

1

Before You Start

7

Introduction	8
Store-Bought versus Self-Build	10
What Do You Want it to Do?	12
OEM versus Retail	13
Where to Buy Your Parts	14
Parts You Will Need	16
Tools You Will Need	16

2

Central Processing Units

17

CPU Manufacturers	18
What CPU to Buy	22
CPU Specifications	23
CPU Technologies	25
Installing a CPU	28
Fitting a Heatsink and Fan	30

3

Memory

31

Overview	32
Types of Memory	32
Error-Checking Memory	35
Buying Memory	36
Handling Memory Modules	40
Installing Memory	41

4

Motherboards

43

Overview	46
Buying a Motherboard	47
Other Motherboard Features	54
Installing a Motherboard	55

5

System Cases

57

Types of Case	58
Important Case Features	59
Aesthetics	64
Case Modding	65

6

Power Supply Units (PSU)

67

Overview	68
Specifications	68
External AC Power Supply	72
Installing a PSU	74
Case Connections	76

7

Video Systems

77

Video Systems	78
Integrated Video	78
Video Cards	79
2D versus 3D	80
The Video Card Market	81
Video Card Specifications	82
Other Factors to Consider	84
Installing a Video Card	88

8

Monitors

91

Overview	92
Types of LCD Panel	93
Monitor Specifications	94
Installing an LCD Monitor	100

9

Testing the Basic System

101

Why Do This Now?	102
Check the Monitor	103
Check the Connections	104
Does it Work?	105
The PC Doesn't Boot-Up	107
Beep Codes	108

10**Hard Drives****111**

Overview	112
Interfaces	113
Hard Drive Specifications	116
Types of Hard Drive	118
Buying a Hard Drive	122
Installing a Hard Drive	123

11**Input Devices****125**

Mouse Technology	126
Types of Mouse	127
Mouse Specifications	128
Mouse Features	129
Keyboard Technology	130
Types of Keyboard	131
Keyboard Specifications	133
Keyboard Features	134

12**Sound Systems****135**

Overview	136
Integrated Sound Systems	137
Sound Cards	138
Installing a Sound Card	142

13**Removable Media Drives****143**

What's Available?	144
DVD Drives	145
DVD Formats	146
DVD Drive Specifications	147
Blu-ray Drives	149
RDX Drives	150
Tape Drives	151
USB Flash Drives	152
Installing a DVD Drive	153

14

Setting Up the System

155

Navigating the BIOS	156
Setting up a Video Card	157
Enabling USB	158
Disabling Integrated Sound	159
Setting the Boot Device	160
RAID Configurations	161
Installing Windows	163
Installing System Drivers	166

15

Peripherals

167

Printers	168
Installing a Printer	171
Multi-Function Devices	171
Broadband Modems	172
Installing a Broadband Modem	173
Scanners	174
Speakers	175
Speaker Installation	176

16

Troubleshooting

177

Hard Drives	178
Windows	180
Sound	182
Removable Media Drives	184
Printers	185
Broadband	186

Index

187

1

Before You Start

This chapter will give you useful information to help buy the components you need, and from the right sources, in order to build yourself the perfect PC.

Hot tip



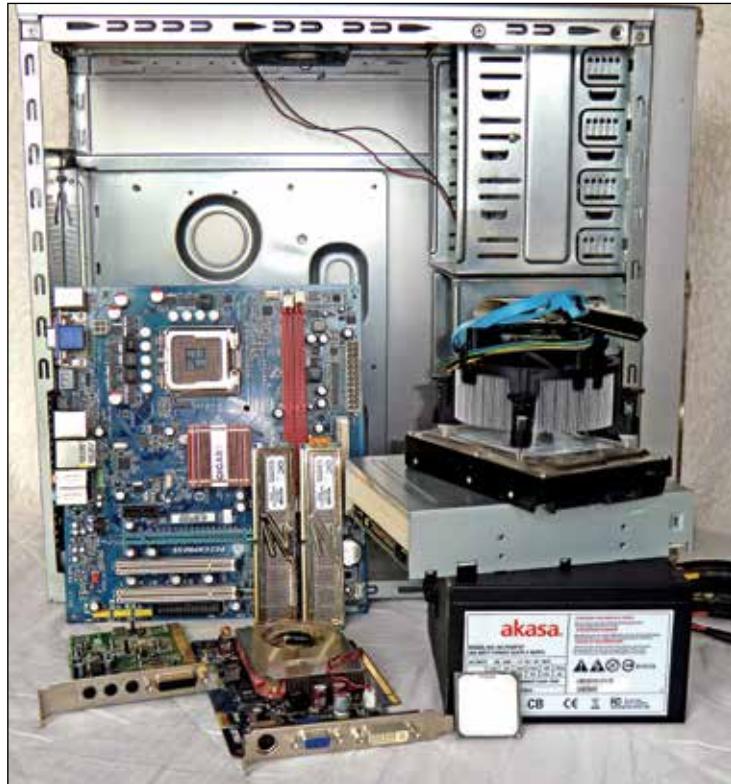
Before you make a start on this project, consider the following:

Hardware technology is currently advancing at a much greater pace than software technology is. If you build a system using all the latest cutting-edge devices, such as quad-core CPUs, DDR3 RAM and PCI-Express video cards, you are going to have a system with a processing power that very few current software applications will be able to fully utilize. It will also be very expensive.

