NINTH EDITION

ILLUSTRATED SERIES™

Computer Concepts

Introductory

Unit B: Computer Hardware

Learning Objectives

- Identify and describe how to use input devices

- Name different types of display devices, and explain their key features

- Describe different types of printers, and explain the advantages and disadvantages of each type

- Identify and explain the different storage devices and their corresponding storage media

Learning Objectives (continued)

- Explain the advantages and disadvantages of magnetic, optical, and solid-state storage systems

- Explain when you might choose a CD, DVD, or BD based on your storage needs

- Describe the different types of solid-state cards and drives available today

- Identify expansion ports and expansion cards, and explain how to use them

Input Devices

- Keyboards:
  - ➤ Type letters and numbers
  - ➤ Navigation keypad – Moves the insertion point

- Mouse:
  - ➤ Controls on-screen pointer
  - ➤ Optical mouse
  - ➤ Laser mouse

Figure B-1: Keyboard examples

on-screen keyboard

built-in keyboard

standard keyboard

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Courtesy of Hewlett-Packard Company

Input Devices (continued)

- Other pointing devices:
  - ➢ Pointing stick
  - ➢ Touchpad (also called a trackpad)
  - ➢ Trackball
  - ➢ Touch screen

- Other ways to input data:
  - ➢ Scanner
  - ➢ Microphone
  - ➢ Digital camera

Display Devices

- Monitor:
  - ➢ Standalone display device
  - ➢ Found with desktop computers

- Screen:
  - ➢ Area where output is displayed
    - • Monitors attached to desktop computers have screens
    - • Notebook computers have screens, but not monitors

Display Devices (continued)

- LCD (liquid crystal display):
  - Manipulates light within a layer of liquid crystal cells
  - Also called flat-panel displays
- LED (light emitting diodes)
- OLED (organic light emitting diodes):
  - Used by most handheld devices
  - Draws less power than LCD screens
  - Can be seen from any angle

Figure B-6: Examples of monitors

Display Devices (continued)

- Graphics card:
  - ➤ Contains circuitry that displays images
  - ➤ Response rate:
    - Speed at which screens update displays
  - ➤ Pixel (picture element):
    - Smallest unit in a graphic image
  - ➤ Resolution:
    - Maximum number of displayed horizontal and vertical pixels

Display Devices (continued)

- Screen size:
  - ➢ Measured diagonally in inches

- Viewing angle width:
  - ➢ Distance to sides you can still clearly view image

- Dot pitch (dp):
  - ➢ Measure of image clarity

- Color depth or bit depth:
  - ➢ Number of colors displayed by monitors and graphics cards

Printers

- Hardcopy:
  - ➤ Printed output

- Softcopy:
  - ➤ Output viewed digitally

Printers (continued)

- Ink-jet printer:
  - ➤ Sprays ink onto paper

- Laser printer:
  - ➤ Produces dots of light on light-sensitive drum that toner adheres to

Figure B-9: An ink jet printer

Figure B-10: A laser printer

Printers (continued)

- Printer resolution:
  - ➢ Determines the quality of printed output
  - ➢ Measured in dots per inch (or dpi)

- Printer speed:
  - ➢ Pages per minute (ppm)

- Duplex printer:
  - ➢ Prints on both sides of paper

- Network-enabled printer

- Photo printer

Data Storage – An Overview

- Storage technology - Data storage system:
  - ➤ Allows for a computer or digital device to store and retrieve data

- Storage medium:
  - ➤ Holds data – Hard drive, tape, memory card, flash drive, CD, DVD, etc.

- Storage device:
  - ➤ Stores and retrieves data from its storage medium – CD/DVD drive.

Flash drive

Card reader

Removable hard
disk drive

Solid-state
drive (SSD)

CD/DVD
Drive

DVD

Solid-state cards

Top, left: © Dmitry Rukhlenko/Shutterstock.com; © Ruslan Ivantsov/Shutterstock.com; © Tatiana Popova/Shutterstock.com; Kingston Technology Company, Inc.; Top, right: Kingston Technology Company, Inc.; BiTMICRO Networks, Inc.

