

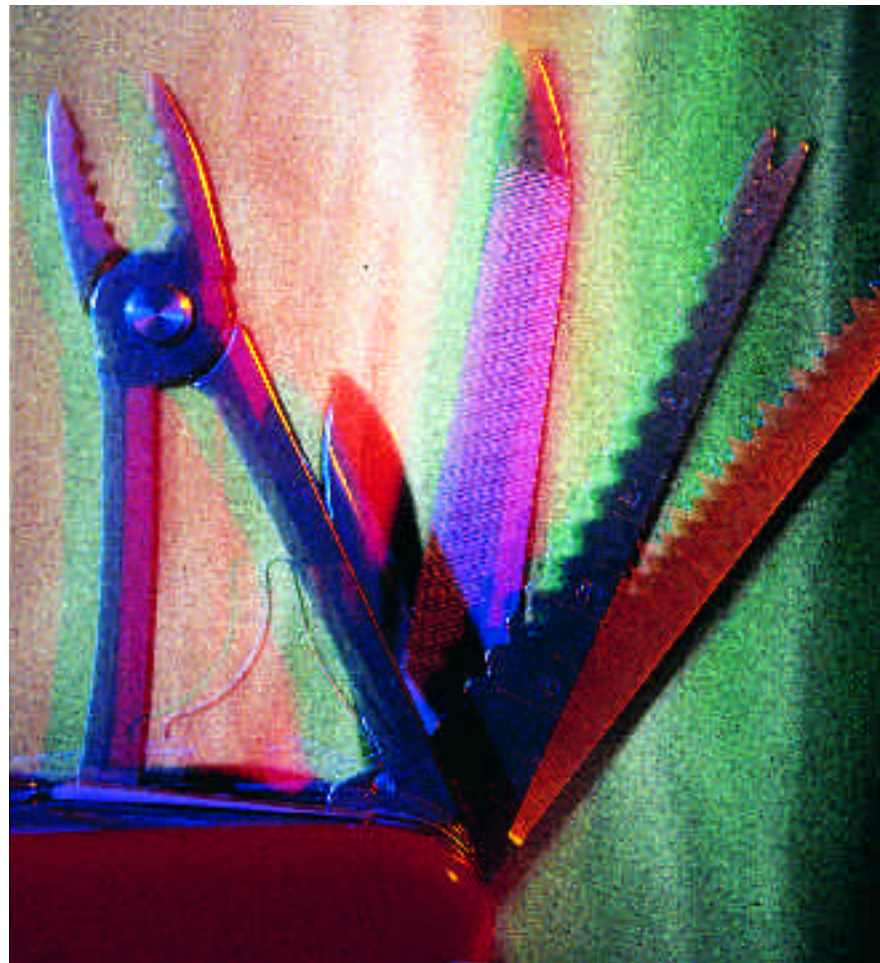
The home-brewed PC

Why not try building your own PC? It's fun, and you can learn a lot about what makes computers tick while you're tinkering. Roger Gann starts off with a list of the bits and pieces you'll need.

In my Hands On Hardware column over the past year or so, I've looked at the many ways you can upgrade your PC's hardware, from adding a SCSI host adaptor to replacing your motherboard. Over the next four months I'll be taking you through a much larger upgrade project: building your own PC from scratch. I'll take you through the A to Z of building a decent quality entry-level Pentium PC, complete with an Enhanced IDE hard disk and a CD-ROM drive.

Let's face it, assembling your own PC isn't a popular pastime, and doesn't begin to rival gardening or fishing as a hobby. But building a DIY PC can be a lot of fun and it's very instructive: at the end of it you'll have a much clearer understanding of PC internals and how they work together. You'll also be better placed to troubleshoot hardware problems in future. By building it yourself, you can opt for the piecemeal approach, spreading the purchase of the components over a period of time. You'll have the benefit of a PC built to your exact specification and to your standards of workmanship.

That's the good news. There's bad news, too. For a start, most PC assemblers already build PCs to your precise specification. More importantly, you're unlikely to beat them on price by opting for the DIY PC. You'll be buying components individually, while PC manufacturers will buy *en masse* so their unit costs will be much lower. Factor in the time spent building it, add up the cost of bundled software so often included with PCs sold today, and you'll see that, overall, it will be cheaper to buy a complete PC. So there are no savings to be had from building it yourself: but we're not doing it for the money, are we? Then



there's the warranty. Escom owners may have a view on the value of service warranties, but any warranty is better than no warranty; and when you brew your own PC, you're on your own.

