

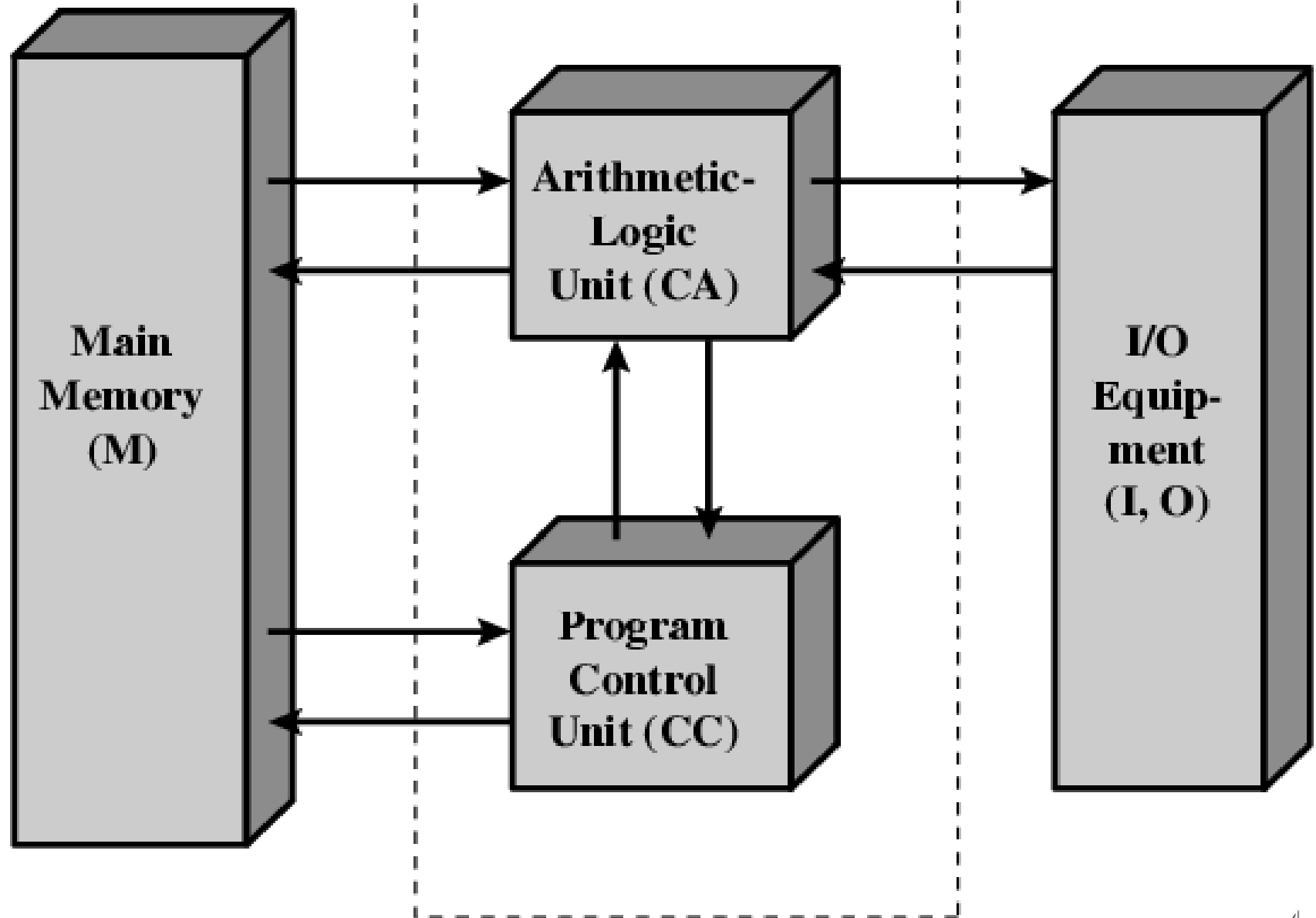
Computer Architecture

Objectives

- 📁 Computer
- 📁 Input and Output Devices
- 📁 Motherboard
- 📁 Machine cycle
- 📁 Memory vs. Storage

Computer

Central Processing Unit (CPU)



