



# Processor and memory upgrades

Paul Wardley continues his series of computer classes with a step-by-step guide to upgrading your PC's memory and processor

**Y**ou can tweak a computer so far but there comes a point when it just won't go any faster – you have to beef up the engine. The engine of a computer is the processor chip, but because this works in tandem with the memory the chances are you'll want to upgrade both at the same time.

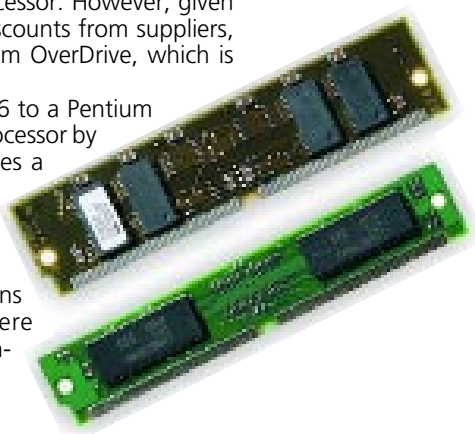
Fortunately, memory and processor transplants are the easiest of all upgrades to carry out, requiring little technical dexterity and no fiddling about with the software already installed on the computer. What you do need to do, however, is find out as much as you can about the hardware you already have so you can choose the correct chips to buy for the upgrade.

## 486 to Pentium

It's possible to upgrade to a faster 486 processor by using an Intel DX4 OverDrive or a chip from a manufacturer such as Kingston, whose TurboChip 133 uses an AMD processor. However, given recent price reductions from Intel and discounts from suppliers, it's probably better to opt for the Pentium OverDrive, which is available from £105 if you shop around.

The Pentium OverDrive converts a 486 to a Pentium and multiplies the speed of the original processor by two-and-a-half, so a 25MHz 486 becomes a 63MHz Pentium and a 33MHz 486 becomes an 83MHz Pentium. The OverDrive chip also works with a 486DX2/66, treating it as if it were a 33MHz 486.

Installation is simple and full instructions are provided with the chip, but we here describe the procedure in case you're wondering whether you dare tackle it.



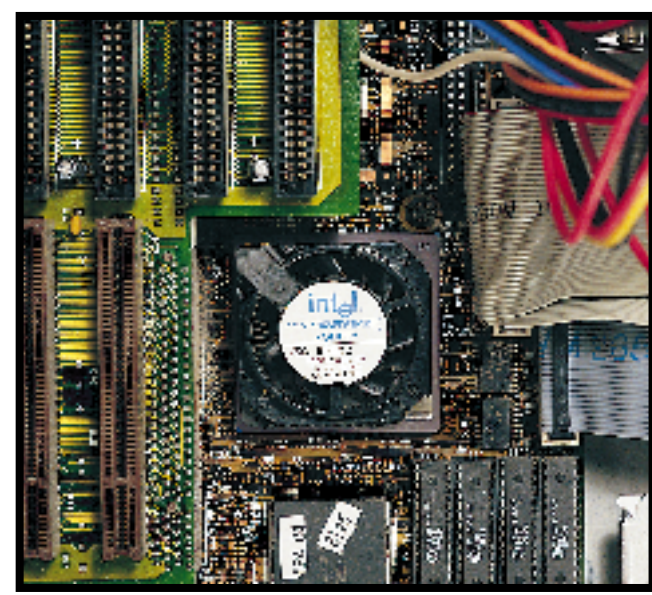
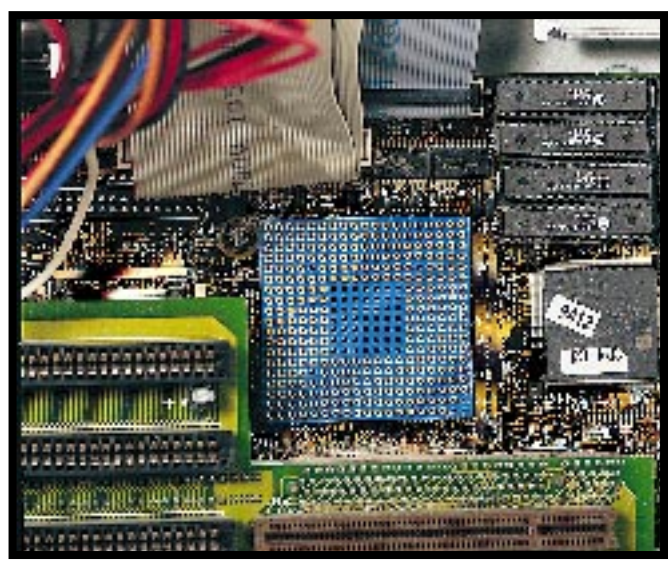




1 Switch off your computer and open its case. Earth yourself by touching a metal part of the case or the power supply, then switch off or unplug at the mains.



