



## Processor push-ups

Give that lazy old PC a kick up the socket with a processor upgrade. Roger Gann tells you how to fortify the 486s.

PCW Chip Photography by Graham Pearson

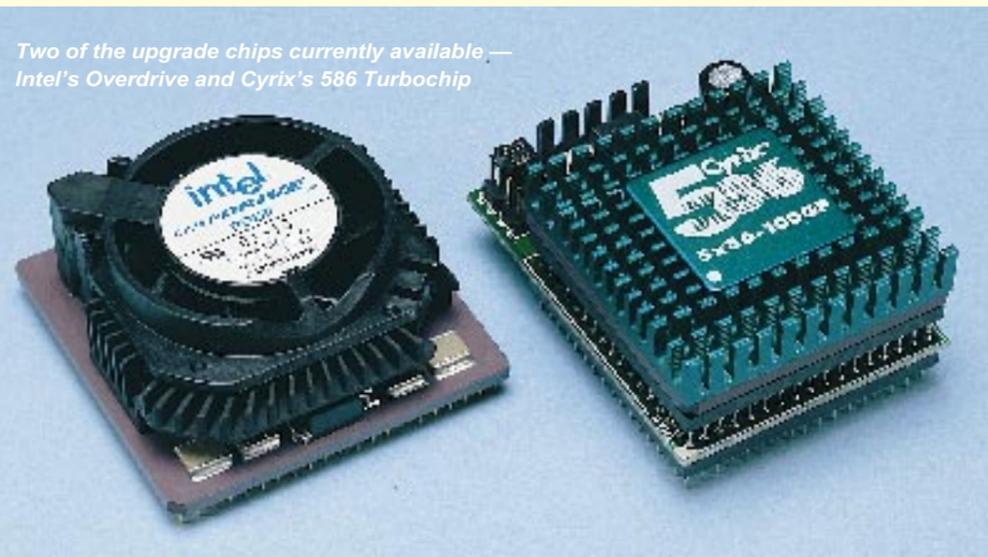
My steely gaze alights this month on processor upgrades. As sure as night follows day, the PC you buy today will inevitably appear to run slowly tomorrow, weighed down by the ever-increasing burden of running the latest 32-bit software and operating systems. Luckily, for the vast majority of PC owners it's possible to revitalise their sluggish PCs by upgrading their existing processor and replacing it with a more powerful one. Luckier still, this is a relatively simple task.

This month I'll be looking at upgrading your CPU and divulging the odd tip or two. I'll concentrate on upgrading 486s as not only are they the most plentiful but they also have the most pressing need of upgrading. Although the 486 is now technically obsolete, the world is awash with them: according to Intel, there are already 50 million upgradable 486s out there. This is no bad thing from an upgrading point of view, because the 486 family was designed from the outset to be upgradable.

### Sockets

The key to processor upgrading is that most, if not all, 486 processors are socketed. This means that it's a simple task to extract the old processor from its socket and plug in a replacement. Even those

Two of the upgrade chips currently available — Intel's Overdrive and Cyrix's 586 Turbochip



### Overdrive vs "loose"

You don't have to look too far to see that plenty of dealers these days are selling both ordinary and Overdrive processors. Internally, these chips are almost identical but they carry quite different price tags: an Intel 486DX2/66 Overdrive might go for £85 while just £22 will buy you a ST486DX2-66-GS CPU made by the French chip giant, SGS.

The two chips are, to all intents and purposes, identical but one is almost four times the price of the other. Surely only a fool would buy the dearer of the two? Well, when confronted with bargains like this, you have to bear in mind the reason for the price difference: you get more if you plump for the Intel.

The cheaper CPUs are invariably sourced from the OEM (original equipment manufacturer) market and so aren't meant to be sold in the retail market — they are intended to be installed by PC manufacturers and not end-users. They are supplied in bulk, with little or no packaging, no instructions and no support: when you buy one of these, you're on your own.

