ago, Guy Swarbrick was saying: 'The PC industry is, without doubt, going through one of its slow periods. Strangely, though, while there is little new

hardware or software around, what there is is innovative.'

One of the innovations he was talking about was the Agilis System, which he described as 'a rugged, flexible, portable PC quite unlike anything else on the market'. It was a machine that could be pieced together to create a system to suit individual needs. It included packet radio capabilities, a portable handheld computer that could communicate with the PC back at base via an Ethernet network. The system was apparently used by the Morgan Hill police department in California to check suspects' details.

The criminal world was also on MP Emma Nicholson's mind with the imminent arrival of the Computer Misuse Act. Far from being a politician in the ivory towers of Westminster, Nicholson had spent 18 years as a programmer and, 'she really does think hacking is wicked and hackers are either wrong minded or criminally intentioned. And if you spend your leisure hours playing pass-the-parcel with someone else's data, she really does

want to see you in the nick,' according to writer John Diamond. Strong words indeed, but faced with today's hackers and viruses, such as the Love Bug, we have to wonder whether times have really changed and if the law introduced 10 years ago has worked.

Where times have changed, however, is in the specs of notebooks. The ever-present Guy Swarbrick tested Sharp's 'power-packed' PC-6200 notebook, an 80286-based machine with a massive 20MB hard disk. And for the number-crunchers, there was a connector for a numeric keypad!

### 5 YEARS AGO September 1995



The imminent launch of Microsoft's Windows 95 dominated this cover, not to mention the issue. A 36-page review bared all about the new OS, as the *PCW*

team separated Windows fact from fiction. Windows was compared to floor wax and dessert topping as the *PCW* team attempted to explain everything a user needed to know, including whether to make the leap. However, not everyone was convinced that Windows 95 was the future. Jez Deacon, technical director at Carrera, told *PCW* it would probably be: 'an optional purchase initially, and we'll gauge the reports and customer reception when we decide whether to make it the initial product on all systems'. Isn't hindsight a wonderful thing?

It may come as a surprise to some that it was five years ago this month that the PlayStation was originally released. It competed with Sega's Saturn and helped fuel the beginning of the games console wars. Chris Cain reviewed both machines, concluding that the PlayStation outclasses the Saturn in terms of hardware design, although Saturn might win the competition initially, because of its superior game titles. However, as Chris said: 'This is an issue Sony can do something about, and once it does, Sega will have a big problem.'

Finally, the chip of the moment, the Pentium 90, was put to the test with the review of 21 P90 PCs. Adams Accura Professional 586 WS picked up the Editor's Choice for its top-quality components, including a new Matrox Millennium with 2MB of VRAM.

THE PCW TEAM

# Atari ST

A 16bit processor and graphical user interface made for a **cheap and cheerful** home computer.

Say Atari and great video games spring to mind, right? After all, this was the company where video games legend Nolan Bushnell created the seminal Pong arcade coin-op in 1972, then followed it up with Breakout. And who can forget the awesome Atari VCS games console in 1977, complete with fake corrugated wooden case and the first home version of Space Invaders?

While Atari was a force to be reckoned with on the games front, more serious projects were afoot. The Atari 400 and 800 ranges during the late Seventies and early Eighties proved Atari could cut the mustard on the home computer front, but better things were on the horizon.

In 1984, Atari was sold to former head of Commodore, Jack Tramiel, and from that day on, the company would focus on computers. The fruit of Atari's labours was a system employing a 16bit Motorola 68000 processor, which with 32bit internal architecture led to Atari coining the name **ST** - short for sixteen/thirty-two. The first model featured no less than 512KB of RAM, and hence was known as the 520ST (give or take a few kilobytes). Launched worldwide in 1985, the Atari 520ST weighed in at a not inconsiderable £750, but most crucially beat Commodore out of the 16bit gates. £750 was also sufficiently cheap for Tramiel to coin the slogan: 'Power without the price'.

In beating arch-rival the Commodore Amiga to the shops, Tramiel did, however, cut a few corners. The first ST's operating systems were not in ROM, but instead supplied on 3.5in floppies. Worse still, Jack named the OS after himself, resulting in the unfortunately acronymed Tramiel Operating System. It did, however, employ Digital Research's GEM desktop, which was the first time a graphical user interface had ever been seen on an affordable home computer.

The 520ST's 68000 CPU ran at 8MHz, backed up by 512KB of RAM and up to 192KB of ROM. The system could drive a mono monitor at 640 x 400 pixels in crisp black and white, or a colour monitor at 640 x 200 in four colours or 320 x 200 in 16 colours, each out of a palette of 512 colours. A 360KB 3.5in floppy drive was built in, and a two button mouse supplied. There was no shortage of plugs: a ROM cartridge slot, a

boasted 1, 2 or 4MB of RAM. At this point, Atari introduced the 20MB MegaFile hard disk and the SLM804 laser printer, creating a new killer application for the ST: a complete desktop publishing system for less than the price of a typical IBM laser printer.

There was even more to come. Atari released the STacy, a portable ST albeit weighing a lap-crushing 15lb. Next, the long-anticipated TT030 arrived boasting a modular case with removable hard disk, a 32MHz 68030 CPU, along with SCSI, LAN and three serial ports on top of the connections already offered on the ST.

In 1988 Atari and Immos



*Atari's 520ST beat Commodore to a 16bit machine and offered 'Power without the price'*

pair of joystick ports, video, parallel, serial, floppy and hard disk connectors, but most importantly of all, a pair of MIDI ports.

PC owners take it for granted that their joystick port doubles up as a MIDI interface, capable of talking to and controlling all manner of musical instruments. Impressively, the ST boasted built-in MIDI 15 years ago.

On the games front the ST absolutely shone, with such classics as Jez San's 3D Starglider 1 and 2, the addictive platform action of Bubble Bobble, and the intricate adventures of The Pawn and Guild of Thieves.

Later, the 1040ST arrived with 1MB of RAM and TOS on ROM, and subsequent STs also included RF modulators for direct connection to a TV set. Much more exciting was the introduction of the Mega ST range, which separated the keyboard from the main processing box, and

announced the ATW800 Transputer Workstation, which combined the power of multiple T800-20 processors (each delivering 10MIPS) running in parallel with the easy-to-use front-end of the Mega ST. However, by 1992, Atari was winding up its computer story with the Falcon 030, a 16MHz 68030 system featuring DSP and hard disk audio recording in a conventional 1040ST case.

Atari was now focused on its Jaguar games console, but the less said about that and its consequences, the better. Let's instead head over to the appropriately named Little Green Desktop website, download Paul Bates' superb WinSTon emulator (<http://lgd.fatal-design.com>), and remember the good times when Atari offered a true GUI powerstation at a price IBM could only dream of.

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William Blake (1757-1827)

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Who could have imagined that the terrific advances in IT would provide so many benefits and create so many new opportunities to businesses and individuals? However, with the explosion of the Internet and e-commerce, the business environment has drastically changed - the 9-5 day is a distant memory and those companies that cannot work 24 hours a day, may not work at all.

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