

Differences in Microcomputer, Microprocessor and Microcontroller

Microcontroller Microprocessor Computers

Let us discuss Microcomputer, Microprocessor, and Microcontroller in this article and also to highlight their respective differences in between.

Microcomputer

A microcomputer can be defined as a small sized, inexpensive, and limited capability computer. It has the same architectural block structure that is present on a computer. Present-day microcomputers are having smaller sizes. Nowadays, they are of the size of a notebook. But in the coming days also their sizes will get more reduced as well. Due to their lower costs, individuals can possess them as their personal computers. Because of mass production, they are becoming still cheaper. Initially, in the earlier days, they were not very much powerful. Their internal operations and instructions were very much limited and restricted. But at present days, microcomputers have not only multiplied and divide instructions on unsigned and signed numbers but are also capable of performing floating point arithmetic operations. In fact, they are becoming more powerful than the minicomputers and main computers of yesteryear.





As an example, the Commodore 64 was one of the most popular microcomputers of its era and is the best-selling model of home computer of all time.

So a microcomputer is a small, relatively inexpensive computer with a microprocessor as its central processing unit (CPU). It includes a single printed circuit board containing a microprocessor, memory, and minimal input/output(I/O) circuitry mounted. With the advent of increasingly powerful microprocessors, microcomputers became popular in the 1970s and 1980s. The predecessors to these computers, mainframes, and minicomputers, were comparatively much larger and more expensive(though indeed present-day mainframes such as the IBM System z machines use one or more custom microprocessors as their CPUs). Also, we can mention that many microcomputers, in the generic sense, (when equipped with a keyboard and screen for input and output) are also personal computers.

Microprocessor

The processor on a single chip is called a Microprocessor which can process micro-instructions. Instructions in the form of 0s and 1s are called micro-instructions. The microprocessor is the CPU part of a microcomputer, and it is also available as a single integrated circuit. Thus as main components, the microprocessor will have the Control Unit (CU) and the Arithmetic Logic Unit (ALU) of a microcomputer. An example is Intel 8085 microprocessor. In addition to the microprocessor features, a microcomputer will have the following additional features:

- ROM/PROM/EPROM/EEPROM for storing program
- RAM for storing data, intermediate results, and final results
- I/O devices for communication with the outside world
- I/O ports for communication with the I/O devices.

In the present-day world, Microprocessors are extensively used. Before the microprocessor's invention, the logic design was done by hardware using gates, flip-flops, etc. A mini-computer was too much costly. With the advent of the microprocessor, logic design using hardware has been mostly replaced. It provides flexibility instrumentation where the characteristics of the system can be changed just by changing the software. Also, new generations of applications have surfaced, which were not thought of earlier because of the prohibitive cost of a minicomputer or the complexity of logic design using hardware.

Some of the applications where microprocessors have been used are listed below –

- Business applications such as desktop publishing
- Industrial applications such as power plant control
- Measuring instruments such as multimeter
- Household equipment such as washing machine
- Medical equipment such as blood pressure monitor
- Defense equipment such as light combat aircraft;
- Computers such as a personal computer

Microcontroller

A Microcontroller is a small and low-cost microcomputer, which is designed to perform the specific tasks of embedded systems like displaying microwave information, receiving remote signals etc.

The general microcontroller consists of the processor, the memory (RAM, ROM, EPROM), Serial ports, peripherals (timers, counters) etc.

Types of Microcontrollers

Microcontrollers are divided into various categories based on memory, architecture, bits and instruction sets. Following is the list of their types –

- Bit – Based on bit configuration, the microcontroller is further divided into three categories.
 - 8-bit microcontroller – This type of the microcontroller is used to execute arithmetic and logical operations like addition, subtraction, multiplication division, etc. For example, Intel 8031 and 8051 are an 8-bit microcontroller.
 - 16-bit microcontrollers – This type of the microcontroller is used to perform arithmetic and logical operations where higher accuracy and performance is required. Forexample, Intel 8096 is a 16-bit microcontroller.
 - 32-bit microcontrollers – This type of the microcontroller is generally used in automatically controlled appliances like automatic operational machines, medical appliances, etc.
- Memory – Based on the memory configuration, the microcontroller is further divided into two categories.
 - External memory microcontroller – This type of microcontroller is designed in such a way that they do not have a program memory on the chip. Hence, it is named as external memory microcontroller. For example Intel 8031 microcontroller.
 - Embedded memory microcontroller – This type of microcontroller is designed in such a way that the microcontroller has all programs and data memory, counters and timers, interrupts, I/O ports are embedded on the chip. For example Intel 8051 microcontroller.
- Instruction Set – Based on the instruction set configuration, the microcontroller is further divided into two categories.
 - CISC– CISC stands for complex instruction set computer. It allows the user to insert a single instruction as an alternative to many simple instructions.
 - RISC– RISC stands for Reduced Instruction Set Computers. It reduces the operational time by shortening the clock cycle per instruction.

Applications of Microcontrollers

Microcontrollers are widely used in various different devices such as –

- Light sensing and controlling devices like LED.
- Temperature sensing and controlling devices like a microwave oven, chimneys.
- Fire detection and safety devices like the Fire alarm.
- Measuring devices like Volt Meter.