2 Locate the existing processor. If the computer has a separate OverDrive socket you don't need to remove the existing chip, but if there is only one socket already occupied by the 486 processor, you'll have to remove it. Intel supplies a tool for this purpose: it hooks under the chip and prises it out of its slot. Some 486 sockets are fitted with a lever that releases the original processor, making Intel's tool redundant.



3 Insert the OverDrive processor into the vacant socket, making sure that it is the right way round: one corner of the chip has a notched edge and some pins missing. You have to make sure that this corner is aligned with a similar corner on the socket. Press the chip home firmly but without undue force, especially if you have a lever-equipped socket, in which case the new chip should drop in almost unaided.

4 In most cases that's all you need to do, but a few computers may need to be told that the processor has changed. This means moving a small switch or connector that will be found on the motherboard – which is the same electrical circuit board as the one on which the processor is mounted. Your computer's manual will tell you its exact location.



5 Refit the computer's case and switch on the power. The upgraded PC is now ready to use. Intel supplies a diagnostic program that tells you whether the new processor is working properly.

What PC? recommended upgrade options			
Current processor	Current memory	Recommended processor upgrade	Memory upgrade
386 (any speed)	4Mb	none	8Mb
386 (any speed)	8Mb	none	none
486 25/33	4Mb	none	8Mb
486 25/33	8Mb	OverDrive 63MHz/83MHz	16Mb
Pentium (any speed)	4Mb or 8Mb	none	16Mb
Pentium 60/66	16Mb	OverDrive 120MHz/133MHz	optional
Pentium 75	16Mb	OverDrive 125MHz or Pentium 166MHz *	optional
Pentium 90	16Mb	OverDrive 150MHz or Pentium 166MHz *	optional
Pentium 100	16Mb	OverDrive 166MHz or Pentium 166MHz	optional
Pentium 120/133	16Mb	none **	optional

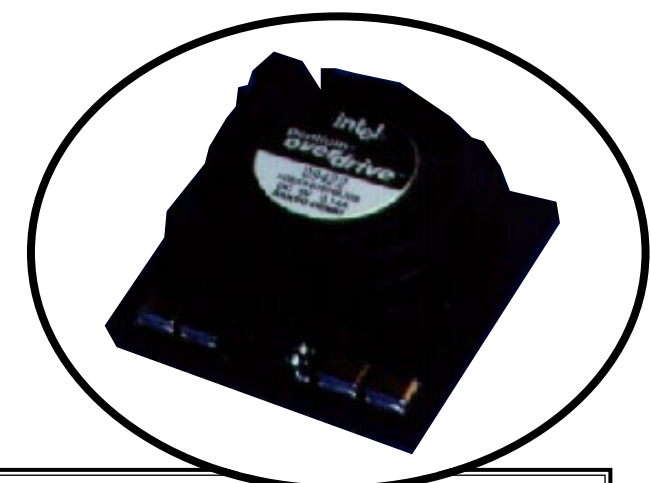
\*To install a 166MHz Pentium you need a motherboard with switchable speeds \*\*The improvement in performance is not worth the expense – increase memory instead.

### Switching to a faster Pentium

Saying that a PC has a Pentium processor is often taken to imply that it is a fast, modern computer – but this is a gross oversimplification. The first 60MHz and 66MHz Pentium-powered PCs were barely faster than well-equipped 486 machines and now that Pentiums have reached 200MHz there's a world of difference between chips of different speeds. Fortunately, there are two ways to upgrade a Pentium processor: use one of Intel's OverDrive chips or replace the existing processor with a faster, original Pentium. The easiest route, and this is the only one for owners of 60MHz and 66MHz chips, is to buy a Pentium OverDrive. One of these will directly replace the existing processor and automatically convert the 5V from the motherboard to match the lower 3.3V requirement of current Pentium chips. Pentiums running at 75MHz and above already use 3.3V circuitry and can therefore be replaced with faster versions, rather than OverDrive units, though this is a slightly more complex procedure as it also involves changing settings on the motherboard. Most boards are switchable between different speeds of processor with recent versions accepting anything from 75MHz to 200MHz. However, older motherboards may only accept a restricted range of processors so do check BEFORE you buy a replacement chip. If in any doubt as to the motherboard's suitability, buy an OverDrive instead of an original Pentium.



