LESSON 2
Input, Output, and Processing

OBJECTIVES
Upon completion of this lesson, you should be able to:

- Identify and describe standard and specialized input devices.
- Identify and describe standard and specialized output devices.
- Identify and describe how input and output devices are connected to the computer.
- Consider computer performance factors.

DATA FILES
You do not need data files to complete this lesson.

VOCABULARY
- audio input
- biometrics
- digital camera
- expansion slot
- FireWire
- inkjet printer
- input keyboard
- laser printer
- modem
- monitor
- mouse
- output
- plug-and-play
- pointing device
- port
- printer
- scanner
- trackball
- Universal Serial Bus (USB)
When it comes to processing data, it is the computer that does all of the work. However, it needs help. Input, which is data or instructions, must be entered into the computer and then stored temporarily or permanently on a storage media device. To turn the data into information, it must be processed. The central processing unit (CPU), which you learned about in Lesson 1, processes the data. After the data is processed, it is “presented” to the user through an output device.

**Standard Input Devices**

Input devices enable you to enter data and commands into the computer, and output devices enable the computer to give you the results of the processed data. Some devices perform both input and output functions, such as the fax machine and fax modem. You use these devices to send (output) and receive (input) data over communications media.

The type of input device you use is determined by the task you need to complete. An input device can be as simple as the keyboard or as sophisticated as those used for specialized applications such as voice or retinal recognition.

**Keyboard**

The keyboard is the most commonly used input device for entering numeric and alphabetic data into a computer. If you are going to use the computer efficiently, it is important that you learn to type. Most of the keyboards provided with desktop computers are enhanced. An enhanced keyboard has 12 function keys along the top, two Alt keys, two Ctrl keys, and a set of directional/arrow keys between the typing area and the numeric keypad.

Some keyboards, such as the one shown in Figure 2-1, have multimedia hot keys that enable you to access e-mail and the Internet, adjust speaker volume, and have other features such as a zoom slider. This device makes it easy to zoom in for a closer look at documents, spreadsheets, pictures, maps, and Web pages.

Not all keyboards, however, are traditional. Some other popular types of keyboards are:

- **Ergonomic**: This type of keyboard is designed to provide users with more natural, comfortable hand, wrist, and arm positions.
- **Cordless or wireless**: This is a battery-powered keyboard that transmits data using wireless technology.
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- **Specialized**: This keyboard has specialized keys that represent items such as those used in fast-food restaurants.
- **Security**: This keyboard provides security features such as a biometric fingerprint reader, magnetic stripe, and smart card readers (see Figure 2-2).

![Biometric fingerprint reader](image1)

**FIGURE 2-2** Keyboard with fingerprint reader

- **Foldable or flexible**: An easily transported keyboard primarily used with PDA and pocket PC-type devices; this type of keyboard has a soft touch and is water resistant (see Figure 2-3).

![Foldable keyboard](image2)

**FIGURE 2-3** Foldable keyboard

- **Laser virtual keyboard**: Packaged in a case smaller than a soda can, a laser beam is used to generate a full-size laser keyboard. This keyboard easily connects to any personal computer, including Macintosh, BlackBerry or other smart phone, and most other handheld devices (see Figure 2-4).

![Laser virtual keyboard](image3)

**FIGURE 2-4** Laser virtual keyboard
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Pointing Devices

A pointing device is an input device that allows you to position the pointer on the screen. The pointer can have several shapes, but the most common is an arrow. You use a pointing device to move the pointer; select objects, such as text or graphics; and click buttons, icons, menu items, and links. The following sections discuss several pointing devices.

Mouse

The mouse is the most commonly used pointing device for personal computers. It moves on a flat surface and controls the pointer on the screen. The mouse fits conveniently in the palm of your hand. You can use any of the following four types of mice:

- **Mechanical:** This type of mouse has a ball located on the bottom that rolls around on a flat surface as the mouse is moved. Sensors inside the mouse determine the direction and distance of the movement. A mouse pad generally is used with a mechanical mouse.
- **Optomechanical:** This mouse is the same as a mechanical mouse, but uses optical sensors to detect motion of the ball.
- **Optical:** An optical mouse (see Figure 2-5a) uses a laser to detect the mouse’s movement. Optical mice have no mechanical moving parts. They respond more quickly and precisely than mechanical and optomechanical mice.
- **Wireless:** A wireless mouse (see Figure 2-5b) is a battery-powered device that relies on infrared or radio waves to communicate with the computer.