With the Overdrive you get full instructions, tech support, software, a three-year warranty and a money-back guarantee. You also get special versions of the chip that will allow a 3.3v Overdrive CPU to run in a 5v socket, for example.

If you know what you're doing, CPUs that are sold "loose" are a bargain. But if you're new to the processor upgrade game it's best to play safe and go down the Overdrive route.

### Supercharging an Overdrive

Intel has gone to considerable lengths to make the potentially fraught matter of processor upgrading as simple as possible. It *must* be as uncomplicated as possible if it's to be a retail product, likely to be installed by a non-technical end-user.

At its simplest, all you have to do is take out the old CPU and bung in the new one. At worst, you might have to move some motherboard jumpers. The down side of this approach is that it limits your choice somewhat: if you had an old 25MHz 486SX and wanted to fit a Pentium Overdrive, you could only buy the 63MHz version because the faster, 83MHz version is meant for 33MHz motherboards. Or, if you were looking at a DX4 you'd have to fit the 75MHz version rather than the 100MHz one.

Nevertheless, most motherboards (even quite old ones) were designed to take a variety of processors and so were able to run at a variety of speeds, typically 25MHz or 33MHz. These so-called "clock speeds" are normally determined by a set of jumpers on the motherboard, so if you could adjust the clock speed from 25MHz to 33MHz you'd be able to fit the 83MHz Pentium Overdrive rather than the slower 63MHz version. Sure, it would cost you more, but you'd be getting a faster PC at the end of the day and thus it's definitely worth paying the extra £30 or so. However, setting the motherboard speed jumpers can be fiddly and you'll need the assistance of your motherboard handbook to tell you which ones to move, but the hassle is worth it in the long run.

### What performance gains can you expect?

Simply fitting a more powerful processor doesn't commensurately increase the overall power of your PC — it'll have a greater impact on some tasks than others. Yes, you do get gains from upgrading your processor but nowhere near as great as you might have hoped for.

Synthetic benchmarking may reveal integer and floating-point performance improvements of as much as 100 percent as a result of such an upgrade, but the real-world improvements you can expect will be much lower: in the 20 to 30 percent range.

Other factors such as installed memory, hard disk and graphics have just as great an influence on overall performance and will dilute the apparent gains to be had from installing a processor upgrade. So if you do a lot of processor-intensive tasks, such as spreadsheeting or multimedia, then provided the price is right, a processor upgrade is worth considering as a PC's mid-life booster.

handful of 486SX processors that were soldered down were, typically, additionally provided with an empty upgrade socket.

The original Pin Grid Array (PGA) socket held the CPU in by friction, which meant that the chip didn't just lift out: the unit and its 168 pins had to be levered out. Normally, the pin holes in a traditional processor socket tapered slightly to ensure a good electrical contact; the chips were effectively tightly held in by friction, hence their reluctance to be removed. Luckily, every Overdrive kit comes with a high-tech crowbar (chip-puller) to prise old 486s out of old PGA sockets.

To make CPU upgrading a lot easier, even though it's a task you'll probably only ever do once or twice, Intel designed the Zero Insertion Force (ZIF) CPU socket. A ZIF socket is a little larger than a normal PGA socket and uses a lever, or handle, to clamp the chip pins tightly. To remove the chip, you unclip the lever and lift it. This unclamps the CPU which then lifts out very easily — with zero force, in fact. Most 486s and all DX4s and Pentiums feature ZIF sockets.

There are several sorts of ZIF socket. The type of socket will determine what processor upgrade options are available, so it pays to take a peek under the bonnet to see just what sort of a socket you've got.

There are four types of ZIF socket installed in 486-based PCs:

**Socket 1** A 169-pin, blue, ZIF socket; this can only accept 486 Overdrive processors.  
**Socket 2** A 238-pin, blue, ZIF socket; this can accept both 486 and Pentium Overdrive processors.

