



## Inside information

**If your machine is being overtaken by faster, sleeker models, tinkering with the hardware to bring it up to date may be easier than you think.**

**Eleanor Turton-Hill leads you gently up the upgrade path.**

The majority of users still regard the inside of a PC as hostile territory. Otherwise intelligent lawyers, engineers, accountants or even programmers break into a cold sweat when faced with the innards of the familiar machine on their desk. What they don't realise is that today's PC is designed to be easy to take apart and put back together again, so there's no need to be intimidated.

If you own a PC you have to accept the fact that it will quickly become out of date. Your hard disk will gradually fill up, your favourite software will be superseded by a bigger version, and finally one day you'll discover that no-one even makes a computer like yours anymore. At one of these stages you'll want to reassess the value of your system.

You could, of course, decide to grit your teeth and ignore the flow of change. Sometimes (depending on what you want to do with your machine) this is a reasonable position to take. Alternatively, you could decide just to go out and buy a new machine. But before you start splashing your money about there is a third option, and that is to upgrade one or several parts of your system. This involves weighing up the cost of the upgraded parts against the cost of a new machine.

### Which part to upgrade?

A PC, like a car, must have a healthy balance of parts which together make for



*Processors: Intel's range will take your 486SX through to the more powerful 486, right the way up to the fastest Pentiums*

optimum performance. There's no point in buying a Rolls Royce engine and putting it inside a Robin Reliant.

There are four basic components which can be upgraded depending on the current state of your machine: memory, hard disk, video card and processor. Adding a CD-ROM drive will also greatly improve your system. To keep a good balance, however, you'll have to decide which part of your system is most in need of a boost. For example, if you have a

200Mb hard disk, a 486 processor and 4Mb of RAM, then your first priority would be a memory upgrade. If your system has a 300Mb hard disk, 8Mb of RAM and a 486SX processor, then you'd be better off upgrading your processor. This month I'll look at upgrading your memory, video card and processor.

### Memory

The most obvious and easiest way to improve your system is to add more RAM. RAM stands for Random Access Memory.

It's the working memory your computer uses to store instructions and data before they can be committed to the hard disk. Because RAM works much faster than the hard disk, it's used for handling all the data in constant use while programs are running, and for this reason it makes a big difference to performance.

In the old days of DOS-based applications, most spreadsheets, word processors, and simple databases could run quite happily on 1Mb or 2Mb. These days, most people run Windows programs which are graphical by definition (even simple spreadsheets and word processors) and are very memory-hungry. It's generally agreed that you'll need at least 8Mb to run the average system satisfactorily, and more if you use graphics or CAD (computer aided design) applications. A system with 4Mb of RAM will just about stand up, but it will soon drive you round the bend with its crunching noises and flashing lights as it struggles to shovel data from memory to disk.

The first thing to check about the RAM provided in your system is whether it uses standard or proprietary memory, and what the upgrade alternatives are. Some PC manufacturers force you to buy proprietary memory chips, usually insisting that their brand of memory is faster and more reliable. Generally this is just a way of getting you to spend extortionate amounts of money. These days 4Mb of



industry standard (72-pin) SIMMs costs about £120. You can still get hold of the older 30-pin type memory second-hand for as little as £15 for 1Mb. Proprietary RAM is generally priced at three to four times the price of industry-standard SIMMs, so weigh up the cost before you decide.

