

Obviously, removable media are a better choice for back-ups and archiving data, because only the media need to be stored and the devices themselves can be left attached to the PC.

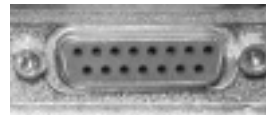
MORE PERIPHERALS

What if the computer presents information to us in more than one way at the same time? The word for that is **Multimedia**. At a minimum, it just means we have sound as well as visual. Television was multimedia before we even had a word for it.

Multimedia PCs are more common in the home than in the office. We don't need stereo speakers to type a quarterly report, but they sure come in handy running a video game or flight simulator program. A **Joystick** would be a good thing to have, too. The joystick or other type of game-control device will sometimes plug into a serial port, although often motherboards have a special **Game Port** for this type of thing.



A typical joystick

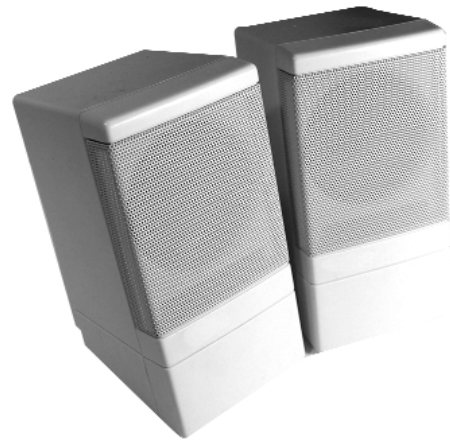


A PC game port

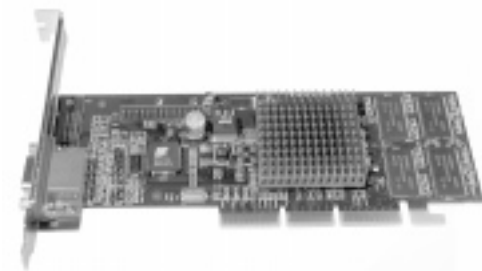
The Game port will use a female connector with one row of 8 pins and one row of 7 pins. That's 15 pins altogether. Some electronic musical instruments will also plug into this connector, which is sometimes called a **MIDI Port**. MIDI stands for **Musical Instrument Digital Interface**, which means not only the port but also the standard for changing music into computer data and then back into music.

To add speakers to the system, we need to plug a **Sound Card** into one of the motherboard's expansion slots, unless the motherboard has a built-in sound card. Then we plug the speakers into the sound card. The sound card may also have jacks for input from a microphone, stereo system or other sound source.

Anyone seriously into computer games, or anyone whose work involves a lot of graphics, will want to have a **Video Card** also. The motherboard already has a **Video Controller** that gets an image to the monitor, but if that image is complex and changing rapidly, the video controller will need some help. The video card will have a more powerful



Speakers for the PC come in all shapes and sizes.



More advanced 3D video cards have their own CPU's.

controller, as well as its own RAM memory chips to hold the video image. That way, the image on the screen can be refreshed without waiting for access to the main system RAM, which is shared by the CPU as well as every peripheral device in the system.

We won't try to list every peripheral and add-on device that might be connected to a computer. Even if we could, the list would be obsolete by next week. But, we will touch on a couple of the more common ones. Of course, the monitor, keyboard and printer are all peripherals too, since they are outside of the computer cabinet, but we covered those in previous chapters. Here are some we haven't discussed yet.

A **Scanner** is a device to copy pictures into the computer. Just like the office copier, you could also use it to duplicate parts of your anatomy, or the Declaration of Independence. Your choice. The difference between a scanner and a copier is that instead of putting the image onto a piece of paper, the scanner turns the image into a pattern of bits, and puts it into a computer file. From there, you can manipulate it in ways never dreamed of in the traditional photo darkroom.



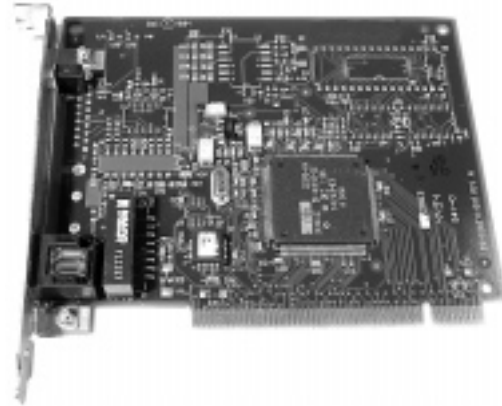
If you work with pictures a lot, you don't even need to make a print first to scan it into the computer. Get yourself a **Digital Camera**. These cameras make up the picture as a pattern of bits to start with, and most can load that image directly into the computer. Most digital cameras can load their images directly into the computer though either the USB or serial ports.



There are also **Digital Video Cameras** including small inexpensive ones that sit on top of your monitor. These send a picture of your mug through the modem along with your voice. If the person at the other end has one too, your phone conversation becomes a video conference.

Once you have these digital photos or videos, to show the images to everyone in the room without having to print them there are even projectors that connect directly to the computer.

All of these add-on devices so far apply to a self-contained system. If we want our PC to talk to other PCs in a network, we must install a **Network Card**. This is also called a **Network Adapter Card** and sometimes a **NIC**, for **Network Interface Card**. You may also hear one called a NIC Card, which is not only unnecessary, but redundant besides.



A PCI Network Interface Card

To really get connected to the outside world, we need a **Modem**, which allows the PC to communicate over a phone line. Most phone lines are designed for **analog** signals, not binary, which means they carry a tone rather than Ones and Zeros. The trick is to send a tone, but change it in some way that will be recognized as a One or Zero at the other end. For instance, we could increase and decrease the frequency of the tone. We could say that a high-pitched tone is a One and a low-pitched tone is a Zero. The tone itself is called the **Carrier Wave**, and there are several ways to change it to carry ones and zeros,



External Modems reside outside the computer's case

which we will discuss in the Modem chapter in Volume 2.

When we change the carrier wave to include information, we say that we **Modulate** it. At the other end, we must **Demodulate** it to extract the information. The word 'modem' comes from **Modulate-Demodulate**, because that's what a modem does.

Modems are rated by how many times they can modulate the carrier wave each second, and that rate is called the Baud Rate. It's named for Emile Baudot, who invented a code for sending binary information back in the days of the telegraph. Baud rates have increased dramatically in recent years, from 300 baud to 2400 to 9600 to 56K baud. Most new PCs now come with a 56K modem as standard equipment.

It is important that the modems on both ends of the line use the same baud rates and the same modulation methods or they will not be able to talk to each other. Fortunately, most modems can slow down when they are talking to a slower modem.

Well, that's a wrap on our "Pack of Peripherals". It's not a complete list by any means, but at least you should know a peripheral when you see one. And when they invent computer-connected devices to iron your clothes, butter your toast or give you a 'Swedish' massage, those will be peripherals too.