The Complete PC

Lesson 2

A typical PC is more than one device, and you need all of the parts (or at least most) to make the PC work. The most important part of the PC is the box that usually sits under your desk: the one that all of the other parts connect to, called the system unit. All of the processing and storage takes place in the system unit. All of the other parts of the PC— the printer, the keyboard, the monitor—connect to the system unit and are known collectively as peripherals. The immediate picture below shows a typical desktop PC, with the system unit and peripherals as separate pieces.

Most computers have a standard set of peripherals to provide input and output. You'll see some variation in color, style and size but here's the standard set:

- **Monitor** The big television thing that provides a visual output for the computer.
- **Keyboard** Keypad for providing keyed input. Based on a typewriter.
- **Mouse** Pointing device used to control a graphical pointer on the monitor for input.
- **Speakers** Provide sound output.
- **Printer** Provides printed paper output.

A typical PC has all of these peripherals, but no law requires a PC to have them. Plenty of PCs don't have a printer. Some PCs don't have speakers, just headphones. Some computers don't even have a keyboard, mouse, or monitor, but they tend to hide in unlikely places, such as the inside of a jet fighter or next to the engine in an automobile

Other PCs may have many more peripherals. Installing four or five printers on a single PC is easy, if you so desire. You'll also find hundreds of other types of peripherals such as Web cameras and microphones, on many PCs. You add or remove peripherals depending on what you need from the system. The only limit is the number of available connections.

External Connections

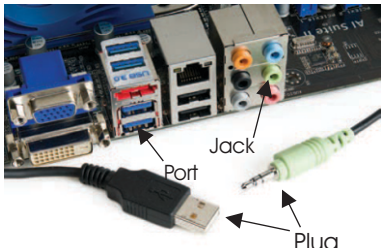
Every peripheral connects to the system unit through one of the many types of ports. The picture shown below is the back of a typical system unit that has many cables running from the system unit to the various peripherals. You may even have a few connectors in the front. All of these connectors and ports have their own naming conventions, and a good technician knows all of them. It's not acceptable to go around saying such things as "That's a printer port," or "That's a little-type keyboard connector." You need to be comfortable with the more commonly used naming conventions so you can say "That's a female DB-25," or "That's a USB connector."

Connections in the back of a PC

Plugs, Ports, Jacks, and Connectors

Although PCs use close to 50 different types of connections, almost all fit into one of six major types: DIN, USB, FireWire, DB, RJ, and audio. Read the next paragraphs to get your terminology straight so that you can then jump into the details of the various connectors.

No one seems to use the terms plug, port, jack, or connector correctly, so let's get these terms straight right from the start. To connect one device to another, you need a cable containing the wires that make the connection. On each device, as well as on each end of the connecting cable, you need standardized parts to make that connection. Because these are usually electrical connections, one part needs to fit inside another to make a perfect fit, for safe connection.



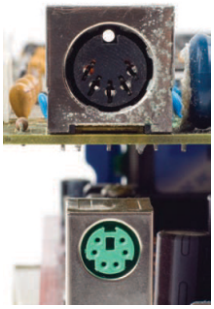
Plug, port, and jack

A plug is a part with some type of projection that goes into a port. A port is a part that has some type of matching hole or slot that accepts the plug. You never put a port into a plug; it's always the other way around. The term jack is used as an alternative to port, so you may also put a plug into a jack. The term connector describes either a port (jack) or a plug. As you progress through this chapter and see the various plugs and ports, this will become clearer, see picture(left).

Mini-DIN Connectors

Most PCs sport the European-designed mini-DIN connectors. The original Deutsche Industrie Norm (DIN) connector was replaced by mini-DIN a long time ago, so you'll only see mini-DIN connectors(top picture) on your PC. Older-style keyboards and mice plugged into DIN ports(bottom picture). You'll hear many older technicians refer to a mini-DIN keyboard connector as a PS/2 connector. That's what IBM called the port when it released the Personal System 2 (PS/2) computer way back in 1987 and the name stuck.

DIN connector



The standard mini-DIN connector has six pins and has been used for many devices aside from mice and keyboards. Some ancient video cards used the mini-DIN connector for output to a television, for example, and a lot of speaker sets use it to connect satellites to a subwoofer or to a control box. In uses other than keyboard or mouse, the mini-DIN gets yet another name, DIN-6.

mini-DIN connector

USB Connectors

Universal serial bus (USB) provides the most common general-purpose connection for PCs. You'll find USB versions of many devices, such as mice, keyboards, scanners, cameras, and printers. USB connections come in three sizes: A, B, and mini-B. The USB A connector's distinctive rectangular shape makes it easily recognizable.

