The games that PCs play

Why not build your own PC? It's easier than you imagine. Here, in Part II, Roger Gann considers a high-power spec, prepares the motherboard, and shows how to fit the SIMM and stand-offs.

Last month we looked at the pros and cons of building your own PC and how to go about selecting those most anonymous of components, the system case and the motherboard. This time around I'll deal with specifying the ultimate games PC, from the ground up.

When I tell you that a top games PC is probably the most powerful, this side of a dedicated graphics workstation, it gives you some idea of what is possible when you have the luxury of being able to build your own PC. But if you don't actually need that much power, you'll be able to scale down the specification accordingly. I'll also be covering the first stage of assembly — the preparation of the motherboard.

You might think that the most powerful PCs are invariably to be found on business desktops? Wrong. The most powerful PCs are those dedicated to playing games, and these are found in the home. If you're serious about games-playing on a PC, then you'll need a serious PC on which to play them. And I'm talking about *really* serious, modern games, which incorporate all manner of multimedia effects: sound, animation, video and 3D rendering; these test the capabilities of a PC like few other programs can. It may sound preposterous, but Intel is aiming the latest and fastest 200MHz MMX Pentiums at the home market simply because games run better on the fastest processor you can buy.

The processor

So, the good news is that as far as games are concerned, you now have two choices. Your first port of call is the 200MHz Pentium MMX. The Pentium Pro is undoubtedly a more powerful processor, but it's not so hot when it comes to running 16-bit apps and doesn't have MMX support (although the Pentium II will), so we'll shortlist the 200MHz Pentium MMX. Although not many games support MMX at present, the list is growing, and it's a must-have for the serious games and multimedia user.

The other hot candidate for fast game play is the recently announced AMD K6 processor. This is faster than the Intel Pentium and in some cases is faster than the Pentium Pro. It's also about 25 percent cheaper than the equivalent Pentium and available in a 233MHz version too, making it both cheap *and* fast. Add to this the fact that there's no performance penalty when running 16-bit apps, that it supports MMX and that it is Socket 7 compatible, and the K6 begins to look very interesting.

Because the K6 is so new, make sure the motherboard you buy supports this advanced CPU. (*See last month's column, which dealt with selecting a motherboard*.)

Storage: hard disks & CD-ROM drives

Although the most powerful games will run almost exclusively from CD-ROM, the hard disk still has an important role to play, so you should ensure that you've got the fastest-possible hard disk subsystem. The vast majority of new PCs these days come equipped with Enhanced IDE hard disks and, thanks to the modern miracle of Mode 4 PIO, can belt out data at a cracking pace of up to 16Mb/sec. Very soon, though, motherboards will appear which support Ultra DMA EIDE, delivering 33Mb/sec throughput.

OK, so the EIDE transfer rate is good; but there's a price to pay, and that is extremely high CPU utilisation rates. But thanks to PIO, the CPU alone has to supervise every chunk of data that is hoovered up off the disk and this takes up plenty of its time; time which could be better spent actually running your game.

Games purists should avoid Enhanced IDE hard disks altogether, good though they are, and instead plump for SCSI because it is clever and handles all data transfers itself, thus not wasting processor power.

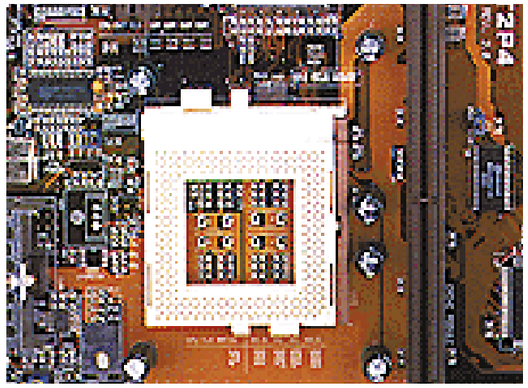
Here, I'd recommend something like the Adaptec AHA-2920 or 2940 host adaptor cards coupled to a Seagate Hawk Fast SCSI-2 drive. Or, if you're very keen, go for Ultra Wide SCSI such as the AHA-2940UW plus an Ultra Wide SCSI drive. This combination can deliver phenomenal throughput in the region of 20Mb/sec to 40Mb/sec.

