

CHAPTER
8

Supporting I/O and Storage Devices

**In this chapter,
you will learn:**

- About the general approaches you need to take when installing and supporting I/O and mass storage devices
- How to install and configure several I/O devices, such as barcode readers, biometric devices, digital cameras, webcams, graphic tablets, and touch screens
- How to install and configure adapter cards
- About supporting the video subsystem, including selecting a monitor and video card and supporting dual monitors and video memory
- How to support optical drives and flash memory devices

This chapter is packed full of details about the many I/O (input/output) and mass storage devices a PC support technician must be familiar with and must know how to install and support. Most of us learn about new technologies as we need to use a device or when a client or customer requests our help with purchasing decisions or solving a problem with a device. Good technicians soon develop the skills of searching the web for explanations, reviews, and ads about a device and can quickly turn to support web sites for how to install, configure, or troubleshoot a device. This chapter can serve as your jumpstart toward learning about many computer parts and devices used to enhance a system. It contains enough information to get you started toward becoming an expert at computer devices.

We begin with the basic skills common to supporting any device, including how to use Device Manager and how to select the right port for a new peripheral device. Then you'll learn to install I/O devices and adapter cards and to support the video subsystem. Finally, you'll learn to select and install an optical drive and enough about memory cards that you'll know which type of card to buy for a particular need.

BASIC PRINCIPLES FOR SUPPORTING DEVICES

A+
220-801
1.5, 1.7,
1.10,
1.12

An I/O or storage device can be either internal (installed inside the computer case) or external (installed outside the case and called a peripheral device). These basic principles apply to supporting both internal and external devices:

- ▲ ***Every device is controlled by software.*** When you install a new device, such as a barcode reader or scanner, you must install both the device and the device drivers to control the device. These device drivers must be written for the OS you are using. Recall from earlier chapters that the exceptions to this principle are some simple devices, such as the keyboard, which are controlled by the system BIOS. Also, Windows has embedded device drivers for many devices. For example, when you install a video card, Windows can use its embedded drivers to communicate with the card, but to use all the features of the card, you can install the drivers that came bundled with it.
- ▲ ***When it comes to installing or supporting a device, the manufacturer knows best.*** In this chapter, you will learn a lot of principles and procedures for installing and supporting a device, but when you're on the job installing a device or fixing a broken one, read the manufacturer's documentation and follow those guidelines first. For example, for most installations, you install the device before you install the device driver. However, for some devices, such as a digital camera and a wireless keyboard, you might need to install the device driver first. Check the device documentation to know which to do first.
- ▲ ***Some devices need application software to use the device.*** For example, after you install a scanner and its device drivers, you might also need to install Adobe Photoshop to use the scanner.
- ▲ ***A device is no faster than the port or slot it is designed to use.*** When buying a new external device, pay attention to the type of port for which it is rated. For example, an external hard drive designed to use a USB 2.0 port will work at that speed even when it's connected to a faster USB 3.0 port. For another example, a TV tuner card in a PCI slot will not work as fast as a TV tuner card in a PCI Express slot because of the different speeds of the slots.
- ▲ ***Use an administrator account in Windows.*** When installing hardware devices under Windows, you need to be logged onto the system with a user account that has the highest level of privileges to change the system. This type of account is called an administrator account.
- ▲ ***Problems with a device can sometimes be solved by updating the device drivers.*** Device manufacturers often release updates to device drivers. Update the drivers to solve problems with the device or to add new features. You can use Device Manager in Windows to manage devices and their drivers.
- ▲ ***Install only one device at a time.*** If you have several devices to install, install one and restart the system. Make sure that device is working and all is well with the system before you move on to install another device.

A+
220-802
1.7

Now let's see how to use the Windows 7 Action Center and Windows 7/Vista/XP Device Manager. These tools can help you solve problems with installed devices.

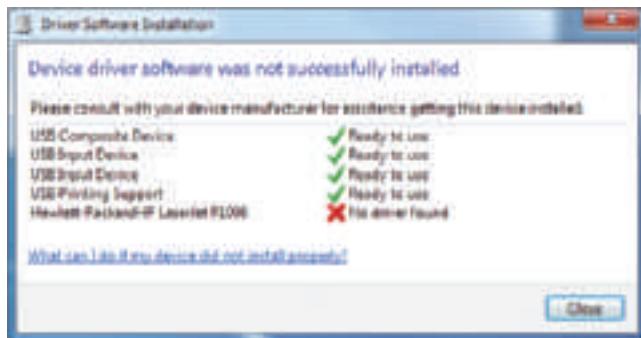
USING THE ACTION CENTER AND DEVICE MANAGER

If a problem occurs while Windows 7 is installing a device, it automatically launches the Action Center to help find a solution. For example, Figure 8-1 shows the error message

A+
220-801
1.5, 1.7,
1.10,
1.12

A+
220-802
1.7

window that appeared when a USB keyboard and USB printer were first connected to a computer. (Windows Vista and XP do not have an Action Center.)

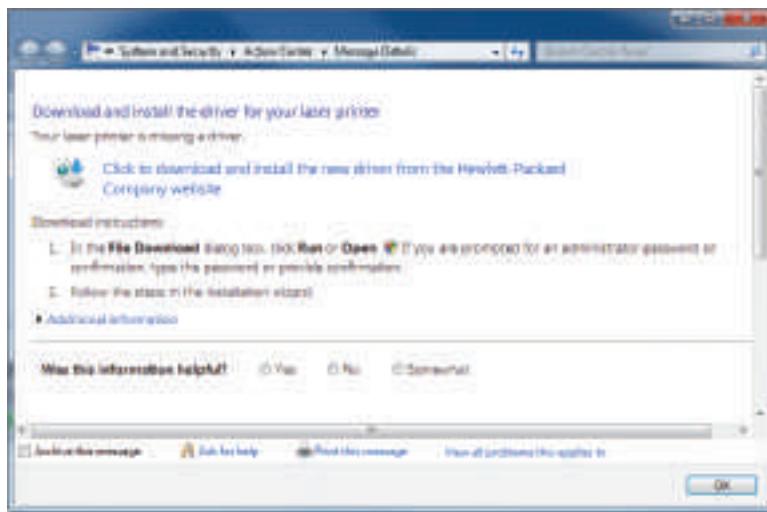


Source: Microsoft Windows 7

Figure 8-1 Windows 7 reports a problem with a driver for a USB printer

8

Immediately after this first window appeared, the Action Center provided the window shown in Figure 8-2. When the user clicked **Click to download and install the new driver from the Hewlett-Packard Company website**, the driver was immediately downloaded and installed with no errors.



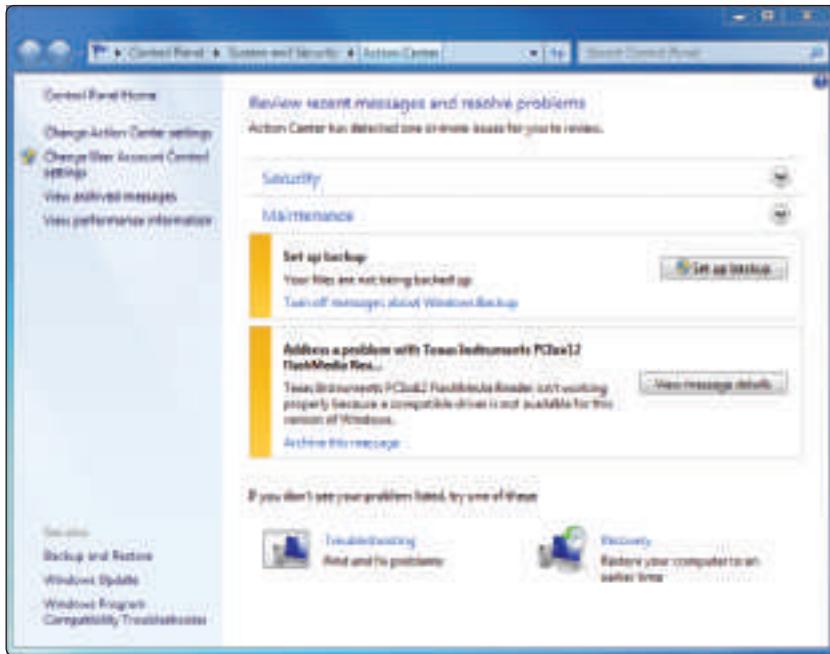
Source: Microsoft Windows 7

Figure 8-2 Windows offers to find the missing USB printer driver

You can also open the Action Center at any time to see a list of problems and solutions. To open the Action Center, click **Start**, right-click **Computer**, and click **Properties**. In the System window, click **Action Center**. For example, the Action Center in Figure 8-3 shows a problem with a media reader. (A media reader is a device that can read and write to memory cards such as an SD card.) When you click a problem, you can follow on-screen directions toward a solution. If the problem is still not resolved after following the solutions offered by the Action Center, turn to Device Manager.

A+
220-801
1.5, 1.7,
1.10,
1.12

A+
220-802
1.7



Source: Microsoft Windows 7

Figure 8-3 Use the Action Center to find a solution to a problem

Recall from Chapter 7 that **Device Manager** (its program file is named devmgmt.msc) is your primary Windows 7/Vista/XP tool for managing hardware. It lists almost all installed hardware devices and the drivers they use. (Printers and many USB devices are not listed in Device Manager.) Using Device Manager, you can disable or enable a device, update its drivers, uninstall a device, and undo a driver update (called a driver rollback).

To access Device Manager, use one of these methods, which you first learned about in Chapter 7:

- ▲ Click **Start**, right-click **Computer**, and select **Properties**. The System window appears. Click **Device Manager**. The Device Manager window opens.
- ▲ Enter **Device Manager** or **Devmgmt.msc** in the Search box and press **Enter**.

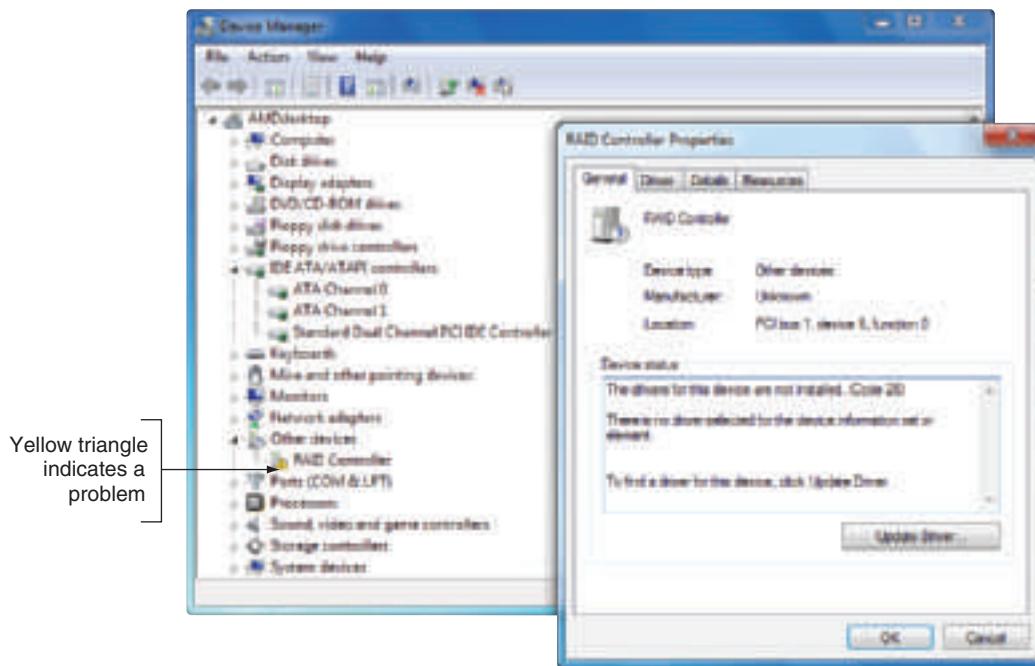
A Device Manager window is shown on the left side of Figure 8-4. Click a white arrow to expand the view of an item, and click a black arrow to collapse the view. Notice the yellow triangle beside the RAID controller, which indicates a problem with the device.

Here are ways to use Device Manager to solve problems with a device:

- ▲ **Look for error messages offered by Device Manager.** To find out more information about a device, right-click the device and select **Properties** on the shortcut menu. The right side of Figure 8-4 shows the properties box for the RAID controller. Many times, a message shows up in this box reporting the source of the problem and suggesting a solution.
- ▲ **Update the drivers or roll back (undo) a driver update.** Updating drivers can often solve a problem with a device. If a driver update creates a problem, you can roll back (undo) the driver update if the previous drivers were working. (Windows does

A+
220-801
1.5, 1.7,
1.10,
1.12

A+
220-802
1.7



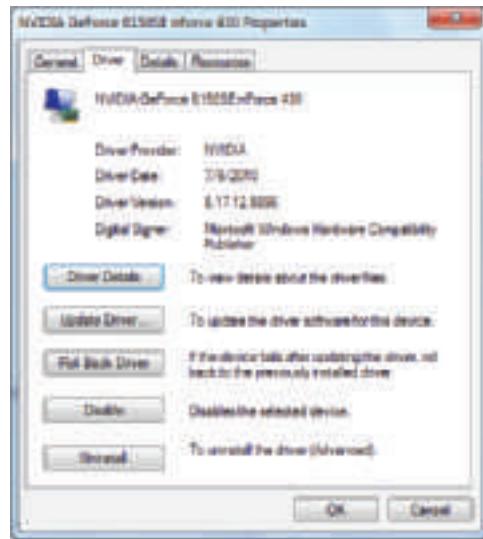
Source: Microsoft Windows 7

Figure 8-4 Use Device Manager to solve problems with hardware devices

8

not save drivers that were not working before the driver update.) Click the Driver tab. Figure 8-5 shows the Driver tab for one device. When you click Update, the box in Figure 8-6 appears.

To search the Internet for drivers, click Search automatically for updated driver software. (Windows 7/Vista searches the Microsoft web site and the manufacturer's

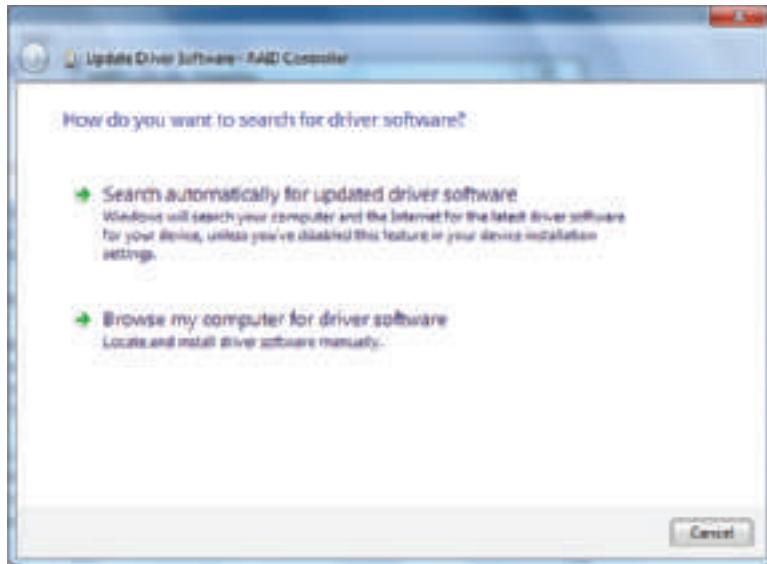


Source: Microsoft Windows 7

Figure 8-5 Update or roll back drivers for a device

A+
220-801
1.5, 1.7,
1.10,
1.12

A+
220-802
1.7



Source: Microsoft Windows 7

Figure 8-6 Decide where Windows should search to find the drivers

web site, but XP searches only the Microsoft web site for drivers.) If you have already downloaded drivers to your PC or you have the drivers on CD that came bundled with the device, click **Browse my computer for driver software**, and point to the downloaded files or to the CD. Note that Windows is looking for an .inf file to identify the drivers. Continue to follow the directions on-screen to complete the installation.

▲ **Try uninstalling and reinstalling the device.** If you are still having a problem with a device, try uninstalling it and installing it again. To uninstall the device, click **Uninstall** on the Driver tab (see Figure 8-5). Alternately, you can right-click the device and click **Uninstall** on the shortcut menu. Then reboot and reinstall the device, looking for problems during the installation that point to the source of the problem. Sometimes reinstalling a device is all that is needed to solve the problem.

If Windows is not able to locate new drivers for a device, locate and download the latest driver files from the manufacturer's web site to your hard drive. Be sure to use 64-bit drivers for a 64-bit OS and 32-bit drivers for a 32-bit OS. If possible, use Windows 7 drivers for Windows 7, and Vista drivers for Vista. You can double-click the downloaded driver files to launch the installation.

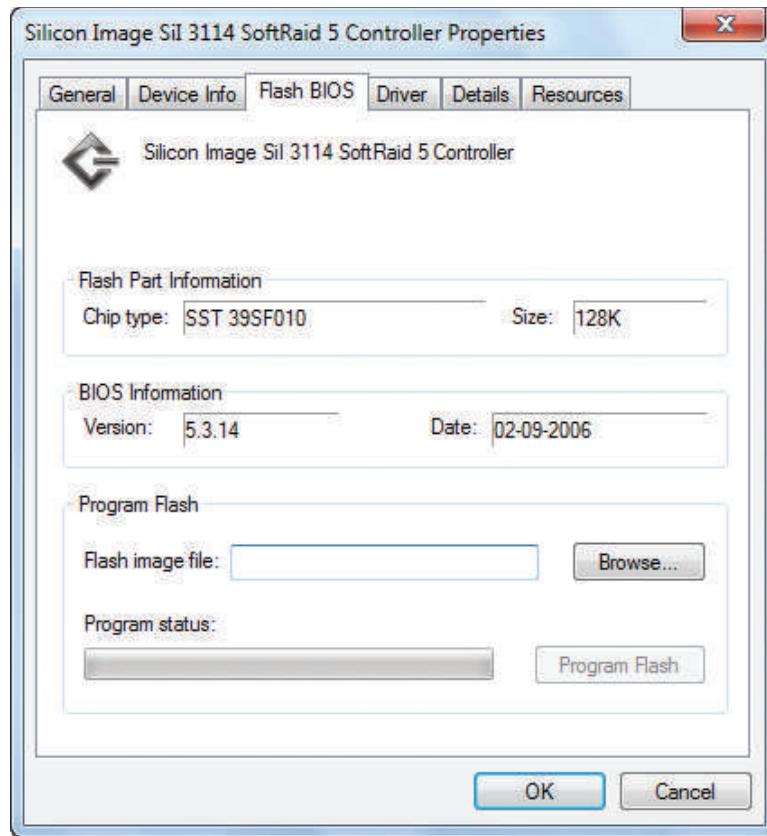
A few devices have firmware on the device that can be flashed similar to the way the BIOS on the motherboard is flashed. For example, after the RAID controller you saw in Figure 8-4 has its drivers installed, new tabs appear on the controller's properties box that are put there by the drivers (see Figure 8-7). To flash the firmware on this controller card, you first download the flash image file from the device manufacturer's web site. Then click **Browse** and locate the file. Next, click **Program Flash** to begin the firmware update.



Notes By default, Device Manager hides legacy devices that are not Plug and Play. To view installed legacy devices, click the **View** menu of Device Manager, and click **Show hidden devices** (see Figure 8-8).

A+
220-801
1.5, 1.7,
1.10,
1.12

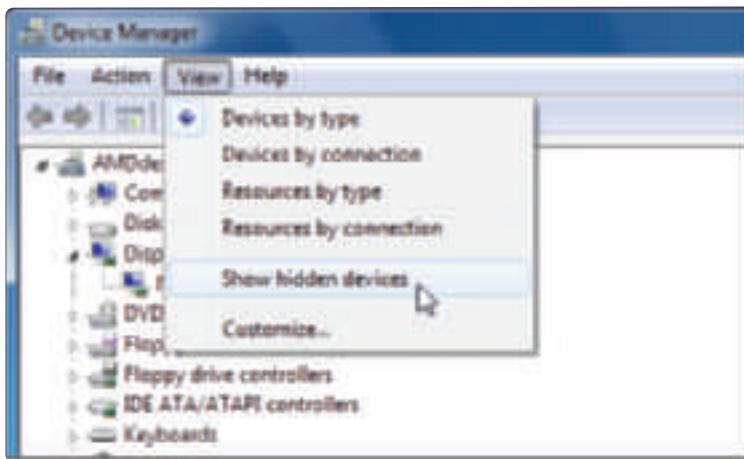
A+
220-802
1.7



Source: Microsoft Windows 7

Figure 8-7 Use the device's properties box to flash the firmware on some devices

8



Source: Microsoft Windows 7

Figure 8-8 By default, Windows does not display legacy devices in Device Manager; you show these hidden devices by using the View menu

Before we move on to installing devices, you need to be familiar with the ports on a computer. When selecting a new device, to get the best performance, select one that uses the fastest port available on your computer.

