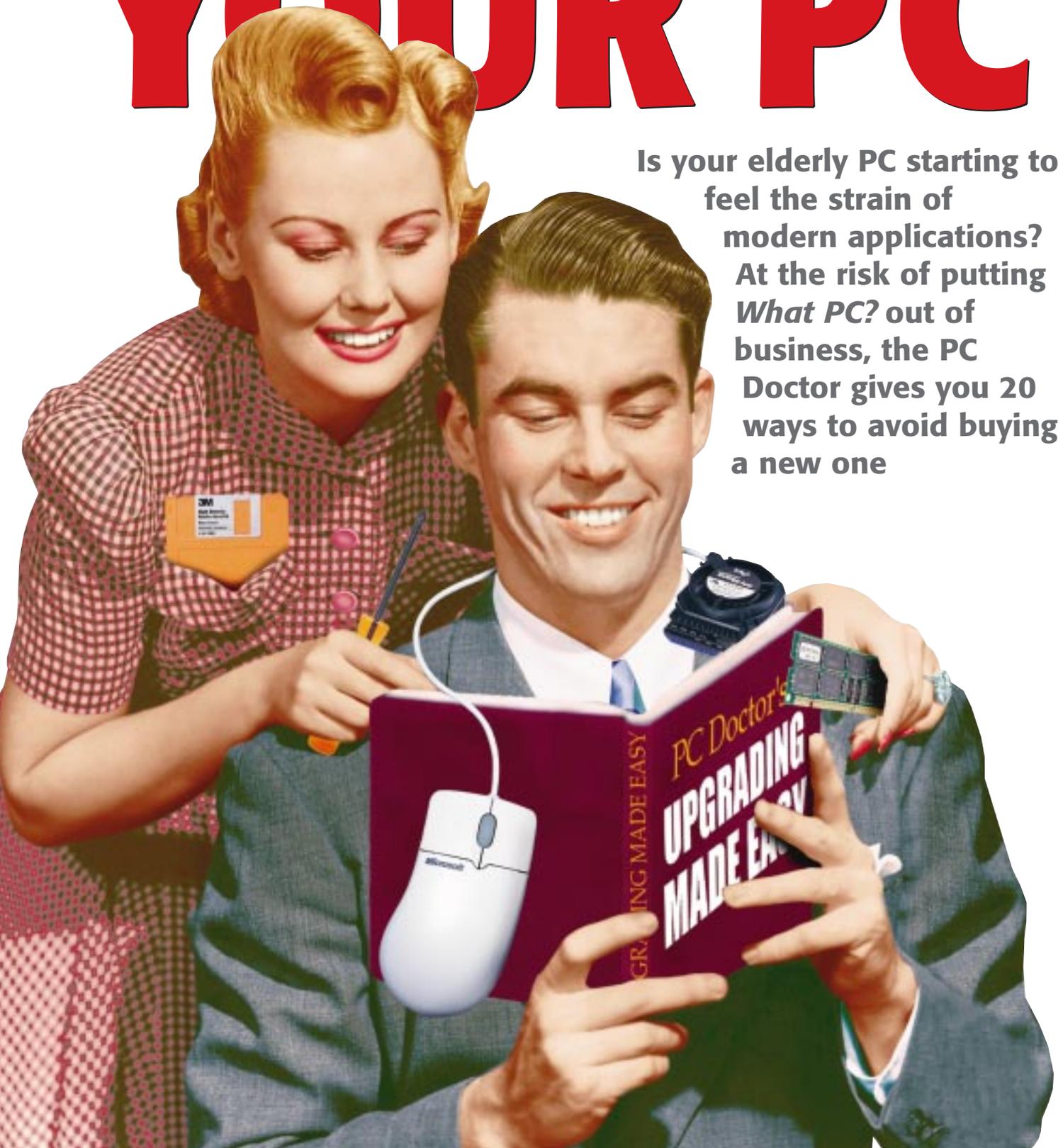


UPGRADING YOUR PC

Is your elderly PC starting to feel the strain of modern applications? At the risk of putting *What PC?* out of business, the PC Doctor gives you 20 ways to avoid buying a new one



With the possible exception of wine and paintings, the ageing process is far from kind. When it comes to computers, it's positively sadistic and it's an accepted fact that nothing goes out of date quicker than a new PC.

