



## Out with the **old**

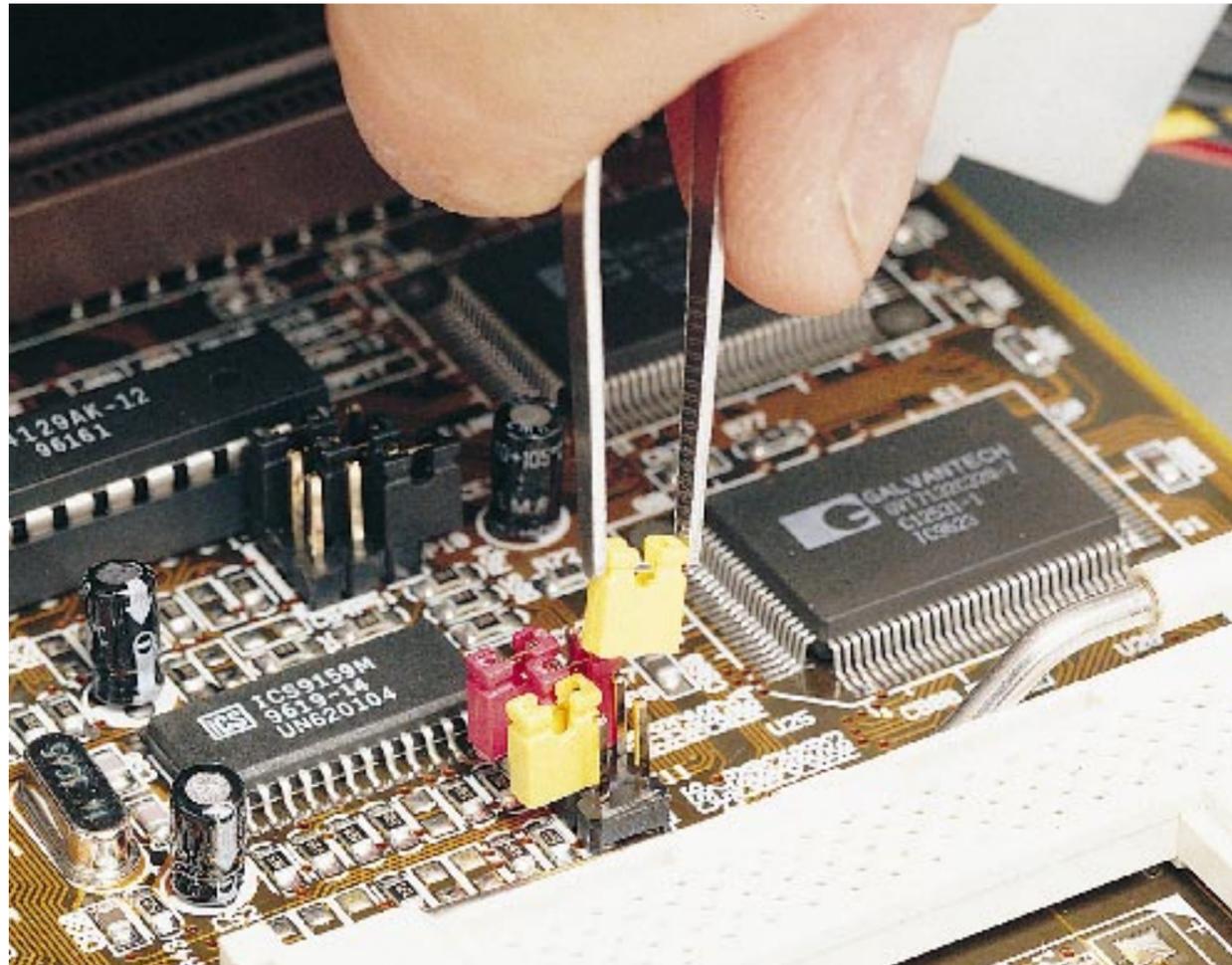
Fed up with watching paint dry while your PC chugs away? Why not upgrade the motherboard — Roger Gann shows you how.

Over the past few months I've looked at upgrading your PC in various ways: adding more memory, fitting an overdrive processor, adding an EIDE hard disk, and so on. While

all these upgrades will improve your PC's performance, the overall gains garnered from these upgrades aren't particularly breathtaking. This is because all you're doing is moving a performance bottleneck

elsewhere in the PC to some other, relatively old, component.