A+
220-801
1.5, 1.7,
1.10,
1.12

POR TS AND WIRELESS CONNECTIONS USED BY PERIPHERAL DEVICES

Many ports used by peripheral or external devices are pictured in Table 1-1 in Chapter 1. When deciding what type of port a new device should use, the speed of the port is often a tiebreaker. Table 8-1 shows the speeds of various ports, from fastest to slowest. Because wireless connections are sometimes an option, they are also included in the table for comparison. For example, you might need to decide between a USB 2.0 printer connection and a Bluetooth wireless connection. This table can help you decide if speed should be a consideration.



A+ Exam Tip The A+ 220-801 exam expects you to be able to compare the speeds and distances among USB (1.1, 2.0, and 3.0) and Firewire 400 and 800 ports and Bluetooth, Infrared, and RF wireless connections. The facts you need to know are found in Table 8-1.

Port or Wireless Type	Maximum Speed	Maximum Cable Length or Wireless Range
eSATA Version 3 (eSATA-600)	6.0 Gbps (gigabits per second)	Cable lengths up to 2 meters
SuperSpeed USB (USB 3.0)	5.0 Gbps	Cable lengths up to 3 meters
eSATA Version 2 (eSATA-300)	3.0 Gbps	Cable lengths up to 2 meters
eSATA Version 1 (eSATA-150)	1.5 Gbps or 1500 Mbps (megabits per second)	Cable lengths up to 2 meters
Firewire 800 (also called 1394b)	1.2 Gbps or 800 Mbps	Cable lengths up to 100 meters
Wi-Fi 802.11n RF (radio frequency) of 2.4 GHz or 5.0 GHz	Up to 500 Mbps	Range up to 70 meters
Hi-Speed USB (USB 2.0)	480 Mbps	Cable lengths up to 5 meters
FireWire 400 (also called 1394a)	400 Mbps	Cable lengths up to 4.5 meters
Original USB (USB 1.1)	12 Mbps or 1.5 Mbps	Cable lengths up to 3 meters
Parallel	1.5 Mbps	Cables up to 4.5 meters (15 feet)
Serial	115.2 Kbps (kilobits per second)	Cables up to 50 feet
Wi-Fi 802.11g RF of 2.4 GHz	Up to 54 Mbps	Range up to 100 meters
Wi-Fi 802.11a RF of 5.0 GHz	Up to 54 Mbps	Range up to 50 meters
Wi-Fi 802.11b RF of 2.4 GHz	Up to 11 Mbps	Range up to 100 meters
Bluetooth wireless RF of 2.4 GHz	Up to 3 Mbps	Range up to 10 meters
Infrared (IR) wireless Invisible light frequency range of 100 to 400 THz (terahertz or 1 trillion hertz) just above red light	Up to 4 Mbps for fast speed IR; up to 1.15 Mbps for medium speed IR, and up to 115 Kbps (kilobits per second) for slow speed IR	Range up to 5 meters

Table 8-1 Data transmission speeds for various port types and wireless connections

© Cengage Learning 2014

A+
220-801
1.5, 1.7,
1.10,
1.12

A+ Exam Tip The A+ 220-801 exam expects you to know about some old technologies, including serial and parallel ports and cables. For this reason, they are listed in Table 1-1 even though you are unlikely to be called on to support these outdated technologies.

USB CONNECTIONS

Here is a summary of important facts you need to know about USB connections:

- The USB Implementers Forum, Inc. (www.usb.org), the organization responsible for developing USB, uses the symbols shown in Figure 8-9 to indicate SuperSpeed USB (USB 3.0), Hi-Speed USB (USB 2.0), or Original USB (USB 1.1).



Source: USB Forum

Figure 8-9 SuperSpeed, Hi-Speed, and Original USB logos appear on products certified by the USB forum

- As many as 127 USB devices can be daisy chained together using USB cables. In a daisy chain, one device provides a USB port for the next device.
- USB uses serial transmissions, and USB devices are **hot-swappable**, meaning that you can plug or unplug one without first powering down the system.
- A USB cable has four wires, two for power and two for communication. The two power wires (one is hot and the other is ground) allow the host controller to provide power to a device. Table 8-2 shows the different USB connectors on USB cables.

Cable and Connectors	Description
A-Male to B-Male cable  © Cengage Learning 2014	The A Male connector on the left is flat and wide and connects to an A-Male USB port on a computer or USB hub. The B Male connector on the right is square and connects to a USB 1.x or 2.0 device such as a printer.
Mini-B to A-Male cable  © Cengage Learning 2014	The Mini-B connector has five pins and is often used to connect small electronic devices, such as a digital camera, to a computer.

Table 8-2 USB connectors (continues)

© Cengage Learning 2014

A+
220-801
1.5, 1.7,
1.10,
1.12

Cable and Connectors	Description
A-Male to Micro-B cable  <small>© Cengage Learning 2014</small>	The Micro-B connector has five pins and has a smaller height than the Mini-B connector. It's used on digital cameras, cell phones, and other small electronic devices.
A-Male to Micro-A cable  <small>© Cengage Learning 2014</small>	The Micro-A connector has five pins and is smaller than the Mini-B connector. It's used on digital cameras, cell phones, and other small electronic devices.
USB 3.0 A-Male to USB 3.0 B-Male cable  <small>© Cengage Learning 2014</small>	This USB 3.0 B-Male connector is used by SuperSpeed USB 3.0 devices such as printers or scanners. Devices that have this connection can also use regular B-Male connectors, but this USB 3.0 B-Male connector will not fit the connection on a USB 1.1 or 2.0 device . USB 3.0 A-Male and B-Male connectors and ports are blue .
USB 3.0 A-Male to USB 3.0 Micro-B cable  <small>© Cengage Learning 2014</small>	The USB 3.0 Micro-B connector is used by SuperSpeed USB 3.0 devices. The connectors are not compatible with regular Micro-B connectors .

Table 8-2 USB connectors (continued)

© Cengage Learning 2014



Notes A USB 3.0 A-Male connector or port has additional pins compared to USB 1.1 or 2.0 ports and connectors but still is backward compatible with USB 1.1 and 2.0 devices. A USB 3.0 A-Male or B-Male connector or port is usually blue. Take a close look at the blue and black USB ports shown in Figure 1-4 in Chapter 1.

FIREWIRE (IEEE 1394) CONNECTIONS

USB and FireWire competed as a solution for fast I/O connections for a few years, but USB clearly won that contest, and now FireWire is hardly used in new devices. FireWire standards are managed by the 1394 Trade Association (www.1394ta.org). The official name

A+
220-801
1.5, 1.7,
1.10,
1.12

of these standards is IEEE 1394, and other names used are FireWire (first used by Apple) and i.LINK (first used by Sony). The most common name used today is FireWire. Here are the key facts you need to know about FireWire:

- ▲ FireWire uses serial transmissions, and Firewire devices are hot-swappable.
- ▲ **FireWire 800** (1394b) allows for up to 63 FireWire devices to be daisy chained together. FireWire 400 (1394a) allows for up to 16 daisy-chained devices.
- ▲ **FireWire 400** (1394a) supports two types of connectors and cables: a 4-pin connector that does not provide voltage to a device and a 6-pin connector that does. Figure 8-10 shows a cable that plugs into a 6-pin FireWire port to provide a 4-pin connector for a FireWire device.



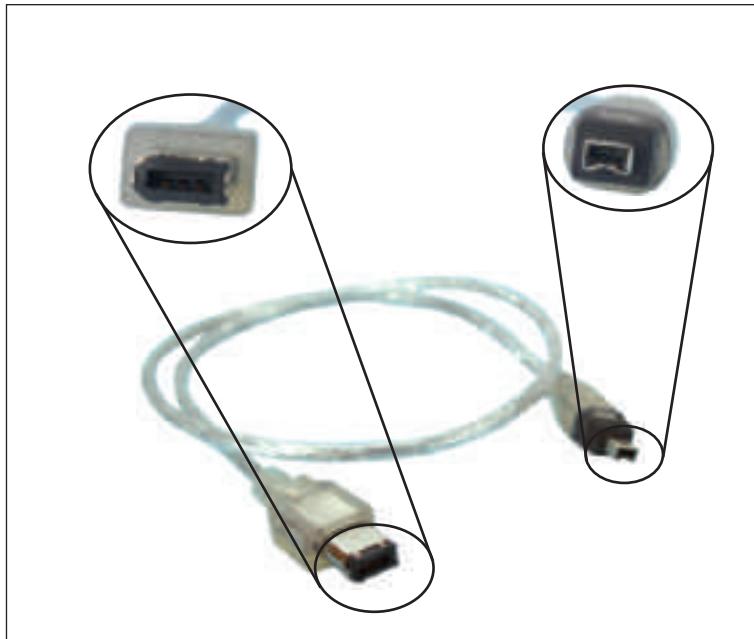
Notes IEEE 1394a ports with six pins are the most common FireWire ports on motherboards.



Video

FireWire Ports

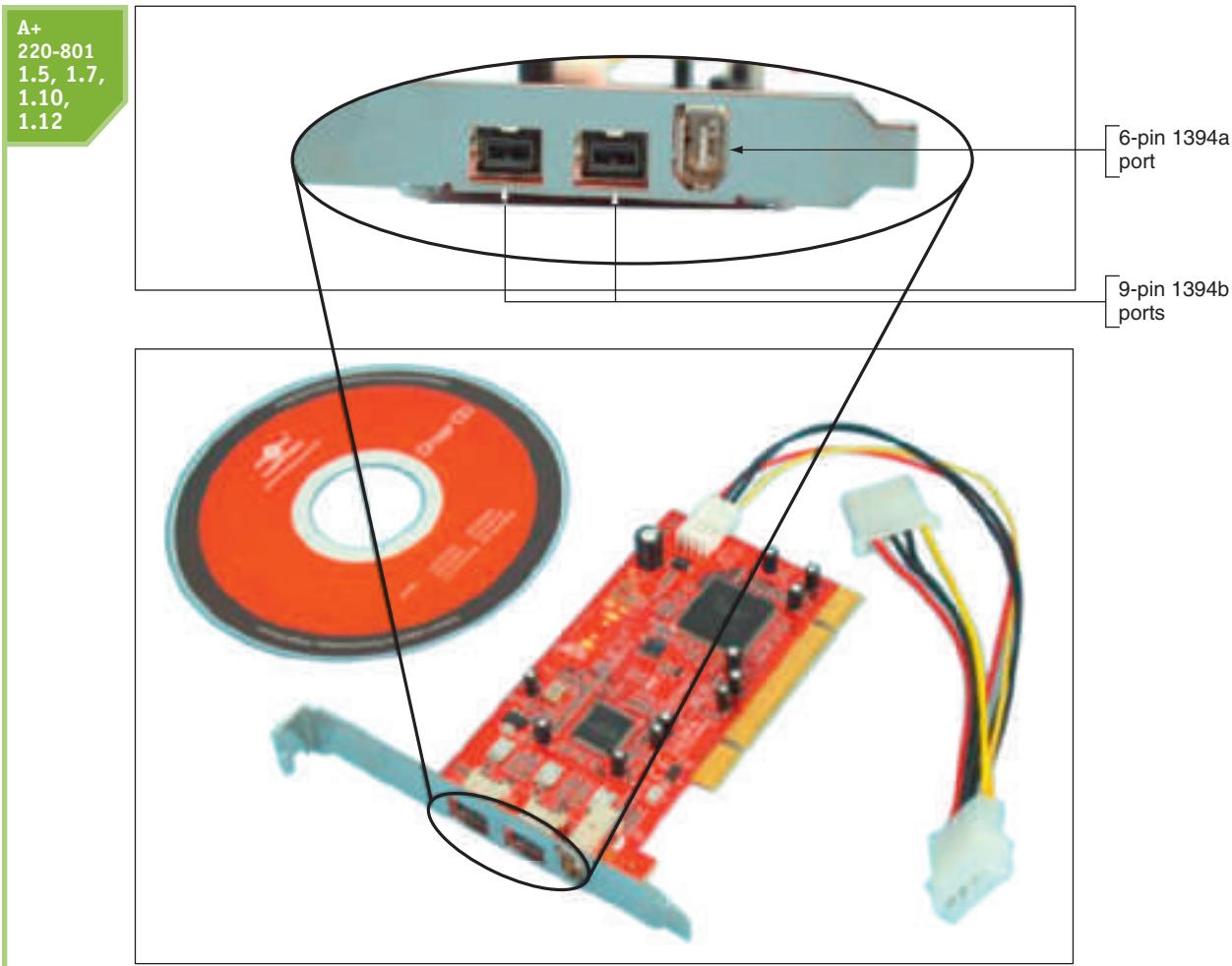
8



© Cengage Learning 2014

Figure 8-10 IEEE 1394a cable provides a smaller 4-pin and larger 6-pin connectors

- ▲ FireWire 800 (1394b) uses a 9-pin rectangular connector. Figure 8-11 shows a FireWire 800 adapter card that provides three 1394 ports: two 1394b 9-pin ports and one 1394a 6-pin port. The power cable connected to the card plugs into a 4-pin Molex power cable from the power supply to provide extra power to the card. The latest 1394 standard is 1394c, which allows FireWire 800 to use a standard network port and network cable.



© Cengage Learning 2014

Figure 8-11 This 1394 adapter card supports both 1394a and 1394b and uses a 32-bit PCI slot

INFRARED CONNECTIONS

Infrared (IR) is an outdated wireless technology that has been mostly replaced by Bluetooth to connect personal devices. IR requires an unobstructed “line of sight” between the transmitter and receiver. Today, the most common use of Infrared is by remote controls. Figure 8-12 shows a remote control that can be used with multimedia applications installed on a notebook computer. The remote communicates with the notebook by way of an IR transceiver connected to a USB port. To use the remote, the device drivers that came bundled with the device are installed and then the IR transceiver is connected to the USB port.



Notes Infrared standards are defined by the Infrared Data Association (IrDA). Its web site is www.irda.org.

A+
220-801
1.5, 1.7,
1.10,
1.12



© Cengage Learning 2014

Figure 8-12 This remote control is an Infrared device that uses an IR transceiver connected to a notebook by way of a USB port

Hands-on | Project 8-1 Update Device Drivers

Using your home or lab computer connected to the Internet, go to Device Manager and attempt to update the drivers on all your installed devices. Which devices did Windows find newer drivers for?

Hands-on | Project 8-2 Research Video Port Adapters

Research the web and find devices that can be used as solutions to these problems. Print or save the web page showing the device and price:

1. Find an adapter that allows you to connect a DisplayPort on a computer to a VGA monitor using a VGA cable.
2. Find an adapter that allows you to connect a Mini DisplayPort on your laptop to a DVI-D port on your monitor. Also find a cable that will work with the adapter.
3. Find an adapter that will allow you to connect a DVI-I port on your desktop to a VGA monitor, using a VGA cable.

Now that you know about the ports and wireless connections used for external devices, let's see how to install them.

INSTALLING I/O PERIPHERAL DEVICES

A+
220-801
1.5, 1.7,
1.10,
1.12

Installing peripheral or external devices is easy to do and usually goes without a hitch. All devices need device drivers or BIOS to control them and to interface with the operating system. Simple input devices, such as the mouse and keyboard, can be controlled by the BIOS or have embedded device drivers built into the OS. For these devices, you don't have to install additional device drivers.

Peripheral devices you might be called on to install include a keyboard, mouse, barcode reader, biometric device (for example, a fingerprint reader), touch screen, scanner, microphone, game pad, joystick, digitizer, digital camera, web cam, camcorder, MDI-enabled devices, speakers, and display devices. These installations are similar, so learning to do one will help you do another. Here are the general procedures to install any peripheral device:

- 1. Read the manufacturer's directions.** I know you don't want to hear that again, but when you follow these directions, the installation goes better. If you later have a problem with the installation and you ask the manufacturer for help, being able to say you followed their directions exactly as stated goes a long way toward getting more enthusiastic help and cooperation.
- 2. Make sure the drivers provided with the device are written for the OS you are using.** Recall that 64-bit drivers are required for a 64-bit operating system, and 32-bit drivers are required for a 32-bit OS. You can sometimes use drivers written for Vista in Windows 7, but for best results, use drivers written for the OS installed. You can download the drivers you need from the manufacturer's web site.
- 3. Make sure the motherboard port you are using is enabled.** Most likely it is enabled, but if the device is not recognized when you plug it in, go into BIOS setup and make sure the port is enabled. In addition, BIOS setup might offer the option to configure a USB port to use SuperSpeed (USB 3.0), Hi-Speed USB (USB 2.0), or original USB (USB 1.1). Figure 8-13 shows the BIOS setup screen for one system where you can enable or disable onboard devices. In addition, if you are having problems with a motherboard port, don't forget to update the motherboard drivers that control the port.



Figure 8-13 Use BIOS setup to enable or disable onboard ports

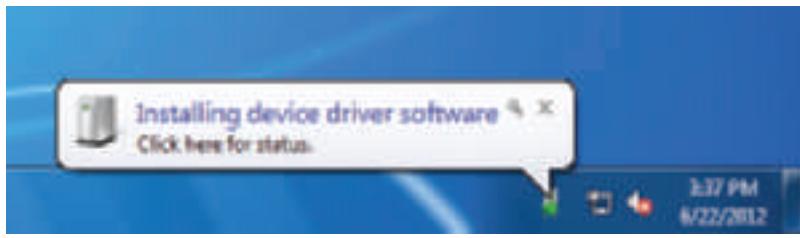
Source: Intel

A+
220-801
1.5, 1.7,
1.10,
1.12

- 4. Install drivers or plug in the device.** Some devices, such as a USB printer, require that you plug in the device before installing the drivers, and some devices require you to install the drivers before plugging in the device. For some devices, it doesn't matter which is installed first. Carefully read and follow the device documentation. For example, the documentation for one digital camera says that if you install the camera before installing the driver, the drivers will not install properly.

 **Video**
Disabling Onboard Ports

If you plug in the device first, The Found New Hardware wizard appears and steps you through the installation of drivers (see Figure 8-14).



Source: Microsoft Windows 7

Figure 8-14 The Found New Hardware wizard begins installing a new device

8

If you need to install the drivers first, run the setup program on CD or DVD. If you downloaded drivers from the web, double-click the driver file and follow the directions on-screen. It might be necessary to restart the system after the installation. After the drivers are installed, plug the device into the port. The device should immediately be recognized by Windows. If you have problems using the device, turn to Device Manager or the Windows 7 Action Center for help.

- 5. Install the application software to use the device.** For example, a FireWire camcorder is likely to come bundled with video-editing software. Run the software to use the device.

Now let's look at some key features and installation concerns for several peripheral devices.

MOUSE OR KEYBOARD

Plug a mouse or keyboard into a USB or older PS/2 port and Windows should immediately recognize it and install generic drivers. For keyboards with special features such as the one shown in Figure 8-15, you need to install the drivers that came with the keyboard before you can use these features.

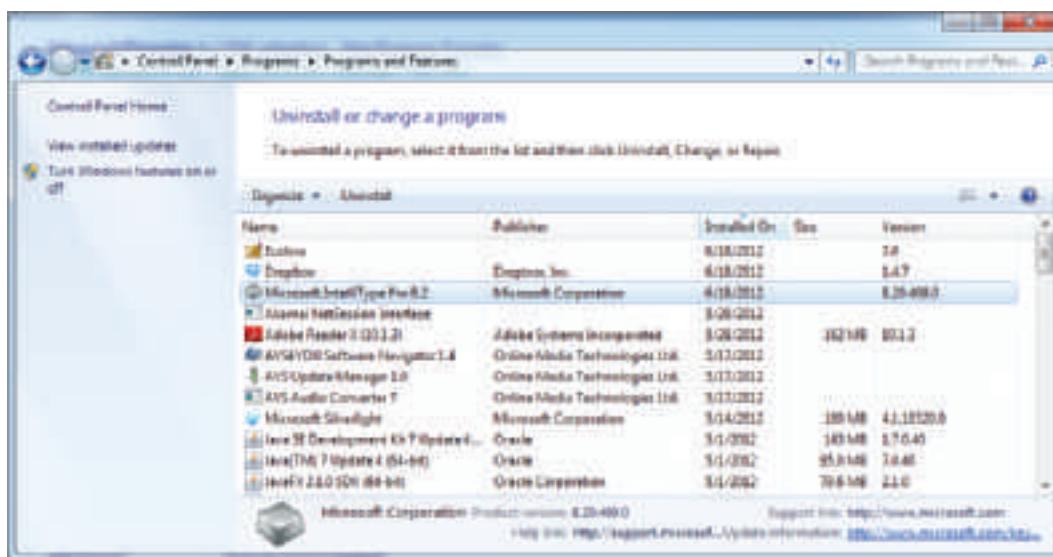
You can later use Device Manager to uninstall, disable, or enable most devices. However, USB devices are managed differently. To uninstall a USB device such as the USB keyboard shown in Figure 8-15, in Control Panel, click **Uninstall a program**. In the Programs and Features window (see Figure 8-16), select the device and click **Change**. Follow the directions on-screen to uninstall the device.