Who's to blame for this seemingly in-built redundancy so prevalent in the world of the PC? Is it the chip manufacturers who constantly produce faster processors? Is it the programmers who write ever more demanding software? Is it magazines like this one, ceaselessly promoting new technology, often at the expense of the old? Well, whatever the reason, there's no denying, as far as computers are concerned, that the 'newer is faster is better' adage is both costly and frustrating to the majority of PC owners.

So what's the solution? Well, there are two. If you're fortunate enough to have more money than sense, you can buy a new PC every year and simply throw the old one away. Alternatively, you can ignore all of the marketing hype and save yourself some serious money by upgrading and maintaining your existing PC.

In this PC Doctor special, *What PC?* gives you 20 ways to get more from your existing PC. Don't worry, you don't need to be a computer engineer for anything here - the 10 hardware upgrades are incredibly simple. If you're short of cash, the 10 software tips are all free, so there's no excuse for not using them.

When to upgrade your PC

It's time to upgrade your PC when you spend more time waiting for it to do something than actually doing it. It's a fact that no matter how powerful a PC is when you buy it, sooner or later, it's going to struggle to run the latest software.

Unfortunately, if you're not happy with the way your dusty 286 or 386 PC is running, too bad. Unless you can get some components for free, it's simply not worth upgrading these

ancient systems. Pentium and 486 owners have more to gain though, thanks to the sheer number of options on offer.

Be careful to compare the value of the upgrade with the benefits it will bring. A brand-new, well-specified, lightning-fast Pentium II PC need cost no more than £1,200. If your upgrade costs are approaching half that figure, think again - the money might be better spent going towards a new system.

If, after reading all this, you're thinking 'Well I'm perfectly happy with the way my 486 runs MS Word 2', then skip over this feature and give yourself a pat on the back. Never feel you have to upgrade your PC - you should only do it if you need to.

What to upgrade

A PC is only as fast as its slowest component, and any component that slows a PC down is called a 'bottleneck'.

A bottleneck is just like it sounds. Imagine a bottle of water. Turn it upside down to empty it and the flow of water is constricted by the width of the neck. Translate this to a computer and a bottleneck becomes any component that slows the transfer of data around the system.

For example, take an old 486/33 PC with 4Mb of RAM and a 150Mb hard disk. Fitting a faster processor will give a significant theoretical performance boost but, in practice, the hard disk just isn't quick enough to keep it supplied with data. In other words, much of the processor's time will be spent waiting for data rather than processing it. Similarly, increasing the amount of RAM will allow you to have more programs open at the same time but, with the slow 486 processor, they will still run very slowly.

So, it's important to establish what parts of your PC are affecting its performance - and then those are the ones that need upgrading. As a rule of thumb, the three main problem areas are the processor, RAM and hard disk but more than one of these components might need upgrading to avoid just moving a bottleneck elsewhere.

10 HARDWARE UPGRADES THAT WILL IMPROVE YOUR PC

Thankfully, the design of the PC makes it easy to swap components around. These 10 hardware upgrades are listed in order of the benefits they will bring to a system but you might need two or more of them to crack that bottleneck.

1 Processor

Since the processor is the engine of a PC, fitting a faster one will obviously make the PC go faster. However, upgrading the processor is only effective if it offers a significant speed increase. If your original processor is a Pentium 200, upgrading to a 200MMX isn't worthwhile and your money is better spent elsewhere. With a Pentium 90, however, you have more to gain.

The type of motherboard socket a processor sits in, its speed and its voltage, will all influence your choice of upgrade

processor but the various possible combinations are too lengthy to explain here. As long as you know the type (486, Pentium, etc) and the speed (66MHz, 90MHz, etc) of your processor, your dealer will tell you what upgrade processors you can use.

Intel has stopped making

upgrade (or OverDrive) processors for 386, 486 and slower Pentium PCs but some dealers still stock them. Alternatively, go for a non-Intel processor - Kingston Technology's TurboChip 133 uses the AMD 5x86 processor - to upgrade a 486 to Pentium 75-like performance for just under £80.