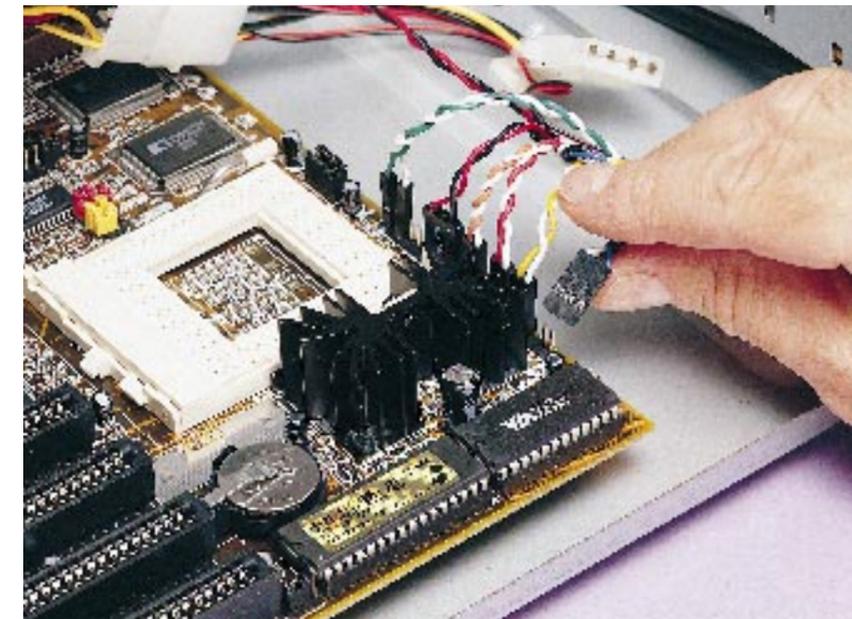
A more fundamental upgrade is required if you are looking for tangible performance gains: I'm talking about replacing the



Coloured jumpers: we're in luck as this motherboard uses coloured jumper sleeves to differentiate the various types of jumper, e.g. clock speed and processor type. Make sure the new motherboard is correctly jumpered for the type and speed of processor you're using

motherboard in your PC with a more powerful one. Not only would such a move allow you to use a more powerful processor, but you'd benefit from other advances, too, such as pipeline burst mode cache or the latest RAM technologies, such as EDO or Synchronous DRAM. You would also benefit from the latest PCI bus technology and lifesavers such as plug and play, especially if you're a Windows 95 user.

Sometimes you have no choice but to swap motherboards. The fastest Pentium overdrive for the 486 architecture stops at 83MHz, yet Pentiums are now running at 200MHz, and if you want more performance you'll have to upgrade your motherboard. But this is not as expensive as you might think. A DX4/100 overdrive will cost £120, while a 100MHz Pentium motherboard will cost only £70 more. Don't lose sight of the potential extra costs imposed by the new motherboard,



Multicoloured leads: pay close attention to the multicoloured leads and plugs before you unplug them from the old motherboard — it'll help you to identify each cable. If you're lucky, the plugs will be labelled

such as new memory if you've got old 30-pin SIMMs, or a new PCI graphics card if all you've got is VL-Bus.

A motherboard upgrade sounds complex, but don't worry. It is relatively hassle-free and your old PC gets a power boost without the need to duplicate or replace files, connections or peripherals. Complex reconfiguring is not necessary and, outwardly, your PC remains as its old familiar self.

### The downside

Although it is physically possible to upgrade just about any PC's motherboard, you should pause before taking the plunge. Swapping motherboards is rather more involved than fitting an expansion card and not something for the technically timid. Choosing a motherboard can be a big problem because, apart from Intel with its Endeavour and Atlantis main boards, most are brand-less designs from companies of

which you may never have heard.

Another problem is that, thanks to the pace of change, a particular model of motherboard might only be in production for a few weeks before being replaced. Remember, only four months separated the launch of the 166MHz and 200MHz Pentium processors, so the odds are that when you see a motherboard listed in an advertisement, its make and model won't be listed. Motherboards are effectively

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generic products, rather like potatoes. As for technical support, well — you are almost always on your own. Then there is the problem of overdoing it. There is no point in performing such an upgrade on a 386 because the rest of its hardware, like its graphics card and its hard disk, will be so slow as to be inadequate. The “weakest link in the chain” analogy applies here.