A+
220-801
1.5, 1.7,
1.10,
1.12



© Cengage Learning 2014

Figure 8-15 The mouse and keyboard require drivers to use the extra buttons and zoom bar



Source: Microsoft Windows 7

Figure 8-16 USB devices are listed as installed programs

BARCODE READERS

A **barcode reader** is used to scan barcodes on products at the point of sale (POS) or when taking inventory. The reader might use a wireless connection, a serial port, a USB port, or a keyboard port. If the reader uses a keyboard port, most likely it has a splitter (called a

A+
220-801
1.5, 1.7,
1.10,
1.12

keyboard wedge) on it for the keyboard to use, and data read by the barcode reader is input into the system as though it were typed using the keyboard. Figure 8-17 shows a barcode reader by Intermec that is a laser scanner and uses Bluetooth to connect wirelessly to the PC.



Courtesy of Intermec Technologies

Figure 8-17 Handheld or hands-free barcode scanner by Intermec Technologies

8

BIOMETRIC DEVICES

A **biometric device** is an input device that inputs biological data about a person, which can be input data to identify a person's fingerprints, handprints, face, voice, eye, and handwritten signature. For example, you can use a fingerprint reader to log on to Windows. These fingerprint readers are not to be considered as the only authentication to control access to sensitive data: for that, use a strong password, which is a password that is not easy to guess.

Fingerprint readers can look like a mouse and use a wireless or USB connection, such as the one shown in Figure 8-18, or they can be embedded on a keyboard, flash drive, or laptop case. Most fingerprint readers that are not embedded in other devices use a USB connection. As with other USB devices, read the documentation to know if you should install the drivers first or the device first.



Courtesy of Microsoft

Figure 8-18 Fingerprint readers can (a) look like a mouse, but smaller, or (b) be embedded on a keyboard

A+
220-801
1.5, 1.7,
1.10,
1.12

DIGITAL CAMERAS AND CAMCORDERS

A digital camera or camcorder can hold images and videos both in embedded memory that cannot be removed or exchanged and in removable flash memory cards. Both of these types of memory retain data without a battery. Here are two ways to transfer images from your camera or camcorder to the PC:

- ▲ **Connect the camera or camcorder to the PC using a cable.** Using embedded memory or flash memory cards, you can connect the device to your computer using a USB or FireWire port and cable. To connect the device to the PC, you might need to first install the software and then connect the device, or you might need to connect the device and then install the software. Read the camera or camcorder documentation to find out which order to use. After the device and software are installed, the software displays a menu to download images or video to your PC.
- ▲ **Install the memory card in the PC.** If images or video are stored on a flash memory card installed in your device, you can remove the card and then insert it in a flash memory card slot on your computer. Most laptop computers have one or more of these slots (see Figure 8-19).



© Cengage Learning 2014

Figure 8-19 This laptop has two flash memory card slots

If your computer doesn't have this slot, or the slot is not compatible with the type of card you are using, you have two choices:

- Perhaps you can purchase an adapter so that your smaller memory card will fit into a larger memory slot. Figure 8-20 shows examples of these adapters.
- You can install a USB memory card reader that provides a memory card slot to fit your card. Figure 8-21 shows one reader that connects to a PC using a USB port.

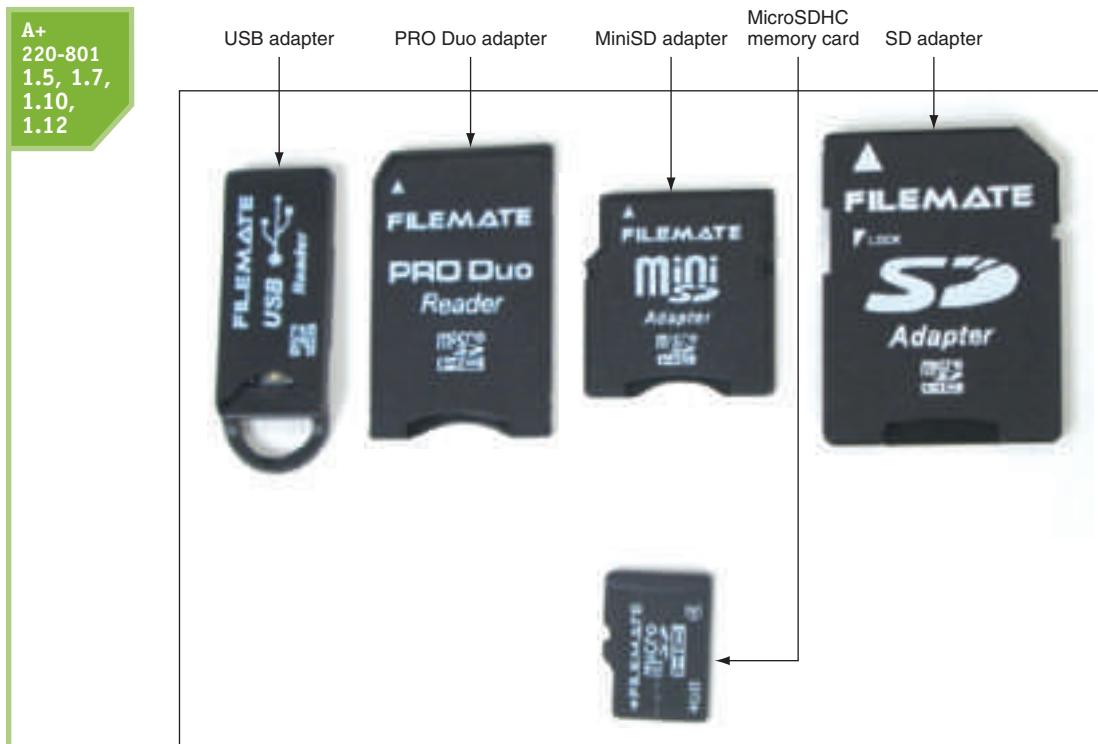
When the memory card is recognized by Windows, it is assigned a drive letter and you can see it listed in Windows Explorer. Use Windows Explorer to copy, move, and delete files from the card.



Notes It's interesting to know that TWAIN (Technology Without An Interesting Name) is a standard format used by scanners and digital cameras and other devices for transferring images.



A+ Exam Tip The A+ 220-801 exam expects you to know how to install the software bundled with your digital camera before attaching the camera to your PC.



© Cengage Learning 2014

Figure 8-20 MicroSDHC card with four adapters

© Cengage Learning 2014

Figure 8-21 This Hi-Speed USB card reader/writer by Targus can read CompactFlash I and II, MicroDrive, SDHC, SD, MMC, xD, Memory Stick, PRO Duo, and Mini SD cards

WEBCAMS

A webcam (web camera) is embedded in most laptops and can also be installed as a peripheral device using a USB port or some other port. For example, the webcam shown in Figure 8-22 works well for personal chat sessions and videoconferencing and has a built-in microphone. First, use the setup CD to install the software and then plug in the webcam to a USB port.

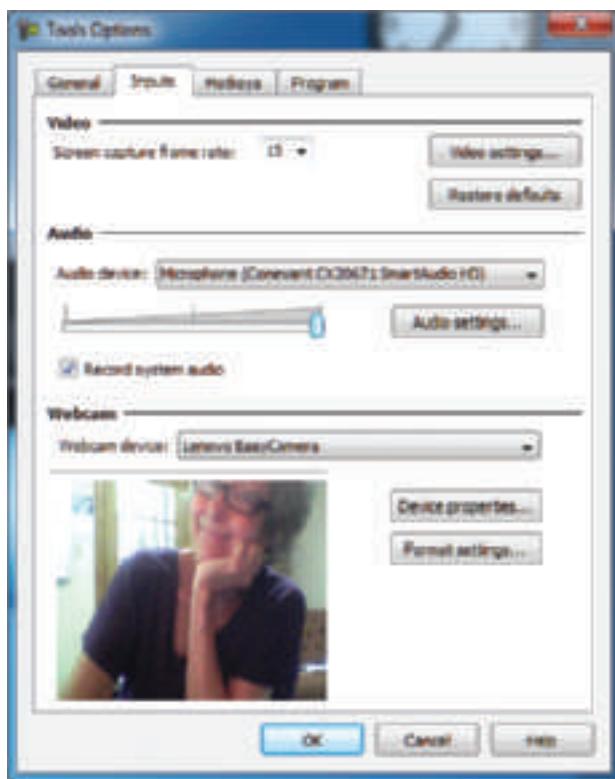
A webcam comes with a built-in microphone. You can use this microphone or use the microphone port on the computer. Most software allows you to select these input devices. For example, Figure 8-23 shows the Tools Options box for Camtasia Recorder by TechSmith (www.techsmith.com).

A+
220-801
1.5, 1.7,
1.10,
1.12



© iStockphoto/Eric Ferfuson

Figure 8-22 This personal web camera clips to the top of your notebook and has a built-in microphone



Source: Camtasia Recorder by TechSmith

Figure 8-23 The Camtasia Recorder application allows you to change the input devices used for video and sound

GRAPHICS TABLETS

Another input device is a **graphics tablet**, also called a **digitizing tablet** or **digitizer**, that is used to hand draw and is likely to connect by a USB port (see Figure 8-24). It comes with a **stylus** that works like a pencil on the tablet. The graphics tablet and stylus can be a replacement to a mouse or touch pad on a laptop, and some graphics tablets come with a mouse. Graphics tablets are popular with graphic artists and others who use desktop publishing applications.

A+
220-801
1.5, 1.7,
1.10,
1.12

Install the graphics tablet the same way you do other USB devices. Additional software might be bundled with the device to enhance its functions, such as inputting handwritten signatures into Microsoft Word documents.



© Cengage Learning 2014

Figure 8-24 A graphics tablet and stylus are used to digitize a hand drawing

8

MIDI DEVICES

MIDI (musical instrument digital interface), pronounced “middy,” is a set of standards that are used to represent music in digital form. Using the MIDI format, each individual note played by each individual instrument is digitally stored. MIDI standards are used to connect electronic music equipment, such as musical keyboards and mixers, or to connect this equipment to a PC for input, output, and editing. Most sound cards can play MIDI files, and most electronic instruments have MIDI ports.

A MIDI port is a 5-pin DIN port that looks like a PS/2 keyboard port, only larger. Figure 8-25 shows MIDI ports on electronic drums. A MIDI port is either an input port



© Cengage Learning 2014

Figure 8-25 MIDI ports on an electronic drum set

A+
220-801
1.5, 1.7,
1.10,
1.12

or an output port, but not both. Normally, you would connect the MIDI output port to a mixer, but you can also use it to connect to a PC.

Here are ways to connect a musical instrument to a PC using the MIDI standards:

- ▲ **MIDI to MIDI:** A few sound cards provide MIDI ports. Use two MIDI cables to connect output jack to input jack and to connect input jack to output jack.
- ▲ **MIDI to USB:** If your PC does not have MIDI ports, you can use a MIDI-to-USB cable like the one in Figure 8-26. The two MIDI connectors on the cable are for input and output.
- ▲ **USB to USB:** Newer instruments have a USB port to interface with a PC using MIDI data transmissions.
- ▲ **USB to MIDI:** A USB port on an instrument can also connect to MIDI ports on a computer sound card.



A+ Exam Tip The A+ 220-801 exam expects you to know how to install and configure MIDI devices.



© Cengage Learning 2014

Figure 8-26 MIDI-to-USB cable lets you connect an electronic musical instrument to your computer

To mix and edit music using MIDI on your PC, you'll need MIDI editing software such as JAMMER Pro by SoundTrek (www.soundtrek.com). Before connecting the instrument to your PC, install the software that you intend to use to manage the music. Then, connect the instrument.

TOUCH SCREENS

A **touch screen** is an input device that uses a monitor or LCD panel as the backdrop for input options. In other words, the touch screen is a grid that senses taps, finger pinches, and slides and sends these events to the computer by way of a USB port or other type of connection. Some laptops have built-in touch screens, and you can also install a touch screen on top of a monitor screen as an add-on device. As an add-on device, the touch screen has its own AC adapter to power it. Some monitors for desktop systems have built-in touch screen capability.

For desktop monitors, clamp the touch screen over the monitor. For most installations, you install the drivers before you connect the touch screen to the computer by way of a USB

A+
220-801
1.5, 1.7,
1.10,
1.12

port. After you install the drivers and the touch screen, you must use management software that came bundled with the device to decide how much of the monitor screen is taken up by the touch screen and to calibrate the touch screen. Later, if the monitor resolution is changed, the touch screen must be recalibrated.

KVM SWITCHES

A **KVM (Keyboard, Video, and Mouse) switch** allows you to use one keyboard, monitor, and mouse for multiple computers. A KVM switch can be useful in a server room or testing lab where you use more than one computer and want to keep desk space clear of multiple keyboards, mice, and monitors or you simply want to lower the cost of peripherals. Figure 8-27 shows a KVM switch that can connect a keyboard, monitor, mouse, microphone, and speakers to two computers. The device uses USB ports for the keyboard and mouse. Figure 8-28 shows a KVM switch that can connect up to four computers using VGA ports for the monitor and PS/2 ports for the keyboard and mouse connections. The setup for the four computers is shown in Figure 8-29.

Connectors for computer 1 Connectors for computer 2



© Cengage Learning 2014

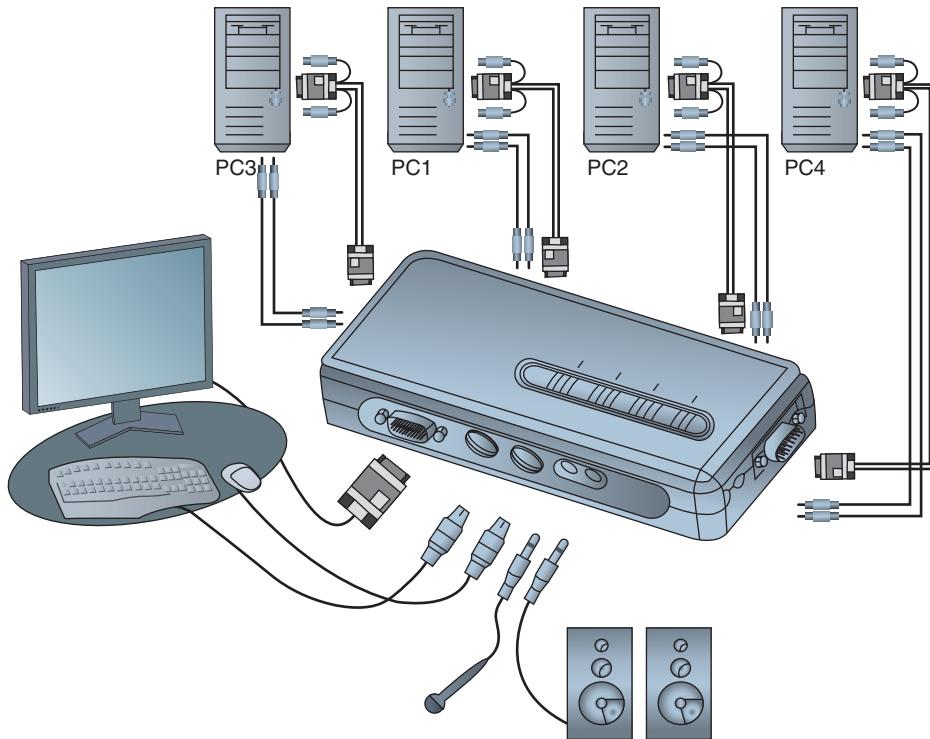
Figure 8-27 This KVM switch connects two computers to a keyboard, mouse, monitor, microphone, and speakers and uses USB for the keyboard and mouse



© Cengage Learning 2014

Figure 8-28 This KVM switch supports up to four computers, uses PS/2 ports for the keyboard and mouse, and provides microphone and speaker ports for sound

A+
220-801
1.5, 1.7,
1.10,
1.12



© Cengage Learning 2014

Figure 8-29 Hardware configuration for a four-port KVM switch that also supports audio

A KVM switch does not require that you install device drivers to use it. Just plug in the cables from each computer to the device. Also plug in the one monitor, mouse, keyboard, and possibly a microphone and speakers to the device. Switch between computers by using a hot key on the keyboard, buttons on the top of the KVM switch, or a wired remote such as the one shown in Figure 8-27.

INSTALLING AND CONFIGURING ADAPTER CARDS

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

In this part of the chapter, you will learn to install and configure adapter cards. These cards include a video card, sound card, storage controller card, serial and parallel port card, FireWire card, USB card, storage card, TV tuner card, and video capture card. The purpose of adding an adapter card to a system is to have available the external ports or internal connectors the card provides.



Identifying Expansion Card

Regardless of the type of card you are installing, when preparing to install an adapter card, be sure to verify and do the following:

- ▲ **Verify the card fits an empty expansion slot.** Recall from Chapter 4 that there are several AGP, PCI, and PCI Express standards. Use the details in Chapter 4 to make sure the card will fit the slot. To help with airflow, try to leave an empty slot between cards. Especially try to leave an empty slot beside the video card, which puts off a lot of heat.
- ▲ **Verify the device drivers for your OS are available.** Check the card documentation and make sure you have the drivers for your OS. For example, you need to install 64-bit Windows 7 drivers in a 64-bit installation of Windows 7. It might be possible to download drivers for your OS from the web site of the card manufacturer.

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

- ▲ **Back up important data that is not already backed up.** Before you open the computer case, be sure to back up important data on the hard drive.
- ▲ **Know your starting point.** Know what works and doesn't work on the system. Can you connect to the network and the Internet, print, and use other installed adapter cards without errors?

 **Video**

Replacing an Expansion Card

Here are the general directions to install an adapter card. They apply to any type of card.

1. Read the documentation that came with the card. For most cards, you install the card first and then the drivers, but some adapter card installations might not work this way.
2. If you are installing a card to replace an onboard port, access BIOS setup and disable the port.
3. Wear a ground bracelet as you work to protect the card and the system against ESD. Shut down the system, unplug power cords and cables, and press the power button to drain the power. Remove the computer case cover.
4. Locate the slot you plan to use and remove the faceplate cover from the slot if one is installed. Sometimes a faceplate punches or snaps out, and sometimes you have to remove a faceplate screw to remove the faceplate. Remove the screw in the top of the expansion slot. Save the screw; you'll need it later.
5. Remove the card from its antistatic bag and insert it into the expansion slot. Be careful to push the card straight down into the slot, without rocking the card from side to side. Rocking it from side to side can widen the expansion slot, making it difficult to keep a good contact. If you have a problem getting the card into the slot, resist the temptation to push the front or rear of the card into the slot first. You should feel a slight snap as the card drops into the slot.

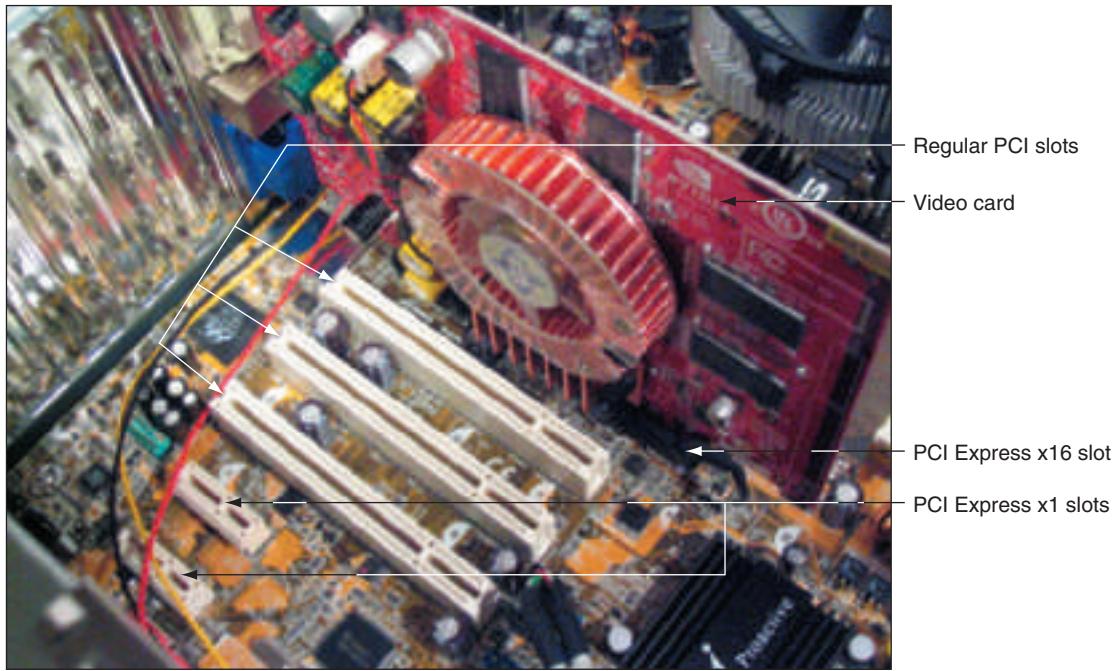
Recall from Chapter 2 that AGP and PCIe x16 slots use a retention mechanism in the slot to help stabilize a heavy card (see Figure 8-30). For these slots, you might have to use one finger to push the stabilizer to the side as you push the card into the slot. Alternately, the card might snap into the slot and then the retention mechanism snaps into position. Figure 8-31 shows a PCIe video card installed in a PCIe x16 slot.