Intel has a range of Pentium MMX OverDrive processors for Pentium PC owners and, providing you have at least a Pentium 75 PC, you can double your processor speed and add MMX in one fell swoop. You can't go beyond a Pentium 200MMX though, so Pentium 166 systems don't benefit as much as Pentium 90s.

Kingston Technology's TurboChip 233 also uses an Intel Pentium MMX processor and will turn a Pentium 75 PC into a Pentium 175MMX, a Pentium 90 into a Pentium 210MMX and a Pentium 100 and above into a Pentium 233MMX. Definitely £242 well spent.



Difficulty	██████████	██████████	██████████	██████████	██████████
Benefit	██████████	██████████	██████████	██████████	██████████
Priciness	██████████	██████████	██████████	██████████	██████████



Notebooks

The tight integration of components in a notebook PC means that there's little for you upgrade if you want to improve performance but there are some things to look at.

Swapping the processor is possible in some circumstances but this isn't something that should be done at home. Most notebooks can take more memory though and this is a sure-fire way of improving performance. The downside is that most notebooks use proprietary memory modules rather than

standard SIMMs or DIMMs and these tend to be a little costlier.

Fitting a bigger hard drive is straightforward but since notebook PCs can only use one, this means losing your old drive. Adding SCSI to a notebook is an

alternative, since it allows you to use external removable hard drives like the Iomega Jaz for potentially unlimited storage. Adaptec has a PC Card SCSI adaptor called the Slim SCSI for £116.33 for this very purpose.



2 RAM

Buying RAM is complicated. If you have your PC's motherboard manual, you're saved - it should tell you the exact type of memory your PC uses and your supplier will take it from there. If you threw it away, contact your PC's manufacturer to find out what sort of RAM you need. If you have neither manual nor manufacturer details, you

need to examine the RAM itself and speak to an expert.

Here's a potted guide to RAM to get you started. Ready?

RAM comes in two forms - SIMMs (Single Inline Memory Modules) and DIMMs (Dual Inline Memory Modules). Older PC's use 30-pin SIMMs, later ones 72-pin and new ones 168-pin DIMMs. SIMMs can also be fast page or EDO, and come in either 60ns, 70ns or 80ns speeds and have gold or tin connections. DIMMs can be EDO or SDRAM, and come in either 66MHz or 100MHz speeds.

30-pin SIMMs need to be fitted in fours on a 486 PC but 72-pin SIMMs can be fitted singly. Conversely, Pentiums need 72-pin SIMMs in pairs but can use single DIMMs. SIMMs and DIMMs fit in slots and if you have no free slots, you'll need to lose the old to make way for the new - so make sure you buy enough RAM first time round to prevent yet more wastage later. Confused yet? Give Kingston Technology a call.

So, how much RAM do you need? Microsoft recommends you have 8Mb of RAM to use Win-

dows 95,

16Mb for Windows 98. As

a conservative estimate, double those figures if you want a usable PC. Quadruple them and Windows will fly.

More RAM will also mean that you can have more applications open (providing your processor is up to it) but your PC's speed will be improved less and less once you go beyond 16Mb on a 486 and 32Mb on a Pentium PC.

At the moment, a 16Mb SIMM costs around £30, so adding an extra 32Mb to your PC is an inexpensive option.

Difficulty

Benefit

Priciness

3 External cache

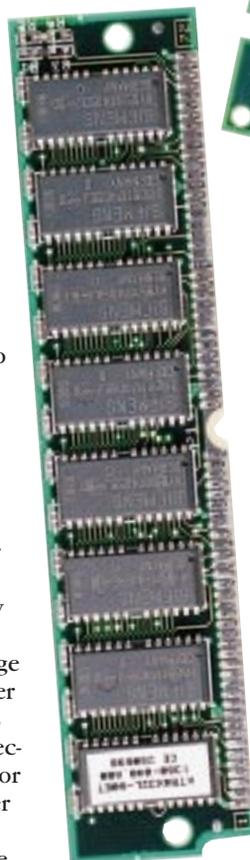
The external cache is a small area of memory that holds frequently-needed data for the processor. Cache memory is much quicker than mere RAM, and consequently, much more expensive. This is why there's usually only 256Kb or 512Kb of it.