So, before you buy the parts, make sure that you really need the features, functions and power that they provide. Otherwise you'll be spending money to no good purpose.

Introduction

The picture below will give you an idea of what's involved in the physical aspect of building a computer:



These are all the components required to build a computer system. As you can see there are quite a few of them and, while putting them all together may seem a somewhat daunting prospect, this stage is actually relatively straightforward.

Building a computer also involves two other stages – buying the parts and then having assembled them, setting up your system.

Regarding the former, there are many factors to consider and any mistakes at this stage can result in a computer system that, at best, is not what you really wanted it to be and, at worst, simply won't work.

For example, the memory modules must be compatible with the motherboard and given the proliferation of motherboards, memory types and form factors, it is very easy to get this wrong.

...cont'd

To ensure you make the right decisions and do not end up with problems down the line, this book provides detailed buying guidelines regarding all the major parts in your system.

We then show you how to install them. While this is not difficult, there are certain things you need to watch out for. A good example is the installation of the memory modules. You need to be very careful when doing this as it is very easy to damage them by incorrect handling.

The use of pictures helps to illustrate the assembly stage as clearly as possible. By the time you have finished, you should be looking at something like this:



Finally, you need to set the system up. This will involve altering settings in the BIOS, partitioning and formatting the hard drive and installing the operating system and device drivers.

Many, if not most, problems are encountered at this stage, so we provide full instructions on how to access and set up the BIOS, and get the hard drive and operating system operational.

The last chapter shows how to troubleshoot commonly experienced problems; this may be useful should you find your new system does not work as expected.

Beware



Before you start, be aware that there are potential pitfalls with building a computer. Horror of horrors, it might not work – then you will be faced with possibly a major troubleshooting exercise.

Hot tip



Computers are modular in construction. This helps to make the assembly stage relatively straightforward.

Hot tip



Setting up the system and getting everything to work will, for most people, be the most difficult part of the job.

Hot tip

Self-build gives you the opportunity to reuse existing parts that may be perfectly adequate for your purposes. Why pay for something you already have?

Hot tip

Allow yourself plenty of time; someone who knows what they are doing can assemble a PC from scratch and have it operational in two or three hours. If this is you, then you really do not need to be reading this book. However, if it is not, allow yourself a good day for the assembly and setting up.

Store-Bought versus Self-Build

Before you decide to take the DIY route and start spending your hard-earned cash on all the various parts, give some thought to the pros and cons. Building a PC yourself can turn out to be an expensive mistake if things go wrong. Also, remember there are good reasons for buying from a store. These include:

Time

Self-build is going to take a lot longer than simply walking into your nearest store, buying a system off the shelf and then taking it home. To make it cost-effective you will have to spend time finding the cheapest suppliers of all the various parts, which will probably mean dealing with several different ones.

Effort

You have to actually build the PC, set it up and install the operating system.

Aggravation

If the completed system does not work then you have to troubleshoot it. This will take more time and, if it turns out you have damaged a component during assembly, it will need replacing at extra cost to you.

In addition, if you are unable to get the system working, you may end up taking it to a repair shop. All of this is going to involve more time and money. Buying from a store spares you all this potential aggravation.

System Warranty

A pre-built system comes with a warranty, a self-built system does not. If things go wrong, you're on your own. Buying from a store will give you peace of mind.

The advantages of self-build are:

Cost

If you buy OEM parts (see page 13), and from the right source, your PC should be cheaper than buying the ready-built equivalent. However, it must be said that the difference will probably not be as much as you might think and, if saving money is your primary motive, you may find it is simply not worth the bother.

...cont'd

Component Warranties

If you take the self-build route, you will at least have the warranties supplied with all the individual components. These are usually worth more than the PC manufacturers' warranties. Also service from component manufacturers is usually much swifter and more reliable.

Quality

It is a fact that most ready-built systems, particularly at the lower-end of the market, include parts of low quality. Typical examples are monitors and power supply units. Self-build allows you to choose good quality components that will give you a more reliable and longer lasting computer.

Features

Buy a PC from a store and you will, in all likelihood, be buying things you do not need or want. For example, it may come with a high specification video card, which will add considerably to its cost. If you don't play resource-intensive 3D games (which is the only application that requires such a card), you will have wasted some of your money.