© Cengage Learning 2014

Figure 8-30 A white retention mechanism on a PCIe x16 slot pops into place to help stabilize a heavy video card

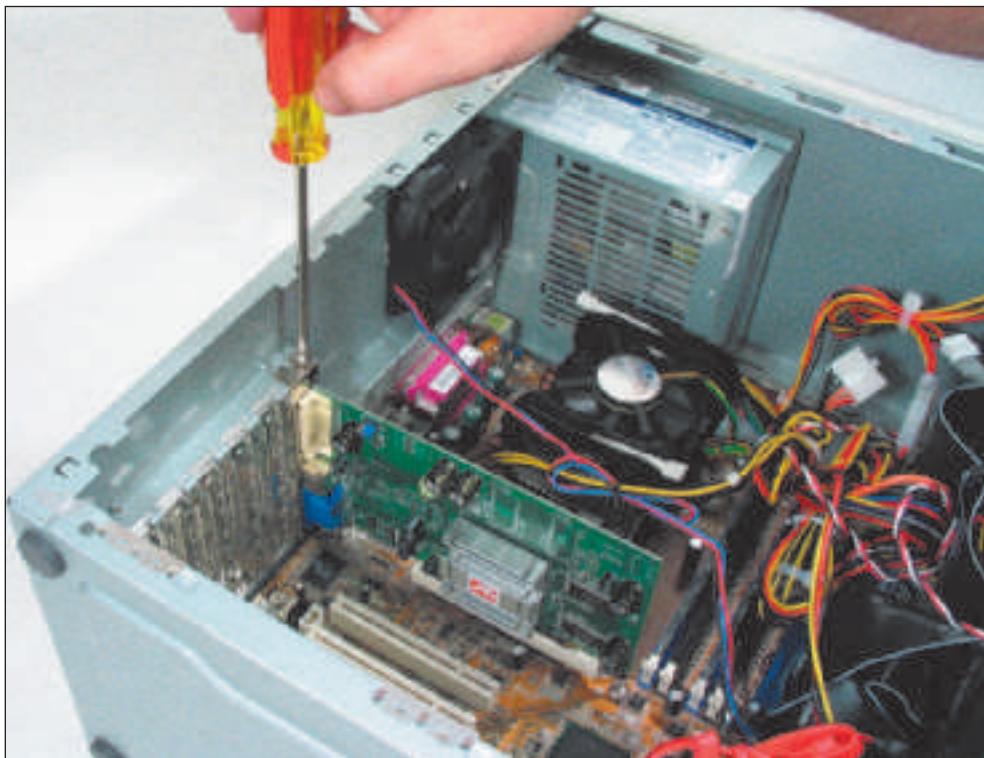
A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12



© Cengage Learning 2014

Figure 8-31 A PCIe video card installed in a PCIe x16 slot

6. Insert the screw that anchors the card to the top of the slot (see Figure 8-32). Be sure to use this screw. If it's not present, the card can creep out of the slot over time.

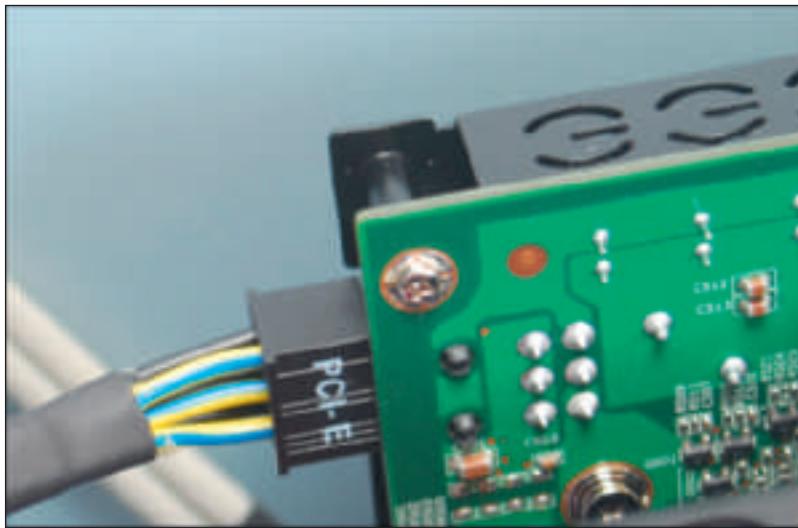


© Cengage Learning 2014

Figure 8-32 Secure the card to the case with a single screw

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

7. Connect any power cords or data cables the card might use. For example, a video card might have a 6-pin or 8-pin PCIe power connector for a power cord from the power supply to the card (see Figure 8-33). (If the power supply does not have the right connector, you can buy an inexpensive adapter to convert a 4-pin Molex connector to a PCIe connector.) In another example, look at Figure 8-11 shown earlier in the chapter. This FireWire card requires a power connection using a 4-pin Molex power cable from the power supply.



Source: Microsoft Windows 7

Figure 8-33 Connect a power cord to the PCIe power connector on the card

8. Make a quick check of all connections and cables, and then replace the case cover. (If you want, you can leave the case cover off until you've tested the card, in case it doesn't work and you need to reseat it.) Plug up the external power cable and essential peripherals.
9. Start the system. When Windows starts, it should detect a new hardware device is present and attempt to automatically install the drivers. As the drivers are installed, a message might appear above the taskbar (refer back to Figure 8-14). You can cancel the wizard and manually install the drivers.
10. Insert the CD that came bundled with the card and launch the setup program on the CD. The card documentation will tell you the name of the program (examples are Setup.exe and Autorun.exe). Figure 8-34 shows the opening menu for one setup program for a video card. Click **Install Video Drivers** and follow the on-screen instructions to install the drivers. If you are using downloaded driver files, double-click the file to begin the installation and follow the directions on-screen.



Notes

All 64-bit drivers must be certified by Microsoft to work in Windows. However, some 32-bit drivers might not be. During the driver installation, if you see a message that says 32-bit drivers have not been certified, go ahead and give permission to install the drivers if you obtained them from the manufacturer or another reliable source.

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12



Source: EVGA

Figure 8-34 Opening menu to install video drivers

11. After the drivers are installed, you might be asked to restart the system. Then you can configure the card or use it with application software. If you have problems with the installation, turn to Device Manager and look for errors reported about the device. The card might not be properly seated in the slot.



Notes Some motherboards provide extra ports that can be installed in faceplate openings off the back of the case. For example, Figure 8-35 shows a module that has a game port and two USB ports. To install the module, remove a faceplate and install the module in its place. Then connect the cables from the module to the appropriate connectors on the motherboard.

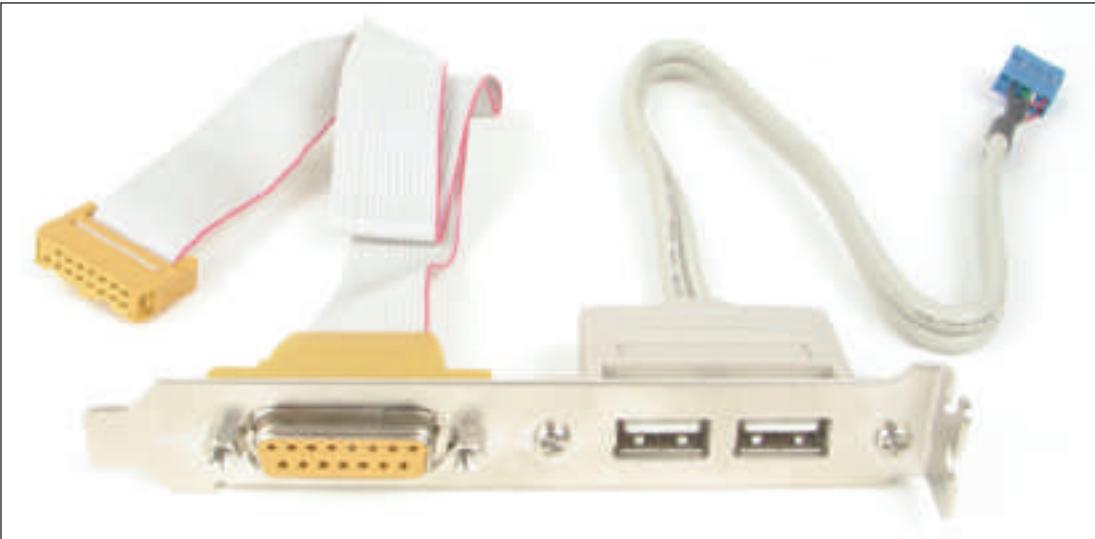


Figure 8-35 This I/O module provides two USB ports and one game port

© Cengage Learning 2014

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

 Video

Installing a Video Card

When you install a video card, here is a list of things that can go wrong and what to do about them:

1. **When you first power up the system, you hear a whining sound.** This is caused by the card not getting enough power. Make sure a 6-pin or 8-pin power cord is connected to the card if it has this connector. The power supply might be inadequate.
2. **When you first start up the system, you see nothing but a black screen.** Most likely this is caused by the onboard video port not being disabled in BIOS setup. Disable the port.
3. **When you first start up the system, you hear a series of beeps.** BIOS cannot detect a video card. Make sure the card is securely seated. The video slot or video card might be bad.
4. **Error messages about video appear when Windows starts.** This can be caused by a conflict in onboard video and the video card. Try disabling onboard video in Device Manager.
5. **Games crash or lock up.** Try updating drivers for the motherboard, the video card, and the sound card. Also install the latest version of DirectX. (You learn about DirectX later in the chapter.) Then try uninstalling the game and installing it again. Then download all patches for the game.

8

Now let's turn our attention to a little information about three types of cards you might be called on to install. As with any adapter card you install, be sure to get familiar with the user guide before you start the installation so that you know the card's hardware and software requirements and what peripheral devices it supports.

SOUND CARDS AND ONBOARD SOUND

A **sound card** (an expansion card with sound ports) or onboard sound (sound ports embedded on a motherboard) can play and record sound, and save it in a file. Figure 8-36 shows a sound card by Creative (us.creative.com). This Sound Blaster card uses a PCIe x1 slot and supports up to eight surround sound version 7.1 speakers. The color-coded



Courtesy of Creative Technology Ltd.

Figure 8-36 Sound Blaster X-Fi Titanium sound card by Creative uses a PCIe x1 slot

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

speaker ports are for these speakers: front left and right, front center, rear left and right, subwoofer, and two additional rear speakers. The two S/PDIF (Sony/Philips Digital Interconnect Format) ports are used to connect to external sound equipment such as a CD or DVD player.



Notes If you are using a single speaker or two speakers with a single sound cable, connect the cable to the lime green sound port on the motherboard, which is usually the middle port.

TV TUNER AND VIDEO CAPTURE CARDS

A **TV tuner card** can turn your computer into a television. A port on the card receives input from a TV cable and lets you view television on your computer monitor. If the TV signal is analog, the TV tuner card can convert it to digital. A **video capture card** lets you capture this video input and save it to a file on your hard drive. Some cards are a combination TV tuner card and video capture card, making it possible for you to receive television input and save that input to your hard drive (see Figure 8-37). A high-end TV tuner/video capture card might also serve as your video card. Also, some motherboards and notebook computers have onboard TV tuners and TV captures.



Courtesy of AVerMedia Technologies, Inc. USA.

Figure 8-37 The AVerMedia AVerTV PVR 150 Plus TV tuner and video capture card uses a PCIe x1 slot and works alongside a regular video card

When installing a TV tuner or capture card, most likely you will install the drivers, install the card, and then install the application software that comes bundled with the card. You can then configure and manage the card using the applications.

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

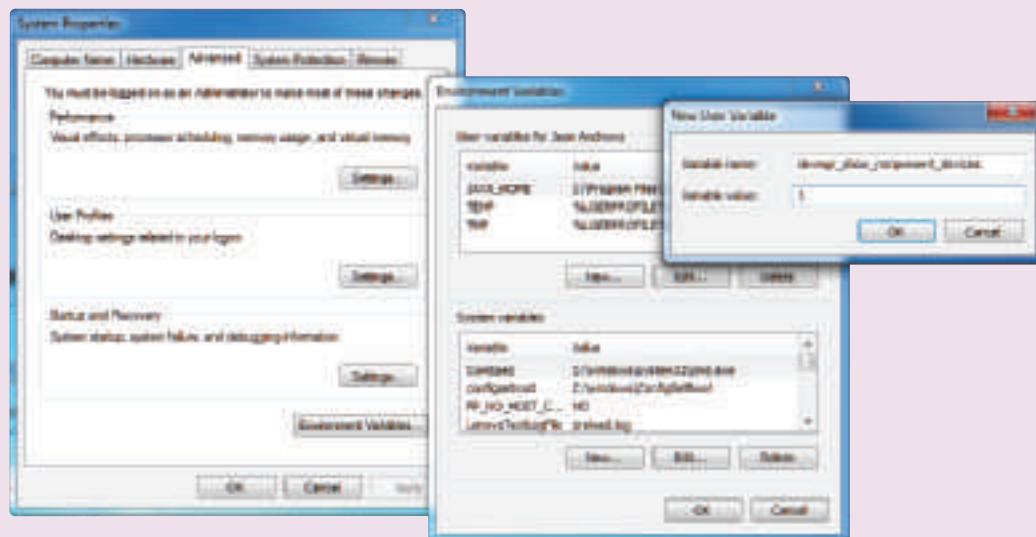
Hands-on Project 8-3 Install a Device

Install a device on a computer. If you are working in a classroom environment, you can simulate an installation by moving a device from one computer to another. Devices that you might consider installing are a video card, webcam, CD drive, or fingerprint reader.

Hands-on Project 8-4 Uninstall Devices Not Present

Device Manager shows only the devices that are currently present. If a device is no longer present, you cannot see the device listed in Device Manager in order to uninstall its drivers. To solve this problem, you can use an environmental variable that causes Device Manager to display devices no longer present. (An environmental variable is a name kept by Windows that has been assigned information, such as the path to a program file or a program setting, and is used by Windows and applications.) Do the following to practice these skills:

1. Install a USB flash drive in a system. Verify you can see the drive listed under Disk drives in Device Manager. Remove the flash drive from the system. Verify the drive is no longer listed in Device Manager even when you click **Show hidden devices** in the View menu of Device Manager.
2. Open the System window and click **Advanced system settings**. On the Advanced tab of the System Properties box, click **Environment Variables**. Add a new user variable named **devmgr_show_nonpresent_devices** and give the variable a value of **1** (see Figure 8-38). Log off and log back on the system.
3. Return to Device Manager. When you show hidden devices, the USB flash drive is listed. Uninstall its drivers. What other devices showed up in Device Manager that were not shown in Step 1?



Source: Microsoft Windows 7

Figure 8-38 Set an environmental variable to cause Device Manager to display nonpresent devices

SUPPORTING THE VIDEO SUBSYSTEM

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

The primary output device of a computer is the monitor. The two necessary components for video output are the monitor and the video card (also called the video adapter and graphics adapter) or a video port on the motherboard. In this part of the chapter, you learn about monitors, video cards, the video connectors they use, and how to support the video subsystem.

MONITOR TECHNOLOGIES AND FEATURES

The most popular type of monitor for laptop and desktop systems is an LCD flat-screen monitor (see Figure 8-39), but you have other choices as well. Here is a list and description of each type of monitor:

- ▲ **CRT monitor.** The **CRT (cathode-ray tube) monitor** (see Figure 8-39) was first used in television sets, takes up a lot of desk space, and is largely obsolete. One reason to still use them is for children. The surface of a LCD monitor can easily be damaged, but CRT monitor surfaces can handle children touching them. CRT monitors use mercury, and, therefore, you must be careful when disposing of one to make sure the environment is not affected.

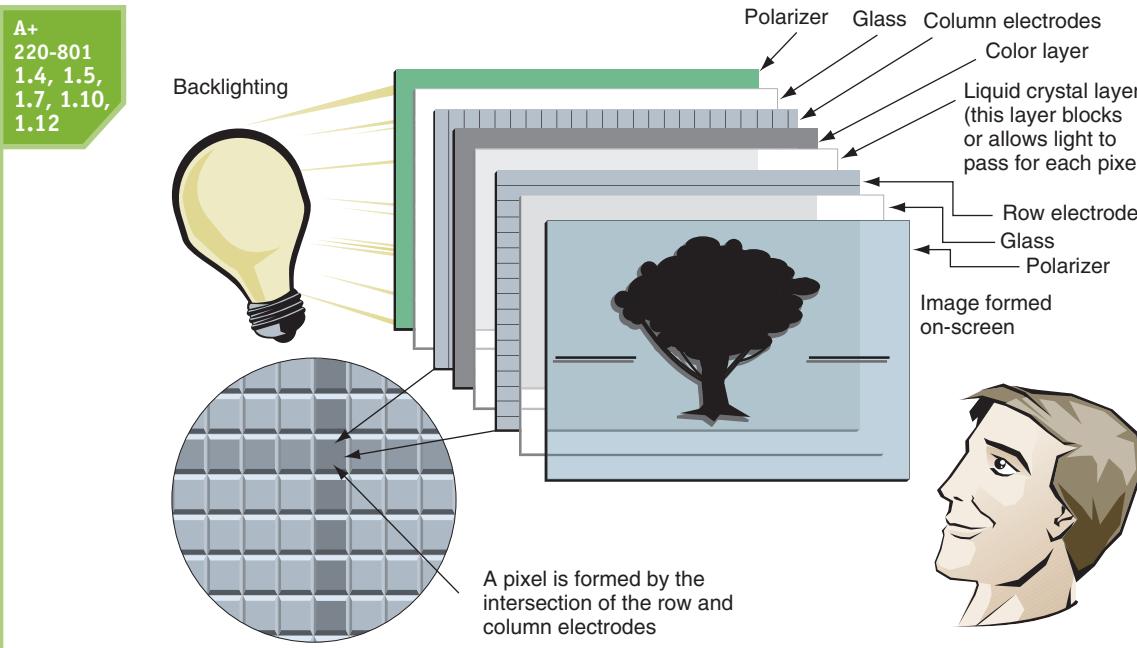


© Cengage Learning 2014

© C Keerati/www.Shutterstock.com

Figure 8-39 (a) An LCD monitor, (b) an older CRT monitor

- ▲ **LCD monitor.** The **LCD (liquid crystal display) monitor**, also called a **flat-panel monitor**, was first used in laptops. The monitor produces an image using a liquid crystal material made of large, easily polarized molecules. Figure 8-40 shows the layers of the LCD panel that together create the image. At the center of the layers is the liquid crystal material. Next to it is the layer responsible for providing color to the image. These two layers are sandwiched between two grids of electrodes forming columns and rows. Each intersection of a row electrode and a column electrode forms one **pixel** on the LCD panel. Software can address each pixel to create an image.



© Cengage Learning 2014

Figure 8-40 Layers of an LCD panel

Backlighting is used to light the LCD panel. The trend for most monitor manufacturers is to use LED backlighting, which provides a better range and accuracy of color and uses less power than earlier technologies. **LED (Light-Emitting Diode)** technology also uses less mercury, and is, therefore, kinder to the environment when an LCD monitor is disposed of. When you see a monitor advertised as an LED monitor, know the monitor is an LCD monitor that uses LED backlighting.

▲ **Plasma monitor.** A **plasma monitor** provides high contrast with better color than LCD monitors. They work by discharging xenon and neon plasma on flat glass and don't contain mercury. Plasma monitors are expensive and heavy and are generally available only in large commercial sizes.

▲ **Projector.** A **projector** (see Figure 8-41) is used to shine a light that projects a transparent image onto a large screen and is often used in classrooms or with other large groups. Several types of technologies are used by projectors, including LCD. A projector is often installed on a computer as a dual monitor, which you learn how to do later in the chapter.



Courtesy of Panasonic Corporation of North America

Figure 8-41 Portable XGA projector by Panasonic

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

▲ **OLED monitor.** An **OLED (Organic Light-emitting Diode) monitor** uses a thin LED layer or film between two grids of electrodes and does not use backlighting. It does not emit as much light as an LCD monitor does, and, therefore, can produce deeper blacks, provide better contrast, work in darker rooms, and use less power than can an LCD monitor. OLED screens are used by digital cameras, camcorders, mobile devices, and other small portable electronic devices. OLED monitors are just now appearing for desktop systems.