Computer

- programmable, electronic device that accepts data, performs operations, presents the results, and can store the data or results
- Input—entering data into the computer
- Processing—performing operations on the data
- Output—presenting the results
- Storage—saving data, programs, or output for future use

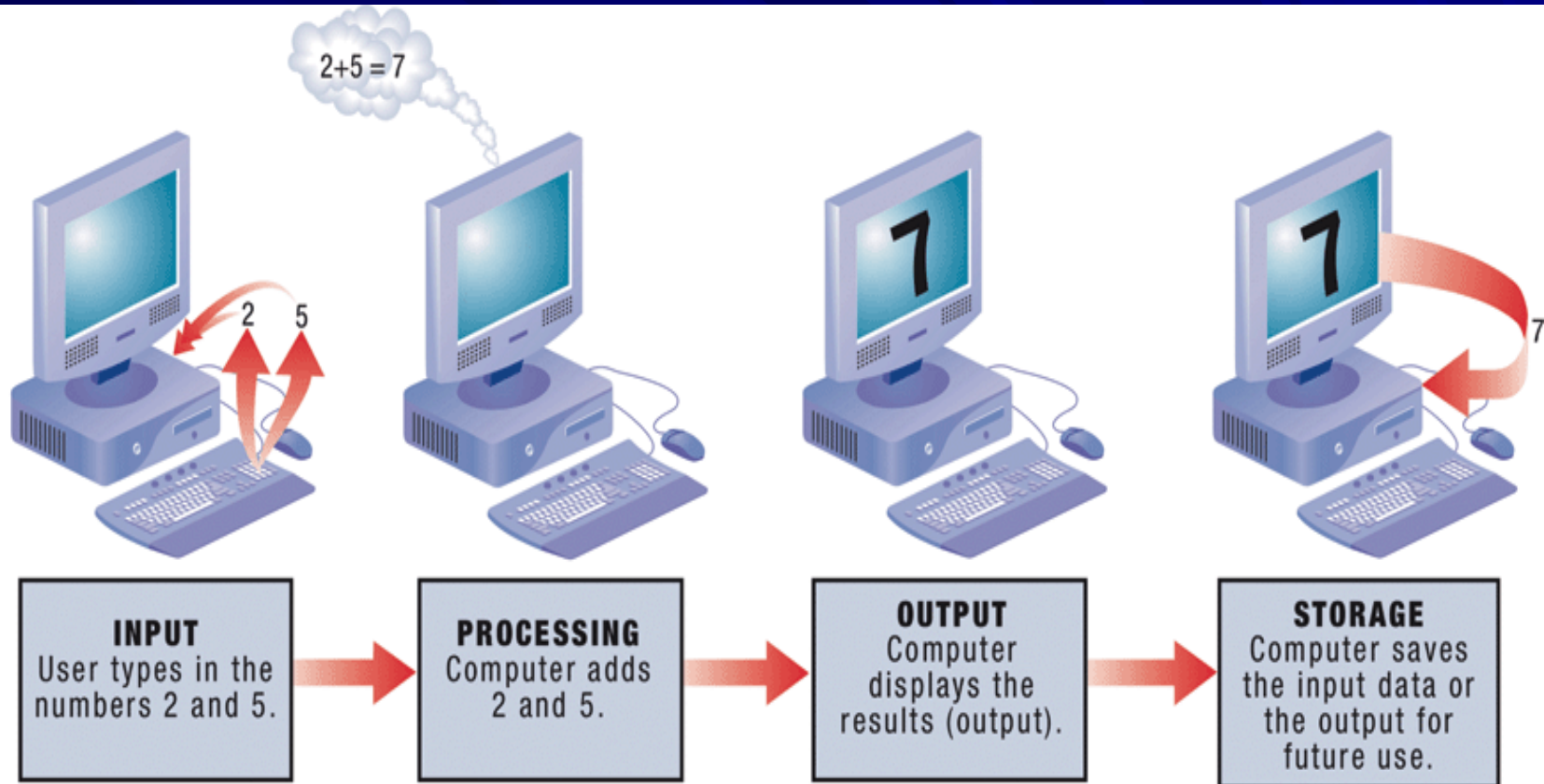
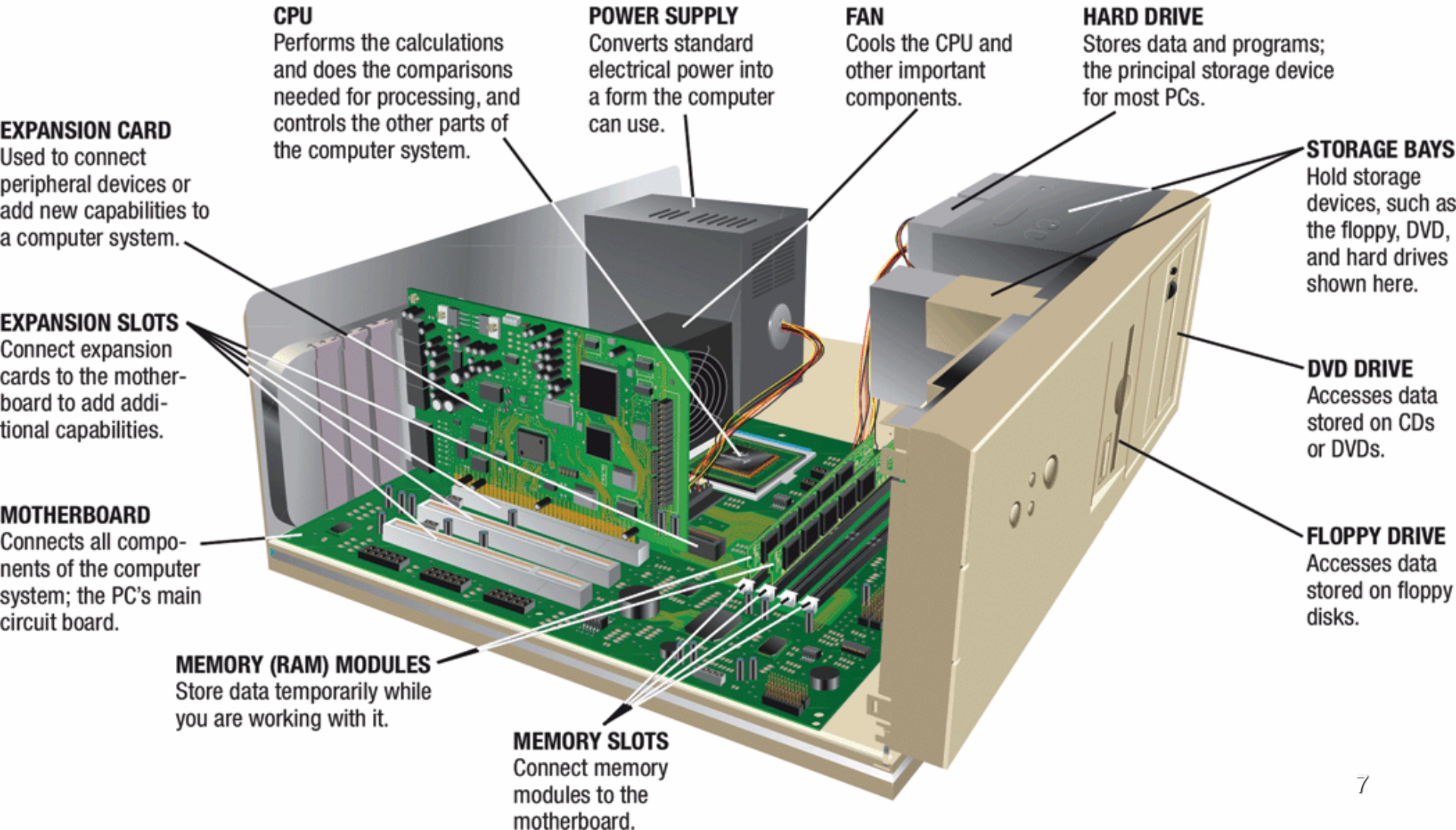


FIGURE 1-6

The information processing cycle.

FIGURE 2-6

Inside a typical system unit. The system unit houses the CPU, memory, and other important pieces of hardware.