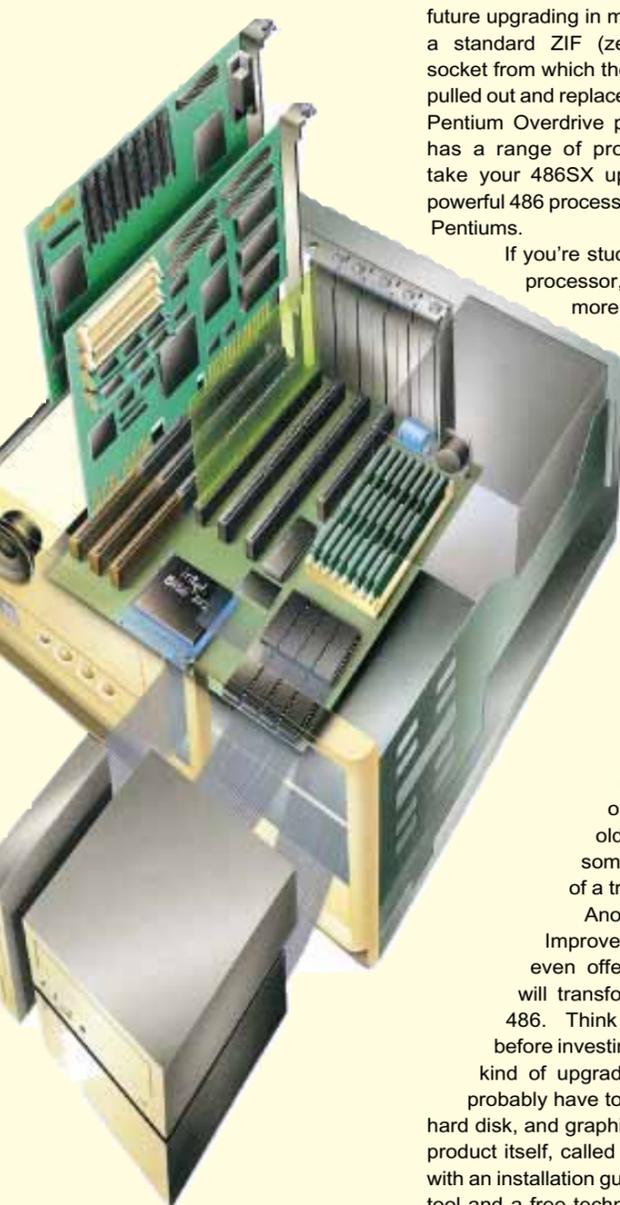
### Video cards

Another way of giving your machine an extra power boost is to upgrade the video card. The video card sits in one of the expansion slots inside the PC and controls the features that the software can display on the monitor. Any kind of graphical manipulation is very demanding on system resources — and that includes normal Windows operations. Even the simplest of graphical procedures like drawing a circle on screen involves thousands of calculations.

One of the first things you'll need to know is whether your current video card is local bus or not. Local bus is a type of interface which connects your video card to the motherboard. It's a hardware standard which allows the memory in the card to be addressed directly by the CPU. This makes it a lot faster than the standard ISA (industry standard architecture) interface.

The most important aspect of your video card, and the most frequently quoted feature, relates to the resolution which the card supports in Windows. This is measured in terms of the number of pixels that the card displays on the screen. The absolute minimum these days is 1024 x 768 with a refresh rate of 70Hz. The refresh rate is an important figure as it relates to the flicker which you will perceive from your monitor. Be careful to check out the capabilities of your monitor before investing in an expensive graphics card. A powerful graphics card is useless if it cannot exploit the resolution capabilities of your monitor.

Modern graphics cards generally have a fair amount of processing power and memory built in. Check the amount of memory on the video card currently in your machine: 2Mb is about standard to run the current generation of software, 1Mb is skimpy and 512Kb is barely usable. Sometimes the memory on video cards can be upgraded, so check this out before buying a new card. Also, check out the performance capability of the card. Video cards come as 16-bit, 32-bit, 64-bit and



even 128-bit.

All you need to know about this is that high numbers of bits mean faster performance and more colours. A reasonable graphics card costs about £70 but more powerful cards can cost anything up to about £500.

### Processor speed

When it comes to performance, the single most important component in your machine is the processor or CPU. The upgrade options for your PC will depend on what type of processor you have. Modern 486-based PCs are designed with

future upgrading in mind. The CPU sits in a standard ZIF (zero insertion force) socket from which the CPU can be easily pulled out and replaced with the latest Intel Pentium Overdrive processor. Intel now has a range of processors which will take your 486SX up through the more powerful 486 processors to the even faster Pentiums.

If you're stuck with a 286 or 386 processor, upgrading will be more problematic. When 386s were made, there were no future-proofing standards to aid processor upgrading, and in fact Intel has completely ignored the 386 processor upgrade market.

However, Cyrix and Evergreen offer a range of options which will give older 386 machines some of the capabilities of a true 486.

Another manufacturer, Improved Technologies, even offers a product which will transform your 286 into a 486. Think carefully, though, before investing your money in this kind of upgrade because you will probably have to upgrade your RAM, hard disk, and graphics card as well. The product itself, called Make-it 486, comes with an installation guide, a chip extraction tool and a free technical support hotline. The company also offers a guarantee of compatibility — if the chip doesn't work, they will give you your money back.

Next month I'll be looking at some of the issues involved when adding a CD-ROM drive to your system, and a second hard disk.

### PCW Contacts

Evergreen upgrade chips available from  
Total Memory Direct 01256 332460  
Intel 01793 431155  
Cyrix 01793 417759  
Improved Technologies Make-It chip  
available from Technomatic  
0181 205 9558