A+ Exam Tip The A+220-801 exam expects you to know about these monitor types and technologies: CRT, LCD, LED, plasma, projector, and OLED.

In this chapter, we focus on LCD monitors—by far the most popular monitors used with desktop systems. Figure 8-42 shows an ad for one high-end LCD monitor. Table 8-3 explains the features mentioned in the ad.

Figure 8-42 An ad for a monitor lists cryptic monitor features

Source: tigerdirect.com



A+ Exam Tip The A+ 220-801 exam expects you to know about these monitor features: refresh rate, resolution, native resolution, brightness in lumens, and analog and digital connectors used.

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

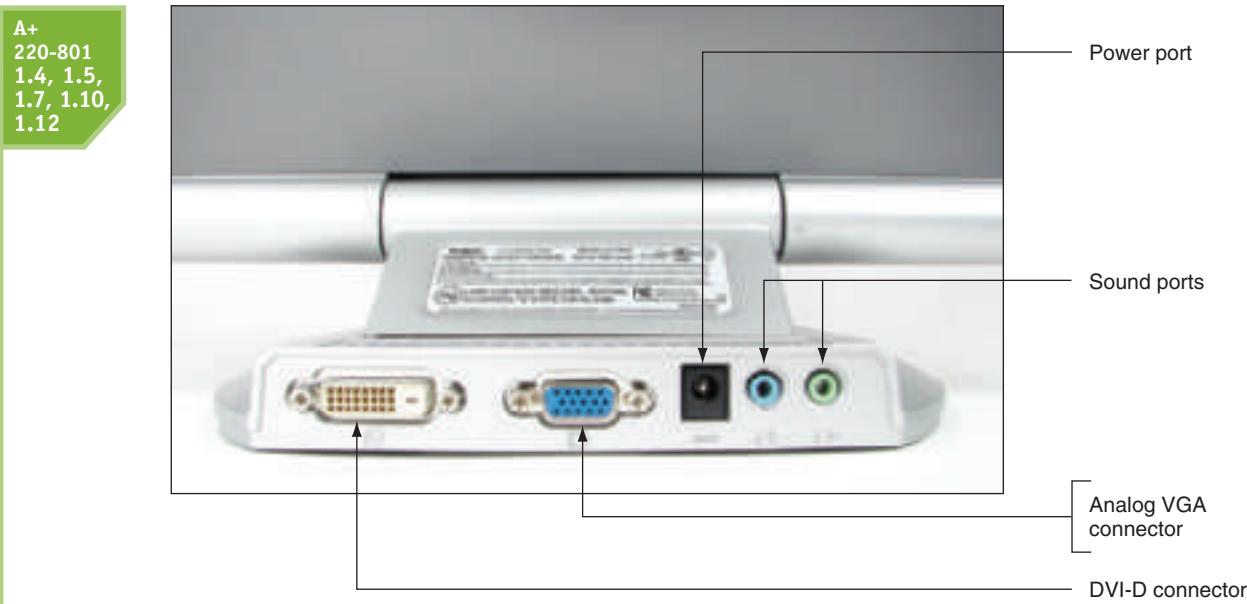
Monitor Characteristic	Description
Screen size	Diagonal length of the screen surface in inches.
Refresh rate	The refresh rate , also called the response time, is the time it takes for a monitor to build one screen, measured in ms (milliseconds) or Hz (hertz). The lower the better. A monitor with a 12-ms response time can build 83 frames per second, and a 16-ms monitor can build 63 frames per second. The ad in Figure 8-42 shows a refresh rate of 6 ms.
Pixel pitch	A pixel is a spot or dot on the screen that can be addressed by software. The pixel pitch is the distance between adjacent pixels on the screen. An example of a pixel pitch is .283mm. The smaller the number, the better.
Resolution	The resolution is the number of spots or pixels on a screen that can be addressed by software. Values can range from 640×480 up to 1920×1200 for high-end monitors. Popular resolutions are 1920×1080 and 1366×768 .
Native resolution	The native resolution is the number of pixels built into the LCD monitor. Using the native resolution usually gives the highest-quality image.
Contrast ratio	<p>The contrast between true black and true white on the screen. The higher the contrast ratio the better. 1000:1 is better than 700:1.</p> <p>An advertised dynamic contrast ratio is much higher than the contrast ratio but not a true measurement of contrast. Dynamic contrast adjusts the backlighting to give the effect of an overall brighter or darker image. For example, in Figure 8-42, the contrast ratio is 1000:1, and the dynamic ratio is 20,000,000:1. When comparing quality of monitors, pay attention to the contrast ratio, more so than the dynamic ratio.</p>
Viewing angle	The angle of view when a monitor becomes difficult to see. A viewing angle of 170 degrees is better than 140 degrees.
Backlighting or brightness	<p>Brightness is measured in cd/m^2 (candela per square meter), which is the same as lumens/m^2 (lumens per square meter).</p> <p>In addition, the best LED backlighting for viewing photography is class IPS (in-plane switching), which provides the most accurate color.</p>
Connectors	Options for connectors are VGA, DVI-I, DVI-D, HDMI, DisplayPort, and Thunderbolt. Some monitors offer more than one connector (see Figure 8-43). These and other connectors used by video cards and monitors are discussed later in the chapter.
Other features	LCD monitors can also provide an antiglare surface, tilt screens, microphone input, speakers, USB ports, adjustable stands, and perhaps even a port for your iPod. Some monitors are also touch screens, so they can be used with a stylus or finger touch.

Table 8-3 Important features of a monitor

© Cengage Learning 2014



Caution If you spend many hours in front of a computer, you may strain your eyes. To protect your eyes from strain, look away from the monitor into the distance every few minutes. Use a good monitor with a high refresh rate or response time. The lower rates that cause monitor flicker can tire and damage your eyes. When you first install a monitor, set the rate at the highest value the monitor can support.

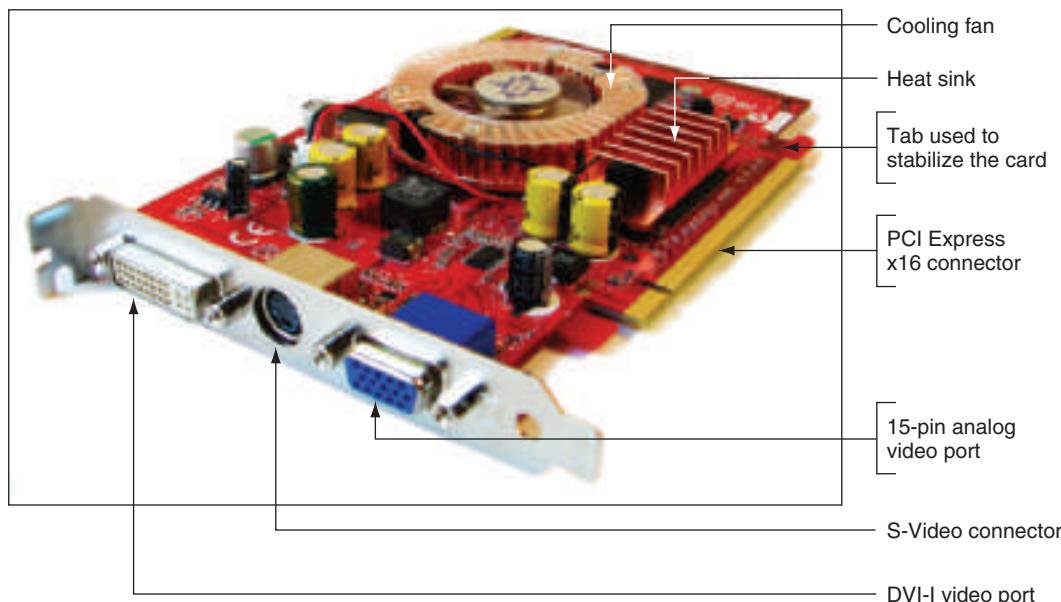


© Cengage Learning 2014

Figure 8-43 The rear of this LCD monitor shows digital and analog video ports to accommodate a video cable with either a 15-pin analog VGA connector or a digital DVI connector

VIDEO CARDS AND CONNECTORS

Video cards (see Figure 8-44) are sometimes called graphics adapters, graphics cards, or display cards. Most motherboards sold today have one or more video ports integrated into the motherboard. If you are buying a motherboard with a video port, make sure that you can disable the video port on the motherboard if it gives you trouble. You can then install a video card and use its video port rather than the port on the motherboard. Recall from Chapter 4 that a video card can use an AGP, PCI, or PCIe slot on the motherboard. The fastest slot to use is a PCIe x16 slot.



© Cengage Learning 2014

Figure 8-44 The PCX 5750 graphics card by MSI Computer Corporation uses the PCIe x16 local bus

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

Recall from Chapter 1 that types of video ports include VGA, S-Video, DVI, DisplayPort, and HDMI connectors, which you can see in Table 1-1 in Chapter 1. In addition to these ports, you also need to know about a composite video, miniHDMI, miniDin-6, DVI-I, DVI-D, and DVI-A ports. All these ports are described here:

- ▲ **VGA.** The 15-pin VGA port is the standard analog video port and transmits three signals of red, green, and blue (RGB). A VGA port is sometimes called a **DB-15** port.
- ▲ **DVI ports.** DVI ports were designed to replace VGA, and variations of DVI can transmit analog and/or digital data. The five DVI standards for pinouts are shown in Figure 8-45. Three DVI connectors are shown in Figure 8-46. The DVI standards specify the maximum length for DVI cables is 5 meters, although some video cards produce a strong enough signal to allow for longer DVI cables.

DVI-D (Digital Only)	DVI-I (Digital or Analog)	DVI-A (Analog Only)
DVI-D Single Link	DVI-I Single Link DVI-A	
DVI-D Dual Link DVI-I Dual Link		

© Cengage Learning 2014

Figure 8-45 Five pinout arrangements for DVI ports and connectors



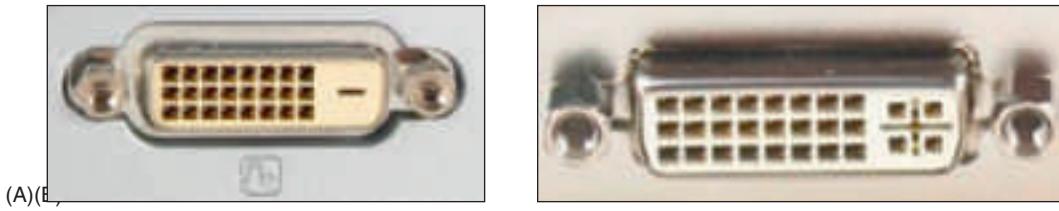
© Cengage Learning 2014

Figure 8-46 Three types of DVI connectors: (left) DVI-I, (middle) DVI-D, and (right) DVI-A

Here are the variations of DVI:

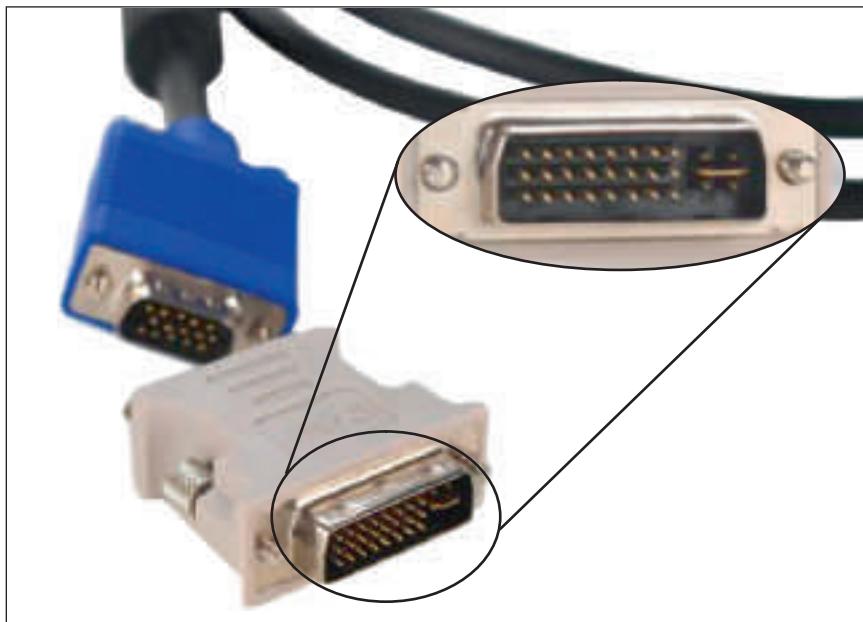
- **DVI-D.** The **DVI-D** port only transmits digital data. Using an adapter to convert a VGA cable to the port won't work. You can see a DVI-D port in Figure 8-47a.
- **DVI-I.** The **DVI-I** port (see Figure 8-47b) supports both analog and digital signals. If a computer has this type of port, you can use a digital-to-analog adapter to connect an older analog monitor to the port using a VGA cable (see Figure 8-48). If a video card has a DVI port, most likely it will be the DVI-I port (the one with the four extra holes) so that you can use an adapter to convert the port to a VGA port.

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12



© Cengage Learning 2014

© Cengage Learning 2014

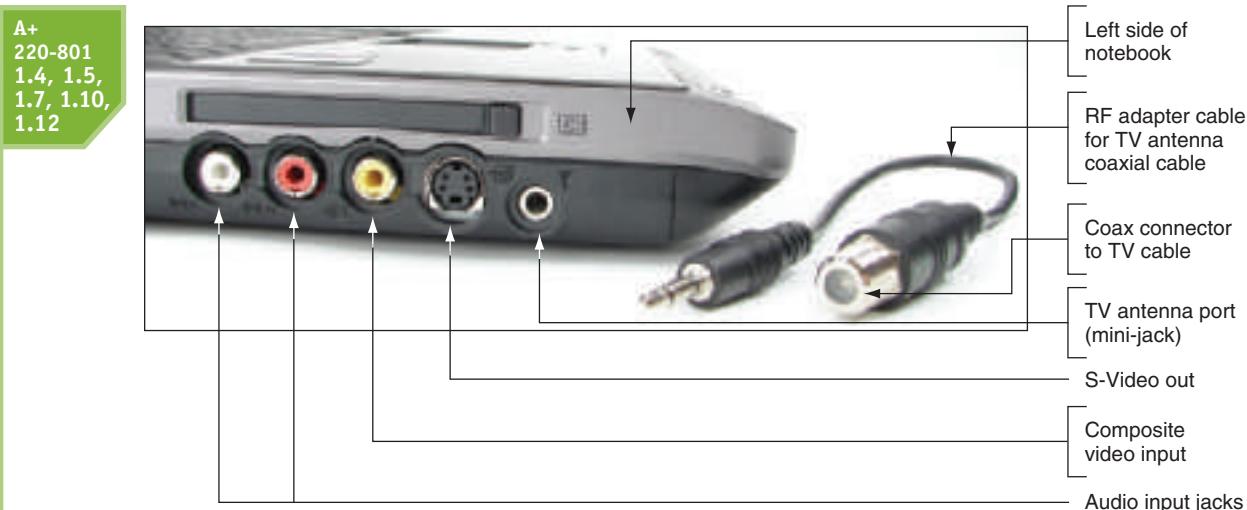
Figure 8-47 Two types of DVI ports: (a) DVI-D, (b) DVI-I

© Cengage Learning 2014

Figure 8-48 Digital-to-analog video port converter using DVI-I connector with extra four pins

- **DVI-A.** The **DVI-A** port only transmits analog data. You don't see them very often.
- **Single Link or Dual Link.** DVI digital transmissions can be Single Link or Dual Link. Dual Link transmissions double the power of the signal and can support higher screen resolutions (up to 2560×1600) than Single Link transmissions (up to 1920×1200). Most DVI-D or DVI-I ports are Dual Link.

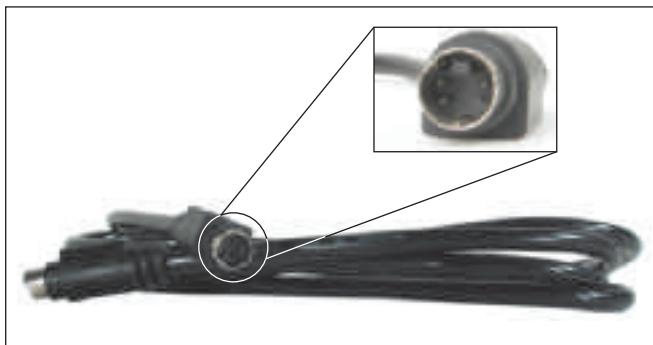
- ▲ **Composite video.** Using a **composite video port**, also called an **RGB port**, the red, green, and blue (RGB) are mixed together in the same signal. This is the method used by television and can be used by a video card that is designed to send output to a TV. A composite port is round and has only a single pin in the center of the port. Figure 8-49 shows a laptop that has a composite video input port so that you can use the laptop as your display for a game box. Composite video does not produce as sharp an image as VGA video or S-Video.
- ▲ **S-Video (Super-Video) ports.** An S-Video port is a 4-pin or 7-pin round port used by some televisions and video equipment. An S-Video cable is shown in Figure 8-50. A few older video cameras use a 6-pin variation of S-Video. The connector is called a **MiniDin-6 connector** and looks like a PS/2 connector used by a keyboard or mouse. (In general, a Din connector is always round with multiple pins in the connector.)



© Cengage Learning 2014

8

Figure 8-49 This laptop designed for multimedia applications has an embedded TV tuner and can also receive audio and video input from game boxes



© Cengage Learning 2014

Figure 8-50 An S-Video cable used to connect a video card to an S-Video port on a television

▲ **Component video.** Whereas composite video has the red, green, and blue mixed in the same signal, component video has been split into different components and carried as separate signals. Figure 8-51 shows the connectors on one component video and audio



© Cengage Learning 2014

Figure 8-51 Component video and audio cable

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

cable. Three lines carry video (red, blue, and green), and the yellow and white connectors are used for audio (audio in and audio out).

▲ **DisplayPort.** DisplayPort was designed to replace DVI and can transmit digital (not analog) video and audio data. It uses data packet transmissions similar to those of Ethernet, USB, and PCI Express, and is expected to ultimately replace VGA, DVI, and HDMI on desktop and laptop computers. Besides the regular DisplayPort used on video cards and desktop computers, laptops might use the smaller Mini DisplayPort. Figure 8-52 shows a DisplayPort to Mini Display Port cable. Some DisplayPort controllers allow you to use a DisplayPort-to-HDMI adapter so the port can be used with an HDMI connection. Maximum length for DisplayPort cables is 15 meters.



© Cengage Learning 2014

Figure 8-52 DisplayPort to Mini DisplayPort cable

BIOS setup can be used to manage onboard DisplayPort and HDMI ports. For example, look at Figure 8-13 shown earlier in the chapter, where you can enable or disable the audio transmissions of DisplayPort and HDMI ports and still use these ports for video.

▲ **HDMI and HDMI mini connectors.** HDMI transmits both digital video and audio (not analog), and was designed to be used by home theater equipment. The HDMI standards allow for several types of HDMI connectors. The best known, which is used on most computers and televisions, is the Type A 19-pin **HDMI connector**. Small mobile devices can use the smaller Type C 19-pin **HDMI mini connector**, also called the **mini-HDMI connector**. Figure 8-53 shows a cable with both connectors that is useful when connecting some devices like a smartphone to a computer. Figure 8-54 shows an HDMI to DVI-D cable. Because HDMI does not transmit analog data, the connector works only on DVI-D ports, not DVI-I ports. The maximum length of an HDMI cable depends on the quality of the cable; no maximum length has been specified.

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12



© Cengage Learning 2014

Figure 8-53 HDMI to miniHDMI cable



Courtesy of Belkin Corporation

Figure 8-54 An HDMI to DVI cable can be used to connect a PC that has a DVI port to home theater equipment that uses an HDMI port

8



A+ Exam Tip The A+ 220-801 exam expects you to know about these video connector types: VGA (DB-15), HDMI, miniHDMI, DisplayPort, S-Video, miniDin-6, composite (RGB), component, DVI-D, DVI-I, and DVI-A connectors.

Now let's see how to configure a monitor or dual monitors connected to a Windows computer.

A+
220-802
1.5

CHANGING MONITOR SETTINGS

Settings that apply to the monitor can be managed by using the monitor buttons and Windows utilities. Using the monitor buttons, you can adjust the horizontal and vertical position of the screen on the monitor surface and change the brightness and contrast settings. For laptops, the brightness and contrast settings can be changed using function keys on the laptop.

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

A+
220-802
1.5

APPLYING CONCEPTS INSTALLING DUAL MONITORS

To increase the size of your Windows desktop, you can install more than one monitor for a single computer. To install dual monitors, you need two video ports on your system, which can come from motherboard video ports, a video card that provides two video ports, or two video cards.