Another significant problem is the form factor of the motherboard: that is, its shape and size. While most clone manufacturers use the so-called “Baby AT”-sized motherboards which are readily interchangeable, most big name manufacturers tend to use their own proprietary motherboard designs, which aren't. Not only are they an odd, non-standard shape, but they may also be highly-integrated designs incorporating all I/O functions directly on the motherboard and not on expansion cards. You expect this from the likes of IBM and Compaq but you'll find that Amstrad, Viglen and Elonex also fall into this category.

The only way to upgrade the motherboard in these makes of machine is via the manufacturer, which makes them difficult to get hold of and pricey. So before jumping in at the deep end, make sure your new board will fit okay.

## Step by step

### Step 1 — Preliminaries

■ Before doing anything, it's a good idea to print out your existing CMOS settings. You can do this by taking a screendump of each

screenful of settings. Ensure your printer is on and connected to the PC, and press the PrtScr key.

The reason for doing this is to prevent potential problems later on when you install your new motherboard and you can't remember the previous settings. Don't forget, we're only changing the motherboard — all the other components are staying put.

Probably the most important settings are those that set the hard disk's geometry, because if you get these wrong, the PC won't reboot at the completion of the upgrade.

You could argue that this is unnecessary as most modern BIOSes are capable of auto-configuring the hard disk's geometry, so what's the point? Problems can arise if you previously used drive translation, say to reduce the number of cylinders to less than 1,024. When auto-configuration kicks in, it will only use the drive's default geometry, not the translated one. The drive will not then boot or be recognised. But if you have the original values, it's easy to key them in.

■ Take a moment to examine your new motherboard and read through its undoubtedly sparse manual. Check if there's anything important of which you should be aware. Most motherboard manuals are invariably techie, but you should try to identify the positions of important jumpers.

■ If you're fitting a new processor as well, install it and move all the jumpers now,

while you've got perfect access to every corner of the board. The same applies if you're fitting new RAM.

■ Finally, assemble your toolkit. You'll need a crosshead screwdriver, an electrician's screwdriver and maybe a pair of fine needle-nose pliers.

### Step 2 — Dismantle the case

■ Switch off the PC and unplug everything attached to the system unit: typically the keyboard and screen. All micro-electronics are very sensitive to static, and the kind of static discharge that gives you a very mild electric shock can be fatal to micro-electronics, so take the precaution of earthing yourself by touching some metal plumbing before handling the new motherboard. Better still, invest in an earthing wrist-strap.

■ Remove the casing lid by undoing the screws at the back.

### Step 3 — Remove the expansion cards

■ Our next task is to remove all the expansion cards, so undo the screw holding each card's blanking plate and carefully extract each card, putting it somewhere safe.

I guess that most people will need to remove just three cards: a graphics accelerator, a sound card and a multi I/O card which will have the serial ports, parallel ports and the hard disk/floppy disk controller. This will have a couple of grey ribbon cables plugged into it, so unplug

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them, taking careful note of which side of the ribbon has the coloured edge.

■ Tuck the now loose cables away behind the disk drives and don't forget to unplug the hard disk's activity LED cable. More modern motherboards have done away with separate I/O cards and instead integrate the I/O ports on the motherboard, so in this case unplug all the cables.

If you have a sound card, unplug the thin CD audio cable before removing the card. With all the cards out, there's no need to remove anything else. The hard and floppy disk drives can stay put. Some compact casing designs use drive cages that hang out over the motherboard and make installing/removing a motherboard awkward, so remove these as well.

#### Step 4 — Remove the cables

■ The next step is to remove the rest of the cables from the motherboard. Located somewhere near the keyboard socket at the rear you should see a pair of large, white or cream, power leads perhaps labelled P8 and P9. These can be quite reluctant to unplug, so you may have to use measured force to get them to shift.