You never see a *USB B connector* on your computer. USB B connecters are for the other end of the USB cable, where it attaches to the USB device (see picture below). The USB B connector's relatively large size makes it less than optimal for small devices such as cameras, so the USB folks also make the smaller *USB mini-B*–style connector shown in the picture(right).

USB A connector and port

USB has a number of features that make it particularly popular on PCs. First, USB devices are hot swappable, which means you can insert or remove them without restarting your PC. Almost every other type of connector requires you to turn the system off, insert or remove the connector, and then turn the system back on. Hot-swapping completely eliminates this process. Second, many USB devices get their electrical power through the USB connection, so they don't need batteries or a plug for an electrical outlet.

Cell phone charging via a USB connection

You can even recharge some devices, such as cellular phones, by plugging them into a USB port. See pictures(left)

USB Mini-B connector

USB B connector

FireWire Connectors

FireWire, also known as IEEE 1394, moves data at incredibly high speeds, making it the perfect connection for highly specialized applications such as streaming video from a digital video camera onto a hard drive. FireWire consists of a 6-wire connector, as shown in the picture(right), or a 9-wire connector for devices that need more speed and power. A smaller 4-pin version is usually seen on peripherals. Like USB, FireWire devices are hot-swappable.

FireWire connector and port

DB Connectors

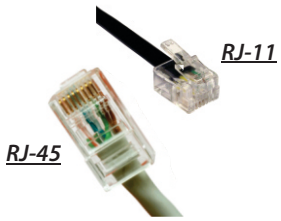
Over the years, DB connectors have been used for almost any type of peripheral you can think of, with the exception of keyboards. They have a slight D shape, which allows only one proper way to insert a plug into the socket and makes it easier to remember what they're called. Technically, they're known as D-sub or D-subminiature connectors, but most technicians call them DBs. The standard name is D-shell connectors, so don't be surprised by that term either.

DB-25 connector and port

Each male DB plug has a group of small pins that connect to DB ports. Female DB plugs connect to male DB ports on the system unit. DB connectors in the PC world can have from 9 to 37 pins or sockets, although you rarely see a DB connector with more than 25 pins or sockets. The picture(top right) shows an example. DB-type connectors are some of the oldest and most common connectors used at the back of PCs.

RJ Connectors

You have more than likely seen an RJ connector, whether or not you knew it by that name. The little plastic plug used to connect your telephone cord to the jack (techs don't use the word "port" to describe RJ connectors) is a classic example of an RJ plug. Modern PCs use only two types of RJ jacks: the RJ-11 and the RJ-45. The phone jack is an RJ-11. It is used almost exclusively for modems. The slightly wider RJ-45 jack is used for your network connection. The picture(right) shows an RJ-11 plug (top) and an RJ-45 plug (bottom).



Audio Connectors

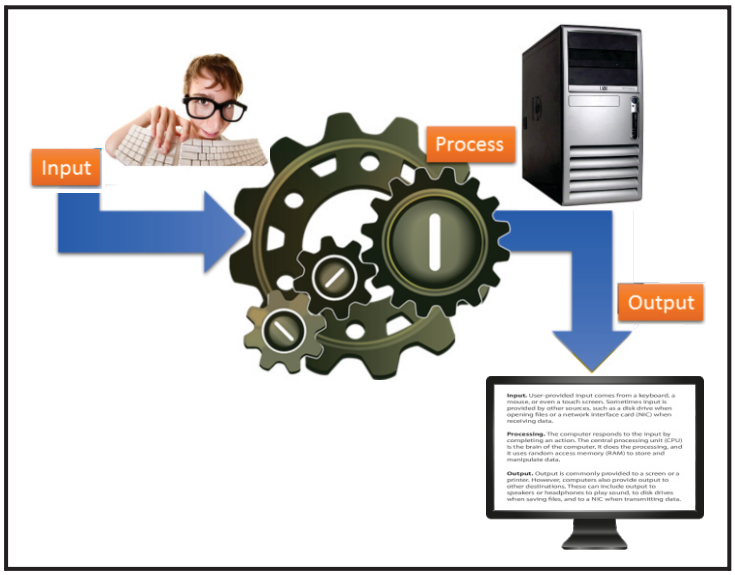
Speakers and microphones connect to audio jacks on the system unit. The most common type of sound connector in popular use is the 1/8-inch connector, also called a mini-audio connector.

Mini-audio jacks and plug

These small connectors have been around for years; they're just like the plug you use to insert headphones into a radio, music player, or similar device as shown in the picture(right). Traditionally, you would find the audio jacks at the back of the PC, but many newer models sport front audio connections as well.