To install a second monitor in a dual-monitor setup using two video cards, follow these steps:

1. Verify that the original video card works properly, determine whether it is PCIe or AGP (on really old computers), and decide whether it is to be the primary monitor.
2. Boot the PC and enter BIOS setup. If BIOS setup has the option to select the order in which video cards are initialized, verify that the currently installed card is configured to initialize first. If it does not initialize first, then, when you install the second card, video might not work at all when you first boot with two cards.
3. Install a second video card in an empty slot. A computer might have a second PCIe slot or an unused PCI slot you can use. (For a really old computer using an AGP slot, most likely you can install the second video card in an empty PCI slot.) Attach the second monitor.
4. Boot the system. Windows recognizes the new hardware and launches the Found New Hardware wizard. You can use the wizard to install the video card drivers or cancel the wizard and install them manually as you learned to do earlier in the chapter.

Here are the steps to configure dual monitors:

1. Connect two monitors to your system. Open **Control Panel**, and in the Appearance and Personalization group, click **Adjust screen resolution**. The Screen Resolution window appears (see Figure 8-55).
2. Notice the two numbered boxes that represent your two monitors. When you click one of these boxes, the drop-down menu changes to show the selected monitor, and the screen resolution and orientation (Landscape, Portrait, Landscape flipped, or Portrait flipped) follow the selected monitor. This lets you customize the settings for each monitor. If necessary, arrange the boxes so that they represent the physical arrangement of your monitors.

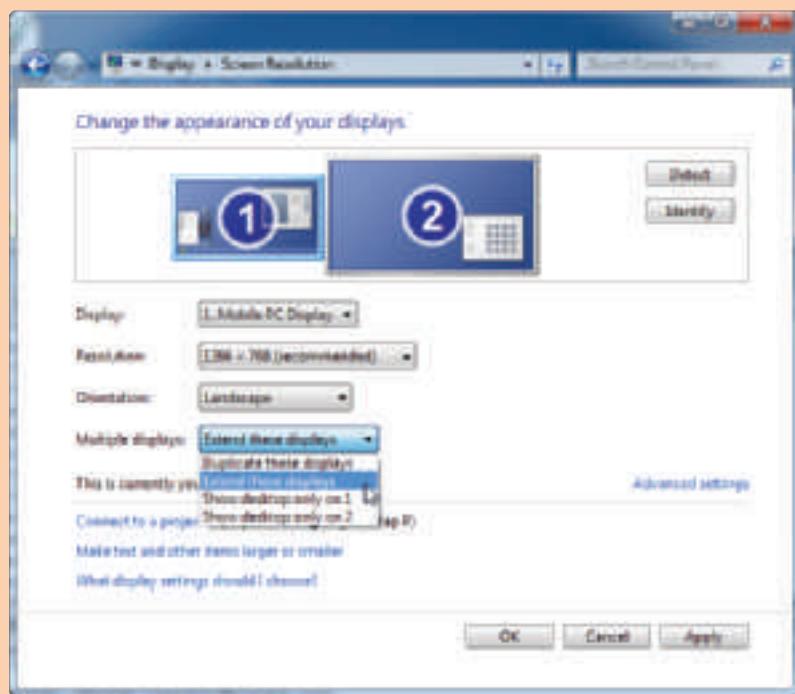


Notes In Figure 8-55, if you arrange the two boxes side by side, your extended desktop will extend left or right. If you arrange the two boxes one on top of the other, your extended desktop will extend up and down.

3. Adjust the screen resolution according to your preferences. For the sharpest images, use the native resolution for each monitor. Most often, the native resolution is the highest resolution listed, but this is not always the case. To know for certain the native resolution, see the documentation that came with the monitor.
4. By default, Windows 7 extends your desktop onto the second monitor. However, in the Multiple displays drop-down list, you can select other options, as shown in Figure 8-55. To save the settings, click **Apply**. The second monitor should initialize and show the extended or duplicated desktop.

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

A+
220-802
1.5



Source: Microsoft Windows 7

Figure 8-55 Configure each monitor in a dual monitor configuration

5. Close the **Screen Resolution** window. For an extended desktop, open an application and verify that you can use the second monitor by dragging the application window over to the second monitor's desktop.

After you add a second monitor to your system, you can move from one monitor to another simply by moving your mouse over the extended desktop. Switching from one monitor to the other does not require any special keystroke or menu option.

Most notebook computers are designed to be used with projectors and provide a VGA, DisplayPort, or HDMI port for this purpose. To use a projector, plug in the projector to the extra port and then turn it on. For a notebook computer, use a function key to activate the video port and toggle between extending the desktop to the projector, using only the projector, duplicating the screen on the projector, or not using the projector. When giving a presentation, most presenters prefer that they see their presentation duplicated on the LCD screen and the projector.



Notes For group presentations that require a projector, the software used for the presentations is likely to be Microsoft PowerPoint. If you configure your projector as a dual monitor, you can use PowerPoint to display a presentation to your audience on the projector at the same time you are using your LCD display to manage your PowerPoint slides. To do so, for PowerPoint 2007 and 2010, select the **Slide Show** tab. In the Set Up group, click **Set Up Slide Show**. In the Set Up Show box under Multiple monitors, check **Show Presenter View** and click **OK**.

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

A+
220-802
1.4, 1.5

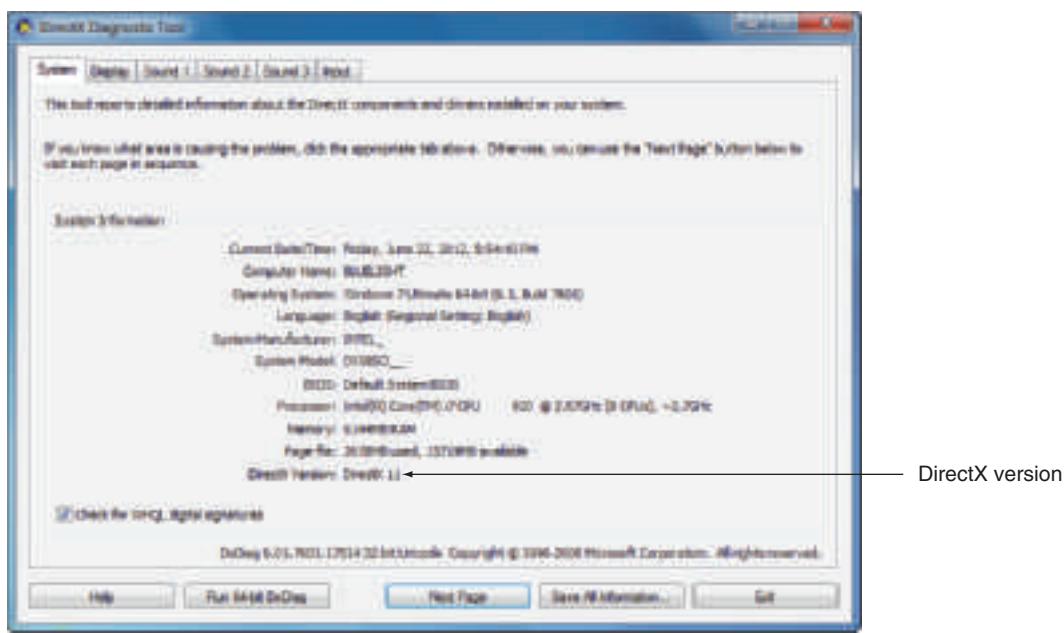
VIDEO MEMORY AND WINDOWS 7/VISTA

Video cards have their own processor called a graphics processing unit (GPU) or visual processing unit (VPU). These processors use graphics RAM installed on the card so that RAM on the motherboard is not tied up with video data. (If a motherboard offers a video port rather than using a video card, the GPU is part of the onboard video controller and is called integrated video. For integrated video, RAM on the motherboard is used for video data, or some video RAM is embedded on the motherboard.)

The more RAM installed on the card, the better the performance. Most video cards used and sold today use DDR2, DDR3, Graphics DDR3 (GDDR3), GDDR4, or GDDR5 memory. Graphics DDR memory is faster than regular DDR memory and does a better job of storing 3D images. Some video cards have as much as 2 GB of graphics memory.

Most Windows 7/Vista editions offer the Aero user interface (also called Aero glass), which has a 3D appearance. The hardware must qualify for Aero glass before Windows can enable it. These requirements include onboard video or a video card that supports DirectX 9 or higher, has at least 128 MB of video memory, and uses the Windows Display Driver Model (WDDM). The Windows Display Driver Model is a Windows component that manages graphics. **DirectX** is a Microsoft software development tool that software developers can use to write multimedia applications such as games, video-editing software, and computer-aided design software. Components of DirectX include DirectDraw, DirectMusic, DirectPlay, and Direct3D. The video firmware on the video card or motherboard chipset can interpret DirectX commands to build 3D images as presented to them by the WDDM. In addition, Windows relies on DirectX and the WDDM to produce the Aero user interface.

If an application, such as a game or desktop publishing app, that relies heavily on graphics is not performing well or giving errors, the problem might be video memory or the version of DirectX the system is using. You can use the **dxdiag.exe** command to display information about hardware and diagnose problems with DirectX. To use the command, click **Start**, type **dxdiag.exe** in the search box, and press **Enter**. The first time you use the command, a message box appears asking if you want to check if your drivers are digitally signed. Then the opening window shown in Figure 8-56 appears. Look for the version of DirectX installed (version 11 in the figure).



Source: Microsoft Windows 7

Figure 8-56 The DirectX Diagnostic tool reports information about DirectX components

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

A+
220-802
1.4, 1.5

To find out the latest version of DirectX published by Microsoft, go to www.microsoft.com and search on “DirectX End-User Runtime Web Installer.” The download page in Figure 8-57 appears. If you want to install a new version of DirectX, click Download and follow the directions on-screen.

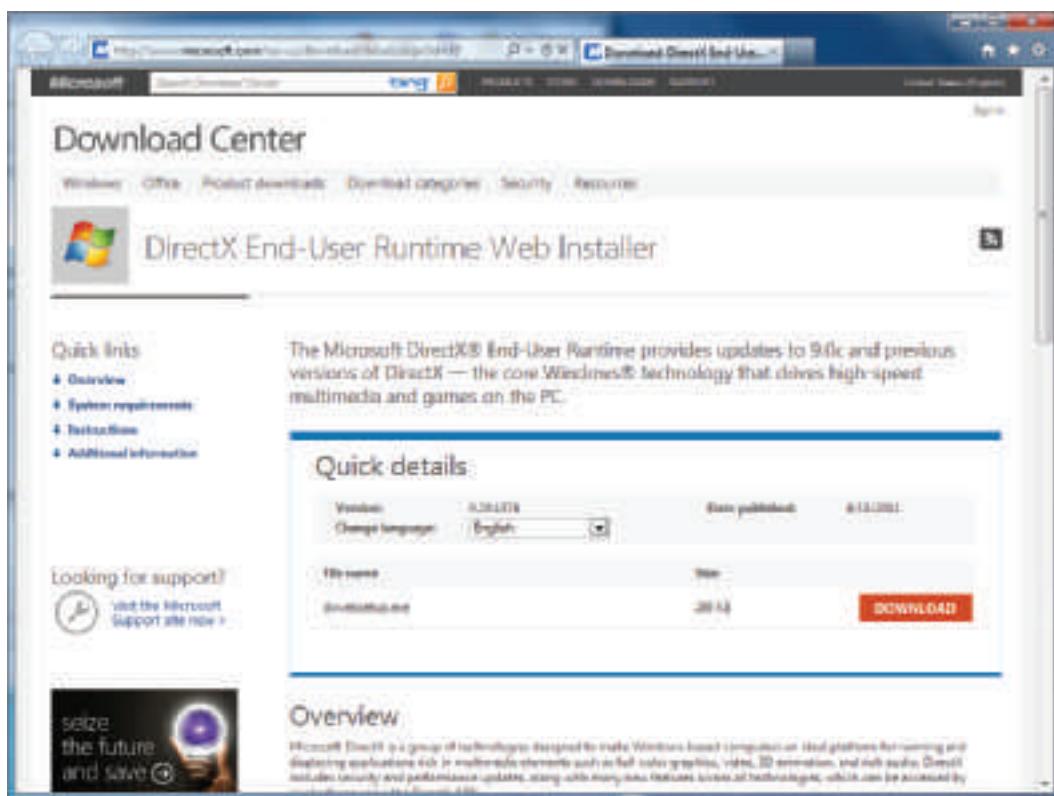


Figure 8-57 Download the latest version of DirectX

Source: Microsoft.com

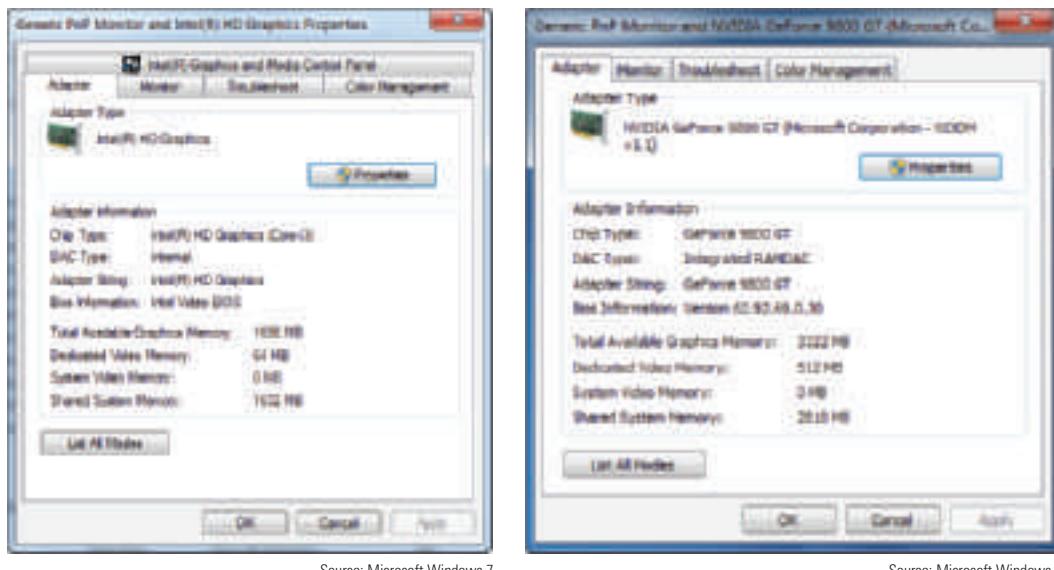
Video memory available to the graphics processor can be the graphics memory embedded on the video card or on the motherboard, system memory, or a combination of both. To see the video memory available to Windows, click **Adjust Screen Resolution** in the Appearance and Personalization group in Control Panel. In the Screen Resolution window, click **Advanced settings**. The video properties box appears. Figure 8-58 shows two properties boxes for two systems. Figure 8-58a is for a notebook computer, and Figure 8-58b is for a desktop computer that has a video card.

Here is an explanation of the four entries in the dialog box that concern video memory:

- ▲ Total Available Graphics Memory is total memory that may be available to the video subsystem.
- ▲ Dedicated Video Memory is found on a video card or embedded on the motherboard. The motherboard in the notebook has 64 MB, and the video card in the desktop system has 512 MB of graphics memory.
- ▲ System Video Memory is system RAM dedicated to video. No other application or component can use it.
- ▲ Shared System Memory is system RAM that might be available to video if another application or component is not already using it.

A+
220-801
1.4, 1.5,
1.7, 1.10,
1.12

A+
220-802
1.4, 1.5



(A)(B)

Source: Microsoft Windows 7

Source: Microsoft Windows 7

Figure 8-58 Memory allocated to video under Windows 7 (a) for a notebook computer, and (b) for a desktop computer with video card

For Windows to enable the Aero user interface, the video controller must have available at least 128 MB video memory. In other words, Total Available Graphics Memory must add up to at least 128 MB. This is true for both systems in Figure 8-58.

SUPPORTING STORAGE DEVICES

A+
220-801
1.5, 1.7,
1.10

By now you must be thinking you've read in this chapter about every computer part there must be, but hold on; we have optical drives and flash memory still to go. Before we explore the details of several storage devices, including optical discs, USB flash drives, and memory cards, let's start with the file systems they might use.

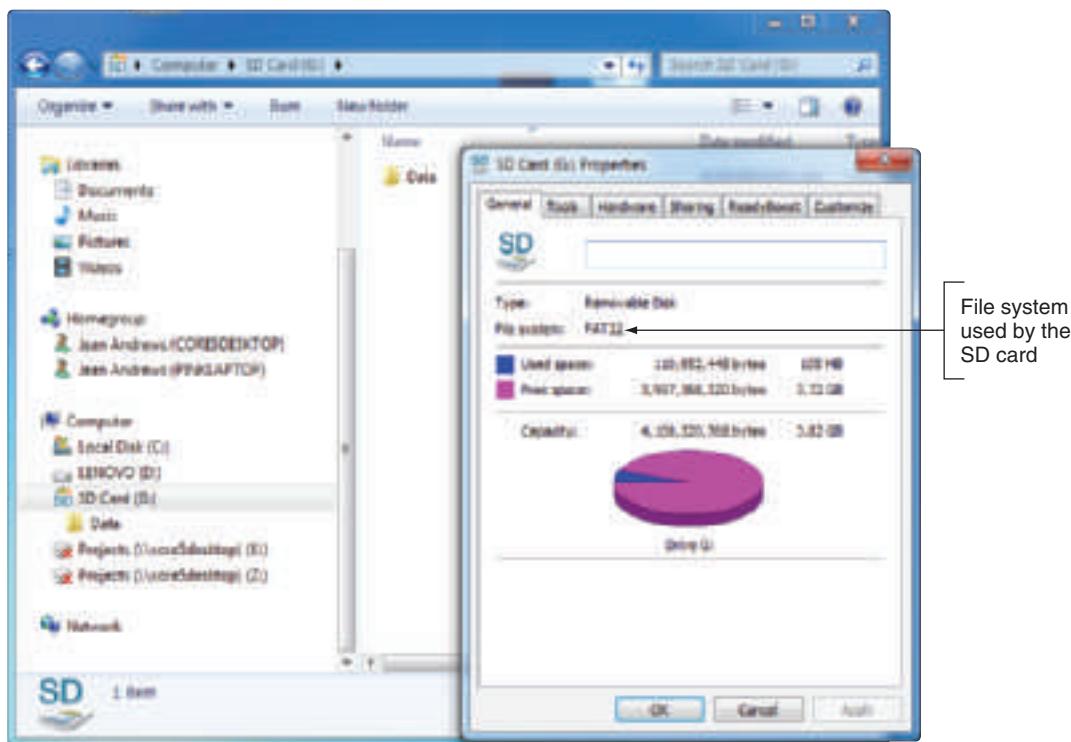
FILE SYSTEMS USED BY STORAGE DEVICES

A storage device, such as a hard drive, CD, DVD, USB flash drive, or memory card, uses a file system to manage the data stored on the device. A **file system** is the overall structure the OS uses to name, store, and organize files on a drive. In Windows, each storage device is assigned a drive letter. In Windows Explorer, to see what file system a device is using, right-click the device and select **Properties** from the shortcut menu. The device Properties box appears, which shows the file system and storage capacity of the device (see Figure 8-59).

Installing a new file system on a device is called **formatting** the device, and the process erases all data on the device. One way to format a device is to right-click the device and select **Format** from the shortcut menu. In the box that appears, you can select the file system to use (see Figure 8-60). The NTFS file system (New Technology file system) is primarily used by hard drives. The exFAT file system is used by removable storage devices such as large-capacity USB flash drives and large-capacity memory cards. In addition, the older FAT32 and FAT file systems are used by smaller-capacity devices.

Now let's look at the types of optical drives you might be called on to support.