**Socket 3** A white, 237-pin, ZIF socket; this is essentially the same as Socket 2 but can take the low voltage 3.3v DX4 and Pentium Overdrive. The "missing" pin is used to correctly orientate the square chip.  
**Socket 6** A 235-pin socket for DX4 processors.

Pentium-based machines have even larger ZIF sockets:

**Socket 4** A white, 273-pin, ZIF socket; this is used for Pentium 60 and Pentium 66 processors.

**Socket 5** A white, 320-pin, ZIF socket; this is used for Pentium 75 processors and above.

**Socket 7** A white 321-pin ZIF socket; the current standard socket for the entire Pentium range. It can take future Pentium upgrade processors.

**Socket 8** The largest ZIF socket of all, for the Pentium Pro.

### The upgrade choice

So given the right socket, the range of upgrade processors you can fit is quite wide. If you've got a 486SX/25 with a Socket 3 you'll be able to choose between four Overdrives: the 486SX2, which is a speed-doubled version of the SX; the 486DX2, which is a speed-doubled CPU with maths co-processor; the DX4, which is a speed-trebled processor with maths co-processor; or, a 63MHz Pentium Overdrive.

Note that Intel is in the process of phasing out the slower Overdrives and you'll have to move fast to snap up any of the 486SX2 or DX2 models before the summer. That leaves the 75MHz and 100MHz DX4 and the 63MHz and 84MHz Pentium Overdrives. Their prices start at £112 for the entry-level DX4. The 100MHz DX4 and the 63MHz Pentium Overdrive are £145 each and the top-end Pentium Overdrive is £209, but street prices are much lower.

And what about Pentium owners? Although it's always been possible to upgrade Pentium 75s and above, simply by replacing them with faster, "loose", OEM (original equipment manufacturer) versions sold in the retail market, this luxury was denied to owners of older 60MHz and 66MHz Pentiums. This has now been rectified with the recent release of the latest clutch of Pentium Overdrives, which cater for 60, 66, 75 and 90MHz Pentiums. It costs £246 to buy a 120/133MHz Pentium Overdrive — 125MHz in the case of 75MHz upgrades (reviewed in the April issue of PCW).

### Alternatives to Intel

But don't think it's Hobson's choice when it comes to CPU upgrades — there are alternatives to Intel. Cyrix has left the upgrade market *per se* but its processors turn up in third-party upgrade products — the new 5x86, for instance, turns up in the PowerLeap/586 (contact Future Upgrades; see PCW Contacts panel). This is as powerful as the Pentium Overdrive 83 but at £95 is less than half the price of its Intel rival. The catch is that the 5x86 is

How to upgrade your processor — see over page



so modern, it's only suited to the more recent motherboards. Kingston Technology does a range of processor upgrades as well, the "Turbochip" range (contact Datrontech; see *PCW Contacts* panel).

## Step-by-Step

### UPGRADING YOUR PROCESSOR

*When handling processors it's particularly important to remove any static electricity you might be carrying by earthing yourself — don't forget, you'll be handling something expensive that's easily zapped by static!*

#### Step 1

- Power down and unplug the PC from the mains and disconnect all other leads.

#### Step 2

- Take the lid off the PC. It'll be held on by four or five self-tapping screws and you'll most likely need a Phillips screwdriver to undo them. Keep them in a safe place.
- Locate and identify the 486 processor. It might be a good idea to remove some or all of the expansion cards to give yourself more space.

