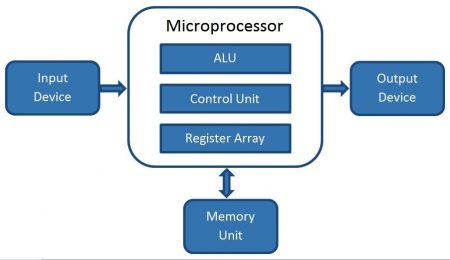
What is a Microprocessor ?

A microprocessor is an integrated circuit (IC) which incorporates core functions of a computer’s central processing unit (CPU). It is a programmable multipurpose silicon chip, clock driven, register based, accepts binary data as input and provides output after processing it as per the instructions stored in the memory.

Block Diagram of a Computer

[](https://electrosome.com/wp-content/uploads/2017/04/Block-Diagram-of-a-Computer.jpg)

*Block Diagram of a Computer*

How does a Microprocessor work ?

A processor is the brain of a computer which basically consists of Arithmetical and Logical Unit (ALU), Control Unit and Register Array. As the name indicates ALU performs all arithmetic and logical operations on the data received from input devices or memory. Register array consists of a series of registers like accumulator (A), B, C, D etc. which acts as temporary fast access memory locations for processing data. As the name indicates, control unit controls the flow of instructions and data throughout the system.

So basically a microprocessor takes input from input devices, process it as per instructions given in the memory and produces output.

Advantages of a Microprocessor

* **Low Cost**

Microprocessors are available at low cost due to integrated circuit technology. Which will reduce the cost of a computer system.

* **High Speed**

Microprocessor chips can work at very high speed due to the technology involved in it. It is capable of executing millions of instructions per second.

* **Small Size**

Due to very large scale and ultra large scale integration technology, a microprocessor is fabricated in a very less footprint. This will reduce the size of the entire computer system.

* **Versatile**

Microprocessors are very versatile, the same chip can be used for a number of applications by simply changing the program (instructions stored in the memory).

* **Low Power Consumption**

Microprocessors are usually manufactured using metal oxide semiconductor technology, in which MOSFETs (Metal Oxide Semiconductor Field Effect Transistors) are working in saturation and cut off modes. So the power consumption is very low compared to others.

* **Less Heat Generation**

Compared to vacuum tube devices, semiconductor devices won’t emit that much heat.

* **Reliable**  
  Microprocessors are very reliable, failure rate is very less as semiconductor technology is used.
* **Portable**  
  Devices or computer system made with microprocessors can be made portable due to the small size and low power consumption.

Common Terms used in a Microprocessor

Here are some common terms that we will use in microprocessor field.

Bus

A bus is a set of conductors intended to transmit data, address or control information to different elements in a microprocessor. Usually a microprocessor will have 3 types of buses : Data Bus, Control Bus and Address Bus. An 8-bit processor will be using 8-bit wide bus.

Instruction Set

Instruction set is the group of commands that a microprocessor can understand. So instruction set is an interface between hardware and software (program). An instruction commands the processor to switch relevant transistors for doing some processing in data. For eg. ADD A, B; is used to add two numbers stored in the register A and B.

Word Length

Word Length is the number of bits in the internal data bus of a processor or it is the number of bits a processor can process at a time. For eg. An 8-bit processor will have an 8-bit data bus, 8-bit registers and will do 8-bit processing at a time. For doing higher bits (32-bit, 16-bit) operations, it will split that into a series of 8-bit operations.

Cache Memory

Cache memory is a random access memory that is integrated into the processor. So the processor can access data in the cache memory more quickly than from a regular RAM. It is also known as CPU Memory. Cache memory is used to store data or instructions that are frequently referenced by the software or program during the operation. So it will increase the overall speed of the operation.

Clock Speed

Microprocessors uses a clock signal to control the rate at which instructions are executed, synchronize other internal components and to control the data transfer between them. So clock speed refers to the speed at which a microprocessor executes instructions. It is usually measured in Hertz and are expressed in megahertz (MHz), gigahertz (GHz) etc.

Classification of Microprocessors

Based on Word Length

Hope you read about word length above. So based on the word length of a processor we can have 8-bit, 16-bit, 32-bit and 64-bit processors.

RISC – Reduced Instruction Set Computer

RISC is a type of microprocessor architecture which uses small, general purpose and highly optimized instruction set rather than more specialized set of instructions found in others. RISC offers high performance over its opposing architecture CISC (see below). In a processor, execution of each instruction require a special circuit to load and process the data. So by reducing instructions, the processor will be using simple circuits and faster in operation.

* Simple instruction set
* Larger program
* Consists of large number of registers
* Simple processor circuitry (small number of transistors)
* More RAM usage
* Fixed length instructions
* Simple addressing modes
* Usually fixed number of clock cycles for executing one instruction

CISC – Complex Instruction Set Computer

CISC is the opposing microprocessor architecture for RISC. It is made to reduce the number of instructions per program, ignoring the number of cycles per instruction. So complex instructions are directly made into hardware making the processor complex and slower in operation.

This architecture is actually designed to reduce the cost of memory by reducing the program length.

* Complex instruction set
* Smaller program
* Less number of registers
* Complex processor circuitry (more number of transistors)
* Little RAM usage
* Variable length instructions
* Variety of addressing modes
* Variable number of clock cycles for each instructions

Special Purpose Processors

There are some processors which are designed to handle some specific functions.

* DSP – Digital Signal Processors
* Coprocessors – processors used along with a main processor (8087 math-coprocessor used with 8086)
* Input/Output processors
* Transputer – Transistor Computer : Microprocessor with its own local memory