Almost all Pentium systems have a built-in external cache but not all 486s do. In fact, some 486s inexcusably have a cache slot with no cache fitted. Consult your manual, manufacturer or a nearby expert to find out what's in your system and if there's a cache slot, there needs to be 512Kb of cache in it. A 512Kb cache module costs around £30, 256Kb about £5 less, as supplied by Kingston Technology.

Difficulty

Benefit

Priciness





4 Hard disk

Fitting a larger hard disk to your PC will give you more space for software and it can also improve performance. A 2Gb hard disk (don't buy anything smaller) will be much faster than say, a 450Mb drive, and will reduce the time it takes to load applications. A bigger drive also means more room for virtual memory, and this will benefit from the extra speed too. Maxtor has a 3.4Gb drive for £149 and its 13.6Gb is just £369.

Most hard drives connect to an interface on a PC's motherboard called an IDE channel (other types use SCSI - see later). One IDE channel supports two IDE drives and modern PCs have two channels.

Some older PCs only have one IDE channel which means that, if there's a hard disk and CD-ROM drive fitted, something needs to go if you want another hard drive. The only way to assess your situation is to look in the motherboard manual or inside your PC. A wide, flat cable connects the hard drive to the motherboard and, if the CD-ROM drive is also part of this 'chain', you'll need to lose your old hard drive if you buy a new one, or move to SCSI.

Difficulty	██████████	██████████	██████████	██████████	██████████
Benefit	██████████	██████████	██████████	██████████	██████████
Priciness	██████████	██████████	██████████	██████████	██████████



5 Graphics card

Adding a better graphics card to your PC will bring several benefits. Providing your monitor is up to scratch, you'll be able to work at higher resolutions, in more colours and at higher refresh rates. Windows will also run more smoothly with a better card and, if you go for a combined 2D/3D card, games performance will improve too.

Hunt around and you may find ISA and VL-Bus cards for older PCs but PCI cards are now the norm. A good all-round PCI card is the ATI Xpert@Work, which starts at around £60 - but whichever you buy, get one with at least 4Mb of video memory.

If you already have a good PCI or even AGP graphics card, a dedicated 3D accelerator card is worth considering. It will only be of use if you play a lot of 3D games but something like the Creative Labs Voodoo 2 will give your system a real performance boost.

Difficulty	██████████	██████████	██████████	██████████	██████████
Benefit	██████████	██████████	██████████	██████████	██████████
Priciness	██████████	██████████	██████████	██████████	██████████

6 Sound card

If you're running any version of Windows without a sound card, you're missing out. Similarly, if you're playing games on a PC without sound, you're not playing them properly.

Providing it has a free expansion slot, any PC can use a sound card. The best-sounding cards are still ISA and the Best Buy from our last sound card group test was the £79.99 Maxi Sound 64 Dynamic 3D. If you want a PCI sound card, then the £59 Terratec XRate is worth a look. Cheaper cards are available but then sound starts to suffer.

Difficulty	██████████	██████████	██████████	██████████	██████████
Benefit	██████████	██████████	██████████	██████████	██████████
Priciness	██████████	██████████	██████████	██████████	██████████



7 CD-ROM/DVD-ROM

To be honest, if you've managed this long without a CD-ROM drive you don't need one. But since almost all software is distributed on CD-ROM, without a drive to read discs you won't be installing anything new. 24-speed CD-ROM drives start at around £40 and unless you plan to install software every single day, there's no point in buying a faster one.

DVD-ROM is the successor to CD-ROM, offering up to 17Gb of storage on a single CD-sized disc. You'll need a dedicated DVD-ROM drive (which will still read CD-ROMs) and an MPEG decoder card if you want to play DVD movies. Installation is as simple as with a CD-ROM drive - just make sure that you have sufficient IDE channels (see Hard disk). Creative Labs' PC-DVD Encore kit combines an MPEG decoder card with a 2nd-generation DVD-ROM drive for £229.