By building it yourself, you end up with a system that is tailored exactly to your requirements with no superfluous features or capabilities that will never be used.

Software

Most ready-built systems come with an operating system pre-installed. In addition, there will often be other software bundled with the system. However, this bundled software is often of dubious quality and usually also well past its sell-by date. Much of it is useless to the buyer and so is money wasted.

Most manufacturers these days do not supply an operating system installation disk but rather a "recovery disk", which recreates the original setup from an image stored on the hard drive.

If the image file is accidentally deleted or becomes corrupt, the user will have no way to recover from operating system failure.

While, with the self-build route, you may have the additional expense of buying the operating system, it will at least be an original copy that can be used as many times as necessary.

Hot tip



Building your own computer allows you to "future-proof" it to a certain degree. For example, you can choose a motherboard that can take a more powerful CPU than the one you are intending to install. A year or so down the line, when the faster CPUs have dropped in price, you can then upgrade it.

Don't forget

Before you buy the parts, think about possible future uses for the PC. This may save you money in the long-term by not having to make an early upgrade.

Don't forget

Unless otherwise stated, references made in this book to Windows 8 also apply to Windows 8.1.

What Do You Want it to Do?

Having made the decision to build the PC yourself, you now need to make a list of all the parts required. This stage of building a computer is probably the most important, as any mistakes here will result in a PC that is not ideal (the whole point of the exercise) or that has to be subsequently modified at extra cost.

However, before you can do this you must establish exactly what you are going to use the PC for, i.e. the applications you intend to run. You then need to buy hardware (CPU, memory, etc.) that will be able to run these applications. The table below shows the approximate hardware requirements for some common applications:

Application	Example	CPU	Memory	Disk Space
Operating Systems	Windows 8	1 GHz	1 GB	16 GB
	Windows 7	1 GHz	1 GB	16 GB
	Windows Vista	1 GHz	1 GB	15 GB
Office Suite	Microsoft Office 2013	1 GHz	1 GB	3 GB
Desktop Publishing	Adobe InDesign CS6	500 MHz	2 GB	2.6 GB
Graphics Editor	PaintShop Photo Pro X5	1.5 GHz	1.5 GB	2 GB
Games	Assassins Creed 3	2.4 GHz	2 GB	17 GB
Media Player	RealNetworks Real Player Plus	1.4 GHz	1 GB	400 MB
DVD Playback	Cyberlink Power DVD 13	2.4 GHz	512 GB	400 MB
CD/DVD Mastering	Roxio Creator NXT	1.6 GHz	1 GB	3 GB

With regard to CPUs, even the slowest model currently on the market will be capable of handling virtually any single application. However, you must remember that in practice you will be running two or more applications simultaneously.

For example, if you intend to play Assassins Creed 3 on a Windows 8 PC, you will need a CPU rated at a minimum of 3.4 GHz and at least 3 GB of memory. We say “minimum” because there will also be other applications running in the background that you are not aware of; these will be using the CPU and memory as well.

OEM versus Retail

Having drawn up your list of required components, it is time to open your wallet. One of your first decisions is whether to buy retail or OEM products.

OEM stands for “Original Equipment Manufacturer” and is a term used to describe a company that manufactures hardware to be marketed under another company’s brand name. Typically, OEM products are sold unboxed and with no documentation or bundled software. Also, warranties offered are usually limited. All this enables these products to be sold at a lower price.

The retail versions, on the other hand, will be packaged and supplied with user manuals, registration cards and full warranties. Very often, the buyer will also get bundled software. Most importantly, retail products are far more likely to be the genuine article – remember, there are many counterfeit products on the market.

Retail products will also include things that OEM versions don’t. For example, a retail CPU will include a heat sink and fan; the OEM version will not. Retail hard drives will include the interface cable; OEM drives won’t.

Another important factor is that of quality. All production lines, whatever the product, produce a number of sub-standard items that nevertheless work. This is particularly so with silicon chips, which are to be found in virtually all PC components. In literally every production run, some chips will be superior to others; these are the ones that will be packaged and sold at retail prices. Inferior chips go the OEM route.

Therefore, if you are looking to build a high quality system, you will definitely need to buy retail boxed components.

If budget is your primary concern, then buy OEM. You will save money, but it could be at the expense of quality. As with all things in life, you get what you pay for.

Something else to be wary of when buying OEM, is that many retailers, computer stores in particular, will try to sell you an OEM component at the full retail price. No one who is computer savvy will fall for this, but many people are caught out and end up paying the full price for an incomplete and sometimes inferior product.

Beware



If you buy OEM parts, be aware that in many cases, you will be buying extremely limited warranties. There is also a risk of getting fake or sub-standard components. Only take this route if you need to save money.

Don't forget



If you want parts guaranteed to be of good quality, spend the extra needed to get retail boxed products. It could save you money in the long run, not to mention unwanted aggravation.