Degrees of difficulty

To be honest, building a PC isn't for everyone, and if you're the technically timid sort that finds fitting a graphics card an ordeal, you should stop reading here and

quickly turn to the next feature, as building a PC from scratch would be a big mistake.

However, if you've attempted any of the more adventurous upgrades I've covered over the months, such as swapping a motherboard or fitting a hard disk, building a PC really isn't substantially any more complex than this. Rocket science isn't involved: there are just more bits to fit and a tad more preparation and planning. Once you've started, will it take ages to

complete? No, is the short answer. With all the bits in front of you, a simple PC can be assembled in less than an hour.

Sadly, there seems to be little in the way of books on the subject. Incredible as it may seem, until recently there were no books at all in the Computer Manuals catalogue on this subject. Now there's one, called, funnily enough, *Build Your Own PC*. But no fear: over the next four months I'll be giving you the low-down on the whole process, from start to finish.

Choosing components

Choosing some of the most important components of your home-brewed PC will be particularly tough. OK, you'll have the reviews at the front of *PCW* to guide you when you come to choose hard disks, graphics accelerators, monitors and the like. But you'll be on your own when it comes to such things as motherboards and cases, as these are invariably ignored when it comes to product reviews in any computer magazine. I guess cases are just too dull and motherboards too anonymous and unbranded to bother with.

Assuming you've got no spare hardware lying around, you'll need the following:

- 3.5in floppy drive (£15)
- 2Gb hard disk (EIDE) (£165)
- Eight-speed CD-ROM drive (£65)
- 72-pin EDO or SDRAM SIMM memory (16Mb) (£50)
- PCI graphics accelerator, e.g. Matrox



Check out Tom's Hardware Guide for some seriously detailed hardware info

Mystique or VideoLogic GrafixStar 600 (£100/£80)

- 15in 0.28mm dot-pitch SVGA display (£250)
- 102-key AT Windows 95 keyboard (£25)
- Mouse (£20)
- System case with power supply (£50)
- Motherboard and P166 CPU (£300)
- Any software, i.e. Windows 95

Choosing the system case

Between them, the case and the motherboard amount to the foundations of your PC, so it pays to thoroughly check out

what's available. These parts may look as alike as peas in a pod in the ads, but believe me, they aren't. With system cases, it's important to actually see the case and open it up. This way, you can judge for yourself just how easy it is to use and whether it meets your needs. If possible, don't buy "blind" (off-the-page); buy in person. Case ergonomics should play a big part in your choice but you'll probably only discover its shortcomings after you've bought it. An example of this is my PC's tower case. I had to remove the entire motherboard just to be able to undo a pair of bolts in order to swap

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a sickly hard-disk drive.

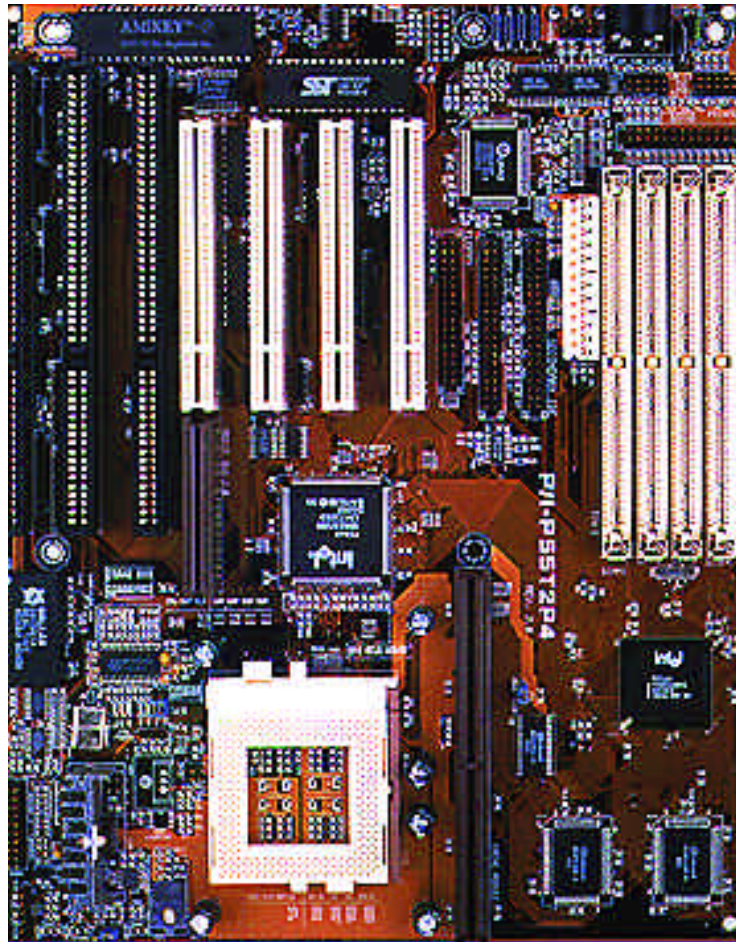
Flicking through the ads reveals that a good selection of system cases are available. However, they're all much of a muchness and fall into four broad types: normal desktop, slimline desktop, compact desktop/mini tower, and full tower. Prices start at about £35 and top out at about £85 for a full tower, although if you want a case that complies with the Euro CE safety standard you can add roughly a tenner to these prices. Wherever possible, try and get the biggest system unit possible. Not only will this give you maximum expansion potential, but it also makes access to the internal components easier. Unless you specifically want a slimline case, go for the larger case. In the end, the final decision boils down to expansion potential: if you want to fit a lot of drives, buy a tower case. If not, buy a desktop or mini-tower case. Don't forget, you get what you pay for: pay peanuts for a case, and you'll get something of flimsy construction and awkward to use.