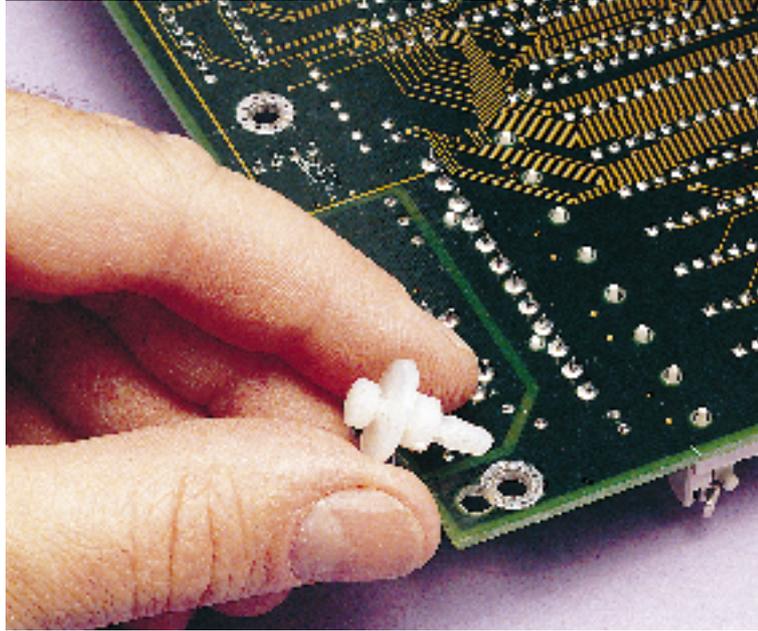
■ There will also be a group of thin multi-coloured cables plugged in at the front of the motherboard. These are for the power and turbo LEDs, the keylock and reset button. Occasionally, the little black plugs will be labelled. If they're not, it makes sense to identify them now while they're still connected. There's often a name printed on the motherboard to identify that connector.

#### Step 5 — Remove the old motherboard

■ The motherboard will probably be held by a couple of bolts. Locate them, undo them and put them in a safe place.

■ The motherboard will now be resting on several white plastic stand-offs, or spacers. These fit into tapered slots at the base of the chassis. You should now be able to slide the old motherboard out to the left but you may have to wiggle it about a bit first.

■ Once the old motherboard is out, use the pliers to extract the stand-offs and re-fit them in the corresponding holes in the new



**Plastic standoffs:** be sure to make a careful note of which holes the standoffs occupied in the old motherboard before transferring them to the new one. You'll need a pair of pliers to remove them

motherboard. There are normally several spare holes in the motherboard so don't fit spacers to all, as there won't necessarily be corresponding slots in the system case.

■ If you're able to reuse any SIMM modules, now is the time to remove them and transfer them to the new board.

#### Step 6 — Install the new motherboard

■ Give the new motherboard a once-over to make sure you've correctly set its jumpers.

■ Slide the new motherboard into position at the base of the chassis, so that the stand-offs engage in the right slots in the casing. The position of the keyboard socket and the hole in the casing for it will help you to locate the motherboard correctly.

■ Refit the bolts to secure the motherboard in place.

#### Step 7 — Reconnect the cables

■ Refit the P8 and P9 power cables to the motherboard: the norm is that the black cables on each plug should go together. The most fiddly bit is refitting the little multicoloured cables. Typically, these will be positioned along the front edge of the motherboard and I can guarantee that they won't be in precisely the same position or order as they were on the old motherboard.

■ There will probably be connectors for these cables: keylock, reset, power, turbo LED, switch and speaker. Sometimes they can be grouped together to form two or

three plugs. If this is a problem because the motherboard connectors are not arranged like this, it's okay to split the plastic plug into two separate plugs using a sharp knife.

#### Step 8 — Refit the expansion cards

■ Replace the previously-removed expansion cards, the graphics card, the I/O and hard disk controller.

■ Reattach the hard disk data ribbon and LED cables.

■ Replace the cover, plug in the screen and keyboard, and power up your PC. If

something is not right, you'll know it because the BIOS will signal an error.

As the BIOS can't depend on the video working, it will simply emit a series of coded beeps through the speaker. If you haven't fitted the memory properly, or if the video card isn't working, you'll hear a pattern of repeated beeps. Check the motherboard handbook to decode the pattern. In my experience, the most common problem has involved a badly-fitted or defective video card. A badly-fitted SIMM which is not quite seated is another candidate.

#### Step 9 — Edit the CMOS settings

■ The new motherboard's CMOS settings will effectively be blank, so the first time you boot up you'll typically be invited to enter CMOS setup to key things like the date and time, hard disk details and so on.

■ Try out the hard disk auto-configuration option and, using the notes you made earlier, compare the old settings with the suggested new ones: if they're the same, accept them; if not, edit the values manually. Don't forget to specify your floppy disk settings. Delay tweaking the advanced CMOS settings for another day, save the settings, and reboot. All things being equal, your PC should now boot up as normal.

#### PCW Contacts

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