

## SECTION 2.3

# STORAGE DEVICES



### Essential Question

Why is it important to rename storage devices?

Data stored in RAM disappears when the computer is turned off, and new data cannot be saved in ROM. Therefore, storage devices are needed to keep data in digital format for reuse. Without a storage device, all data not stored in ROM will be erased as soon as power is disconnected from the computer. Storage devices also allow for portability of data between computers and keeping data in a location other than inside the computer.

Different types of storage devices have different ways in which data are saved on the device. However, all storage devices save data in the forms of on and off (1s and 0s). The amount of data held by storage devices is measured in bytes, the same way as the capacity of RAM is measured. The capacity of storage devices varies by type. Some types of storage devices are available in a range of capacities, while other types are a fixed size.



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### LEARNING GOALS

After completing this section, you will be able to:

- Identify types of storage devices.
- Assign names to storage devices.

### TERMS

flash drives  
hard disk drive  
magnetic media  
optical storage  
solid-state drives (SSDs)  
volume label



## Types of Storage Devices

There are a variety of storage devices that may be used with a computer. The most popular storage devices are hard drives, CDs and DVDs, and flash drives. These devices fall into three basic types of storage media: magnetic media, optical storage, and solid-state devices.

### Magnetic Media

**Magnetic media** are made of iron oxide-coated disks that can be selectively magnetized to store on-off signals (1s and 0s). The computer's internal hard disk drive is the most common example of a magnetic medium. It converts the electronic signals from RAM into stored data by orienting the iron components based on their magnetic properties.

A **hard disk drive**, or *hard drive*, is a sealed unit that contains a stack of individual disks, or platters, which are magnetic media that rotate at a very high speed, as shown in Figure 2-22. Each platter has a large number of concentric circles on it, and data are stored in these rings. A hard drive also contains fixed read-write heads that move across the surface of the platters to store and retrieve patterns of magnetism. Hard drives can have enormous storage capacities. Commonly available hard drives can hold over 5 terabytes of data. That is more data than can be found in all printed books in an average school library.

External hard drives are commonly used to provide additional storage. They are very useful as back-up devices. Data from the internal hard drive can be copied to an external drive in case a problem arises in the internal drive. External hard drives are also portable and can be used

### FYI

Although personal computers are expected to have hard drives, a hard drive is not essential to the basic operation of a computer.



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**Figure 2-22.** A hard disk drive consists of multiple platters. The unit is enclosed, but the cover has been removed in this photo.



to share data between computers. Common external hard drives currently have capacities of between 2 and 4 TB.

Special care should be taken to protect a hard drive from any damage. Hard drives are sensitive to dust and dirt, which is why they are sealed units. Hard drives are also sensitive to high temperature, jarring, and external magnetic fields.



### Career Skills

#### Nursing

IT has changed the landscape of nursing. Vital signs are measured instantly, and constant electronic monitoring alerts nurses to changes in a patients' conditions. The use of Electronic Medical Records (EMR) makes it easy for any health care professional to take over the care of any patient. Working with embedded computers and high tech systems, nurses have improved their care of hospitalized patients.

### FYI

When hardware can handle older versions of the technology, it is said to be backwardly compatible.

## Optical Storage

**Optical storage** involves saving data as tiny pits in foil on a plastic disc. These pits are read with a laser. The optical discs come in the form of a compact disc (CD), digital versatile disc (DVD), and Blu-ray discs (BD). These discs are the same physical size, but each type holds a different amount of data. The capacity of each type is fixed.

Optical discs are more resilient than hard disks. They can tolerate dirt because they can be cleaned with a soft cloth. They are immune to normal temperature changes and extraneous magnetic fields. However, care must be taken to avoid scratches and prolonged exposure to ultraviolet (UV) light.

### CD

The CD was first developed for audio recordings as a replacement for tapes and records. However, the format was quickly adapted for use in computers as the CD-ROM. A CD offers 700 MB of storage. There are several types of CDs:

- compact disc digital audio (CD-DA)
- compact disc read-only memory (CD-ROM)
- compact disc interactive (CD-i)
- compact disc recordable (CD-R)
- compact disc rewritable (CD-RW)

There are two basic types of recordable and rewritable discs: minus (–) and plus (+). The minus discs, such as CD-R and CD-RW, are single-session discs. All data must be added in one session. The plus discs, such as CD+R and CD+RW, are multisession discs. Data can be added at different times.