#### Step 3

- Note the orientation of the printing on

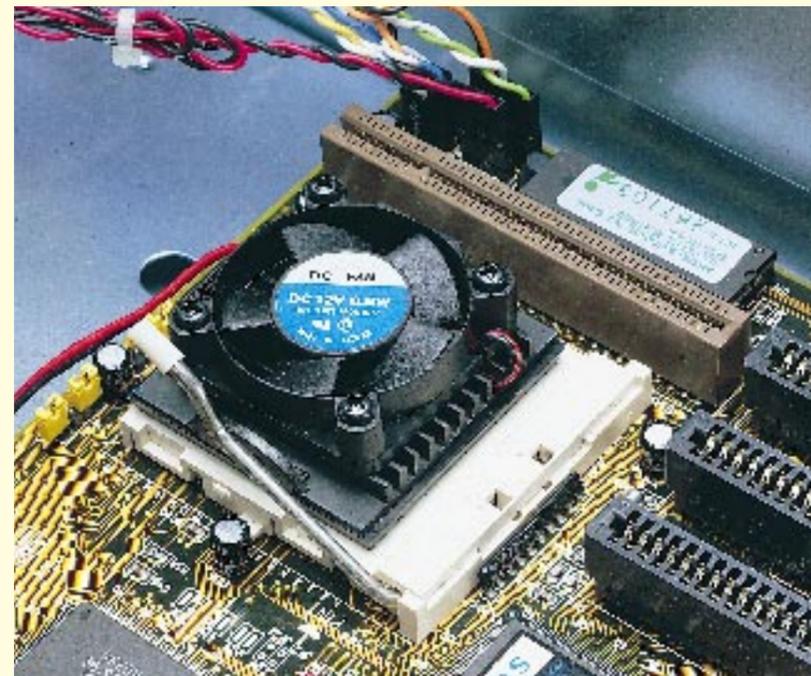
*The bevelled corner of the new chip must be lined up correctly. Here, Pin 1 is marked on the motherboard*

the old processor: it may help you orientate the new chip.

- Remove the processor. If it's in a ZIF socket, simply unclip the release lever and lift it up — you can now lift out the processor. If it's in a PGA socket, use the special lever supplied in the upgrade kit to prise it out — *be careful to insert it between the socket and the chip and not to put it under the socket*. Use gentle pressure and lift all four sides of the CPU evenly. Put the old CPU somewhere safe.

#### Step 4

- Because all current processor upgrades are square (i.e. symmetrical) it's quite possible to attempt to fit it into the socket in any of four ways, so take care to correctly orientate the new processor. This is easy: the socket will have a bevelled corner, or mark indicating the position of the corner pin; and the CPU will have a corresponding dot, or bevelled corner.
- Marry the two marks up and insert the chip, quickly checking beforehand that none of its pins are bent. Note that some Overdrive chips use an additional pin to orientate the chip in the socket, which makes it impossible to fit it the wrong way. If the ZIF socket is of the large Pentium Overdrive sort, insert your 486 Overdrive in the centre of the socket so that a line of



pin holes remains visible on all four sides of the ZIF socket.

- Simply drop in the CPU, lower the lever and clip it into the locked position. If it's a PGA socket then you'll have to use some force to insert the chip — make sure the chip is level and goes in "straight" and evenly. Be very careful, too, not to overflex the motherboard. You may need to shift a few motherboard jumpers at this point to identify the new CPU, so have that motherboard manual handy!

*The lever on the ZIF socket allows you to lock the new chip into place*

#### Step 5

- Reassemble the PC, replace the lid, do up the screws and plug everything back in.
- Plug in all the cables and power up the PC. You'll soon know if the new processor has gone in okay — if it hasn't, the PC won't boot.

### Explanation of acronyms and terms used

#### Low level

CPU Central processing unit.

#### Hard drive and peripheral interface standards

BIOS Basic input/output system.

#### Other terms

Clock speed The speed, in MHz, at which a microprocessor runs.

- If you have a "verbose" BIOS, which signs on with lots of information, it may tell you what sort of processor it recognises. To be extra sure, install the supplied diagnostic software that came with the upgrade just to make sure everything is A-OK.

#### Further reading

See *First Impressions* for a review of the MAke-it 586, from Improve Technologies, vs Kingston Technology's TurboChip 133.

### PCW Contacts

Roger Gann can be contacted either by post c/o PCW or via email at [rgann@mcgilivray.win-uk.net](mailto:rgann@mcgilivray.win-uk.net)

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