For the same reasons, you'd have to choose a SCSI CD-ROM as well. Even though most modern CD-based games are mastered on four-speed drives, it is a good idea to get a faster drive. Right now, the fastest CD-ROM drives are 12- and 16-speed models. Unfortunately, these are mostly IDE/ATAPI drives which make severe demands on the CPU to deliver this kind of performance: SCSI CD-ROM drives don't, so I'd recommend these above their ATAPI counterparts any day. Sadly, they're also considerably more expensive, but I would bite the bullet and opt for something like the new Plextor 12/20Plex drive which can deliver data at 3,000Kb/sec.

Graphics cards

Without doubt, if you want the most realistic-looking games you'll need a graphics accelerator which supports 3D graphics. Unfortunately, the development

Step by Step — Motherboard, SIMM and stand-offs



Preparing the motherboard

1. First, get your toolkit together. You'll need:
- a Phillips screwdriver;
- an electrician's screwdriver; and
- a pair of fine needle-nose pliers.

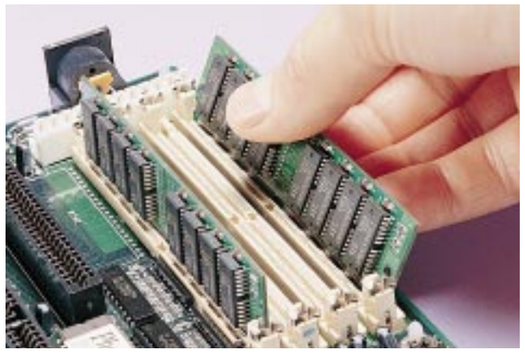
2. Take a moment to examine your new motherboard and read through its (no doubt sparse) manual. Check whether there's anything important of which you should be aware.

3. Most motherboard manuals are invariably terse and techie but you should try to identify the positions of important components and jumpers.

4. If the processor is supplied loose, fit it into the ZIF socket on the motherboard:
- lift the socket lever clamp;
- orientate the CPU so that the bevelled corner on the processor (a.k.a. Pin 1) aligns with Pin 1 on the ZIF socket; and
- lower the CPU in, then lower the lever to clamp the chip into its socket.

Most modern motherboards support a variety of processors from Intel, AMD and Cyrix, and you normally have to move a fair number of jumpers to configure the motherboard for the particular type of processor you're using.

You'll also have to configure the motherboard for the clock speed of the CPU. Many Pentium motherboards are festooned with these tiny black jumpers which are often poorly laid out (from a point of view of ease of use). Mercifully, though, jumpers are on the way out and the latest motherboards are entirely software-configurable from the CMOS Setup menu.



Fitting a SIMM

While access to the motherboard is so easy, take the opportunity to fit the SIMM memory. You will probably have planned to buy EDO SIMMs but if both your motherboard chipset and your budget support it, consider buying Synchronous DRAM (SDRAM) instead — it's a tad faster than EDO.

1. SIMMs are notched at one end to prevent them being inserted incorrectly in their sockets. Find the notched end and locate the

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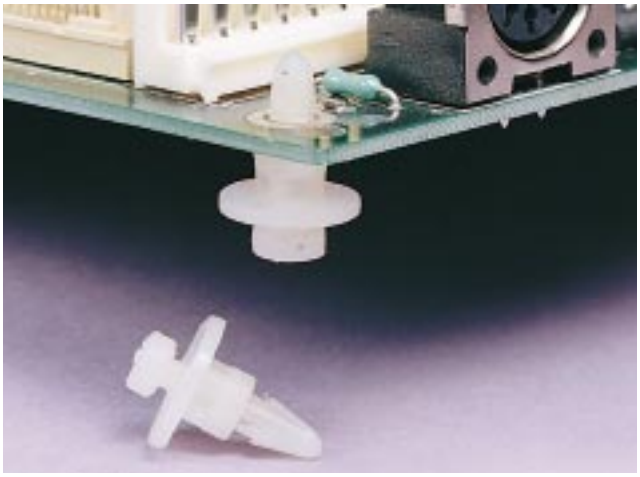
corresponding key in the SIMM socket.
2. Insert the SIMM module, at a shallow angle, into the first SIMM socket (they'll be numbered), then gradually rotate it until it's vertical and the side clips have snapped into place.
3. Do the same for the second SIMM (they have to be fitted in pairs).

