

Basic organization of a computer

1- Basic operation of computer system

The five basic operations of a computer system:-

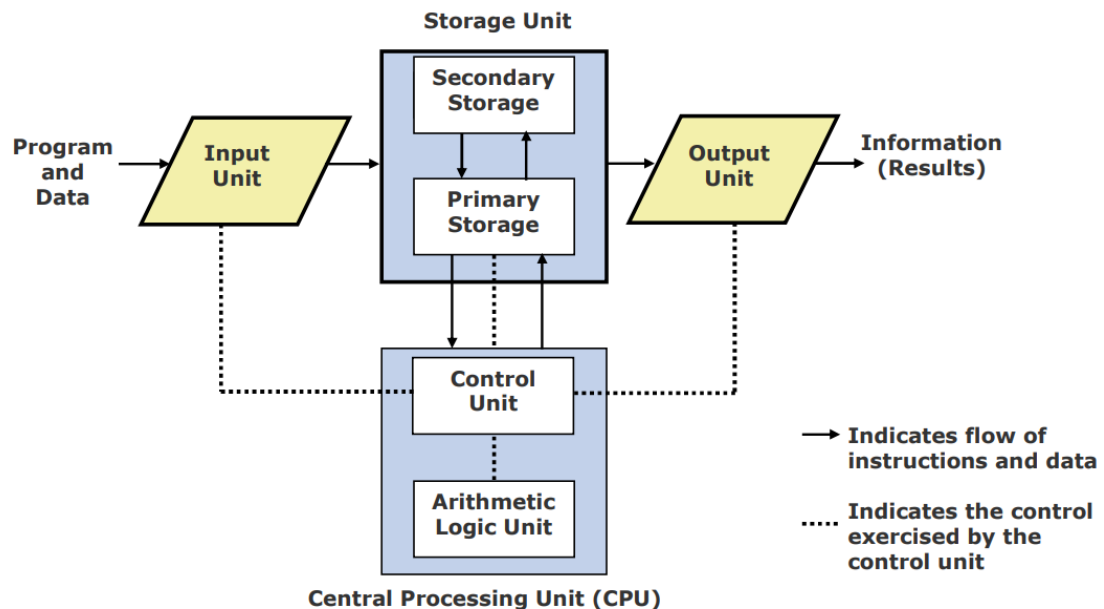
Inputting: - The process of entering data and instructions into the computer system.

Storing: - Saving data and instructions to make them readily available for initial or additional processing whenever required.

Processing: - Performing arithmetic operations (add, subtract, multiply, divide, etc.) or logical operations (comparisons like equal to, less than, greater than, etc.) on data to convert them into useful information.

Outputting: - The process of producing useful information or results for the user such as a printed report or visual display.

Controlling: - Directing the manner and sequence in which all of the above operations are performed.



2- input unit

An input unit of a computer system performs the following functions:

1. It accepts (or reads) instructions and data from outside world
2. It converts these instructions and data in computer acceptable form

3. It supplies the converted instructions and data to the computer system for further processing

3- output unit

An output unit of a computer system performs the following functions:

1. It accepts the results produced by the computer, which are in coded form and hence, cannot be easily understood by us
2. It converts these coded results to human acceptable (readable) form
3. It supplies the converted results to outside world

4- storage unit

The storage unit of a computer system holds (or stores) the following :

1. Data and instructions required for processing (received from input devices)
2. Intermediate results of processing
3. Final results of processing, before they are released to an output device

Two types of storage: -

➤ **Primary storage**

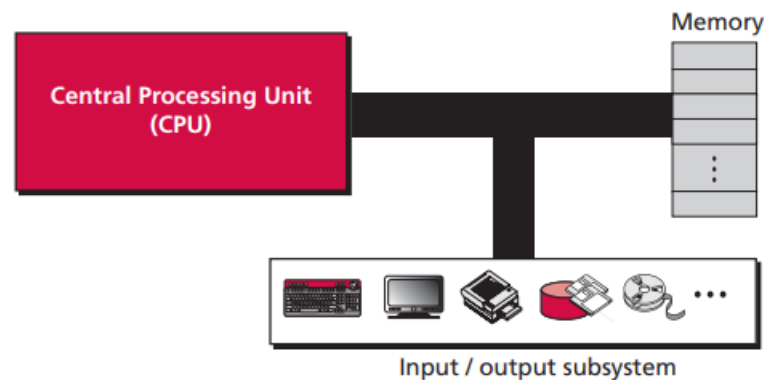
- Used to hold running program instructions
- Used to hold data, intermediate results, and results of ongoing processing of job(s)
- Fast in operation
- Small Capacity
- Expensive & Volatile (loses data on power dissipation)