Input and Output Devices

Input Devices

- Keyboard
- Mouse
- Trackball, touchpad, mouse stick
- Microphone
- Scanner
- Bar code reader
- Card reader

Output Devices

- Monitor
- Printer
- Speaker
- Plotter

Monitor



- A **monitor** is a peripheral device which displays computer output on a screen.
- Screen output is referred to as a **soft copy**.

Types of Monitors

- **Cathode-ray tube (CRT)**— Resemble televisions; use picture tube technology; inexpensive, but they take up desk space and use a lot of energy.
- **Liquid Crystal Display (LCD or flat-panel)**— Cells sandwiched between two transparent layers form images; used for notebook computers, PDAs, cellular phones, and personal computers; expensive, and they take up less desk space and use less energy than CRT monitors.

CRT



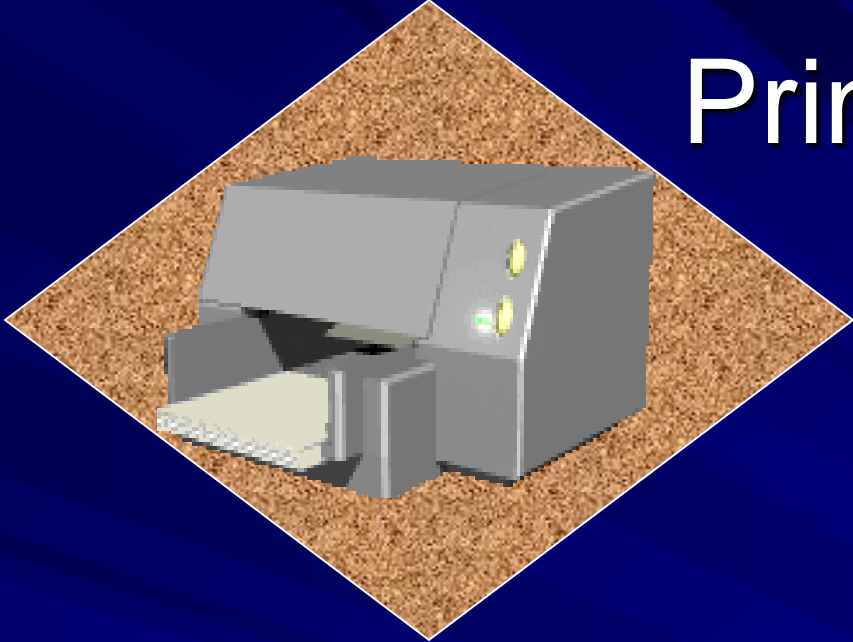
LCD



Monitor Specifications

- **Screen size**— The diagonal measurement of the screen surface in inches (15, 17, 19, 21).
- **Resolution**— The sharpness of the images on the screen determined by the number of horizontal and vertical **pixels** that the screen can display (800x600, 1024x768, 1600x1200).
- **Dot pitch**— The distance between each pixel on the screen measured in millimeters (.22mm, .25mm, .28mm).

Printers



- A printer is a peripheral device that produces a physical copy or **hard copy** of the computer's output.
- Two basic types:
 - Impact printer
 - Nonimpact printer

Impact Printer

Impact printer



Dot-matrix



- An **impact printer** is a printer that has a print head that contacts the paper to produce a character.
- It uses ink ribbon.
- It is noisy, produces **Near-letter quality** printouts, and is not commonly used today.
- **Dot-matrix**– Pins are used to make characters.

Nonimpact Printer



Inkjet



Laser

- Two types of nonimpact printers:
 - Inkjet printer– Also called bubble-jet; makes characters by inserting dots of ink onto paper;
 - Laser printer works like a copier; quality determined by dots per inch (dpi)

Multifunction Printer



- A **multifunction printer** combines the functions of a nonimpact printer, scanner, fax machine, and copier in one unit.

Plotter



- A **plotter** is a printer that uses a pen that moves over a large revolving sheet of paper.
- It is used in engineering and map making.