![Figure 2-5](image)

FIGURE 2-5  (a) Optical mouse (b) Wireless mouse and receiver

Most mice have two or three buttons; some have a wheel. You use the left button for most mouse operations. Generally, clicking the right button displays a shortcut menu. After you place the on-screen pointer where you want it, press a button on the mouse. This causes some type of action to take place in the computer; the type of action depends on the program. Use the wheel to scroll or zoom a page.

You use the mouse to accomplish the following techniques in most software programs and Web pages:

- **Pointing:** Placing the on-screen pointer at a designated location
- **Clicking:** Pressing and releasing the mouse button to select a specific location within a document
- **Dragging:** Pressing down the mouse button and moving the mouse while continuing to hold down the button to highlight a selected portion of text
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- **Double-clicking:** Pressing and releasing the mouse button two times in rapid succession to select a word
- **Triple-clicking:** Pressing and releasing the mouse button three times in rapid succession to select a paragraph
- **Right-clicking:** Pressing the right mouse button to display a menu
- **Rotate wheel:** Rotate wheel forward or backward to scroll vertically
- **Tilt wheel:** Press the wheel right or left to scroll horizontally

**Trackball**

The **trackball** is a pointing device that works like a mouse turned upside down; the ball is on top of the device. See Figure 2-6a. You use your thumb and fingers to operate the ball, thus controlling the pointer on the screen. A trackball is a stationary device and is a good alternative to the mouse when you have limited desktop space. Some trackballs are built into the keyboard. See Figure 2-6b.

![Trackball Image](image)

FIGURE 2-6 (a) Trackball on a mouse (b) Trackball on a keyboard

**Touchpad**

A common feature on laptop computers is the touchpad, a pointing device with a specialized surface that can convert the motion and position of your fingers to a relative position on screen. Touchpads are a common feature of laptop computers and can be found on personal digital assistants (PDAs) and portable media players.

**Pointing Stick**

Many notebook computers contain a pointing stick—a pressure-sensitive device that looks like a pencil eraser. It is located on the keyboard, generally between the G, H, and B keys. See Figure 2-7. It is moved with the forefinger, while the thumb is used to press related keys. In a confined space, a lot of people find a pointing stick more convenient than a mouse. IBM popularized this device by introducing the TrackPoint on its ThinkPad notebooks.
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Audio Input

Audio input is the process of inputting sound into the computer. This could include speech, sound effects, and music. Audio input devices include microphones, CD/DVD players, radios, and other hardware such as electronic keyboards. Voice input is a category of audio input. Voice-recognition devices are used to “speak” commands into the computer and to enter text. These devices usually are microphones. The computer must have some type of voice-recognition software installed before you can use a voice-recognition device. Directory assistance is a type of voice-recognition technology, as are devices that disabled persons use to command wheelchairs and other objects that make them more mobile.

Standard Output Devices

Output is data that has been processed into a useful format. Examples of output are printed text, spoken words, music, pictures, video, or graphics. The most common output devices are monitors and printers. Output devices display information.

Monitors

Desktop computers typically use a monitor as their display device. The screen is part of the monitor, which also includes the housing for its electrical components. Screen output is called soft copy because it is temporary.

Computer monitors come in many varieties. The cathode ray tube (CRT) was one of the earliest types of monitors. This type of monitor is similar to a standard television and can be either monochrome or color. A monochrome monitor screen has a one-color display, which can be white, green, or amber. Most of today’s monitors are color monitors, which display thousands of colors. CRT monitors are available in various sizes, with the more common being 17-, 19-, and 21-inch. See Figure 2-8a. Some of the newest monitors are available in sizes up to 30 inches or more.

Flat-panel monitors come in two varieties: liquid crystal display (LCD) and gas plasma. Both types of monitors are more expensive than CRT monitors. They take up less space, however, and are much lighter in weight.