Chapter 2
Laboratory Manual

COMPUTER BASICS and ITS PERIPHERALS



Laboratory Activities

2.01 Exploring the Functions and Components of a PC
2.02 Examining User-Accessible Components
2.03 Recognizing External Connections
2.04 Identifying CPU Characteristics
2.05 Recognizing CPU Sockets
2.06 Cooling Your CPU
2.07 Exploring CPU Specifications with CPU-Z

Chapter 2.08 Analysis and Written Test

2.09 Determining the Amount of RAM in a PC
2.10 Identifying Types of RAM
2.11 Exploring RAM Specifications with CPU-Z

Chapter 2.12 Analysis and Written Test

2.13 Researching New Motherboards
2.14 Identifying Motherboard Features
2.15 Exploring Motherboard Features with CPU-Z
2.16 Identifying BIOS ROM
2.17 Accessing BIOS via the CMOS Setup Program
2.18 Configuring and Clearing CMOS Setup Program Passwords
2.19 Configuring BIOS Settings

Chapter 2.20 Analysis and Written Test

2.21 Electricity
2.22 Power Supply Output
2.23 Power Protection

Chapter 2.24 Analysis and Written Test

2.25 Installing Parallel ATA Hard Drives
2.26 Installing Serial ATA Hard Drives
2.27 Configuring CMOS Settings
2.28 Comparing Solid-State Drives and Magnetic Hard Drives

Chapter 2.29 Analysis and Written Test

Lab Activity 2.02 Examining User-accessible Components

One scenario, when you are scheduled for an interview and arrived at the site. You walked into what should have been a simple job interview only to meet a very frantic IT manager dealing with a crisis of epic proportions. She doesn't even bother to interview you. Instead, she shuttles you out of her office, points down the hall, and says, "Go check the accounting's PC fourth cubicle on the left. The accounting's PC is locked up and rebooting itself! I told the operator to turn it off until you get there. Don't change anything, and don't open it up. Find out if it will shut down, boot properly, and access the drives." Then the IT manager leaves to deal with her crisis, and you're on the spot.

This activity looks at the many PC components that you can access without removing the case. Scanning the outside of your PC can help you track down any basic issues. Take your time, and jot down notes when you feel the need. Practice each step until you're confident you can do it on the job as a PC tech.

Learning Objectives

At the end of this lab, you'll be able to

- recognize and manipulate user controls
- describe the use of built-in user-accessible devices

Lab Materials and Setup

The materials you need for this lab are

- one fully functioning desktop computer system unit, with monitor
- a working optical drive (any drive that reads or records CD, DVD, or Blu-ray Discs)
- one readable data CD with files
- one keyboard
- one mouse
- a paper clip

Let's Get the Lab Started

As a technician, you need to know how everything works on a PC. Let's start with the externally accessible functions. Make sure the computer is turned off.

Step 1 Before you can do much work with a PC, you need a functioning output device, such as a monitor. Check the monitor to see if it has power. If the monitor is not on, find the power button on the monitor and press it. You'll notice a small light-emitting diode (LED) on or near the monitor 's power button. Record the color of the LED when the PC is turned off.

Color of the LED when the system is off: _____

Later in this exercise, we'll check the color of the LED when the PC is turned on. Stay tuned!

Step 2 Look at the front of your system unit. Locate the power button. Compare your button to the one shown in Figure 2-1.

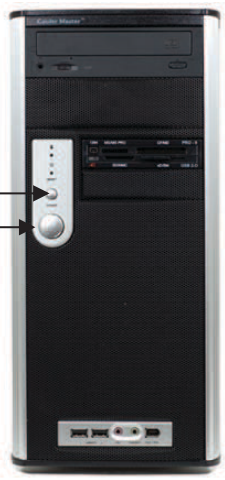


FIGURE 2-1. Recognizing the power and reset buttons on the front of a PC.

Once you have located the power button on your system, make a note of its appearance. Is it in plain sight, or hidden behind a door or lid? Is it round, square, or some odd shape? Pressing the power button to start a PC when the electricity is off is known as a cold boot or sometimes a hard boot. Many systems also have a reset button, which you can use to restart a PC that is already on. This is also called a warm boot.

Describe your power and reset buttons here:

_____

_____

Sometimes software will lock up your system, in which case the only way to shut the system down is to force a power down. This requires that you press and hold the power button for four to six seconds.

Notice the three LEDs on the front panel near the power button. These LEDs will become important later in this activity.

Most systems have a power switch located on the back of the case that controls the flow of electricity to the power supply, and a power button on the front that boots and shuts down the PC.

