

Functions and Components of A Computer

A computer does mainly the following functions:

Receive Input: Accept raw data through various input device like keyboard, mouse

Process Information: perform arithmetic and logical operations on any piece of information

Produce Output: Display information through output devices monitor, printer

Store Information: Store information in storage devices like hard disk, CDs for future reference

All the above listed functions are performed smoothly in presence of both the hardware and the software.

Hardware:

Hardware is a general term that refers to the physical, mechanical and electronic artifacts of a technology which can be touched, seen and felt. They are the devices capable of accepting and storing computer data, executing a systematic sequence of operations on computer data, or producing control outputs. Such devices can perform substantial interpretation, computation, communication, control, or other logical functions.

Software:

Software is a general term used to describe a collection of computer programs, procedures and documentation that perform some tasks on a computer system. They are the programs that enable a computer to perform a specific task. This includes application software such as a word processor, which enables a user to perform a task, and system software such as an operating system, which enables other software to run properly, by interfacing with hardware and with other software.

Central Processing Unit (CPU)

A central processing unit (CPU), or sometimes simply processor, is the component in a digital computer that interprets instructions and processes data contained in computer programs. CPUs provide the fundamental digital computer trait of programmability, and are one of the necessary components found in computers of any era, along with primary storage and input/output facilities.

On large machines, CPUs require one or more printed circuit boards. On personal computers and small workstations, the CPU is housed in a single chip called a microprocessor. Since the 1970's the microprocessor class of CPUs has almost completely overtaken all other CPU implementations.

A CPU has two parts – the Control Unit (CU) and the Arithmetic and Logic Unit (ALU)

Control Unit

The control unit tells the computer system how to carry out a program instruction. It is a typical component of the CPU that implements the microprocessor instruction set. It extracts instructions from memory and decodes and executes them, and sends the necessary signals to the ALU to perform the operation needed. Control Units are either hardwired or micro-programmed.

Arithmetic and Logic Unit (ALU)

The arithmetic and logic unit is the part of a computer that performs all arithmetic computations, such as addition, subtraction, multiplication and division. It also performs the logical operations like comparison between data. Besides these operations some processors also supports operations which check if particular bits are on or off.

Memory

Memory, also known as the primary storage, is the storage point in the computers that holds data for processing, instructions for processing the data (the program) and information (processed data). The content of primary memory is volatile and stored until there is a supply of electricity.

Registers

These are the additional memory locations in the CU and ALU to make processing more efficient. They are the special hi-speed storage areas that hold data and instructions temporarily during processing. The important registers within CPU the are, Program Counter (PC) that keeps track of next instruction to be executed and the Instruction Register(IR), which holds instruction to be decoded by the control unit.

Addresses

The characters of data or instructions in the main memory of the computers are stored in certain locations known as the address designated by a unique number. Each cell in memory has an address, which is used to refer to that cell. To get data from memory, a program gives the address of the cell that holds the data. To put data into memory, a program gives the address of the cell which will hold the data.

How do the CPU and memory work?

1. The control unit recognizes that the program has been loaded into memory and begins to execute the first step of the program.
2. The program tell the user to enter the first number.
3. The user enters 10 from the keyboard. An electronic signal is sent to the CPU.
4. The control unit recognizes this signal and routes the signal to a memory address – 7.
5. After completion of the above instruction, the next instruction tells user to enter another number.
6. The user enters 4 from the keyboard. An electronic signal is sent to the CPU.
7. The control unit recognized this signal and routes the signal to a memory address – 8.
8. The next program instruction is executed – Multiply 1st and 2nd numbers.
9. To execute this instruction, the control unit informs the ALU that two numbers are coming and the ALU is to multiply them. The control unit next sends to the ALU a copy of the contents of addresses 7 (10) and 8 (4).
10. ALU performs the multiplication: $10 \times 4 = 40$
11. The control unit sends a copy of the multiplication result (40) back to memory to address 9.
12. The next program instruction is executed: "Print the result"
13. To execute this instruction, the control unit sends the contents of the address 9 (40) to the monitor.
14. Monitor displays the value 40
15. Final Instruction is executed: "End" The program is complete.