Difficulty	██████████	██████████	██████████	██████████	██████████
Benefit	██████████	██████████	██████████	██████████	██████████
Priciness	██████████	██████████	██████████	██████████	██████████



WARNING! WARNING! WARNING!

Never, ever, remove the case from your PC when it is switched on. Always shut down and turn off your PC before going anywhere near it with a screwdriver. You should, however, leave it plugged in but turned off at the mains.

The reason for this is static. When you remove your PC's case, touch the metal cover that surrounds the power supply. This will discharge any static and send it safely down the mains lead. If the PC isn't plugged in, the static will discharge into the PC itself, which isn't recommended.

You should not get a shock from touching the power supply cover. If your PC has a wiring problem or other power supply fault, there is a risk of shock but then you should have noticed this long before you decided on an upgrade.



8 56Kbits/s modem

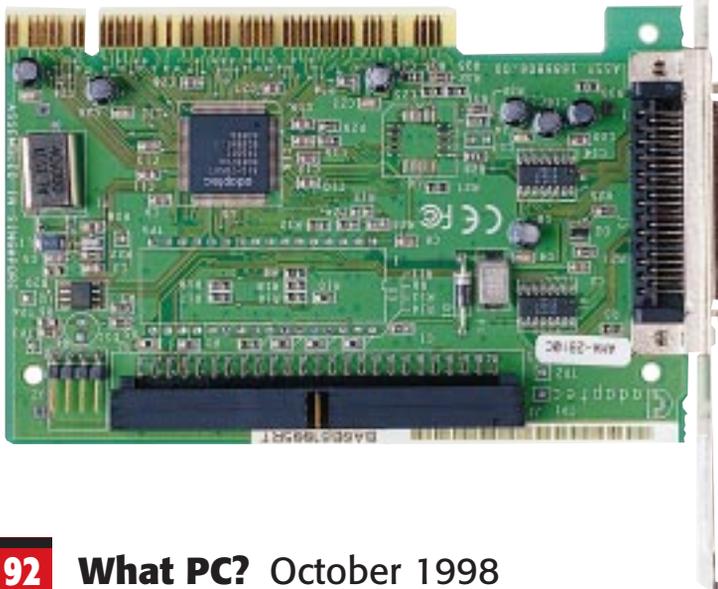
Surfing the Net can be slow even at the best of times and if you want to ensure the problem isn't at your end of the connection, you need a fast modem. Most ISPs now support the latest 56Kbits/s modems, either as K56flex or the upcoming V.90 standard.

The Pace 56 Voice won the *What PC?* Award for best modem this year and it comes in two versions. The external model (£89) is fine for modern PCs with a free and sufficiently quick serial port but, if your PC has the older 8250 UART serial port (get that manual out again), go for the internal ISA model (£139).

Difficulty	■	■	■	■	■	■	■	■	■
Benefit	■	■	■	■	■	■	■	■	■
Priciness	■	■	■	■	■	■	■	■	■

9 SCSI

If you've run out of IDE channels, want to use faster hard drives and CD writers or just need to use certain scanners, SCSI is the answer. SCSI is a faster alternative to IDE and allows up to seven



different devices to be connected in a 'chain'. SCSI hard drives are much faster than their IDE counterparts (and also more expensive) and SCSI scanners beat parallel port models hands down.

To use a SCSI device, you'll need to install a SCSI card. Adaptec has a range to suit all PCs and pockets, starting with the PCI SCSI Card 2910 for £76.38.

Difficulty	■	■	■	■	■	■	■	■	■
Benefit	■	■	■	■	■	■	■	■	■
Priciness	■	■	■	■	■	■	■	■	■



10 Monitor

Okay, buying a bigger monitor won't make your PC faster but it will make it much more pleasant to use. If you're happy squinting at a 14in model, fine, but step up to a 15in monitor and that resolution of 800x600 pixels becomes much more comfortable.

Go to a 17in model and you can run at 1024x768 pixels with ease, which makes a new graphics card that much more attractive. The Best Buy in this month's 17in monitor group test is the ViewSonic GT775 (it won last year too), costing £405.38.