Figure B-12: Examples of storage media and storage devices

Data Storage – An Overview (continued)

- Hard drives – Internal or External:
  - ➢ Main storage system for PCs
  - ➢ Mechanical or solid state drives (SSD)
    - Solid state technology – No moving parts
- Additional storage devices:
  - ➢ USB flash drives
  - ➢ CD/DVD/BD drives
  - ➢ Solid-state card readers

Courtesy of Media Technics Corporation

Spindle   Read-write head   Platter

Figure B-13: Inside of a mechanical hard drive

Data Storage – An Overview (continued)

- Connections:
  - ➢ Drive bays or expansion slots
  - ➢ USB ports
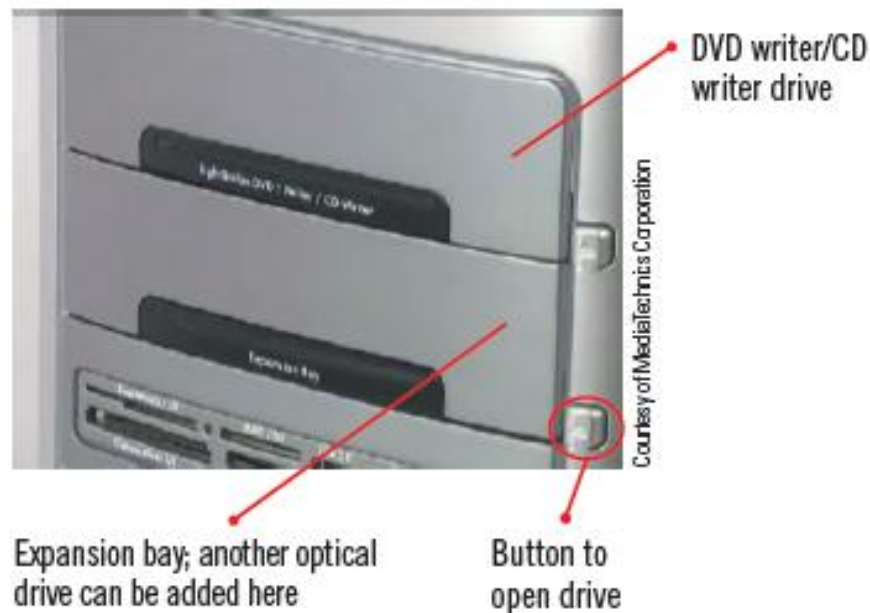
Figure B-14: Drive bays

Data Storage Systems Features

- Storage capacity:
  - ➢ Maximum amount of data that can be stored
  - ➢ Measured in megabytes (MB), gigabytes (GB), or terabytes (TB)

Data Storage Systems Features (continued)

- Access time:
  - ➤ Average time to locate data on the storage medium and read it
  - ➤ Measured in milliseconds (thousandths of a second, abbreviated as ms)

- Data transfer rate:
  - ➤ Amount of data moved from the storage medium per second.

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Data Storage Systems Features (continued)

- Random access – Direct access:
  - Device can jump directly to the requested data

- Sequential access:
  - Device reads through data from the beginning to the end

- Magnetic storage:
  - Stores data by magnetizing microscopic particles on the disk or tape surface
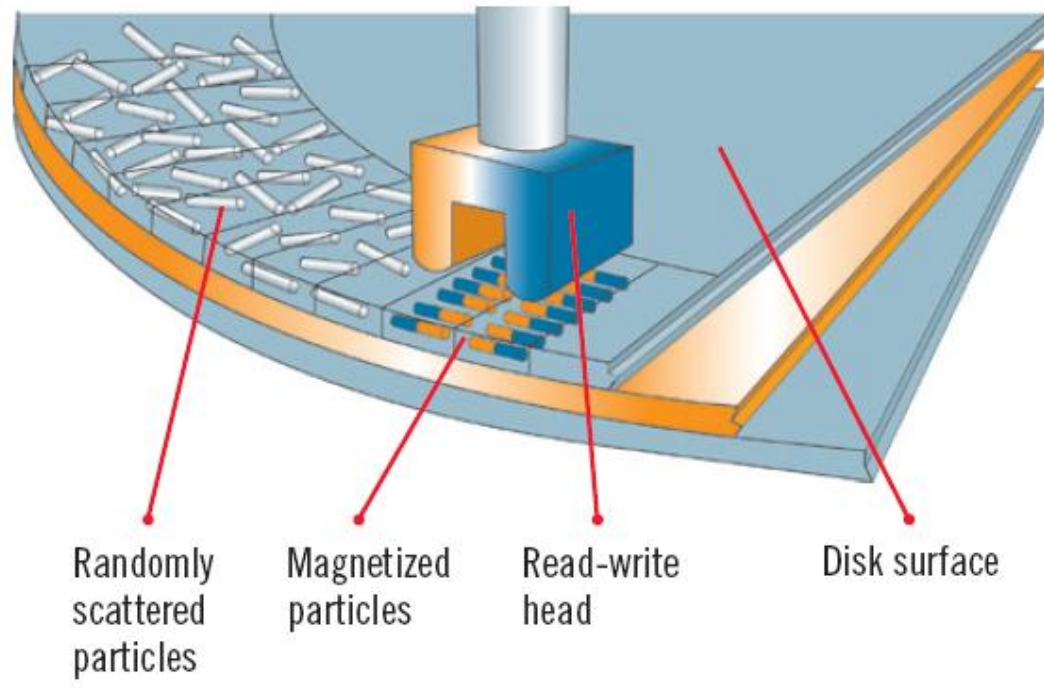 - Hard drives and tapes