Motherboard

GREAT COMPUTING STARTS
WITH INTEL INSIDE

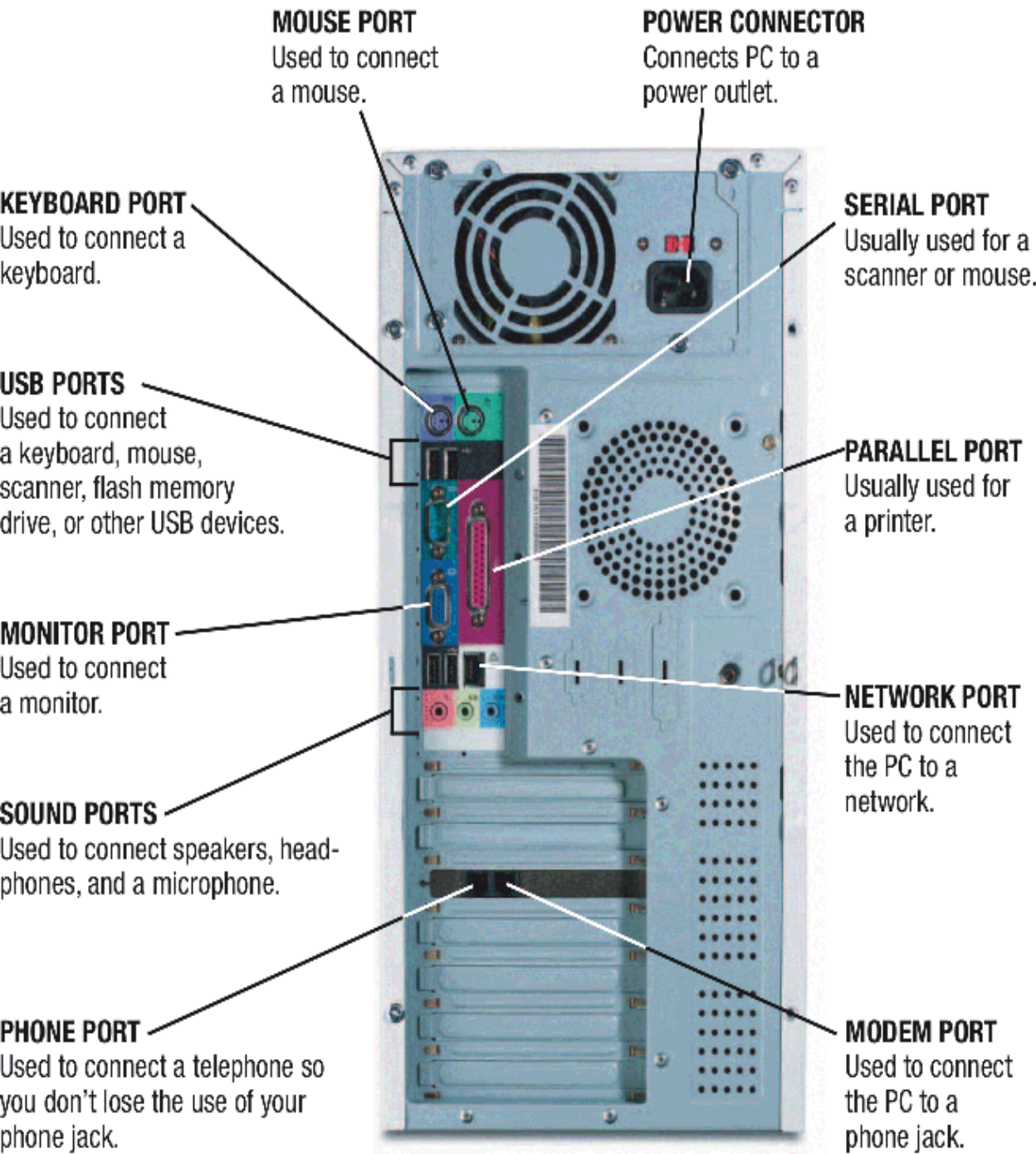


Motherboard

- It holds and allows communication between many of the electronic components of a system, such as the central processing unit (CPU) and memory, and provides connectors for other peripherals.
- It is on the size of A4 paper, its color is green or gold. On which we can distinguish the following components:

Motherboard

- RAM
- Expansion Slots
- Expansion Cards
- Processor, on which a fan or a heat sink is mounted.
- Battery
- Power supply to convert the 200v ac to 3.3 v dc.
- Clock, which generates series of pulses per second
- Chip Sets
- ROM
- Connectors



CONNECTORS

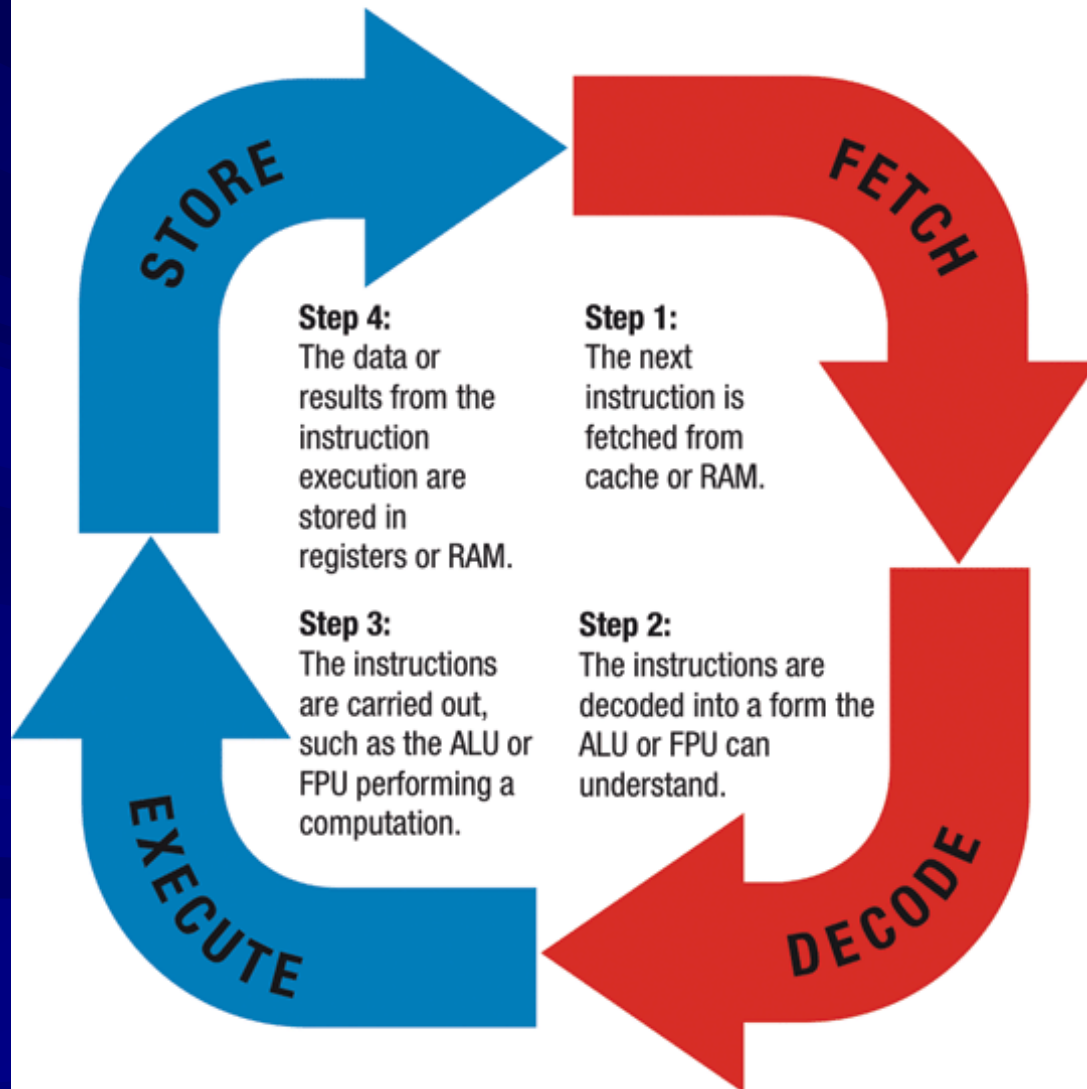
	Power plug
	USB plug
	FireWire plug
	PS/2 plug for mouse or keyboard
	Serial plug
	Monitor plug
	Parallel plug
	Telephone plug for modem and telephone
	Network (RJ-45) plug
	Network (Fiber-optic) plug

Machine cycle

كيف تنفذ وحدة التشغيل الأمر

- Four steps performed for each instruction
 - **Machine cycle**: the amount of time needed to execute an instruction
 - Personal computers execute in less than one millionth of a second
 - Supercomputers execute in less than one trillionth of a second
- Each CPU has its own instruction set
 - those instructions that CPU can understand and execute

FIGURE 2-20
A machine cycle. A machine cycle is typically accomplished in four steps.