Difficulty	■	■	■	■	■	■	■	■	■
Benefit	■	■	■	■	■	■	■	■	■
Priciness	■	■	■	■	■	■	■	■	■



10 SOFTWARE TUNE-UP TIPS

If you're short of cash, you can tweak Windows for free to improve performance. The improvement won't be dramatic but your PC will run more smoothly and a little bit quicker.

Always, always back up your important files before performing any of these tweaks. None of them should harm your PC but it's easy to change something by accident and not notice what you did until it's too late.

1 Defragment your hard drive

Data is stored on a hard drive as blocks. As new blocks (new data) are created and old ones moved or deleted, spaces between blocks appear. Over time, the blocks become dispersed over the hard drive and it becomes fragmented. A fragmented hard drive takes longer to read, since the PC has to hunt around for blocks that may be scattered in no particular order. Defragmenting a hard drive rearranges the blocks into one continuous sequence, instantly improving hard disk performance.

Windows 95 and 98 have disk defragmenter tools built in - look in Start/Accessories/System Tools. Defragmentation can take a few hours, so it's usually best to do it overnight, at least every month or so.



Difficulty
Benefit

2 Check your hard drive for errors

When a program crashes, or you switch off your PC without first shutting down Windows, you run the risk of corrupting files on your hard disk. Cross-linked files, lost clusters, files with invalid date stamps - all are technical terms for files that need fixing.



Windows has a program to do just that and it's called ScanDisk.

It's in Start/Programs/Accessories/System Tools for Windows 95 and 98 but there's a version in Windows 3.1 as well. Windows 98 and later versions of Windows 95 run ScanDisk from MS-DOS automatically after a crash, but it's wise to run the Windows version once a month or so.

Difficulty
Benefit

3 Use the latest drivers

Manufacturers update drivers for their hardware on a regular basis, usually to fix bugs and improve performance.

All PC hardware uses drivers but you only think about key components - graphics cards, sound cards, CD-ROM drives, mouse, printer, etc.

The best way to check for drivers is to look at the manufacturers' Web sites. If you don't have Net access, you could try contacting the manufacturers directly - some may send out new drivers on disk.



Difficulty
Benefit

4 Remove unused drivers

Just as you should always use the latest drivers, you should also get rid of the ones your PC doesn't need.

To find old drivers, start Windows 95 in Safe Mode. When Windows is starting, look for the message that says 'Starting Windows 95' and quickly press the F8 key. Choose 'Safe Mode' from the menu that appears.



Once Windows has loaded, right-click on My Computer to get to System Properties and click the Device Manager tab. You'll now see a list of all the hardware that has ever been present on your PC, divided into categories. It's now a question of clicking the '+' signs next to each entry to open up the lists, and looking through the hardware items.

If you see something you know isn't present on your PC - an old graphics card, for instance - click it with the mouse and click the 'Remove' button. If you see something listed twice or if you aren't sure, leave it alone.

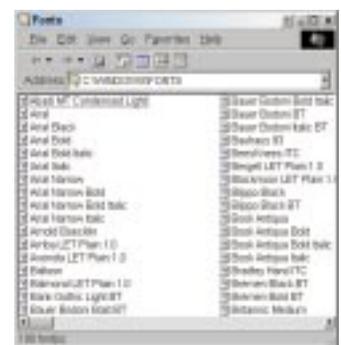
Difficulty
Benefit

5 Lose some fonts

Unless you're involved in DTP, you probably only use a few fonts on your PC - Arial, Times New Roman, plus a handful of others. Take a look in your Fonts folder though (c:\Windows\fonts), and you'll probably find dozens of files.

Fonts take up hard disk space and occupy memory, even if they're not being used, so getting rid of some will have a two-fold benefit. The easiest way to do this is to go to Start/Control Panel/Fonts. Just select the fonts from the list that appears and delete them.

Some fonts are used by Windows, so some care is needed



when deleting them. To be on the safe side, move any fonts you're not sure about to another folder and delete them later if Windows doesn't complain.