All "Baby AT" motherboards will fit standard cases, but watch that the slimline case doesn't require an expansion card riser or "tree" so that cards can be fitted horizontally. If it does, be sure to select a motherboard that has these features and, most importantly, fits the case. And if you're fitting an ATX-style motherboard, make sure you buy a case designed to take ATX form-factor boards.

Most cases come with a 150W or 200W power-supply unit (PSU) as standard, but this might be a bit light for a well-stocked full tower. Ask how many power connectors the PSU has (the more the merrier), and what sort they are. It should have two types: the standard Molex, and the mini power connector. Most PSUs have power leads for only four peripherals, but try and find one with six. Ask whether it comes complete with all the fixings and accessories, things like printed circuit-board (PCB) supports, mounting bolts and drive rails. Consider at this point whether you want to fit a removable hard-disk tray.

Choosing the right motherboard

If choosing a simple thing like a system case isn't straightforward, choosing a motherboard to go inside it is tougher still. The motherboard is, of course, the heart of your PC and, thus, is a fairly technical piece of kit. They are mainly sold as virtually unbranded, generic devices, each one near



The Asus P/I-P55T2P4 motherboard recommended in Tom's Hardware Guide pushes the new Intel 430HX chipset to its full potential

enough identical to its neighbour. There are such things as motherboard "best buys", but in the absence of proper product reviews who's to know? Sadly, there's no comfort to be derived from relying upon brand names to guide you. With the exception of Intel, you probably won't have heard of the major motherboard players: people like Asus, Abit, ECS/EliteGroup, Gigabyte, Micronics and SuperMicro.

So what should you be looking for in the ideal Pentium motherboard? Well, there's a veritable laundry list of desirable features that should appear on your checklist. There are the obvious ones like the form factor (Baby AT or ATX), the number of PCI and ISA slots, and the nature of the on-board I/O it has (EIDE, fast serial and enhanced parallel ports). There are other less obvious but just as important features. These include having a Flash BIOS (which permits software upgrading), the number of SIMM slots (usually four but sometimes eight), and is there a DIMM slot? Does it have an IR port or support for Universal Serial Bus?

On the techie side, you should check the board supports a wide variety of processors, including Cyrix and AMD CPUs. It should have an adjustable CPU voltage regulator

(Standard/VRE/MMX), support EDO and SDRAM (particularly the latter) and should have a modern, up-to-date chipset. If it's an Intel chipset, it ought to be a Triton 430VX, HX, or the just-released TX.

So which motherboard is best? Luckily, there is an excellent web site that conducts benchmarking tests on motherboards which you can refer to. Tom's Hardware Guide (www.sysdoc.pair.com) contains an absolute goldmine of technical info plus hints and tips about PC hardware, and is well worth a visit. There you'll find various motherboard "Top Tens". For example, for 430HX boards, Tom Pabst recommends the Asus P/I-P55T2P4 and Abit IT5H boards, and for Triton 430VX boards, the Abit IT5V. Boards like these not only offer jumperless "Soft Menu" configuration but can also run the bus at 75MHz or even 83MHz (as opposed to 66MHz) for the latest generation of fast CPUs. It's worth searching Yahoo on the keyword "motherboards": you'll find all the motherboard manufacturers with an internet presence.

And that's all for this month. In part two, I'll be looking at what you'll need if you want to build the ultimate games platform, plus the first step, installing the motherboard. ■