LCD panels produce an image by manipulating light within a layer of liquid crystal cells. See Figure 2-8b. Until recently, LCD panels were used primarily on notebook computers and other mobile devices such as cell phones and PDAs. In 1997, several manufacturers started producing full-size LCD panels as alternatives to CRT monitors.
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Gas plasma technology consists of a tiny amount of gas that is activated by an electrical charge. See Figure 2-8c. The gas illuminates miniature colored fluorescent lights arranged in a panel-like screen. These monitors have a brilliant color display and are available in sizes up to 60 inches or more.

![Figure 2-8](a) CRT (b) LCD panel (c) Gas plasma display

Printers

Printers are used to produce a paper or hard copy of the processing results. Printer output is called hard copy because it is permanent. Several types of printers are available, with significant differences in speed, print quality, price, and special features.

When selecting a printer, consider the following features:

- **Speed**: Printer speed is measured in pages per minute (ppm). The number of pages a printer can print per minute varies for text and for graphics. Graphics print more slowly than regular text.
- **Print quality**: Print quality is measured in dots per inch (dpi). The higher the dpi, the higher the resolution or print quality.
- **Price**: The price includes the original cost of the printer as well as what it costs to maintain the printer. A good-quality printer can be purchased very inexpensively; however, a high-output system can cost thousands of dollars. The ink cartridges and toners need to be replaced periodically. Printers are classified as either impact or nonimpact. Impact printers use a mechanism that actually strikes the paper to form letters and images. Dot matrix printers are impact printers. Nonimpact printers form characters without striking the paper. The two most popular types of printers, laser printers and inkjet printers, are examples of nonimpact printers.

Laser Printers

A **laser printer** produces images using the same technology as copier machines. The image is made with a powdery substance called toner. A laser printer produces high-quality output. The cost of laser printers has come down substantially in recent years. Color laser printers, however, are still expensive, some costing thousands of dollars. See Figure 2-9.
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FIGURE 2-9 How a laser printer works

Inkjet Printers

An inkjet printer provides good-quality color printing for less expense than a laser printer. See Figure 2-10. Inkjet printing, like laser printing, is a nonimpact process. Ink is squirted from nozzles as they pass over the media. Unlike earlier versions of the inkjet printer, newer versions can use regular photocopy paper.
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During printing, the paper passes below the carriage, which holds the ink cartridges and print head. As the carriage moves back and forth over the paper, ink is sprayed in minute droplets onto the page.

Inkjet printers use single sheets of paper. Since plain paper can be too absorbent for inkjets, manufacturers recommend special inkjet paper, which has a harder surface.

The control panel includes the on/off switch, an online button, and an LCD panel that displays messages and menus.

FIGURE 2-10 How an inkjet printer works

Speakers

Speakers are also a type of output device. Speakers and headsets generate sound, such as music or instructions on how to complete a tutorial. Individuals use headsets or earphones to hear the music or other voice output privately.
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Specialized Input Devices

A variety of other input devices are also available, most of which are used for specialized applications. The following section describes these input devices.

Digital Cameras

The pictures taken with a digital camera are stored digitally and then transferred to the computer’s memory. Digital cameras use a variety of storage media to store the images, including flash memory cards, memory sticks, USB keys, mini-discs, and other solid-state storage devices. After the pictures are transferred to the computer, they can be viewed quickly and any imperfections can be edited with photo-editing software.

Video input is the process of capturing full-motion images with a type of video camera and then saving the video on a storage medium such as a hard drive, CD, or DVD. After the video is saved, you can view and edit it. A digital video (DV) camera records video as digital signals; some cameras also capture still images. Some are just a little larger than a credit card. See Figure 2-11. A PC video camera is a type of digital video camera that allows the user to send live images over the Internet, make video telephone calls, and send e-mail messages with video attachments.

Webcams are video-capturing cameras that are connected to computers or to computer networks and display images through the World Wide Web. Generally, these cameras are used for videoconferencing and or monitoring. Webcams are also used for security purposes, monitoring both movement and sound.