Difficulty

Benefit

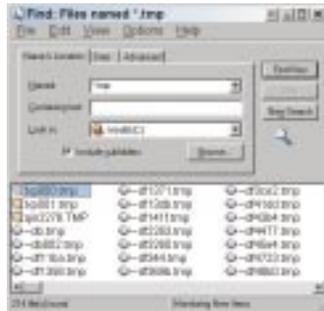
6 Clean up your hard disk

Hard disks accumulate junk like a magnet picks up iron filings. Temporary Internet files, files left behind from program crashes - they all take up valuable hard disk space, so hunt them down and throw them out.

The first thing to do is clear out your Internet browser's cache. With Internet Explorer 4, this is done with View/Internet Options. Click the Delete Files button in the Temporary Internet section. With Netscape Communicator, go to Edit/Preferences/Advanced/Cache and click the Clear Disk Cache button.

Any file ending in .TMP is a temporary file and needs to be deleted. Use Start/Find/Files or Folders to search for files called *.TMP on all of your hard drives. Once found, delete them all. Take a look in c:\Windows\Temp too, and delete any files or folders in there.

Finally, deleting files doesn't actually delete them - make sure you empty the Recycle Bin when you've finished.



Difficulty

Benefit

7 Virtual memory

If your PC doesn't have enough RAM, Windows fakes it using virtual memory on your hard disk. To ensure virtual memory is running at peak performance, there are a couple of things to check. First, virtual memory needs plenty of hard disk space to

work at its best, so if you're running low, look at step 6. Second, if you have more than one hard drive, virtual memory should be using the fastest one, or at least the one with the most space. Right-click My Computer, choose Properties, click the Performance tab and then the Virtual Memory button to change the drive it uses.



Difficulty

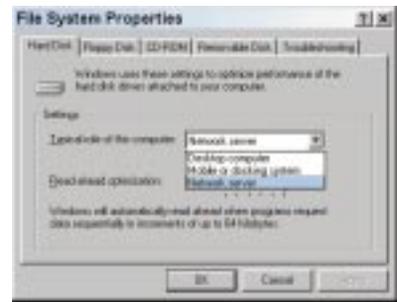
Benefit

8 Performance tweaks

There are more tweaks under the Performance tab. Click the File System button and under the Hard Disk tab, change 'Typical role of this computer' to Network server and 'Read ahead optimization' to Full.

Under CD-ROM, set the 'Supplemental cache size' to Large

and providing your hard drive has at least a 4-speed CD-ROM drive, set 'Optimize access pattern for' to Quad-speed or higher.



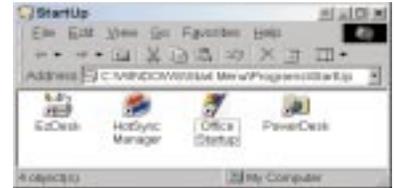
Difficulty

Benefit

9 Reduce boot time

The more programs Windows has to run when it's starting, the longer you'll be looking at that animated startup screen.

Look in c:\Windows\Startup for shortcuts to any programs that start automatically with Windows. Unless they're ones you use all the time in the background, delete them (or move them elsewhere to be on the safe side) to reduce startup time and free up some memory too.



Difficulty

Benefit

10 Optimise the Registry

The Registry is a database used by Windows 95 and 98 to keep track of every piece of installed hardware and software. Over time, it can accumulate unwanted information and as the Registry is processed each time Windows starts, this can slow things down.

Editing the Registry yourself is possible but not recommended. Fortunately, Microsoft has a free program to clean up the Registry for you. Called RegClean, it can be downloaded from the Microsoft Website and it's also on this month's cover CD. It's called oadist.exe and can be found in software\utility\oldauto\oadist.exe.



Difficulty

Benefit

Useful contacts

- **Adaptec UK:** 01276 854500
 - **ATI:** 01628 533115
 - **Creative Labs:** 01245 265265
 - **Guillemot (MaxiSound):** 0181 944 9000
 - **Intel:** 01793 403000
 - **Kingston Technology:** 0800 435978
 - **Maxtor:** 00 353 1 286 6222
 - **Pace:** 0990 561001
 - **Terratec:** 01600 772111
 - **ViewSonic:** 01293 643900
- Microsoft Hardware Compatibility List**
Lists known compatibility issues between Windows and various pieces of hardware. Useful reading if you're planning on an upgrade to Windows and aren't sure about your system.