Step 3 Locate the floppy bay or slot. You can recognize it by its 3½-inch horizontal slot. How many visible 3½-inch slots does your PC have?

a. _____

Do you see the eject button below the slot on the right side of the drive? Below the slot on the left side is an LED that lights up when the drive is actively reading or writing information on a floppy diskette.

Because floppy disks can store only a relatively tiny amount of data, floppy drives are disappearing from PCs. In fact, most new computer systems ship without floppy drives. As a computer tech, however, you will most likely still have to deal with floppy drives for a few more years. If your system doesn't have a floppy drive, you may want to explore an older machine to see one in action. Just remember to clear the dust and cobwebs out of the way first.

Take another system unit below, on the front of your system, you should also see the external face of your system's optical drive. It fits comfortably inside an available 5¼-inch slot (or drive bay). How many 5¼-inch drive bays does your PC have?

b. _____

You'll see either the front edge of the tray that opens to accept an optical disc, or a small door that protects the tray when it's retracted. Once you've located this drive, notice that it also has a button in the lower-right corner. When the system is on, you can press that button to open the tray door (if there is one) and slide the tray out to receive your disc (see Figure 2-2). Pressing the button while the tray is out retracts the tray so that the drive can read the disc.

Don't be tempted to force the disc tray to close by pushing it in. Always press the button on the front of the drive to close the tray or to eject a disc. Forcing the tray to close can cause the gears inside to become misaligned, so that the tray no longer closes properly.

FIGURE 2-2 Can you locate the floppy drive and optical drive on this system unit?

Your system may have other devices installed, such as a USB flash drive, a tape drive, a Blu-ray Disc drive, or a Secure Digital (SD) memory card slot. Each of these uses removable media; take care when inserting or removing the media.

With USB flash drives or thumb drives, as they're often called the drive is the removable media.

Step 4 Now it's time to prepare your system for the scenario outlined in the opening text.

The leds mentioned has different functions and indications. It referred to the hard drive activity, monitor and floppy drive LEDs, the three LEDs next to your power button. Take note that your existing casing has different led indicators. Now, let's watch them in action. Turn on your PC.

a. Color of monitor LED: _____
b. Color of floppy drive LED: _____
c. What is the status of the green LED next to the power button? Is it steady, flashing, or intermittent?
d. What is the status of the red (or amber) LED next to the power button? Is it steady, flashing, or intermittent?

The power LED generally lights up green to indicate that the power is on, and the hard drive LED lights up red when the internal hard drive is active.

e. Press the eject button on the front of the optical drive. When the tray opens, carefully insert a disc. Press the eject button again to close the tray. If you haven't done this a lot, practice inserting and removing a disc until you feel comfortable with the process. When the optical drive closes, what is the status of its LED? Is it steady, flashing, or intermittent?

Don't start any applications yet! Close any open applications or open windows before performing Step 5. You're going to force a "power down," and you do not want to damage any of the software or data.

Step 5 Now you're going to simulate a PC that has become nonresponsive and "locked up." Perform a forced power down as follows:

a. Press and hold the power button.
b. While continuing to hold the power button in, count out loud (one–one thousand, two–one thousand, three–one thousand…) until the system powers down and the screen goes blank.

According to your count, how many seconds did it take for the screen to go blank?

Step 6 After the system has been powered down for approximately one minute, do the following:

a. Press the power button and allow the system to boot.
b. Log on in a normal fashion so that you are viewing the operating system desktop.
c. Select Start | My Computer or Computer and double-click the icon that represents the optical drive. T his should enable you to view the contents of the disc that was inserted prior to the forced power down.

List some of the contents of the disc:

d. Select Start | Shut Down. If you're using Windows Vista or 7, it goes straight to a shutdown routine. Windows XP opens the Shut Down Windows dialog box, in which you select Shut Down from the drop-down list. T his performs a graceful shutdown of the system.

If all the actions in Step 6 were successful, the system likely is stable and you can report to the IT manager that Jane's machine is back up and running. If any of the actions failed, you should select Start | Restart in Windows Vista/7 or Start | Shut Down in Windows XP. In the Shut Down Windows dialog box, select Restart from the drop-down list. After the system reboots, complete substeps b, c, and d once more. Sometimes, the forced power down leaves some of the files in a state of flux; restarting shuts the computer down "gracefully," properly closing all open files before powering down. This should clear everything up and enable the computer to function properly.

Step 7 While the computer is turned off, take a paper clip and straighten it out, giving yourself a small handle to hold. Find the small hole on the front of your optical drive and insert the end of your paper clip. What happens?