Game Controllers

The joystick and wheel are types of pointing devices. Joysticks and wheels, such as the ones shown in Figure 2-12, most often are used for games. The joystick consists of a plastic or metal rod mounted on a base. You can move the rod in any direction. Some joysticks have switches or buttons that can input data in an on/off response. A wheel is a steering-wheel type of device used to simulate driving a vehicle. Most wheels also include foot pedals used for braking and acceleration actions.
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Scanners/Bar Code Readers

Scanners are devices that can change images into codes for input to the computer. Scanners are available in various sizes and types, including the following:

- **Image scanners**: These devices convert images into an electronic form that can be stored in a computer's memory. The image can then be manipulated.
- **Bar code scanners**: This type of scanner reads bar lines that are printed on products (for example, in a grocery store or department store). See Figure 2-13a.
- **Magnetic scanners**: These devices read encoded information on the back of credit cards. The magnetic strip on the back of the cards contains the user's encoded account number.
- **Wireless scanners**: A Bluetooth barcode scanner uses Bluetooth wireless technology to scan data, such as from a hospital bracelet, and transmit it to a computer. See Figure 2-13b.
- **Optical character recognition (OCR) and optical mark recognition (OMR)**: These devices use a light source to read characters, marks, and codes; the data is then converted into digital data. Banks use OCR technology to scan checks. Commonly known as Scantrons, schools and other organizations use OMR for testing purposes.
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Touch Display Screen

The touch display screen, shown in Figure 2-14, is a special screen with pictures or shapes. You use your fingers to “point” to the desired object to make a selection. You can find these screens in many public places such as airports, hotels, banks, libraries, delivery services, and fast-food restaurants. Many mobile devices have touch screens.

![Touch screen on a handheld device](image)

**FIGURE 2-14** Touch screen on a handheld device

Stylus

A stylus and digital pen are pen-like writing instruments. See Figure 2-15. These devices allow you to input information by writing on a PDA or other mobile device or to use the pen as a pointer.
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Environmental Probes and Sensors

Environmental monitoring in many industries and companies is a critical component of stabilization in the work area. Workers can use environmental probes and sensors with a standard Web browser, such as Internet Explorer, to view elements such as the temperature and humidity of a remote environment, smoke detector readings, pollution control readings, and so on. Industries such as farming, tropical fish production, moisture monitoring, and warehouse security use environmental probes and sensors.

Remote Controls

Remote controls, also a type of specialized input device, are used for numerous standard applications, such as television, lights, fans, and so on. Industry and business also use remote controls for various applications. For example, a construction worker can use a remote control to control a crane, or a warehouse worker can have a remote control for a product cart.

Security Devices

Consider the following scenario: You are going on a two-week vacation to Tahiti and Bora Bora—you are packed and ready to go, but you do not need a wallet or credit cards. You use your fingerprint as an input device to pay for all of your expenses.

In information technology, biometrics is an authentication technique using automated methods of recognizing a person based on a physiological or behavioral characteristic. Biometric devices consist of a reader or scanning device and software that converts the scanned information into a digital format. The scanned information is then compared to a database of stored biometric data.
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Several types of biometric identification techniques exist. Some of the more common use a person’s fingerprints, face, handwriting, or voice. Other less common techniques are retina (analysis of the capillary vessels located at the back of the eye), iris (analysis of the colored ring surrounding the eye’s pupil), hand geometry (analysis of the shape of the hand and length of the fingers), and vein (analysis of pattern of veins on the back of the hand and the wrist).

The process or the way in which biometric technology works, however, is basically the same for all identification techniques:

- **Enrollment:** The user enrolls in the system by establishing a baseline measurement for comparison.
- **Submission:** The user presents biological proof of his or her identity to the capture system.
- **Verification:** The system compares the submitted sample with the stored sample.

Privacy and civil liberties advocates, however, are concerned about the widespread adoption of biometric systems. They argue that by using biometric data, unauthorized parties can access someone’s data without their consent and link it to other information, resulting in secondary uses of the information. This erodes the users’ personal control over their private information. On the other hand, biometrics can also be applied to private security. For example, several companies now offer biometric computer keyboards and USB flash drives with fingerprint authentication that can be used for personal applications. (Flash drives were discussed in Lesson 1.) See Figure 2–16.