Figure B-16: Magnetic storage

Data Storage Systems Features (continued)

- Solid-state storage:
    - ➢ Data stored in a nonvolatile, erasable, low-power chip
    - ➢ Used in compact storage cards – memory cards, thumb drives – flash drives, memory sticks, and some hard drives

- Optical storage:
    - ➢ Data stored as microscopic light and dark spots on the disc surface
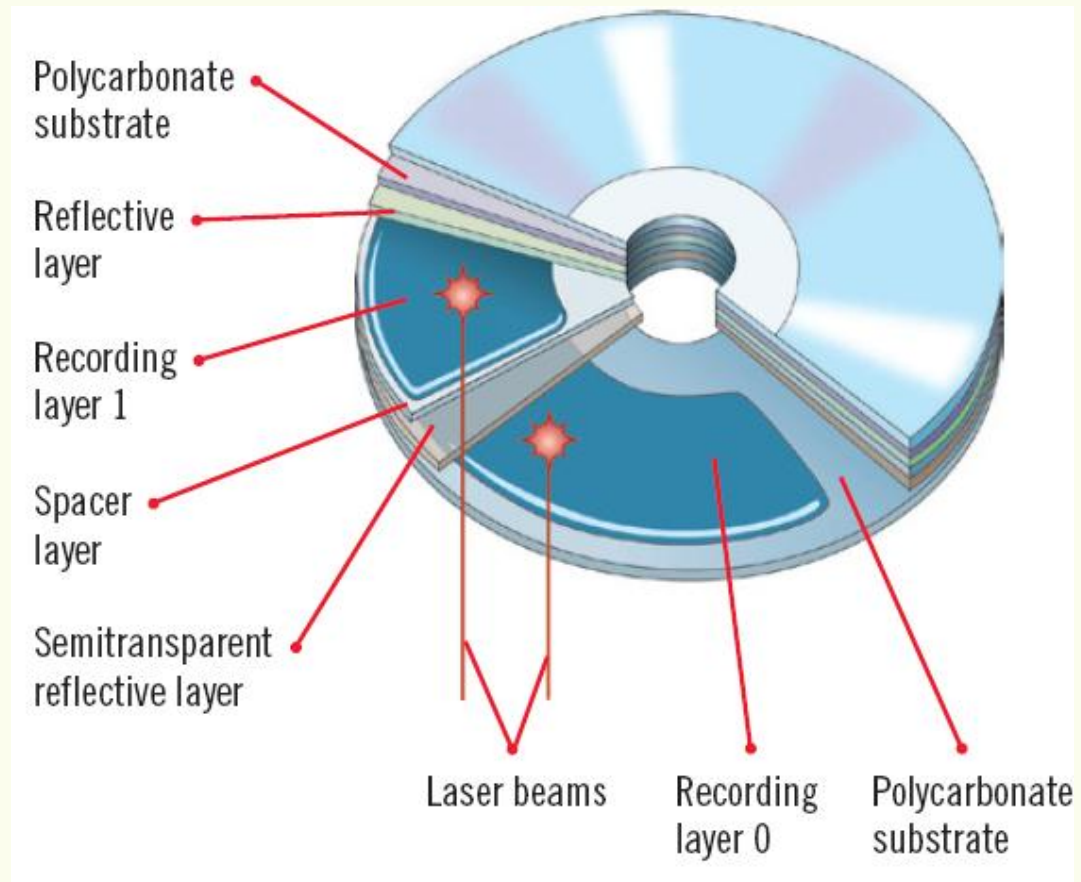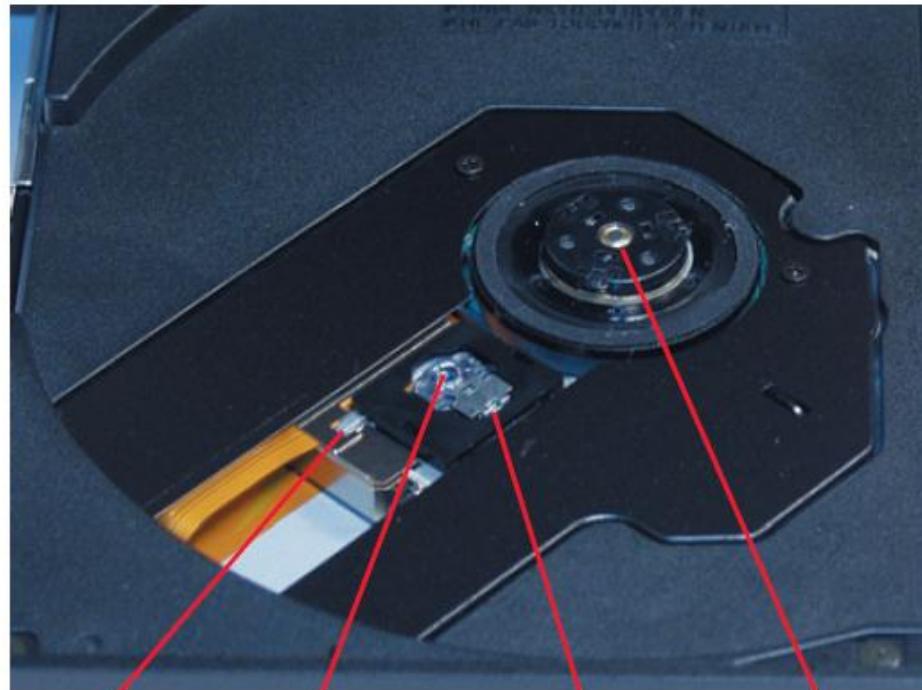   - ➢ CDs, DVDs, and BDs

