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**COMPUTER SCIENCE**  
**1 stage**

**chapter\_1**

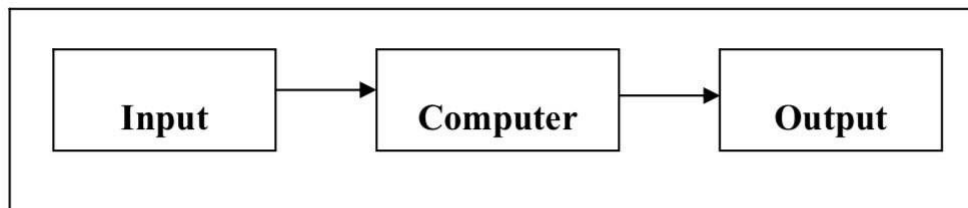
**By**

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## Computer organization :

Computer: - electronic device that accepts input, stores large quantities of data, execute complex instructions which direct it to perform mathematical and logical operations and outputs the answers in a human readable form. (See fig. 1)



**Fig (1) simple model of a computer**

Advantages of computer system:

- 1- Store and retrieve large quantities of data.
- 2- The speed is faster than in any other form of data processing.
- 3-A single computer can perform a wide variety of activities as directed by a set of instructions (program).
- 4-Once data and instructions are fed into the computer, processing is continuous with a minimum of human intervention.
- 5-Data and programs may be stored inside the computer indefinite and be retrieved quickly.
- 6-Accuracy is greater than any other system.



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## Computer structure:

### Computer system are made of two main parts: -

- 1-Hardware:** refers to the physical components of the computer such as: -Keyboard, memory, printer...
- 2-Software:** refers to programs, languages, procedures and instructions that make the hardware work for us.

Main components of hardware:

The basic components of a computer system are: (see fig. 2)

**1-Input unit**

**2-Central processing unit:** -which consists

**a-** control unit.

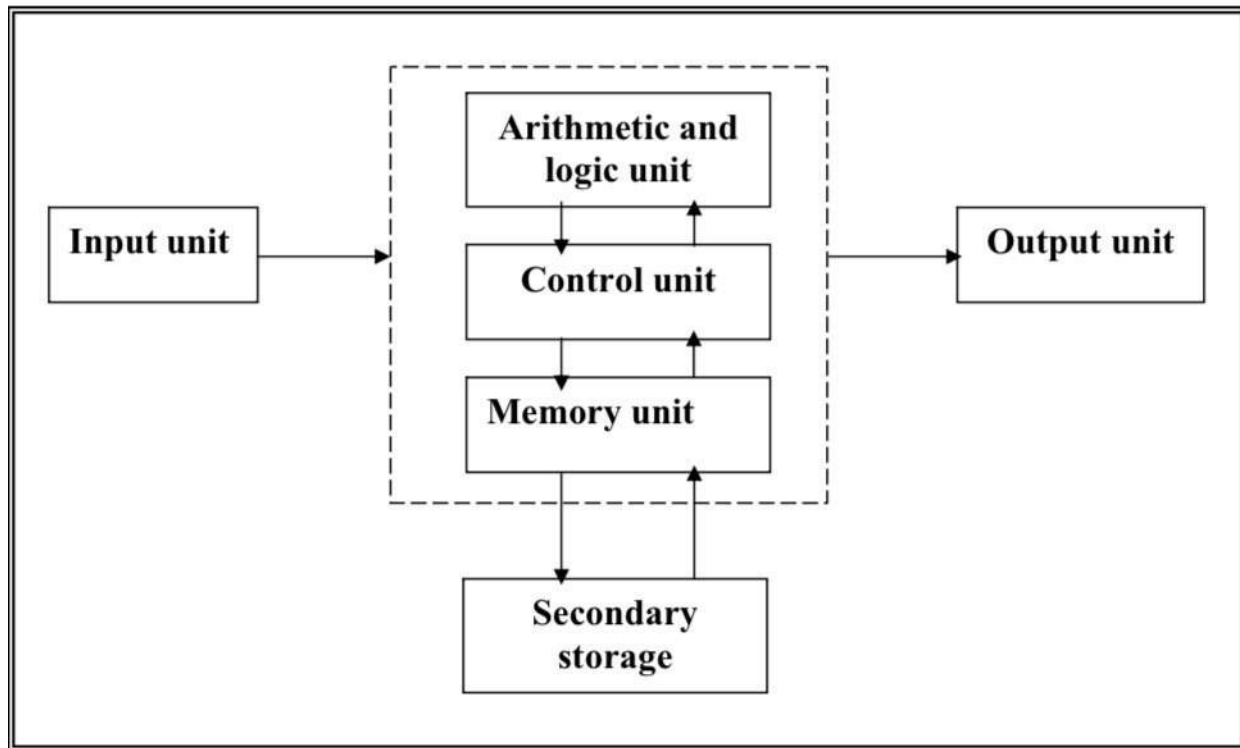
**b-** Arithmetic and logic unit.