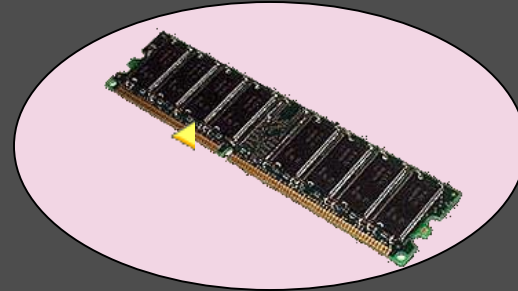
Memory vs. Storage

Memory vs. Storage

Hard Drive



RAM Memory



- **Storage**, also known as **mass media** or **auxiliary storage**, refers to the various media on which a computer system can store data.
- **Storage devices** hold programs and data in units called **files**.
- Files are stored in **directories** or **folders**.
- **Memory** is a temporary workplace where the computer transfers the contents of a file while it is being used.





Why is storage necessary?

Storage:

- Retains data when the computer is turned off.
- Is cheaper than memory.
- Plays an important role during startup.
- Plays an input role when starting applications.
- Is needed for output.
- Devices can hold a large amount of data.



Storage Devices

Storage devices are:

- Hardware that is capable of retaining data when the electricity is turned off.
- Able to **read** (retrieve) data from a storage medium (disk/tape).
- Able to **write** (record) data to a storage medium.



Types of Storage Technologies

- **Sequential**– Hardware that reads and writes data in a serial (one after the other) fashion.
- **Random-Access**– Hardware that reads and writes data without going through a sequence of locations.
- **Magnetic**– Hardware that uses disks or tapes that are coated with magnetic material.
- **Optical**– Hardware that uses laser beams to read data from plastic disks.
- **Solid State**– Devices that use nonvolatile memory chips to read and write data.



The Storage Hierarchy

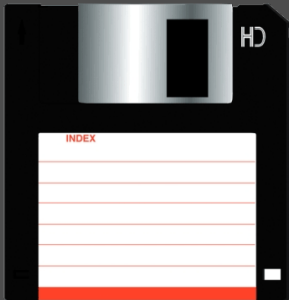
Storage hierarchy consists of three levels. They are:

- **Online storage**– Also called **primary storage**, it is made up of the storage devices that are actively available to the computer system. User action is not required.
- **Near-online storage**– Also called **secondary storage**, it is not readily available to the computer system. The user performs an action, such as inserting a disk, to make it available.
- **Offline storage**– Also called **tertiary storage** or **archival storage**, it is not readily available to the computer system. Devices such as tape backup units store data for archival purposes.



Capacity and Speed of Storage Devices

Floppy Disk



Capacity– 720 KB to 1.44 MB

Access Time– 100ms

Hard Drive



Capacity– Up to 1 TB

Access Time– 6 to 12ms

CD ROM / DVD



Capacity– CD-ROM 650 MB; DVD 17 GB

Access Time– 80 to 800ms

A storage device's performance is measured by:

- **Capacity**– The number of bytes of data that a device can hold.
- **Access Time**– The amount of time, in milliseconds (ms), it takes for the device to begin reading data.