A+
220-801
1.5, 1.7,
1.10



8

Figure 8-59 This 4 GB SD card is using the FAT32 file system

Source: Microsoft Windows 7

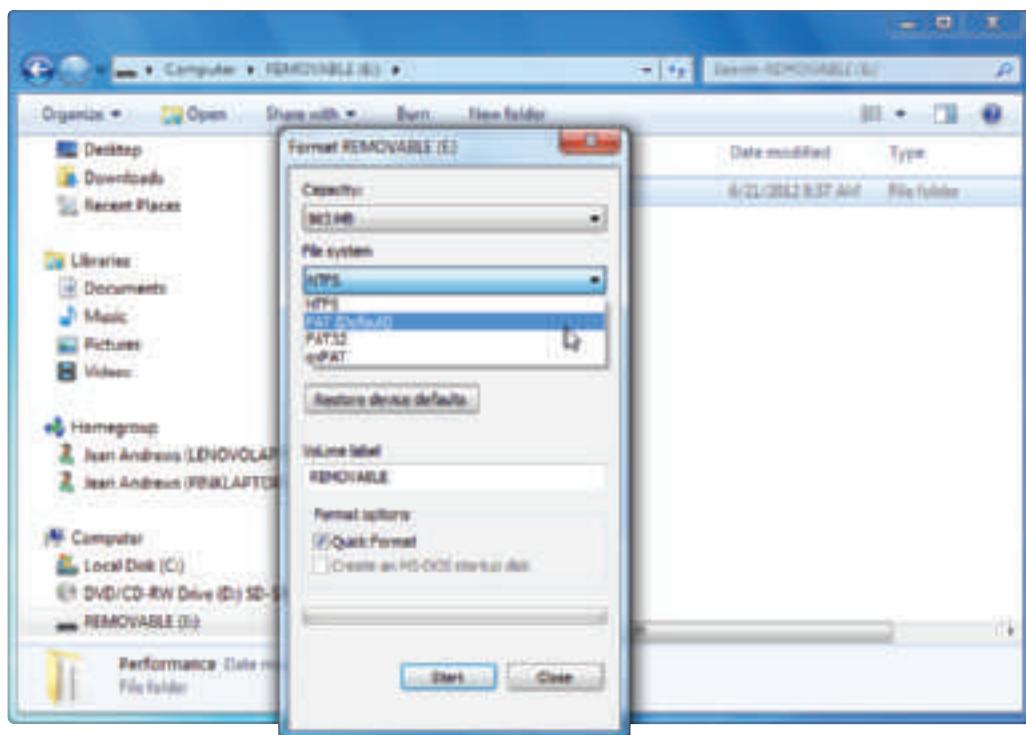


Figure 8-60 A storage device can be formatted using Windows Explorer

Source: Microsoft Windows 7

A+
220-801
1.5, 1.7,
1.10

STANDARDS USED BY OPTICAL DRIVES AND DISCS

CDs, DVDs, and Blu-ray discs use similar laser technologies. Tiny lands and pits on the surface of a disc represent bits, which a laser beam can read. This is why they are called optical storage technologies. **CD (compact disc)** drives use the **CDFS (Compact Disc File System)** or the **UDF (Universal Disk Format) file system**, while **DVD (digital versatile disc or digital video disc)** drives and **Blu-ray Disc (BD)** drives use the newer UDF file system.

Blu-ray drives are backward compatible with DVD and CD technologies, and DVD drives are backward compatible with CD technologies. Depending on the drive features, an optical drive might be able to read and write to BDs, DVDs, and CDs. An internal optical drive can interface with the motherboard by way of an IDE or SATA connection. An external drive might use an eSATA, FireWire, or USB port. Figure 8-61 shows an internal DVD drive, and Figure 8-62 shows an external DVD drive.



© Cengage Learning 2014

Figure 8-61 This internal DVD drive uses a SATA connection

Data is written to only one side of a CD, but can be written to one or both sides of a DVD or Blu-ray disc. Also, a DVD or Blu-ray disc can hold data in two layers on each side. This means these discs can hold a total of four layers on one disc (see Figure 8-63).

The breakdown of how much data can be held on CDs, DVDs, and BDs is shown in Figure 8-64. The capacities for DVDs and BDs depend on the sides and layers used to hold the data.

A+
220-801
1.5, 1.7,
1.10



8

Courtesy of Plextor

Figure 8-62 The PX-610U external DVD±RW drive by Plextor uses a USB 2.0 port

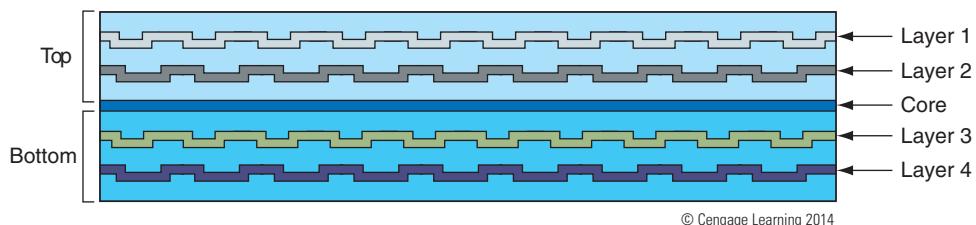


Figure 8-63 A DVD can hold data in double layers on both the top and bottom of the disc, yielding a maximum capacity of 17 GB

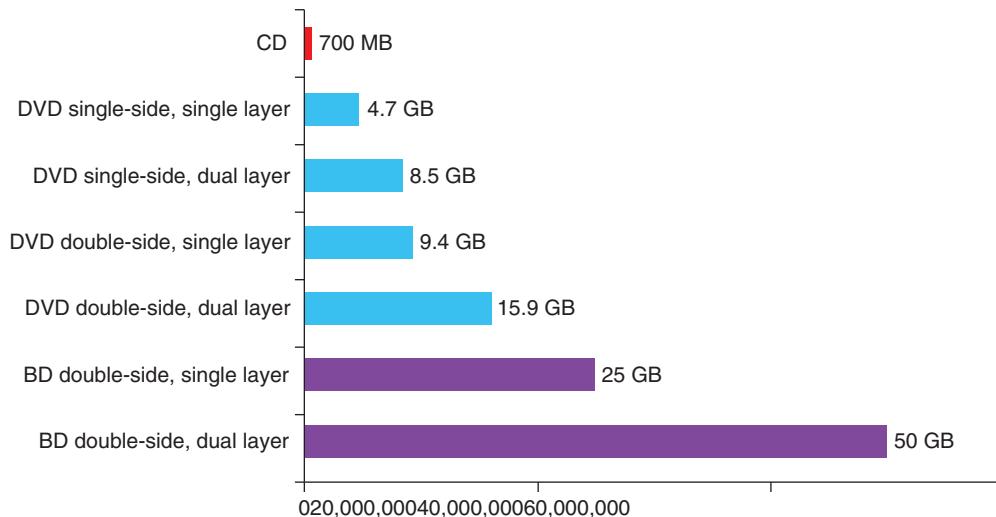


Figure 8-64 Storage capacities for CDs, DVDs, and BD discs



A+ Exam Tip The A+ 220-801 exam expects you to know the capacities of CDs, DVDs, and Blu-ray discs. These capacities are all listed in Figure 8-64.

A+
220-801
1.5, 1.7,
1.10

 **Notes**

The discrepancy in the computer industry between one billion bytes (1,000,000,000 bytes) and 1 GB (1,073,741,824 bytes) exists because 1 KB equals 1024 bytes. Even though documentation might say that a DVD holds 17 GB, in fact, it holds 17 billion bytes, which is only 15.90 GB.

When shopping for an optical drive, suppose you see a couple of ads like those shown in Figure 8-65. To sort out the mix of disc standards, Table 8-4 can help. The table lists the popular CD, DVD, and Blu-ray disc standards.



Lite-On IHAS124-04 Internal DVD Writer - DVD+R 24X, DVD-R 24X, DVD+RW 12X, DVD-RW 6X, DVD+R DL 12X, SATA (OEM)
Part #: L12-1312 OEM | Model #: IHAS124-04
★★★★★ (600 Reviews)
In Stock (Details)
Retail Store: Check Store Availability
 Compare

Samsung SE-208AB/T5E5 Slim External 8x DVD Writer - DVD+R 6x, DVDr DL 6x, DVD+RW 6x, DVD-RW 6x, DVD-RAM 5x, CD-R 24x, CD-RW 24x, USB 2.0, Tray
Part #: S2E3-0005 | Model #: SE-208AB/T5E5
★★★★★ (58 Reviews)
In Stock (Details)
Retail Store: Check Store Availability
 Compare

Figure 8-65 Ads for internal and external DVD burners

Source: tigerdirect.com

Disc Standard	Description
CD-ROM disc or drive	CD-read-only memory. A CD-ROM disc burned at the factory can hold music, software, or other data. The bottom of a CD-ROM disc is silver. A CD-ROM drive can read CDs.
CD-R disc	CD recordable. A CD-R disc is a write-once CD.
CD-RW disc or drive	CD rewriteable. A CD-RW disc can be written to many times. A CD-RW drive can write to a CD-RW or CD-R disc and also overwrite a CD-RW disc.
DVD-ROM drive	DVD read-only memory. A DVD-ROM drive can also read CDs or DVDs.
DVD-R disc	DVD recordable, single layer. A DVD-R disc can hold up to 4.7 GB of data and is a write-once disc.
DVD-R DL disc	DVD recordable in dual layers. Doubles storage to 8.5 GB of data on one disc surface.
DVD-RW disc or drive	DVD rewriteable. Also known as an erasable, recordable drive or a write-many disc. The speeds in an ad for an optical drive indicate the maximum speed supported when burning this type of disc, for example, DVD-RW 6X.
DVD-RW DL disc or drive, a.k.a. DL DVD drive	DVD rewriteable, dual layers. Doubles disc storage capacity to 8.5 GB.
DVD+R disc or drive	DVD recordable. Similar to but faster than DVD-R. Discs hold about 4.7 GB of data.
DVD+R DL disc or drive	DVD recordable, dual layers. Doubles disc storage to 8.5 GB on one surface.

Table 8-4 Optical discs and drive standards (continues)

© Cengage Learning 2014

A+
220-801
1.5, 1.7,
1.10

Disc Standard	Description
DVD+RW disc or drive	DVD rewriteable. Faster than DVD-RW.
DVD-RAM disc or drive	DVD Random Access Memory. Rewriteable and erasable. You can erase or rewrite certain sections of a DVD-RAM disc without disturbing other sections of the disc, and the discs can handle many times over the number of rewrites (around 100,000 rewrites), compared to about a thousand rewrites for DVD-RW and DVD+RW discs. DVD-RAM discs are popular media used in camcorders and set-top boxes.
BD-ROM drive	BD read-only memory. A BD-ROM drive can also read DVDs, and some can read CDs.
BD-R disc or drive	BD recordable. A BD-R drive might also write to DVDs or CDs.
BD-RE disc or drive	BD rewriteable. A BD-RE drive might also write to DVDs or CDs.

Table 8-4 Optical discs and drive standards (continued)

© Cengage Learning 2014

8

A+ Exam Tip The A+ 220-801 exam expects you to know about the combo optical drives and burners, including CD-RW, DVD-RW, Dual Layer DVD-RW, BD-R, and BD-RE combo drives.

One more feature that you might look for in an optical drive is the ability to burn labels on the top of a disc. Two competing technologies for this purpose are LabelFlash and LightScribe. Using either technology, you flip a LabelFlash or LightScribe CD or DVD upside down and insert it in the drive tray so that the drive can then burn a label on top of the disc. Both the drive and disc must support the technology for it to work, and the two technologies are not compatible. Figure 8-66 shows a LightScribe CD-R that was just labeled using LightScribe. Another way to print labels on a disc is to use special discs that have a white paper-like surface. Insert the disc into an ink-jet printer that will print the label. The printer has to be the type that will print on optical discs. It is not recommended that you glue paper labels on the top of discs because they can throw the disc off balance or clog up a drive if the labels come loose. You can use a permanent felt-tip marker to handwrite labels on a disc.



© Cengage Learning 2014

Figure 8-66 This disc label was written using a DVD burner that supports LightScribe

Notes CDs, DVDs, and BDs are expected to hold their data for many years; however, you can prolong the life of a disc by protecting it from exposure to light.

A+
220-801
1.5, 1.7,
1.10

INSTALLING AN OPTICAL DRIVE

Internal optical drives use a SATA, IDE, or SCSI interface. You learned to install drives using these interfaces in Chapter 6. Figure 8-67 shows the front and rear of an EIDE DVD drive. Note the jumper bank that can be set to cable select, slave, or master. Figure 8-68 shows the rear of a SATA optical drive.

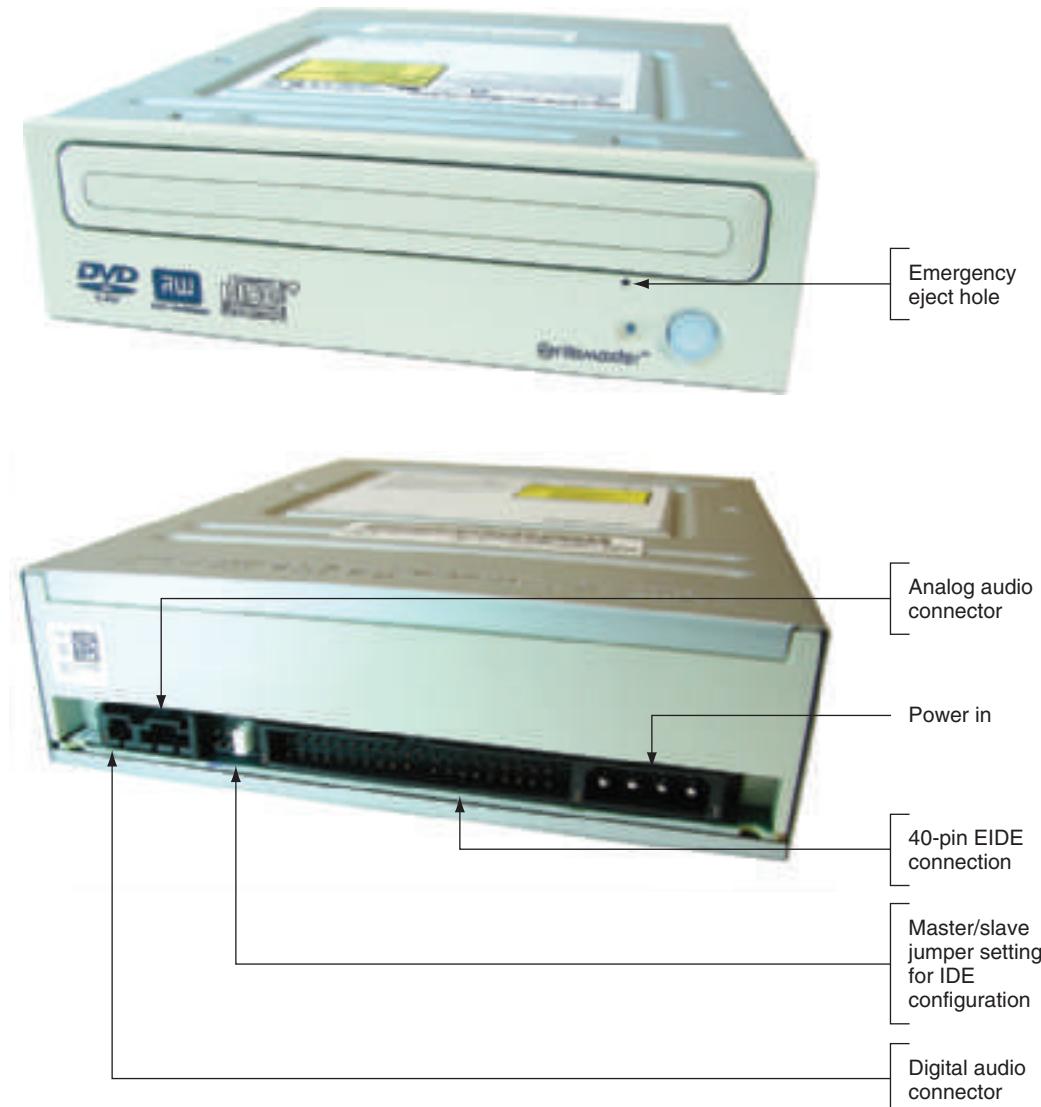


Figure 8-67 Front and rear of an EIDE DVD drive

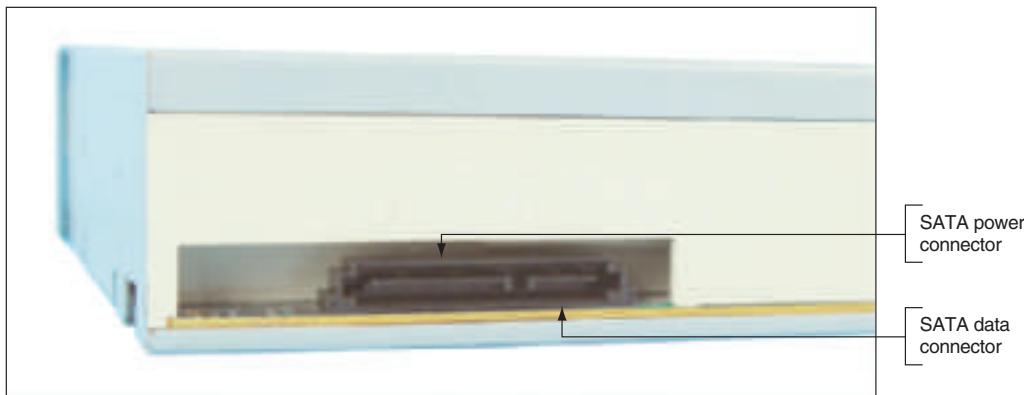
© Cengage Learning 2014



A+ Exam Tip The A+ 220-801 exam expects you to know how to install a CD, DVD, or Blu-ray drive.

When given the choice of putting an IDE optical drive on the same cable with an IDE hard drive or on its own cable, choose to use its own cable. An optical drive that shares a cable with a hard drive can slow down the hard drive's performance. If you must, however,

A+
220-801
1.5, 1.7,
1.10



© Cengage Learning 2014

Figure 8-68 Rear of a SATA optical drive

8

put the optical drive and hard drive on the same IDE channel, make the hard drive the master and the optical drive the slave.

Some motherboards have one SATA connection and one IDE connection. Use SATA connections for all hard drives. The optical drive can use the one IDE connection or a SATA connection. An optical drive is usually installed in the drive bay at the top of a desktop case (see Figure 8-69). After the drive is installed in the bay, connect the data and power cables.

Optical drives might also have a connection for an audio port so that sound from audio CDs can be sent directly to the audio controller. The DVD drive in Figure 8-67 has two connectors for audio. The 4-pin connector is used for analog sound, and the 2-pin connector is used for digital sound. These connections are no longer needed because Windows 7/Vista/XP transfers digital sound from the drive to the sound card without the use of a direct cable connection.



© Cengage Learning 2014

Figure 8-69 Slide the drive into the bay flush with the front panel

Windows 7/Vista/XP supports optical drives using its own embedded drivers without add-on drivers. Therefore, after the Found New Hardware Wizard completes, Windows should recognize the drive.

And now, moving onward to solid state storage. . . . You're almost done!

A+
220-801
1.5, 1.7,
1.10

SOLID STATE STORAGE

Types of solid state storage include SSD hard drives, USB flash drives, and memory cards. You learned about SSD hard drives in Chapter 6. USB flash drives currently for sale range in size from 128 MB to 256 GB and go by many names, including a flash pen drive, jump drive, thumb drive, and key drive. Several USB flash drives are shown in Figure 8-70. Flash drives might work at USB 2.0 or USB 3.0 speed and use the FAT (for small-capacity drives) or exFAT file system (for large-capacity drives). Windows 7/Vista/XP has embedded drivers to support flash drives. To use one, simply insert the device in a USB port. It then shows in Windows Explorer as a drive with an assigned letter.



© Cengage Learning 2014

Figure 8-70 USB flash drives come in a variety of styles and sizes

To make sure that data written to a flash drive is properly saved before you remove the flash drive from the PC, double-click the **Safely Remove Hardware** icon in the notification area (see Figure 8-71). The Safely Remove Hardware box opens, also shown in Figure 8-71. After you click the device listed, it is then safe to remove it.

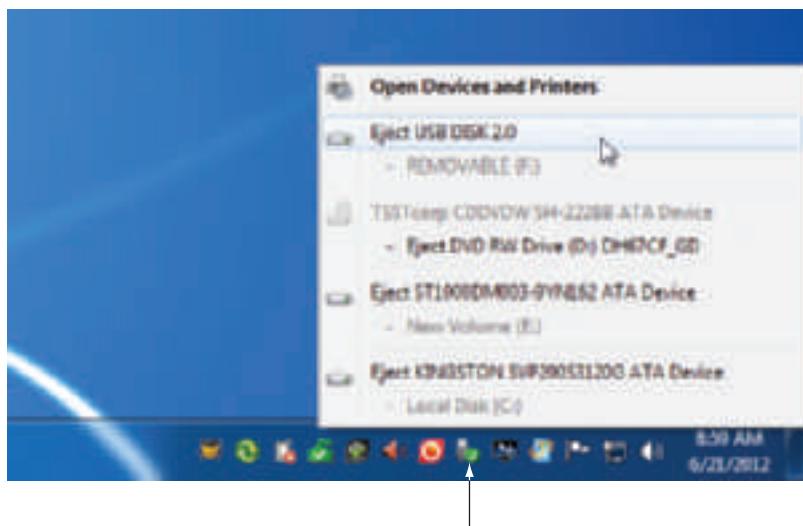


Figure 8-71 Safely Remove Hardware icon and dialog box

Source: Microsoft Windows 7

Safely Remove
Hardware icon

A+
220-801
1.5, 1.7,
1.10

Memory cards might be used in digital cameras, tablets, cell phones, MP3 players, digital camcorders, and other portable devices, and most laptops have memory card slots. The SD Association (www.sdcard.org) is responsible for standards used by the **Secure Digital (SD) cards** shown in Table 8-5. The three standards used by SD cards are 1.x (regular SD), 2.x (SD High Capacity or SDHC), and 3.x (SD eXtended Capacity or SDXC). In addition, these cards come in three physical sizes.