Figure B-16: Optical storage

Optical Data Storage Systems

- CD-ROM – Read-only technology:
  - ➤ DVD-ROM, BD-ROM

- CD-R – CD recordable technology:
  - ➤ DVD-R/DVD+R, BD-R

- CD-RW - CD rewritable technology:
  - ➤ DVD-RW/DVD+RW, BD-RE

- A computer system can have a CD drive, DVD drive, or BD drive

Tracking mechanism positions a disc track over the laser lens

Laser lens directs a beam of light to the underside of the CD-ROM disc

Laser pickup assembly senses the reflections and translates the information into 1s and 0s

Drive spindle spins disc

Figure B-20: How an optical drive works

Solid-State Data Storage Systems

- Solid-state storage technology:
  - Stores data in a nonvolatile, erasable, low-power chip/electronic circuit
  - Used in digital cameras, MP3 players, etc., or for transporting data

- Wide range of solid-state memory cards:
  - CompactFlash (CF) cards
  - SecureDigital (SD) cards
  - Memory stick

Figure B-23: Solid state cards

Figure B-26: Examples of solid-state drives

Solid-State Data Storage Systems (continued)

- Card reader:
  - ➢ Required to transfer data to or from solid-state storage cards

- USB flash drives and solid-state drives (SSD):
  - ➢ Incorporate memory and reader into one device
  - ➢ Easily transportable from one computer to another

How to Add Devices to Your Computer

- Expansion card:
  - ➢ Small circuit board allowing computers to communicate with a peripheral devices

- Expansion slot:
  - ➢ Slot on motherboards where expansion cards are plugged

Figure B-29: An expansion card slides into an expansion slot

How to Add Devices to Your Computer (continued)

- Expansion port:
  - ➢ Part of expansion card
  - ➢ Connector passing data between a computer and a peripheral device
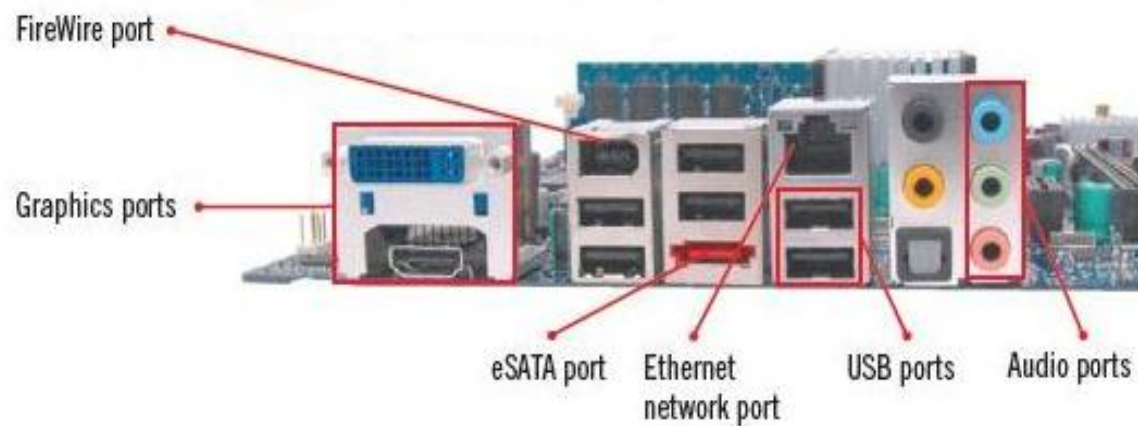   - Graphics ports, FireWire ports, Ethernet network ports, USB ports, etc.