### DVD

The DVD format is more advanced than the CD format. It was initially developed for video recordings as a replacement for video tapes. However, like the CD format, the DVD format was quickly adapted for use in computers. The wavelength of the laser used in the DVD format is shorter than that used in the CD format. As a result, a DVD can hold more data than a CD. A DVD can store 4.5 GB. That is enough capacity to store 4.5 hours of high-definition video. DVD drives can read CDs.

## Blu-ray

The Blu-ray disc format is designed to replace the DVD format. Blu-ray is so named because the technology uses a blue laser instead of the infrared laser for CD and red laser for DVD. The wavelength of the blue laser is shorter. This allows for more information to be stored on a Blu-ray disc than on a DVD or CD. A Blu-ray disc typically holds 25 GB. Blu-ray drives can read DVDs and CDs.

## Solid-State Drives

**Solid-state drives (SSDs)** are similar to RAM, but they have an integrated circuit to store data as nonvolatile memory rather than volatile memory. **Flash drives**, also known as thumb or jump drives, are removable peripheral devices and the most recognizable examples of SSDs. However, SSDs are also used in place of traditional hard drives in many portable devices, such as netbooks and tablets.

Flash drives are physically small, extremely portable, provide quick access to data, and use very little power. They are so small and portable that it is very easy for students to forget about them and leave them in the computer lab. Flash drives are available in different sizes, from as small as 2GB to as large as 256GB.

## Naming Storage Devices

Storage devices are usually automatically named by the operating system. The device drive name is a letter followed by a colon. For example, C: is the primary hard drive, and it is referred to as the "C drive." Additionally, the name of the device itself is called the **volume label** or *volume name*. The volume label can be more descriptive than the device drive name. The volume label can usually be changed for rewritable media, such as hard disks, flash drives, and rewritable optical discs.

There is a pattern for how drive names are assigned to devices. Internal disk drives are named first, followed by optical drives. Removable drives are named after optical drives. All of these letters are usually automatically assigned by the operating system. Network drives are named after all other drives. The user can usually select the drive letter when network drives are connected. Network drive letters conventionally are selected from letters at the end of the alphabet.

The volume label for a device is usually given a name by the manufacturer of the device. In the case of CDs, DVDs, and Blu-ray discs, the volume label is added to the disc when the disc is manufactured. Rewritable discs and other rewritable media generally can be renamed by the user.

### FYI

The device drive names A: and B: are designated for floppy disk drives, which is obsolete technology. These drive letters are reserved to maintain backward compatibility.

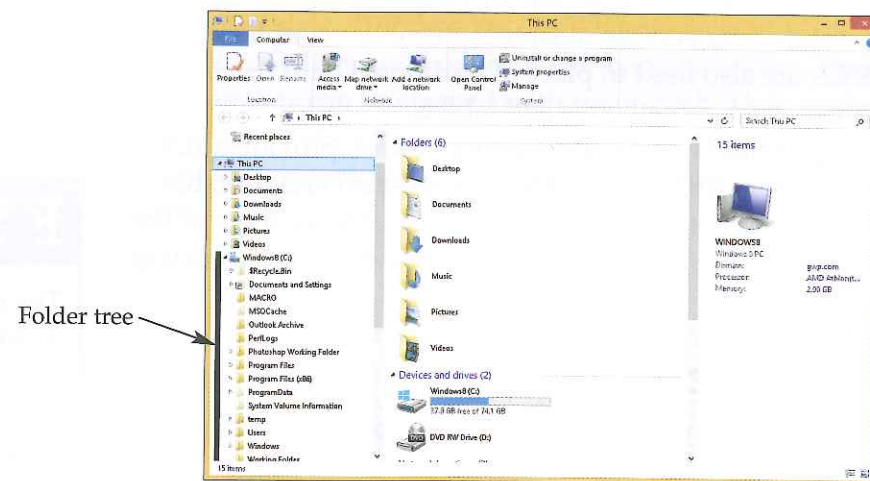


## HANDS-ON EXAMPLE 2.3.1

## STORAGE DEVICE NAMES AND VOLUME LABELS

The device drive name for installed storage devices can be easily identified using Windows Explorer. Rewritable storage media, such as a flash drive, can have its volume label changed.

1. Open Windows Explorer. This can be done by double-clicking the **Computer** icon on the desktop or by right-clicking on the **Start** menu button and clicking **Open Windows Explorer** in the shortcut menu.
2. Locate the left-hand pane in Windows Explorer. This contains a tree that shows the devices, folders, and files accessible to the computer, as shown.