➤ **Secondary storage**

- Used to hold stored program instructions
- Used to hold data and information of stored jobs
- Slower than primary storage
- Large Capacity
- Lot cheaper than primary storage
- Retains data even without power

Central processing unit

The central processing unit (CPU) performs operations on data. In most architectures it has three parts: an arithmetic logic unit (ALU), a control unit, and a set of registers, figure (2.1).



1- Arithmetic Logic Unit(ALU)

Arithmetic Logic Unit of a computer system is the place where the actual executions of instructions take place during processing operation. Its performs:

- ✓ **Logic operations** We discussed several logic operations, such as NOT, AND, OR, and XOR. These operations treat the input data as bit patterns and the result of the operation is also a bit pattern.
- ✓ **Shift operations** We discussed two groups of shift operations on data. logical shift operations and arithmetic shift operations. Logical shift operations are used to shift bit patterns to the left or right, while arithmetic operations are applied to integers. Their main purpose is to divide or multiply integers by two.
- ✓ **Arithmetic operation** We discussed some arithmetic operations on integers. We mentioned that some operations can be implemented more efficiently in hardware.

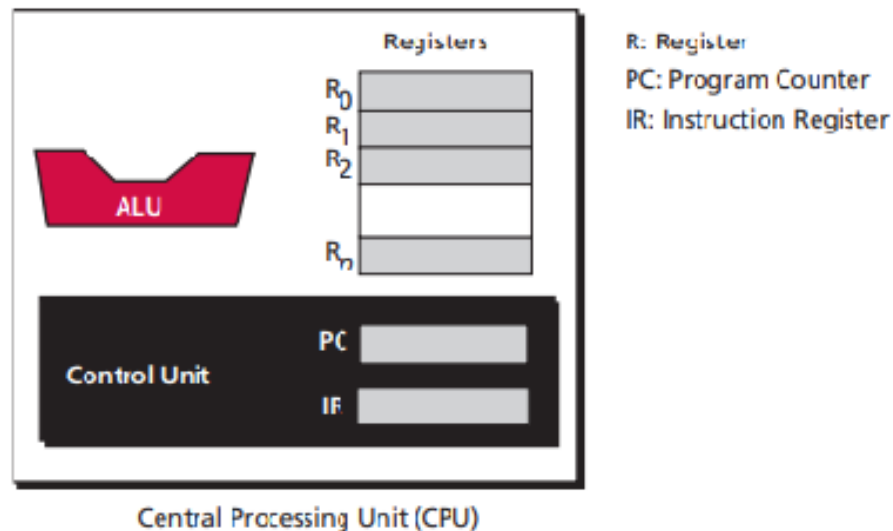
2- Registers

Registers are fast stand-alone storage locations that hold data temporarily. Multiple registers are needed to facilitate the operation of the CPU. Some of these registers are shown in Figure 2.2.

Data registers In the past computers had only a few data registers to hold the input data and the result of the operations. Today, computers use dozens of registers inside the CPU to speed up their operations, because complex operations are done using hardware instead of software. These require several registers to hold the intermediate results. Data registers are named R1 to Rn in Figure 2.2.

Instruction registers Today computers store not only data, but also programs, in their memory. The CPU is responsible for fetching instructions one by one from memory, storing them in the instruction register (IR in Figure 2.2.), decoding them, and executing them. We will discuss this issue later in the chapter. Program counter Another common register in the CPU is the program counter (PC in Figure 2.2.).

The program counter keeps track of the instruction currently being executed. After execution of the instruction, the counter is incremented to point to the address of the next instruction in memory



3- Control Unit(CU)

The third part of any CPU is the control unit. The control unit controls the operation of each subsystem. Controlling is achieved through signals sent from the control unit to other subsystems.

The system concept

A system has following three characteristics:

1. A system has more than one element
2. All elements of a system are logically related
3. All elements of a system are controlled in a manner to achieve the system goal