**c-** Register.

**3-Output unit.**

**4-Memory unit (internal memory).**

**5-External storage.**



**Fig (2) The logical structure of a computer**

**1- Input unit:** - the input unit of a computer system accepts data, convert it into electrical impulses that are sent in to internal memory or to the central processing unit (CPU) where can be processed. Such as Punched cards (old system), Magnetic tape, Floppy disk, keyboard, mouse.

**2- Central processing unit (CPU):** -

The brain of any computer system is the CPU, which is sometime called “Processor” or “Microprocessor” in personal computer.

The CPU supervises and controls all of the peripheral equipment, perform arithmetic and makes logical decisions. The CPU is responsible for includes the data movement computations and logical operation necessary to convert data into meaningful information.



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It is divided into three sections:

- 2-1. Arithmetic and Logic unit (ALU).
- 2-2. Control unit.
- 2-3. Register.

### **2-1 Arithmetic and Logic unit (ALU): -**

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

### **2-2 Control Unit.:-**

- Direct and coordinates all units of the computer to execute program steps.
- Direct and coordinates all operations 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 and the arithmetic and logic unit.

Control unit automatically coordinates the operation of the entire computer system, although the control unit does not performed any actual processing on the data, It acts as a central nervous system uses to send control signal to other units.

### **2-3 Register: -**

Register are devices capable of storing information, receiving data from other areas within the computer and transferring information as directed by the control unit, it is used for temporary storage of data or instruction and the most important register are: -

- a- Program counter (PC): It contains the address of the next instruction to be executed.



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- b-** Instruction Register (IR): It contains the instruction being executed.
- c-** Address Register (AR): holds the address of memory location.

### **3- Output unit: -**

Output units are instruments of interpretation and communication between human and computer, that let you see (or here) the result of the commands you enter, the most common output device are a display screen (monitor), printer or other device that let you see what the computer has accomplished.

The CPU execute each Instruction in a series of steps: -

- 1-** Fetch the next instruction from memory to IR.
- 2-** Changes the program counter to point to the following instruction.
- 3-** Determine the type of the instruction to be fetched.
- 4-** IF the instruction uses data in memory determines where they are.
- 5-** Fetch the data into the internal CPU register.
- 6-** Execute the instruction.
- 7-** Store the result in the proper place.
- 8-** Go to step 1 to being executing the following instruction.

### **4- Main Memory units: -**

The memory is the part of the computer that holds information (data and Instruction) for processing, main memory also known as primary or internal memory or primary storage, there are two types of main memory are ROM (Read Only Memory) and RAM (Random Access Memory).

The specific function of main memory are to hold (store):

- 1-** All data to be processed.
- 2-** Intermediate result of processing.
- 3-** Final result of processing.



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A computer system generally includes two types of storage: -

- 1- Primary storage
- 2- Secondary storage

## 1- Primary storage:-

There are two Primary storage Media

### 1-1 Magnetic core storage

The second and third generation computers contained primary storage units composed of magnetic cores each core could store one bit when electricity flowed through the wire making up the cores a magnetic field was created the direction of the magnetic field was created the direction of the magnetic field determined which binary state's core represent a magnetic field in one direction indicate an one "1" condition a magnetic field in the other direction indicate an off "0" condition,

So the core Memory stores data magnetically unlike semiconductor memory and operates at lower speed.

### 1-2 Semiconductors memory

It is a set of electronic circuits that put on the silicon chip. These circuit are often called "gates" because they represent a (1) when current is permitted to flow and a (0) when it is not.

The type of main memory contains a large number of semiconductor storage cells, each capable of storing one bit of information a bit which is a short of binary digit which either 1 or 0 (full or empty).

### 4-1 Type of main memory:

There is basically two type of memory

#### 4-1-1 Random access memory (RAM):

And also called read/write memory, it is used for storing data and instruction, in this type the stored information will be lost when computers power is turned off so that it is called the volatile memory,



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it's used only for temporary storage and the ram can be either dynamic or static.

- a-** Static RAM: it is a semiconductor memory device in which the stored data will remain permanent stored as long as power is supplied without the need for periodically rewriting the data in to memory.
- b-** Dynamic RAM: it is a semiconductor memory device in which the stored data will not remain permanent stored even with power is applied unless the data are periodically rewritten in to memory, the later operation is called a refresh operation.

### **4-1-2 Read only memory (ROM):**

Is read only memory which can be read from but not written on so that it is called a non-volatile memory, when the user turn the computer off the content of ROM are not changed, the type of ROM is:

#### **1- Programmable Read Only Memory (PROM):**

It is prepared by the maker and can be electrical programmed by the user, it cannot be erased and programmed a gain this means its content can never be changed.

#### **2- Erasable Programmable Read Only Memory (EPROM):**

The maker prepares it and can be electrical programmed by the user, it can be erase (deleted) by exposure to ultraviolet light and programmed many times.

#### **3- Electrically alterable Programmable Read Only Memory (EAPROM):** read only memory that is electrically reprogrammable.