Beware



If you do decide to buy any OEM products, make sure that you are not being conned into paying the full retail price. Be especially wary when buying OEM parts from a store.

Hot tip

Before setting foot in a retail store, bone-up on the technical details of the product in which you are interested.

This will help you to understand what the sales staff are talking about. You will also come across as computer literate, making it less likely that they will try to put one over on you.

Hot tip

You need to be clued-up about the latest versions of any products that you are intending to buy.

Otherwise, you may end up buying last year's model and possibly paying today's price for it.

Manufacturers' websites are the place to check for the latest products.

Where to Buy Your Parts

Computer Stores

Buying from a store is probably your quickest and safest option. If a part is defective, you can simply take it back and exchange it for a new one. However, it does mean getting off your backside, and does not offer the convenience afforded by the mail order and Internet methods of shopping.

It is a known fact that sales staff in some of the general stores can be somewhat limited in their knowledge of computers. Any advice or opinions offered by these people should be taken with a pinch of salt and checked out before you part with your cash. Alternatively, go to a reputable store where the staff are known to be technical experts.

There is also the risk of being conned into paying the full price for outdated items. While, to be fair, this can also happen with mail order and Internet companies, in practice, it is less likely as these companies exist by undercutting the big computer stores and will take every opportunity to do so.

You will pay the highest price for your components in computer stores, as they have high overheads to cover.

Mail Order

Mail order is very convenient and allows the buyer to compare prices without having to trudge from store to store. In addition, you do not have to keep fending off pushy sales staff.

You will usually find that a mail order catalog has a much wider range of products than you would find in any computer store.

Sales staff tend to be more knowledgeable about the products they are selling and will usually give you better advice than you would get in a store.

Prices will be lower than store prices and this is mail order's main advantage.

Disadvantages include time and distance. The company's headquarters could be several hundred miles away, so if there is a problem you cannot just nip down and get it sorted out immediately. Delivery is done by courier and it is quite common for delivered goods to arrive in a damaged condition. This means delays while the item is reshipped.

...cont'd

Another drawback is lack of information. Whereas in a computer store you can get a lot of facts from the box and associated promotional literature, not to mention actually seeing the product, the details in many catalogs can be on the sketchy side.

The Internet

The Internet has become a real boon to those who build and upgrade PCs. Not only can you buy your parts at the lowest price online, but you can also get a tremendous amount of information to help you make informed buying decisions.

There are sites devoted to all the major parts of a computer system. These offer information such as technical details, troubleshooting, installation and buying guides, etc. If you are looking for detailed specifications on a particular product, visit the manufacturer's website; all the major manufacturers are online.

Also online are the major computer and computer parts retailers. Their online prices are lower than in their retail outlets.

Price comparison sites, such as **www.pricewatch.com** in the USA and **www.kelkoo.co.uk** in Europe, are very useful.



Simply key in the relevant details and you will be presented with a list of sites selling the product, together with the price. This can save a lot of time when looking for the best deal.

In all other respects though, buying on the Internet is the same as buying mail order. It all relies on courier and postal delivery, and is subject to the same limitations and restrictions.

Don't forget



Mail order catalogs and the Internet give you access to a much wider range of products than you are likely to find in any retail outlet. In addition, you will have no sales staff to keep at arms length, so you can browse at your leisure.

Beware



Many websites offer products at seemingly bargain prices that do not actually exist. This is a common ruse to get you interested in the site. Sites selling bargain holidays and flights are typical offenders in this respect, and some computer-related sites use the same trick.

Hot tip

Most motherboards come with integrated sound and video systems. If you don't need high quality sound and video, these will be perfectly adequate.

Parts You Will Need

The following is a list of the hardware components you will need to build a basic computer system:

- Monitor
- System case
- Power supply unit (PSU)
- Motherboard
- Central processing unit (CPU)
- Memory (RAM)
- Hard disk drive (HDD)
- Video card (see top margin note)
- Sound card (see top margin note)
- DVD or Blu-ray drive
- Keyboard
- Mouse
- Speakers

Tools You Will Need

Very little is required in the way of tooling. The following is all you are likely to need:

Don't forget

A toolkit is not necessary to build a PC.



Screwdrivers

One medium size cross-head screwdriver for screwing the motherboard into place and securing the drive units and expansion cards.

Cutter

For cutting cable ties to length. You will need these to bundle up the internal cables in a neat fashion, so they do not interfere with airflow in the case.

You will also need a supply of cable ties. These are available from any computer store.

Electrostatic Wrist Strap

This item is not essential, but is highly recommended. The static electricity in your body is a killer for the PC's circuit boards; this applies particularly to the memory modules.

Alternatively, you can buy a pair of close fitting rubber gloves such as those used by surgeons. This will serve the same purpose.