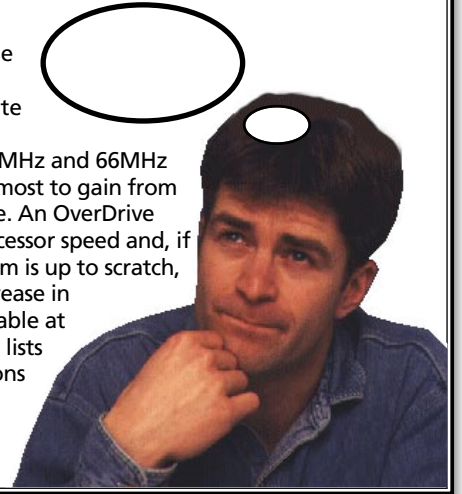
Speeds	
Actual speed	Bus speed
90MHz	60MHz
100MHz	66MHz
120MHz	60MHz
133MHz	66MHz
150MHz	60MHz
166MHz	66MHz
200MHz	66MHz



### Is it worth upgrading?

Sorry, but if you've got a 386 PC it's not worth upgrading it beyond increasing the memory to 8Mb. Processor chips to boost 386s to something like 486 performance do exist, but with the 486 itself nearing obsolescence (and the antiquity of the other components in a 386 holding it back) you'd be wasting your money. If you already have a 486 PC and the hard disk is of a reasonable size (say 500Mb), then a 486-to-Pentium OverDrive processor will give you an extra year or two of useful life before the requirements of new software reach into the stratosphere. You'll also need to increase the RAM to 16Mb to make the most of the new chip. Pentium owners should think carefully before upgrading their processor unless they can double the speed of the existing chip. While a 50 percent increase in speed is desirable, it doesn't make as much difference as

you'd think because the hard disk and graphics still operate at the old speeds. Users of early 60MHz and 66MHz Pentiums have the most to gain from a processor upgrade. An OverDrive will double the processor speed and, if the rest of the system is up to scratch, yield a tangible increase in performance. The table at the top of the page lists our recommendations for processor and memory combinations.







Here's a step-by-step guide to fitting a Pentium processor:

1. Switch off your computer and open its case. Earth yourself by touching a metal part of the case or the power supply, then switch off or unplug at the mains.
2. Locate the existing Pentium processor and unclip the cooling fan (if fitted), and disconnect it from the lead attached to the power supply.
3. Remove the heatsink if it is clipped to the processor. If the heatsink has been glued in position, leave it in place.
4. Open the processor socket by lifting its handle and remove the existing processor.
5. Insert the replacement OverDrive or Pentium processor. There is only one way to fit it in the socket, so don't force it, and when the chip is in position lock down the retaining lever.

If you're fitting an OverDrive processor, these five steps are all you need to do because clever circuitry sandwiched between the chip itself and the cooling assembly takes care of everything else, but if you're upgrading with an original Pentium you'll have to continue as follows:

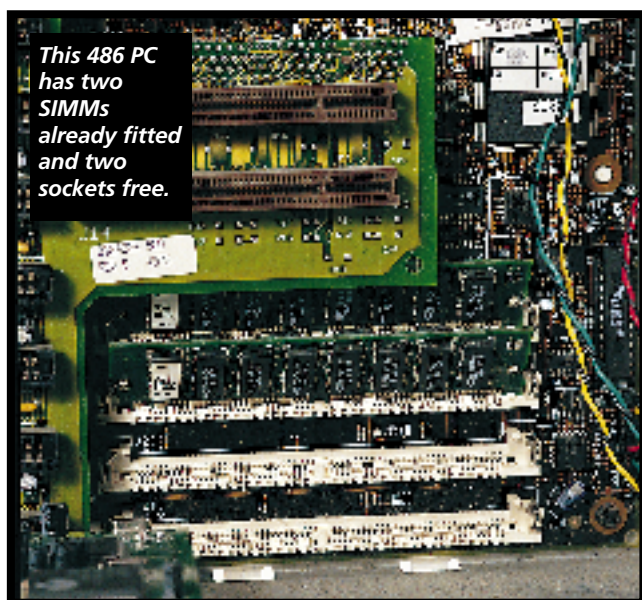
1. Re-attach the heatsink and fan to the new processor.
2. Re-connect the fan to the power supply.
3. Adjust two sets of motherboard pin connectors or switches to tell your computer about the new processor. You'll need your computer's manual for this, though some motherboards have the information etched onto their surfaces. One set of connectors determines the new processor's bus speed (how fast it communicates with other components on the motherboard) and the other its actual speed. (See the table on speeds on the preceding page of this class.)