3. In the left-hand pane, locate the primary hard disk drive. What letter is assigned to this storage device?
4. Are there any other storage devices attached to the computer? Notice the icon in the tree for each attached device represents the type of device. What are the letters assigned?
5. Insert your course flash drive into one of the USB ports on the computer.
6. In the **AutoPlay** dialog box that appears, make note of the drive letter for the flash drive.
7. Click **Open folder to view files** in the **AutoPlay** dialog box. Windows Explorer is launched.
8. Locate the flash drive in the left-hand pane. It will have the same drive letter that was displayed in the **AutoPlay** dialog box.
9. Right-click on the flash drive in Windows Explorer, and click **Rename** in the shortcut menu. The volume label for the drive becomes editable. Notice the current name is highlighted in blue. This means the text is selected.
10. Using the keyboard, enter the name **PRINC-OF-IT**.
11. Press the [Enter] key to rename the volume label. This flash drive will hold your notes from this course.

## 2.3

## SECTION REVIEW

## CHECK YOUR UNDERSTANDING

1. What is the most common example of a magnetic storage medium in a personal computer?
2. What type of storage media are CDs, DVD, and Blu-ray?
3. What type of storage device is a flash drive?
4. Describe a volume label for a storage device.
5. Which type of drive is named first when names are assigned?

## IC3 CERTIFICATION PRACTICE

The following question is a sample of the type of questions presented on the IC3 exam.

1. An external device connected to a computer is called a:
  - A. processor device
  - B. CPU
  - C. peripheral device
  - D. driver device

## BUILD YOUR VOCABULARY

As you progress through this course, develop a personal IT glossary. This will help you build your vocabulary and prepare you for a career. Write a definition for each of the following terms and add it to your IT glossary.

flash drives  
hard disk drive  
magnetic media  
optical storage  
solid-state drives (SSDs)  
volume label



## Chapter Summary

### Section 2.1

#### Types of Computers and Components

- Historically, computers were grouped in one of three categories based on size: mainframes, minicomputers, or microcomputers. Computers today are usually categorized based on usage and cost as well as size: supercomputers, mainframes, servers, and personal computers and mobile devices.
- All computers contain the same basic types of components: input device, memory, processor, and output device. If a device does not have all four components, it is not a computer.
- The operating system (OS) is software that manages all of the devices, as well as locates and provides instructions to the CPU. General-use computers, such as a PC or tablet, must have an OS to work, but single-use computers do not require an operating system.

### Section 2.2

#### Input and Output Devices

- An input device makes it possible for the user to provide communication to the computer. Input devices include keyboards, pointing devices, touch screens, image-input devices, text-input devices, audio-input devices, and devices to assist persons with disabilities.
- An output device makes it possible for the user to receive communication from the computer. Information can be output to the user as video, sound, or in physical form.

### Section 2.3

#### Storage Devices

- There are three basic types of storage media: magnetic media, optical storage, and solid-state devices. The most popular storage devices are hard drives, CDs and DVDs, and flash drives.
- The volume label is the name of the device. The volume label can usually be changed for rewritable media, such as hard disks, flash drives, and rewritable optical discs.

Now that you have finished this chapter, see what you know about information technology by scanning the QR code to take the chapter posttest. If you do not have a smartphone, visit [www.g-wlearning.com](http://www.g-wlearning.com).



## Chapter 2 Test

### Multiple Choice

Select the best response.

- Which of the following is *not* a current computer classification?
  - supercomputers
  - personal computers
  - miniframes
  - mainframes

- The four major hardware components of a computer are:

- Computer programs, input, processing, and joysticks.
- Phones, Internet, apps and social networks.
- Input device, memory, processor, and output device.
- Personal computers, tablets, smartphones, and video cameras.

- Which of the following is not one of the basic capabilities of a computer?

- produce output
- store data
- process data
- operate peripherals

- Which of the following computer peripherals provides input?

- mouse
- touch pad
- keyboard
- All of the above.

- Which of the following computer peripherals provides output?

- printer
- RAM
- microphone
- All of the above.

### Completion

Complete the following sentences with the correct word(s).

- The \_\_\_\_\_ is the device that fetches coded instructions, decodes them, and then runs or executes them.