![Biometric keyboard scanner](image1)

![Fingerprint scanner](image2)

**FIGURE 2–16** (a) Biometric keyboard scanner (b) Fingerprint scanner

**Virtual Devices**

Similar to the laser virtual keyboard mentioned earlier, virtual devices use the synchronized positioning of light-emitting and sensing devices to detect user input. Figure 2–17a shows a virtual computer keyboard and Figure 2–17b shows a virtual piano keyboard.
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FIGURE 2-17 (a) Virtual computer keyboard (b) Virtual piano keyboard

Touch-Sensitive Pads

The touch-sensitive pad on a portable device, such as an iPod, enables you to scroll through a list, adjust the volume, play music, view videos or pictures, and customize settings.

Input Devices for the Physically Challenged

A variety of special input devices are available for the physically challenged. Following are some examples:

- Some keyboards can be operated with one hand or with the feet.
- A program called Camera Mouse enables users to use a Webcam and control the mouse pointer by moving their heads.
- A human-computer interface uses eye control to move a pointer and make selections.
- A joystick computer mouse can be operated with the lips, chin, or with the tongue for people with little or no head movement.
- Voice input devices allow visually impaired, blind, and physically challenged individuals to more easily interact with computers.
- A computer display screen is sensitive to human touch and allows the user to interact with the computer by touching an active area or a target, or to control data such as pictures or words on the screen.

Specialized Output Devices

Similar to specialized input devices, a variety of specialized output devices are also available:

- Projectors: A data projector projects the computer image onto a screen; this is mostly used for presentations.
- Fax machines and fax modems: A fax machine and fax modem transmit and receive documents over a telephone line or through a computer.
- Multifunction printer: A multifunction printer combines various output options such as printing, scanning, copying, and faxing.
- Control devices/robots: The field of robotics is defined as the study, design, and use of robot systems for manufacturing. Some of the typical applications of robots include testing, product inspection, painting, assembly, packaging, and painting.
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Specialized Printers

Impact printers, such as the dot matrix and line printer, have been around for a long time. Dot matrix printers transfer ink to the paper by striking a ribbon with pins. The higher the number of pins (dpi), the better the resolution or output. The mechanism that actually does the printing is called a printhead. The speed of the dot matrix printer is measured in characters per second (cps). With the reduction in cost of laser and ink jet printers, dot matrix printers are used less often today. A variation of the dot matrix printer is the line printer. This type of high-speed printer is attached primarily to large computers such as mainframes or midrange servers.

Several other types of specialty printers are available. Some examples are:

- **Thermal**: A thermal printer forms characters by heating paper. The printer requires special heat-sensitive paper.
- **Mobile**: A mobile printer is a small, battery-powered printer, primarily used to print from a notebook computer.
- **Label and postage**: A label printer prints labels of various types and sizes on an adhesive-type paper; a postage printer is a special type of label printer. This type of printer contains a built-in digital scale and prints postage stamps.
- **Plotters/large-format**: Engineers, architects, and graphic artists use plotters and large-format printers for drawings and drafting output.

Output Devices for the Physically Challenged

Similar to input devices for the physically challenged, output devices are also available. Following are some examples:

- **Screen magnifiers**: These devices contain a range of magnifications and a variety of fonts and are used to enlarge the information displayed on the computer screen.
- **Screen readers**: A screen reader assists people who are blind or otherwise visually impaired. A speech synthesizer generally is used to read the screen content. Some screen readers can also read scanned documents.
- **Voice synthesizers**: Speech synthesis is the computer-generated simulation of human speech. A voice changes written computer text into synthetic speech. This technology is useful especially for people with limited sight.

Connecting Input and Output Devices to the Computer

Input and output devices must be connected to the computer. Some devices connect to the computer through a physical connection, such as a port. For instance, you can plug the cable for a physical device into an existing port located on the back or front of the computer. Some monitors also have ports. Wireless devices connect through infrared or radio waves.
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Ports and Connectors

A port, also called a jack, is an interface to which a peripheral device attaches to or communicates with the system unit. Older peripheral devices use serial and parallel ports to connect to the computer. Serial devices transmit data one bit at a time. Parallel devices transfer eight bits at a time. A bit is represented by a 0 or 1. Typically, eight bits make one byte. Most computers traditionally have at least one parallel port and one serial port. In older computers, you will likely find a printer connected to a parallel port and perhaps a mouse connected to a serial port. A modem is a device that allows one computer to talk to another.

