
## Department of biology

## (( علوم الحاسوب ))

## Stage 2

**المحاضرة الثالثة**

# Computer hardware

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## 1.1 Computer hardware

Computer based information system (CBIS) are composed of hardware, software, databases, people, telecommunications, and procedures. The components are organized to input, processing, output data and information.Physical equipment used for the input, processing, output and storage activities of computer system.

It consists of the following:

- Central processing unit (CPU)
- Memory (primary and secondary storage)
- Input technology
- Output technology
- Communication technology

### 2.3.1-The Central Processing Unit

The central processing unit (CPU) perform the actual computation inside any computer, the CPU is a microprocessor for example, Pentium III) made up of millions of microscopic transistors embedded in a circuit on a silicon wafer or chip. Examples of specific microprocessor.

The microprocessor has different portions which perform different functions:

1- **Control Unit**: this controls the flow of information.

2- **Arithmetic Logic Unit** (ALU) performs arithmetic calculations.

3- **Registers**: which store very small amount of data and instructions for short period of time.

**Control unit**

-Direct and coordinates all units of the computer to execute program steps.

-Direct and coordinate all operation of the computer systems.These operations include;

1- Control to the input and output devices.

2- Entry and retrieval of information from memory.

3- Routing of information between the memory, arithmetic and logicunit.

4- Control unit automatically coordinates the operation of the entire computer system, although the control unit does not performed any actual processingon the data, it acts as a central nervous system uses to sent control signalto other units.

**Arithmetic and Logic Unit (ALU)**

Perform the processing of data including arithmetic operation such as addition, subtraction, multiplication, division and logic operation including comparison (ex. A<B) and sorting.

**2.3.2 Computer Memory**

There are two basic categories of memory:

**A-Primary storage (main memory)**: The memory is the part of the computer that holds information (data and instruction) for processing so name because small amounts of data and information that will be immediately used by the CPU are stored there.

The specific functions of main memory are to hold (store):1- All data to be processed. 2- Intermediate result of processing. 3- Final result of processing.

**B-Secondary Storage:** where much larger amount of data and information (an entire software program, for example) are stored for extended period of time.

**Memory Capacity**

**Bit**: All computers work on a binary numbering system, i.e. they processdata in ones or zeros. This 1 or 0 level of storage is called a bit. Oftenhardware is specified as a 32-bit computer, which means that the hardwarecan process 32 bits at a time. Software is also described as 16 bit, 32 bit or 64 bit software.

CPU process only 0s and 1s, all data are translated through computerlanguages into series of these binary digits, or bits.

Eight bits are needed to represent a character. This 8-bit string is known asa byte. The storage capacity of a computer is measured in bytes. Thehierarchy of byte memory capacity is as follows:

1- **Byte**: A byte consists of eight bits.
2- **Kilobyte**: A kilobyte (KB) consists of 1024 bytes.
3- **Megabyte**: A megabyte (MB) consists of 1024 kilobytes, (1024*1024) byte or 1,048,576 byte) approximately 1,000,000 bytes.
4- **Gigabyte**: A gigabyte (GB) consists of 1024 megabytes, (1024*1024*10240byte) or (1,073,741,824 byte), approximately1,000,000,000 bytes.
5- **Terabyte**: A terabyte (TB) consists of approximately 1,000,000,000,000 bytes.

**A: There are four main types primary (main) memory:**

1- **Random Access Memory (RAM):** it stores more information than registers and is farther away from the CPU, but it stores less than secondary storage and is much closer to the CPU than is the secondary storage. When you start most software programs on your computer, the entire program is brought from secondary storage into RAM. As you use the program, small parts of the programs instructions and data are sent into the instructions as close to the CPU.

**2-Read Only Memory (ROM)**

Read-only-memory (ROM) is the place (a type of chip) where certaincritical instructions are safe guarded. ROM is nonvolatile and retains these instructions when the power to the computer is turned off.

## B) Secondary Storage (Backing Storage)

Secondary storage is designed to store very large amounts of data forextended periods of time .secondary storage can have memory capacity of gigabyte or more; only small portions of the data are placed in primary storage at any one time. Secondary storage **has <u>the following Characteristics:</u>**

1- it takes much more time to retrieve data from secondary storage than itdoes from RAM

2- it much more cost effective than primary storage

3- it can take place on a variety of media each with its own technology, as iscussed below:

a) **Magnetic tape**

b) **Magnetic disc**

c) **Magnetic diskette (floppy disc)**

d) **Optical discs**

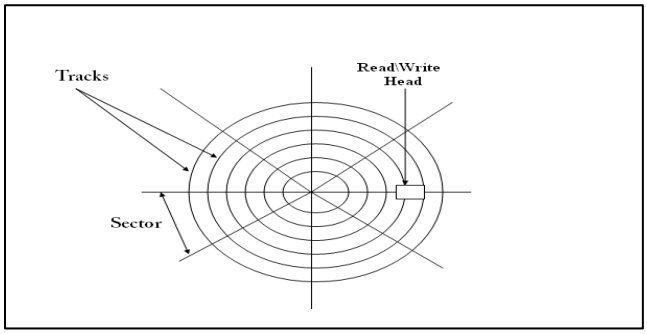
**<u>B-Features of magnetic disks (hard disks)</u>**

1. disks are randomly accessed
2. disks are of size and shape similar to a long-playing record
3. The surfaces of each disk are of magnetic able material.
4. Each disk surface is divided into a number of concentric tracks(typically 200).
5. Disks are placed on pack and each pack may have 6 or 11 disks andis used as a single unit.
6. The latest models of disk packs can store many hundreds of megabytes of data (i.e. hundreds of millions of characters).

**Hard Disk Performance:** Several basic parameters determine the performance of a given hard disk drive. A seek operation is the movement of the read/write head to the desired track.

1- Seek Time: A seeks time is the movement of the read\write head to the desired track, hard disk drives have an average seek time of several milliseconds, depending on the particular drive.

2- Latency Time: The latency period is the time takes for the desired sector to spin under the head once the head is positioned over the desired track.Latency time depend on the constant rotational speed of the disk.




## Hard Disk

**The Difference between Internal and External hard disks**: Internal hard disks are located inside your main computer unit, while external hard disks are joined to the main computer unit via a lead which you plug into the back of your computer unit. Some external hard disks will plug into the USB port (connector) located at the back of your computer. Other external hard disks require the installation of a special card within your computer which allows the connection of the external hard disk to the computer unit.

## C- Features of optical disks

1- this is a random access device.

2- Data is written into the disk by burning a permanent pattern into the surface of the disk by means of high precision laser beam.

3- data is read by using the laser at lower intensity and detecting the pattern reflected from its beam by the surface of the disk.

## There are many types of optical disks:

1- compact disk read-only memory (CD-ROM) storing devices feature high capacity, low cost.

It has become popular for recorded music as well as information (such as books) a variant is the digital video disk (DVD), used for movies.

2- Write once, read many (WORM) disk can be written.

3- rewritable CD is a less common technology that allows the disk to be written upon and written up to 1.000 times.

## PRIMARY STORAGE

Primary storage has much less capacity than secondary storage, andis faster and more expensive per byte stored, primary storage is located much closer to the CPU than is secondary storage. Sequential _accesssecondary storage media such as magnetic tape is much slower and less expensive than direct access media (e.g. hard drives, optical media)