## Adding extra memory

Memory comes on SIMMs – little circuit boards with tiny memory chips soldered onto them. The SIMMs are plugged into sockets inside the computer and are very easy to fit, but it's important to make sure you buy the right kind for your PC.

The most obvious difference between them is the number of pins on their bottom edges – 30 or 72 – but they also differ internally and are classified as parity or non-parity according to the way they work. The only way to be certain which type your PC uses (unless you're an expert at chip identification) is to look it up in your computer's manual or ask the manufacturer.

Many Pentium PCs can accept an advanced kind of memory, called EDO. If your computer can take EDO SIMMs then buy them – they're no more expensive but they're faster.

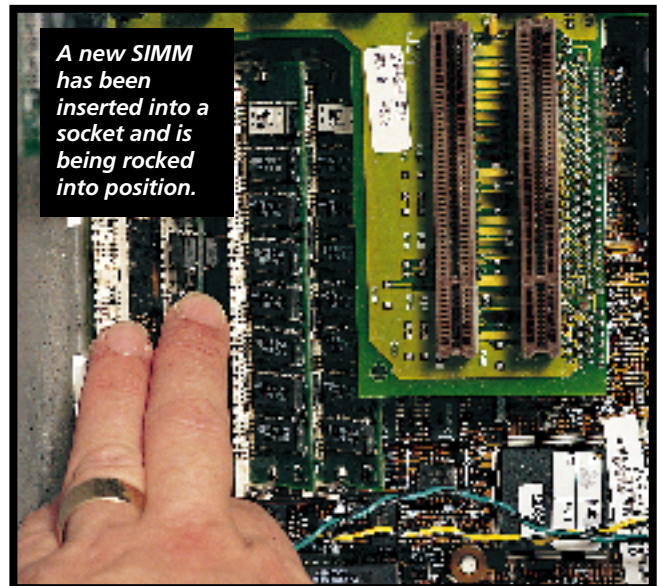


Before you buy memory, check your manual or open up your computer to see how many SIMM sockets are unused. 386 PCs are almost certain to use 30-pin SIMMs, which must be fitted in sets of four, so you need four free sockets unless you are will-

ing to discard the existing memory. Most 486 PCs use 72-pin memory and can accept a single SIMM. Pentiums always have the SIMMs fitted in pairs, so look for two empty sockets.

To fit new memory, do the following:

1. Switch off your computer and open its case. Earth yourself by touching a metal part of the case or the power supply, then switch off or unplug at the mains.
2. Remove the new SIMMs from their protective anti-static bags, taking care not to touch the soldered-on memory chips because they are very sensitive to static electricity. Try to hold the SIMMs by their edges instead.



3. Look at the orientation of the SIMMs already fitted to your PC. If you can see that they lean back at an angle of about 30 degrees from vertical, then the new SIMMs must be inserted vertically and pushed back until they click into this position, held by clips at either side of the socket. In a variation on this procedure, some sockets are designed to accept SIMMs at an angle, which are then locked into an upright position. Use the existing memory as a guide.

4. If you need to remove any of the original SIMMs you must first release the two retaining clips and then rock the chip into its release position before trying to extract it. It sometimes seems that this procedure needs three hands so if you have a willing helper, so much the better.

5. Replace your computer's case and switch on. Your computer will recognise that the memory has changed and flash up a message saying something along the lines of

'Invalid memory configuration – press any key to start Set-up'. When you do this, the computer will re-configure itself for the new memory – all you have to do is save the settings and exit. ●



## See it on our CD-ROM

Our cover CD this month includes videos showing processor and memory upgrades being carried out.