The Universal Serial Bus (USB) port can connect up to 127 different peripherals with a single connector and supports data transfer rates of up to 200 million bits per second (Mbps). USB replaces the standard serial and parallel ports on newer computers. USB 2.0 is a recent and more advanced version of USB technology, with speeds 40 times faster than that of its predecessors. Today’s personal computers typically have four to eight USB ports either on the front or back of the system unit. Using a daisy-chain arrangement or a USB hub, you can use a single USB port to connect up to 127 peripheral devices. A USB hub is a device that plugs into a USB port and contains multiple USB ports into which cables from USB devices can be plugged. USB also supports plug-and-play and hot plugging. Plug-and-play refers to the ability of a computer system to configure expansion boards and other devices automatically. Hot plugging is the ability to add and remove devices to a computer while the computer is running and have the operating system automatically recognize the change.

Another type of external bus is FireWire, also known as IEEE 1394 and IEEE 1394b. The IEEE 1394 bus standard supports data transfer rates of up to 400 Mbps and can connect up to 63 external devices; IEEE 1394b provides speeds up to 3200 Mbps. Figure 2-18 shows an example of some of the more popular traditional ports and examples of FireWire and USB ports.
In addition to the preceding ports, you might find three additional special-purpose ports on various computing devices. These special-purpose ports are:

- **SCSI**: An abbreviation for Small Computer System Interface, SCSI (pronounced skuzzy) is a standard interface for connecting peripherals such as disk drives and printers.
- **IrDA**: A wireless standard that allows data to be transferred between devices using infrared light instead of cables is called IrDA. Both the computer and the device must have an IrDA port, and the IrDA port on the device must align with the IrDA port on the computer.
- **Bluetooth**: Bluetooth uses radio waves and provides wireless short-range communications of data and voice between both mobile and stationary devices. This technology does not require alignment; it is an alternative to IrDA. See Figure 2–10.

**FIGURE 2–19** Bluetooth device

**VOCABULARY**

**Expansion slots** are openings on the motherboard where an expansion board, also called an adapter card, can be inserted. Expansion boards enhance functions of a component of the system unit and/or provide connections through a port or other connectors to peripheral devices. Expansion boards are also called expansion cards, add-ins, and add-ons. See Figure 2–20.
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FIGURE 2-20 Expansion slots and card

Traditionally, ports have been located on the back of the system unit. With the introduction of portable devices, such as digital cameras and pocket PCs, many newer computers also include ports on the front of the system unit. This provides for easier access.

Hardware Installation

For most hardware devices to work, they need a set of instructions that communicates with the computer’s operating system. This set of instructions is called a driver. In many instances, the operating system includes drivers for the more popular peripheral devices and performs an automatic plug-and-play installation for newly connected devices.

If the operating system does not contain a driver for the hardware, the driver needs to be installed manually. Usually, the software is included with the hardware device. If an installation disk is not available, the manufacturer’s Web site generally provides a downloadable file.

Computer Performance Factors

A variety of factors can affect a computer’s performance. In Lesson 1, you learned about the central processor, computer memory, and input/output devices. These three components, plus video capability and disk organization, affect the speed at which the computer performs.

The following list provides an overview of these various devices and discusses how more than one component can slow down or speed up computer performance.

1. **Microprocessor:** The architecture of the central processor is the most important processing element. CPUs are classified by generations. The higher the generation, the faster and better the processing speed. Some processors support...
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parallel processing. With this type of processing, while one instruction is being executed, the next instruction is fetched from memory and decoded. Thus, the faster the processor, the more instructions per second it can process.

2. Random access memory (RAM): The amount of RAM also helps to increase the processing cycle and to enhance the computer’s performance. When the memory capacity is reached, the CPU stores data on the hard drive. This slows down the processing cycle because it takes longer for the CPU to read from a hard drive compared to reading from RAM.

3. Hard disk: The size and speed of the hard drive also affects a computer’s performance. The bigger and faster the hard drive, the faster the data is processed. In addition, how the disk is organized affects computer performance. If a hard disk contains many unneeded and outdated files, it takes longer for the computer to find the information it needs.

4. Video: The video device that is connected to the computer can enhance or slow down the computer’s performance. Having adequate video memory for the video card allows the processor to perform to its full potential.