	Full-size SD	MiniSD	MicroSD
SD SD 1.x Holds up to 2 GB	SD card  © Cengage Learning 2014	MiniSD card  © Cengage Learning 2014	MicroSD card  © Cengage Learning 2014
SD High Capacity SD 2.x Holds 4 GB to 32 GB	SDHC card  © Cengage Learning 2014	MiniSDHC  © Cengage Learning 2014	MicroSDHC card  © Cengage Learning 2014
SD eXtended Capacity SD 3.x Holds 32 GB to 2 TB	SDXC card  © Cengage Learning 2014	NA	MicroSDXC card  Courtesy of SanDisk © Cengage Learning 2014

Table 8-5 Flash memory cards that follow the SD Association standards

8

SDHC and SDXC slots are backward compatible with earlier standards for SD cards. However, you cannot use an SDHC card in an SD slot, and you cannot use an SDXC card in an SDHC slot or SD slot. Only use SDXC cards in SDXC slots.

SD and SDHC cards use the FAT file system, and SDXC cards use the exFAT file system. Windows 7/Vista supports both file systems, so you should be able to install an SD, SDHC, or SDXC card in an SD slot on a Windows 7/Vista laptop with no problems (assuming the slot supports the SDHC or SDXC card you are using). Windows XP can use the exFAT file system only when exFAT drivers are installed. For information about these drivers, see support.microsoft.com/kb/955704.

Memory cards other than SD cards are shown in Table 8-6. Some of the cards in Table 8-6 are now obsolete.

A+
220-801
1.5, 1.7,
1.10

Flash Memory Device

The Sony Memory Stick PRO Duo is about half the size of the Memory Stick PRO but is faster and has a higher storage capacity (up to 2 GB). You can use an adapter to insert the Memory Stick PRO Duo in a regular Memory Stick slot.

Example



© Cengage Learning 2014

CompactFlash (CF) cards come in two types, Type I (CFI) and Type II (CFII). Type II cards are slightly thicker. CFI cards will fit a Type II slot, but CFII cards will not fit a Type I slot. The CF standard allows for sizes up to 137 GB, although current sizes range up to 32 GB. UDMA CompactFlash cards are faster than other CompactFlash cards. UDMA (Ultra Direct Memory Access) transfers data from the device to memory without involving the CPU.

MultiMedia Card (MMC) looks like an SD card, but the technology is different and they are not interchangeable. Generally, SD cards are faster than MMC cards.



© Cengage Learning 2014

The Memory Stick is used in Sony cameras and camcorders. A later version, the Memory Stick PRO, improved on the slower transfer rate of the original Memory Stick.



© Cengage Learning 2014

The **xD-Picture Card** has a compact design (about the size of a postage stamp), and currently holds up to 8 GB of data. You can use an adapter to insert this card into a PC Card slot on a notebook computer or a CF slot on a digital camera.



© Cengage Learning 2014

Table 8-6 Flash memory cards

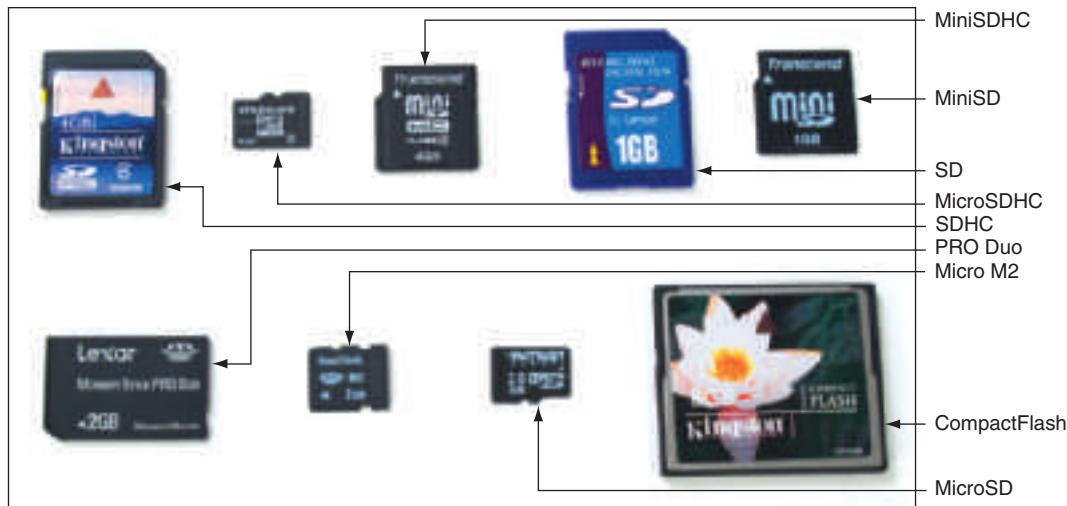


A+ Exam Tip

The A+ 220-801 exam expects you to know about SD, MicroSD, MiniSD, CompactFlash, and xD memory cards

Sometimes a memory card is bundled with one or more adapters so that a smaller card will fit a larger card slot. Earlier in the chapter, Figure 8-20 shows a MicroSDHC card that came packaged with four adapters, which are labeled in the figure. Figure 8-72 shows several flash memory cards together so you can get an idea of their relative sizes.

A+
220-801
1.5, 1.7,
1.10



© Cengage Learning 2014

Figure 8-72 Flash memory cards

8

Hands-on | Project 8-3 Learn How Optical Drives Work

Optical drives and other removable storage technologies are interesting to study. Check out the animated explanation at the web site of HowStuffWorks, Inc. (www.howstuffworks.com). Search on "How Removable Storage Works." List 10 facts you learned about optical drives.

Hands-on | Project 8-4 Shop for Storage Media

Shop online and print or save web pages showing the following devices. Two online sites you can use are Micro Center (microcenter.com) and TigerDirect (tigerdirect.com):

1. DVD+R DL discs, which are usually sold in packs. What is the storage capacity of each disc? How many discs are in the pack? What is the price per disc?
2. DVD+RW disc, which is usually sold as a single. What is the price per disc? How many more times expensive is a DVD+RW disc than a DVD+R disc?
3. The largest-capacity USB flash drive you can find. What is its capacity and price?
4. The eight types of SD memory cards in Table 8-5. What is the storage capacity and price of each card? Which type of SD card gives you the most storage per dollar?

>> CHAPTER SUMMARY

Basic Principles for Supporting Devices

- Adding new devices to a computer requires installing hardware and software. Even if you know how to generally install an I/O device, always follow the specific instructions of the product manufacturer.

- ▲ Use Device Manager under Windows to manage hardware devices and to solve problems with them. The Windows 7 Action Center can also help with problem solving.
- ▲ Popular I/O ports on a motherboard include eSATA (Versions 1, 2, and 3), FireWire 800 and 400, and USB (Versions 1, 2, and 3). Older ports include parallel, serial, and PS/2 ports.
- ▲ Wireless connections can use Wi-Fi 802.11a/b/g/n, Bluetooth, and Infrared standards.
- ▲ USB connectors include the A-Male, B-Male, Mini-B, Micro-B, Micro-A, USB 3.0 B-Male, and USB 3.0 Micro-B connectors.

Installing I/O Peripheral Devices

- ▲ When installing devices, use 32-bit drivers for a 32-bit OS and 64-bit drivers for a 64-bit OS.
- ▲ A touch screen is likely to use a USB port. Software is installed to calibrate the touch screen to the monitor screen and receive data input.
- ▲ Biometric input devices, such as a fingerprint reader, collect biological data and compare it to that recorded about the person to authenticate the person's access to a system.
- ▲ A KVM switch lets you use one keyboard, monitor, and mouse with multiple computers.

Installing and Configuring Adapter Cards

- ▲ Generally, when an adapter card is physically installed in a system and Windows starts up, it detects the card and then you install the drivers using the Windows wizard. However, always follow specific instructions from the device manufacturer when installing an adapter card because the order of installing the card and drivers might be different.
- ▲ A TV tuner card turns your PC or notebook into a television. A video capture card allows you to capture input from a camcorder or directly from TV. Combo cards have both abilities.

Supporting the Video Subsystem

- ▲ Types of monitors include CRT monitor, LCD monitor, plasma monitor, projector, and OLED monitor.
- ▲ Technologies and features of LCD monitors include screen size, refresh rate, pixel pitch, resolution, native resolution, contrast ratio, viewing angle, backlighting, and connectors that a monitor uses.
- ▲ Video ports that a video card or motherboard might provide are VGA, DVI-I, DVI-D, DVI-A, composite video, S-Video, component video, DisplayPort, HDMI, and HDMI mini ports.
- ▲ Use the Screen Resolution window in Windows 7/Vista to configure a monitor resolution and configure dual monitors.
- ▲ To use the Aero user interface, Windows 7/Vista requires a video card or onboard video to have at least 128 MB of video RAM, support DirectX version 9 or higher, and use the Windows Display Driver Model (WDDM).
- ▲ The dxdiag.exe command is used to report information about hardware, including the video card and which version of DirectX it is using.

Supporting Storage Devices

- ▲ File systems a storage device might use in Windows include NTFS, exFAT, and FAT.
- ▲ CDs, DVDs, and BDs are optical devices with data physically embedded into the surface of the disc. Laser beams are used to read data off the disc by measuring light reflection.
- ▲ Optical discs can be recordable (such as a CD-R disc) or rewriteable (such as a DVD-RW disc).
- ▲ Types of flash memory card standards by the SD Association include SD, MiniSD, MicroSD, SDHC, MiniSDHC, MicroSDHC, SDXC, and MicroSDXC. Other memory cards include Memory Stick PRO Duo, Memory Stick PRO, Sony Memory Stick Micro M2, CompactFlash I and II, and xD-Picture Card.

>> KEY TERMS

For explanations of key terms, see the Glossary near the end of the book.

8

1394a	DVI-D	MiniDin-6 connector
1394b	DVI-I	mini-HDMI connector
A Male connector	dxdiag.exe	native resolution
B Male connector	file system	OLED (Organic Light-emitting Diode) monitor
barcode reader	FireWire 400	pixel
biometric device	FireWire 800	pixel pitch
Blu-ray Disc (BD)	flat panel monitor	plasma monitor
CD (compact disc)	formatting	projector
CDFS (Compact Disc File System)	graphics tablet	refresh rate
CompactFlash (CF) card	HDMI connector	resolution
composite video port	HDMI mini connector	RGB port
contrast ratio	hot-swappable	Secure Digital (SD) card
CRT (cathode-ray tube) monitor	Infrared (IR)	sound card
DB-15	KVM (Keyboard, Video, and Mouse) switch	stylus
Device Manager	LCD (Liquid Crystal Display) monitor	touch screen
digitizer	LED (Light-Emitting Diode)	TV tuner card
digitizing tablet	Micro-A connector	UDF (Universal Disk Format) file system
DirectX	Micro-B connector	USB 3.0 B-Male connector
DVD (digital versatile disc or digital video disc)	MIDI (musical instrument digital interface)	USB 3.0 Micro-B connector
DVI-A	Mini-B connector	video capture card
		xD-Picture Card

>> REVIEWING THE BASICS

1. What command can you enter in the Search box to launch Device Manager?
2. Which is faster, an eSATA-600 port or a FireWire 800 port?
3. What is the speed for Hi-Speed USB?
4. How many times faster is a Hi-Speed USB port than an Original USB port running at 12 Mbps?
5. Which is faster, USB 3.0 or eSATA 600?

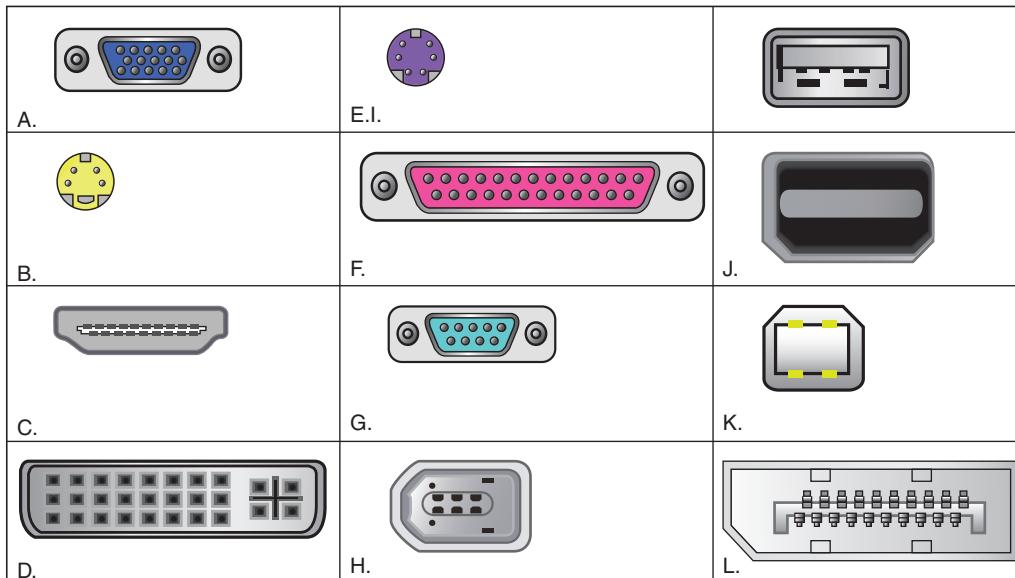
6. Which is faster, Wi-Fi 802.11n or Bluetooth?
7. How many pins does a FireWire 800 port have?
8. What type of wireless transmission requires a line-of-sight clearance?
9. Will a printer rated to use USB 3.0 work when you connect the printer's USB cable into a USB 2.0 port on your computer?
10. What is the easiest way to tell if a USB port on a notebook computer is using the USB 3.0 standard?
11. For an LCD monitor, what is the best resolution to use?
12. Which gives a better measurement for the quality of an LCD monitor, the contrast ratio or the dynamic contrast ratio?
13. Which type of port gives the best output, a composite out port or an S-Video port?
14. What command do you use to find out what version of DirectX your video card is using?
15. Name two types of ports a keyboard might use.
16. Which Windows utility is most likely the one to use when uninstalling an expansion card?
17. Would you expect all the devices listed in BIOS setup to also be listed in Device Manager? Would you expect all devices listed in Device Manager to also be listed in BIOS setup?
18. Why is it best to leave a slot empty between two expansion cards?
19. Which speaker port should you use when connecting a single speaker to a PC?
20. What type of adapter card allows you to watch TV using your computer?
21. What type of file system is used by Blu-ray discs?
22. What type of file system is used by SDXC memory cards?
23. What two types of interfaces might be used by an internal DVD drive?
24. How much data can a CD hold?
25. How much data can a double-sided, dual-layer DVD hold?
26. How much data can a double-sided, single-layer BD hold?
27. Which costs more, a CD-R or a CD-RW disc?
28. Which type of flash memory card is currently the smallest type of card?
29. What is the group of standards that are used to represent music in digital form?
30. Why might a musical keyboard have two MIDI ports?

>> THINKING CRITICALLY

1. If a PS/2 keyboard does not work on your system and yet you know the keyboard is good, what is the best solution?
 - a. Disable the PS/2 port in BIOS setup and use a PS/2 splitter to install a keyboard and mouse using the PS/2 mouse port.
 - b. Install a USB keyboard on a USB port.

- c. Exchange the PS/2 port on your motherboard.
- d. Replace the motherboard.
2. You plug a new scanner into a USB port on your Windows 7 system. When you first turn on the scanner, what should you expect to see?
- a. A message displayed by the scanner software telling you to reboot your system.
- b. You see the Found New Hardware Wizard launch.
- c. Your system automatically reboots.
- d. An error message from the USB controller.
3. You turn on your Windows 7 computer and see the system display POST messages. Then the screen turns blue with no text. Which of the following items could be the source of the problem?
- a. The video card
- b. The monitor
- c. Windows
- d. Microsoft Word software installed on the system
4. You have just installed a new sound card in your system, and Windows says the card installed with no errors. When you plug up the speakers and try to play a music CD, you hear no sound. What is the first thing you should do? The second thing?
- a. Check Device Manager to see if the sound card is recognized and has no errors.
- b. Reinstall Windows 7.
- c. Use Device Manager to uninstall the sound card.
- d. Identify your sound card by opening the case and looking on the card for the manufacturer and model.
- e. Verify the volume is turned up in Windows and on the speakers.
- f. Use Device Manager to update the sound card drivers.
5. You have just installed a new DVD drive and its drivers under Windows 7. The drive will read a CD but not a DVD. You decide to reinstall the device drivers. What is the first thing you do?
- a. Open Control Panel and launch the Add New Hardware Wizard.
- b. Open Device Manager and choose Update Driver.
- c. Remove the data cable from the DVD drive so Windows will no longer recognize the drive and allow you to reinstall the drivers.
- d. Open Device Manager and uninstall the drive.

6. Match the following ports to the diagrams in Figure 8-73. Note that some ports are not used: Dual Link DVI-I, Single Link DVI-D, parallel, USB Type A, USB Type B, FireWire 400, VGA, DisplayPort, Mini Display Port, 4-pin S-Video, HDMI, PS/2, and serial.



© Cengage Learning 2014

Figure 8-73 Identify ports

>> REAL PROBLEMS, REAL SOLUTIONS

REAL PROBLEM 8-1: Helping with Upgrade Decisions

Upgrading an existing system can sometimes be a wise thing to do, but sometimes the upgrade costs more than the system is worth. Also, if existing components are old, they might not be compatible with components you want to use for the upgrade. A friend, Renata, asks your advice about several upgrades she is considering. Answer these questions:

1. Renata has a four-year-old desktop computer that has a Core2 Duo processor and 2 GB memory. It does not have a FireWire port. She wants to use a camcorder that has a FireWire 400 interface to a PC. How would she perform the upgrade, and what is the cost? Save or print web pages to support your answers.
2. Her computer has one USB port, but she wants to use her USB printer at the same time she uses her USB scanner. How can she do this, and how much will it cost? Save or print web pages to support your answers.
3. Renata also uses her Windows 7 computer for gaming and wants to get a better gaming experience. The computer is using onboard video and has an empty PCI Express video slot. What is the fastest and best graphics card she can buy? How much does it cost? Save or print web pages to support your answer.
4. What is the total cost of all the upgrades Renata wants? Do you think it is wise for her to make these upgrades or purchase a new system? How would you explain your recommendation to her?

REAL PROBLEM 8-2: Using Input Director

Input Director is software that lets you use one keyboard and mouse to control two or more computers that are networked together. You can download the free software from www.inputdirector.com. To use the software, you need to know the host name of each computer that will share the keyboard and mouse. To find out the host name, right-click **Computer** (**My Computer** in Windows XP) and select **Properties**. The host name is listed in Windows 7/Vista as the Computer name and in XP as Full computer name.

Working with a partner, download and install Input Director and configure it so that you and your partner are using the same keyboard and mouse for your computers.

REAL PROBLEM 8-3: Researching a Computer Ad

Pick a current web site or magazine ad for a complete, working desktop computer system, including computer, monitor, keyboard, and software, together with extra devices such as a mouse or printer. Research the details of the ad and write a two- to four-page report describing and explaining these details. This project provides a good opportunity to learn about the latest offerings on the market as well as current pricing.

8

REAL PROBLEM 8-4: Working with a Monitor

Do the following to practice changing monitor settings and troubleshooting monitor problems:

1. Practice changing the display settings, including the wallpaper, screen saver, and appearance. If you are not using your own computer, be sure to restore each setting after making changes.
2. Pretend you have made a mistake and selected a combination of foreground and background colors that makes reading the screen impossible. Solve the problem by booting Windows into Safe Mode. Correct the problem and then reboot.
3. Change the monitor resolution. Try several resolutions. Make a change and then make the change permanent. You can go back and adjust it later if you want.
4. Work with a partner who is using a different computer. Unplug the monitor in the computer lab or classroom, loosen or disconnect the computer monitor cable, or turn the contrast and brightness all the way down while your partner does something similar to the other PC. Trade PCs and troubleshoot the problems.
5. Wear a ground bracelet. Turn off the PC, press the power button, remove the case cover, and loosen the video card. Turn on the PC and write down the problem as a user would describe it. Turn off the PC, reseat the card, and verify that everything works.
6. Turn off your system. Insert into the system a defective video card provided by your instructor. Turn on the system. Describe the resulting problem in writing, as a user would.