Fit the stand-offs

Our final task for this month is to fit the plastic stand-offs to the motherboard. These plastic legs both secure the motherboard to the system unit and insulate it.

• The motherboard will have a number of holes through which the plastic stand-offs are pushed. These stand-offs then locate in tapered "key-holes" in the floor of the system unit. The problem here is that the two sets of holes seldom match up exactly and there will probably be more holes in the system unit base than there are on the motherboard itself.

• At this point you have to carefully work out which holes in the motherboard match up with the corresponding holes in the base of the system unit and *only* fit stand-offs in these holes.



■ **Next month:** We'll actually fit the motherboard and the rest of the peripherals.

Motherboard check list

Your minimum motherboard specification should look something like this:

- At least a 166MHz Pentium MMX (or equivalent) CPU.
- At least four SIMM slots. Maybe one DIMM slot.
- At least 256Kb of pipeline burst-mode secondary cache memory.
- A Triton 430HX or 430VX chipset.
- At least three PCI and four ISA slots.
- On-board I/O (e.g. EIDE, floppy, serial and parallel ports).
- A PnP BIOS of reputable brand such as AMI, Award, MR or Phoenix.

You should be able to get a motherboard to this specification for about £275 (ex VAT). Don't forget the memory: at the time of writing, 16Mb SIMMs cost about £55 and you'll need a pair of them, making £110 (ex VAT).

and take-up of 3D games has been hindered by Microsoft's dilly-dallying over Windows 95 graphics standards. Ordinary DOS games, which are always looking for maximum performance, access the graphics hardware directly; something that was *verboten* under Windows 3.1x. As a result, most DOS games couldn't run under Windows, or if they did, ran so slowly as to make them unplayable.

That settles it — it's DirectX

After much to-ing and fro-ing, Microsoft finally settled on DirectX, a video standard which permitted games to run under Windows 95. This standard embraces DirectDraw, DirectVideo, DirectSound and Direct3D, among others. All are supposed to simplify and speed operating-system access to hardware devices by providing direct access with as little driver overhead as possible.

Most 3D (and 2D) cards now ship with DirectX drivers but it's an emerging technology and you should check Microsoft's web site, which can be found at www.microsoft.com, to see whether updates are available.

DirectX and especially Direct3D are important because until recently games were, in the absence of a common 3D standard, specific to a particular graphics accelerator. Once Direct3D becomes ubiquitous, you'll be able to play any Direct3D game on any 3D graphics card.

Games developers will no longer have to account for what 3D acceleration hardware you might possess, and 3D acceleration hardware vendors will not have to worry about what games you have. So you should check for Direct 3D support when making your choice of graphics accelerator.

3D hardware

So what 3D hardware is available? The most popular 3D accelerators are based around S3's ViRGE and ViRGE/VX chipsets; cards like the entry-level Diamond Stealth 3D. As well as offering 3D rendering, they can all be hooked up to S3's Scenic/MX2 hardware MPEG decoder and, potentially, to other multimedia components via S3's Scenic Highway local-peripheral bus.

Because 3D cards deal with a third dimension, they require far more memory than a 2D card and you should be thinking about 4Mb or maybe even 8Mb of display memory for these.

Then there are the dedicated 3D processors, like the VideoLogic Apocalypse 3D or the Diamond Multimedia Monster cards. These work in conjunction with existing 2D cards to deliver high-quality 3D graphics. They add realism to 3D objects by using transparency effects, lifelike shadows, shading, fogging and search-lighting. These cards are fast, too, because they perform the complex 3D calculations on-card and don't bog-down the CPU. Priced at less than £150, these 3D add-ons are worthy of an appearance on your shortlist.

Back Issues

See page 12 or this month's *PCW* CD-ROM for details of how to obtain Part I of this Workshop, which appeared in the June 1997 issue.

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