Windows Vista provides several options to determine what hardware you have in your computer system. In Step-by-Step 2.1, you learn how to view this information. When you view this information, most likely you will see abbreviations such as MB or GB, which are units for measuring bytes. Bits and bytes were discussed in Lesson 1.

Step-by-Step 2.1

1. Click the Start button on the taskbar, and then click Computer. The Computer window appears, as shown in Figure 2-21.

2. Click System properties on the menu bar. The System screen is displayed (see Figure 2-22). Most likely, your System screen will display different system information than that in Figure 2-22.
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3. What Microsoft Windows edition is listed for your computer? What processor does your computer contain? How much memory (RAM) is in your computer? What description and name are assigned to your computer?

4. Click the Change settings link. If a User Account Control dialog box is displayed, click the Continue button. The System Properties dialog box is displayed (see Figure 2–23).

FIGURE 2–22  System window

FIGURE 2–23  System Properties dialog box
5. Click each of the tabs in the dialog box and read the information contained on each tab. If directed by your instructor, use Notepad or your word-processing program and write an overview of the features contained within the System Properties dialog box.

6. Click the OK button to close the System Properties dialog box, and then close the System window.

ETHICS IN TECHNOLOGY

Computer Viruses

The word *virus* can put fear into anyone who uses the Internet or exchanges disks. How can such a small word cause such fear? It is because a virus can cause tremendous damage to your computer files!

A virus is a computer program that is written intentionally to attach itself to other programs or disk boot sectors and duplicates itself whenever those programs are executed or the infected disks are accessed. A virus can wipe out all of the files on your computer.

Viruses can sit on your computer for weeks or months and not cause any damage until a predetermined date or time code is activated. Not all viruses cause damage. Some are just pranks; maybe your monitor will display some silly message. Viruses are created by persons who are impressed with the power they possess because of their expertise in the area of computers; sometimes they create them just for fun. To protect your computer from virus damage, install an antivirus software program on your computer and keep it running at all times so that it can continuously scan for viruses.

SUMMARY

In this lesson, you learned:

- Input devices enable you to input data and commands into the computer. The most common input devices are the keyboard and mouse.
- Other types of input devices include the trackball, joystick, wheel, pointing stick, graphics tablet, touch display screen, stylus, voice recognition devices, touchpad, scanner, digital camera, video input, and biometric input.
- Monitors and printers are examples of output devices. Monitors produce soft copy. Printers are used to produce a paper or hard copy of the processed results.
- Criteria for selecting a printer include speed, print quality, and cost.
- Input and output devices must be connected to the computer. Some input and output devices communicate with the computer through serial, parallel, and Universal Serial Bus (USB) ports. USB is a newer standard expected to replace serial and parallel ports.
- Peripheral devices are connected to the computer through serial, parallel, and Universal Serial Bus (USB) ports. USB is a newer standard expected to replace serial and parallel ports.
- FireWire is a type of external bus that can connect up to 63 external devices.
- SCSI, IrDA, and Bluetooth are special-purpose ports.
- A computer's performance is affected by the speed of the processor, the amount of RAM, hard disk size and speed, capability of monitor, and disk organization.
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VOCABULARY REVIEW

Define the following terms:

- audio input
- biometrics
- digital camera
- expansion slot
- FireWire
- inkjet printer
- input
- keyboard
- laser printer
- pointing device
- port
- printer
- mouse
- modern
- monitor
- scanner
- trackball
- firewire
- plug-and-play
- Universal Serial Bus (USB)

REVIEW QUESTIONS

TRUE / FALSE

Circle T if the statement is true or F if the statement is false.

1. Video input is the process of capturing full-motion images with a video camera.  
   T F

2. Input and output devices perform the same function.  
   T F

3. A data projector is a type of specialized output device that projects the computer image onto a screen, usually during a presentation.  
   T F

4. Input and output devices can stand alone—they do not need to be connected to the computer.  
   T F

5. An optical mouse uses a laser to detect the mouse’s movement.  
   T F

MULTIPLE CHOICE

Select the best response for the following statements.