- The two types of memory are \_\_\_\_\_, which is permanent, and \_\_\_\_\_, which is erased when the power is turned off.
- In the United States, the most common keyboard is the \_\_\_\_\_ layout.
- The \_\_\_\_\_ is the most common output device.
- The three major technologies for storage devices are \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

### Matching

- output device
  - input device
  - volatile memory (RAM)
  - processing
  - storage device
- Loads programs and executes them.
  - Gives information to a computer.
  - Records the results of computer processing.
  - Permanently saves information.
  - Temporarily saves information.

## Application and Extension of Knowledge

- Look at your home computer or a computer in the school's computer lab. Make a list of all peripherals attached to the computer. Write one sentence for each device explaining why you think it is a peripheral. Be prepared to discuss your list with the class.




- Complete the following table by converting the given information into the missing information.


Unit	byte	kilobyte	megabyte	gigabyte	terabyte
500 bytes	—				
2058 kilobytes		—			
50.4 megabytes			—		
5.7 gigabytes				—	
2.5 terabytes					—

- Examine your school's computer lab or visit your local library and examine the computers for public use. What accommodations have been made for people with disabilities? Look for both accessible input and output devices. What other accommodations have been made, such as for wheelchair access? Be prepared to discuss your findings in class.
- Select a type of printer to research. Locate information regarding its cost of operation. Most manufacturers provide this information in sales or technical literature. Identify the specific ink or toner cartridge(s) the printer uses, and price the replacements from three different stores.
- Visit a local computer store, and examine the storage devices offered. Compare the type of storage device, whether it is internal or external, the storage capacity, and the prices. Make a table to summarize your research.

## Online Activities

Complete the following activities, which will help you learn, practice, and expand your knowledge and skills.

 **Certification Practice.** Complete the certification practice test for this chapter.

 **Vocabulary.** Practice vocabulary for this chapter using the e-flash cards, matching activity, and vocabulary game until you are able to recognize their meanings.

## Communication Skills



**College and Career Readiness**

**Reading.** Skimming means to quickly glance through an entire document. Skimming will give you a preview of the material to help comprehension when you read the chapter. You should notice headings, key words, phrases, and visual elements. The goal is to identify the main idea of the content. Skim this chapter. Provide an overview of what you read.

**Writing.** Generate ideas for writing a paper that describes the concept of technology as you interpret it. Gather information to support your thoughts and ideas. Keep careful and accurate records of any sources that you use as references. Create the notes that you could use to write a paper to distribute for discussion with your classmates.

**Speaking.** Career-ready individuals understand that demonstrating leadership qualities is a way to make a positive contribution to the team. Identify leadership

characteristics that you believe all team members should possess. Use a graphic organizer to record your ideas. Share with the class.

## Internet Research

**Hard Disk Drives.** Research the evolution of the hard disk drive (HDD) using various Internet resources. Write several paragraphs that describe how HDDs have developed since their inception. Did the hard disk drive replace any technology when it was developed? Has new technology begun to replace the hard disk drive? Use correct grammar, punctuation, and terminology as you write.

## Teamwork

Working with your team, conduct an audit of the hardware in your computer lab. What items are common to all computers? What items are found on only some computers?

## Portfolio Development



**College and Career Readiness**

**Objective.** Before you begin collecting information for your portfolio, write an objective for the finished product. An *objective* is a complete sentence or two that states what you want to accomplish.

The language in your objective should be clear and specific. Include enough details so you can easily judge when you have accomplished it. Consider this objective: "I will try to get into college." Such an objective is too general. A better, more detailed objective might read: "I will get accepted into the communications program at one of my top three colleges of choice." Creating a clear objective is a good

starting point for beginning to work on your portfolio.

- Decide the purpose of the portfolio you are creating, such as short-term employment, career, community service, or college application.
- Set a timeline to finish the final product.
- Write an objective for your portfolio.

## CTSOs



**Performance.** Some competitive events for CTSOs have a performance component. The activity

could potentially be a decision-making scenario for which your team will provide a solution and present to the judges.

To prepare for the performance component of a presentation, complete the following activities.

- On your CTSO's website, locate a rubric or scoring sheet for the event.
- Confirm whether visual aids may be used in the presentation and the amount of setup time permitted.
- Review the rules to confirm whether questions will be asked or if the team will need to defend a case or situation.
- Make notes on index cards about important points to remember. Use these notes to study. You may also be able to use these notes during the event.
- Practice the performance. You should introduce yourself, review the topic that is being presented, defend the topic being presented, and conclude with a summary.
- After the performance is complete, ask for feedback from your instructor. You may also consider having a student audience listen and give feedback.