Figure B-27: Common expansion ports

How to Add Devices to Your Computer (continued)

- Data bus:
  - ➢ Circuits over which data is transmitted to peripheral devices

- RAM (Random access memory):
  - ➢ Volatile main memory

- Expansion bus:
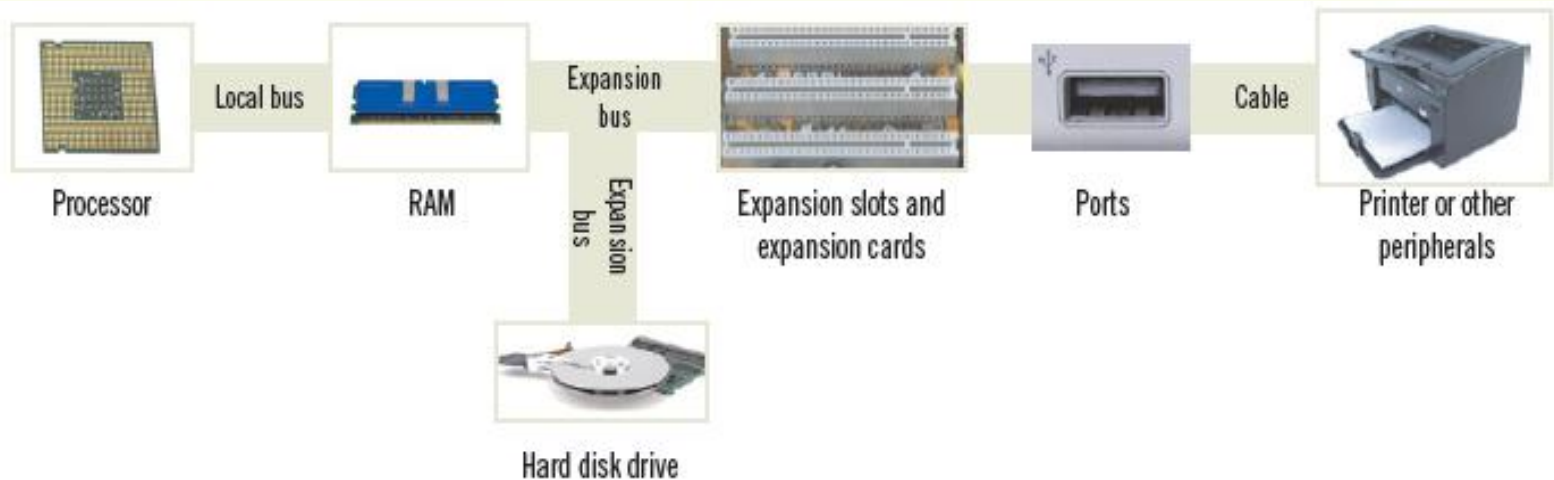 - ➢ Segment of the data bus between RAM and the peripheral devices

Figure B-28: How the expansion bus works

How to Add Devices to Your Computer (continued)

- Device driver:

  - ➢ Software controlling communication with peripheral devices or expansion cards

- USB (universal serial bus) port:

  - ➢ Used for connecting many peripheral devices

Talking Points: Why Recycle Computers?

- U.S. landfills already hold more than 2 million tons of computer parts:
  - ➢ Computer parts contain toxic substances, such as lead, phosphorus, and mercury

- Better options for disposing of computers:
  - ➢ Sell it, donate it, recycle it, or send it back to the manufacturer

- About half the states in the U.S. have taken legislative action to deal with the problem

Courtesy of TECOART LLC

Figure B-31: Creative use of old computer parts

Summary

- This unit introduced:
  - ➤ Input Devices
  - ➤ Display Devices
  - ➤ Printers
  - ➤ Data Storage—An Overview
  - ➤ Data Storage Systems Features
  - ➤ Optical Data Storage Systems
  - ➤ Solid-State Data Storage Systems
  - ➤ How to Add Devices to Your Computer