1. Which of the following is not considered an input device?
   A. keyboard
   B. scanner
   C. mouse
   D. monitor

2. Which one of the following is a type of scanner that converts graphics into an electronic form?
   A. image scanner
   B. magnetic scanner
   C. barcode scanner
   D. OCR scanner

3. Plug-and-play refers to a computer’s ability to _____________.
   A. connect multiple USB devices
   B. configure hardware devices automatically
   C. communicate with the system unit
   D. talk to another computer

4. ____________ produce an image by manipulating light within a layer of liquid crystal cells.
   A. Gas plasma monitors
   B. LCD panels
   C. CRT monitors
   D. Scanners

5. Which of the following is a biometric identification scanning technique?
   A. fingerprint
   B. face
   C. voice
   D. all of the above


**MODULE 1  Computing Fundamentals**

**FILL IN THE BLANK**

Complete the following sentences by writing the correct word or words in the blanks provided.

1. A(n) ________ is the most widely used device for entering data into the computer.
2. ____________ is data or instructions entered into the computer.
3. The ____________ port can connect up to 127 different peripherals with a single connector.
4. To improve performance dramatically, increase the amount of ____________ on your computer.
5. A(n) ________ is a small, battery-powered printer, primarily used to print from a notebook computer.

**PROJECTS**

**PROJECT 2-1**

Gmail is a free Web mail service provided through Google. Complete the following steps to create an account.

1. Open your browser and go to [http://mail.google.com/mail/help/open.html](http://mail.google.com/mail/help/open.html).
2. When the Welcome to Gmail screen is displayed, read the information provided on the page. Then click the Create an account link.
3. Type your first and last name and desired login name. Click the check availability button to verify that the name is available.
4. When selecting a password, Google assists with a password strength level—poor, fair, and strong. Your goal is to create a strong password. It must be a minimum of eight characters. Be sure to write down your password or send the password to yourself in an e-mail.
5. If you are using a school computer or a computer other than your own, do not select the “Remember me on this computer” or the “Enable Web History” check boxes.
6. Select a Security Question that you are sure to remember. E-mail the answer to yourself.
7. If you have another e-mail address, you can enter it into the Secondary e-mail text box. However, this is not necessary or required.
8. For Word Verification, type the characters displayed on the form.
9. Read the Terms of Service, and then click the I accept Create my account button.
10. When an Introduction to Gmail page is displayed, read the information on the page and then click Show me my account. Sign in to your account using your user name and password.
11. Click the Compose Mail link and send a message to your instructor and/or another classmate. List three facts in the message that relate to the topics presented in this lesson. Print a copy of your message and submit it to your instructor.

For additional information, see [http://mail.google.com/support/](http://mail.google.com/support/).

**PROJECT 2-2**

Biometric technology is the automated method of recognizing a person based on a physiological or behavioral characteristic. Use the Internet and other sources to research this topic.

1. Use your favorite search engine to search for Web pages discussing biometric technology.
2. Based on your findings, create a document listing the pros and cons of biometric technology. Include your personal opinion about this topic.
3. Submit the document to your instructor as requested.

**PROJECT 2-3**

Prepare a written report on input devices.

1. Select at least five input devices discussed in this lesson.
2. Create a document for the report. Include a table in your report listing each input device, describing how it could be used, and explaining the device’s advantages and disadvantages.
3. Submit the document to your instructor as requested.

**TEAMWORK PROJECT**

This exercise is a student role-playing activity. Students are given a specific task and a set of rules. They then role-play parts of a computer to accomplish the task. Student roles include a processor, main memory, storage devices, and input/output devices. Following are some of the task examples: (a) inputting pictures from a digital camera, modifying and viewing the pictures, and outputting and printing the pictures; (b) using word-processing software to create a report on a specified school topic, adding pictures to the report, and then printing copies for all students in the class; (c) students use a spreadsheet program to create a worksheet and chart and then print copies for all students in the class; (d) students use a presentation program such as PowerPoint and create a presentation with text, images, and video; they display the presentation to the class.
LESSON 2  Input, Output, and Processing

CRITICAL THINKING

You want to learn more about how the computer processes data and the factors that influence the processing speed. Your instructor thinks this is a great idea and asks you to prepare a report on what factors produce the best overall processing system. Prepare a report listing the devices you would select to produce the best all-around processing system.

ONLINE DISCOVERY

Google has a feature that focuses solely on blog searching. This feature, called Blog Search, is located at www.google.com/blogsearch. Access this Web site and then search for increase computer speed. Write a one-page report on what you learned.