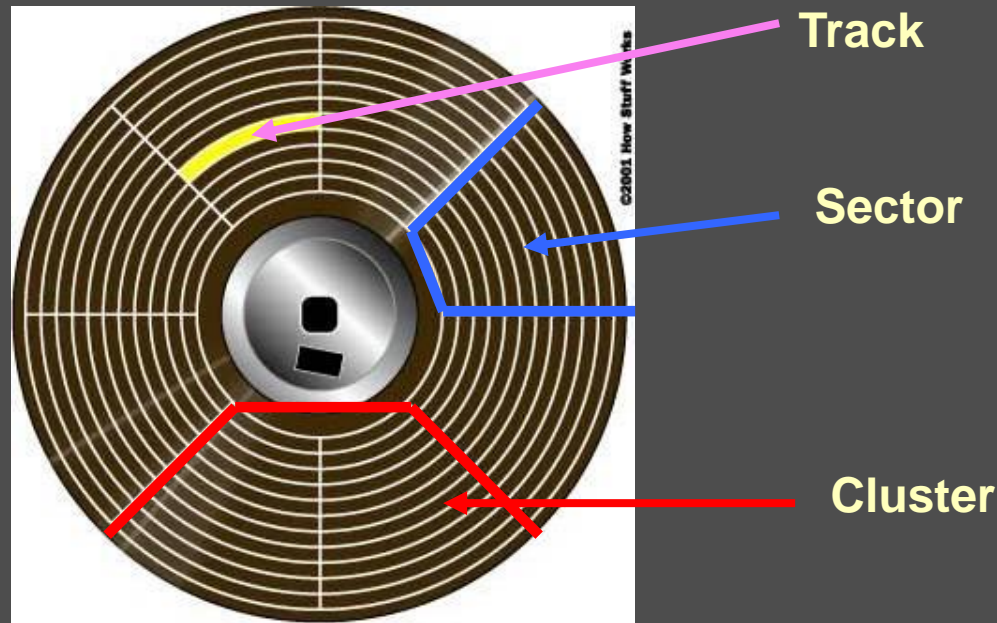


Disks and Disk Drives

- A **disk** or **diskette** is a portable storage medium.
- Disks are circular plastic disks coated with a magnetically sensitive film.
- Disks work with a disk drive.
- **High-density floppy disks**
Floppy disks store 1.44 MB of data.
- **SuperDisk** and **High FD** disks store up to 250 MB of data and are downwardly compatible with floppy disks.



Disk Organization



- A disk is **formatted**—that is, it is divided into **tracks** and **sectors** and a **file allocation table (FAT)** is created.
 - ❖ **Track**— circular band
 - ❖ **Sector**— pie shaped section
 - ❖ **Cluster**— two or more adjacent sectors
 - ❖ **FAT**— keeps track of specific locations of files



How Hard Disks Work



- Hard disks are a high-speed, high-capacity storage devices.
- They contain metal disks called **platters**.
- They contain two or more stacked platters with **read/write heads** for each side.
- Hard disks can be divided into **partitions** to enable computers to work with more than one operating system.



Factors Affecting a Hard Disk's Performance

- **Seek time** or **positioning performance**– How quickly the read/write head positions itself and begins transferring information. It is measured in milliseconds (ms).
- **Spindle speed** or **transfer performance**– How quickly the drive transfers data. It is measured in rotations per minute (RPM).
- **Latency**– The time it takes for the spinning platter to bring the desired data to the read/write head. It is measured in milliseconds (ms).



Magnetic Tape

Tape Backup Unit



- Magnetic tape backup units store large amounts of data that are not used frequently.
- They use a cassette-type reel-to-reel plastic tape.



CD-ROM Disks and Drives



- CD-ROM stands for **C**ompact **D**isk-**R**ead **O**nly **M**emory.
- They are capable of storing 650 MB of data.
- They are used for storing operating systems, large application programs, and multimedia programs.



CD-R and CD-RW Disks and Recorders

CD-R

- Disks that can be read and written to.
- Disks can only be written to “once”.
- Drives that are capable of reading and writing data are needed.

CD-RW

- Disks that can be read and written to.
- Disks are erasable.
- Disks can be written to many times.
- Drives that are capable of reading, writing and erasing data are needed.



DVD-ROM Disks and Drives



- DVD stands for **D**igital **V**ideo **D**isk.
- They use technology similar to CD-ROM.
- They are capable of storing up to 17GB of data.
- Their data transfer rate is comparable to that of hard disk drives.
- **DVD-RAM**– Has the ability to read/write data.

