

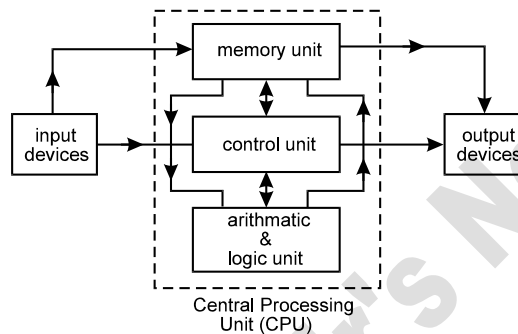


1.44 INTRODUCTION

In the previous six chapters, we have studied the fundamentals of computer hardware. Now in this last chapter, we shall study the simple and fundamental concepts of general purpose computer system. The computer consists of main section as CPU along with input and output devices. It also contains semiconductor memory and auxiliary memory. We shall study all these fundamental concepts in the following pages.

1.45 BLOCK DIAGRAM OF A COMPUTER

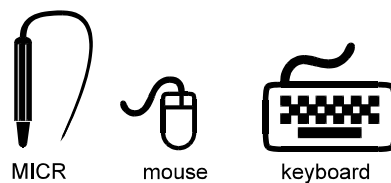
Following figure shows the basic block diagram of general-purpose computer. It has following main blocks or sections as given below.



1.45.1 INPUT OUTPUT DEVICES

The input output devices act as the interface between the human and the computer. The input device gives information as commanded by the human to the central processing unit (CPU). The information is in the form of logic-1 and logic-0. i.e. it is in coded form, which is 'understood' by the computer. It is then processed and produced as the result on the output devices. There is a large variety of input/output devices. Some of them are given below.

Keyboard: It is the most important and common input device. It is just like the keypad of old typewriter. It is available in different languages.



Mouse: It is particularly used in graphics applications. It gives the visual idea of x - y coordinates to move the *cursor* over the screen of computer's monitor.

MICR: MICR means magnetic ink character reader. It is used to read the coded information (data) on bar code. The bar codes are generally printed on electronics products, books etc.

Floppy disk: It works as both input/output device. It is the old type of media on which the information can be stored in the form of magnetic impressions (*like in audiocassette*) for future use.



Compact disc (CD): It is the modern input/output device. It has very high storage capacity up to 700MB. Its different types are: CD-R, CD-RW etc.

Magnetic disk: It is a type of both input and output device. Its working is similar to an audiocassette.

Visual display unit (VDU) or monitor: It is the main output device in computer. On this, we can all the activities and processes done by the computer.

Dot matrix printer, laser printer, ink-jet type color printer: These are used particularly in document or object printing.

The x-y plotter: It is used in the recording and monitoring of seismic activities of earth. It is also used in plotting complicated drawings like industrial plans, site plans, machine plans etc.

1.45.2 CENTRAL PROCESSING UNIT

The CPU consists of three main parts as given below –

Control unit: It is used for the controlling and processing the information (data) within the CPU. The data may be either in calculated form or in comparison form. This data is passed towards output after processing.

Memory unit: It is used to store the data and programs. The ALU constantly refers to the memory block to act on the input data. The memory basically consists of two parts –

Random Access Memory (RAM): It is a temporary state of memory. When power supply is switched OFF every bit of data stored in is lost.

Read Only Memory (ROM): It is the permanent memory. When power supply is switched OFF, it remains as it is!

Arithmetic & Logic unit (ALU): It performs both arithmetic and logical operations. In all, there are four arithmetic operations – addition (+), subtraction (–), multiplication (×) and division (÷) and three logic operations – less than (<), greater than (>) and equal to (=). The ALU consists of adder, subtractor, comparator etc. to perform all these operations as required.

1.45.3 ADDRESS AND DATA BUS

The input output devices and the CPU are interconnected through two bunch of conducting wires called as address bus and data bus. *The address bus is unidirectional.* The CPU sends the related address code of the required memory or any other device, which it selects for operation. The greater is the width of address bus (i.e. number of wires in it) the higher is the memory handling capacity of the CPU. *The data bus is bidirectional.* On this bus, the CPU can transfer the data to and fro.

1.46 TYPES OF MEMORIES

Auxiliary memory: There is one more facility of auxiliary memory (*also called Hard Disk Drive–HDD*) for the computer (*not shown in the block diagram*). It is used to extend the storage capacity. It is also called as secondary memory and it is always connected externally with the CPU.

Semiconductor memories: It has seven different types. This memory is faster than the auxiliary memory. It is available in different configuration like 1kB, 16kB, 32kB, 64kB 1MB, 64MB, 128MB etc. Here note that 1kB of memory means it has 1024 memory cells (*i.e. flip-flops*) to store 1024 bits of information. Following are its types given in details –

Random Access Memory (RAM): When it is required to change the data contents of memory constantly whenever required, the RAM is used. Since its data content can be changed if and when required, it is called as scratch pad or read/write memory. The data is stored it at random locations. Each cell used in RAM is a small flip-flop made-up of bipolar transistors or MOSFETs. This memory retains its stored data as long as the power supply is running. Once the power supply is cutoff, all the contents in it are lost. Hence, it is called as volatile memory. There are two sub types of RAM as follows –

Static RAM: In this type of RAM, as long as its power supply is on, the stored data remains as it is! Due to this, the stored data constantly draws electrical energy from the power supply. Hence, the total power consumption of the RAM increases. Therefore, it is used in medium size memory applications.

Dynamic RAM: In this type of RAM, the data is stored again and again with a particular rate. This happens because, the memory cells have inter-electrode capacitance, which discharges internally and the data in it is lost after a short delay. Hence, the memory contents are refreshed repeatedly. To refresh, a timing signal is produced periodically. Due to such refreshing, the power consumption of this memory is very less.

Read Only Memory (ROM): It is subdivided into following main types –

Mask Programmable ROM: This is the simple ROM. It is used by the primary manufacturers, who decide to store a specific data, for their special system or products (*like medical equipments, weighing machines, etc.*). Once this memory is programmed, its data content cannot be altered.

Programmable Read Only Memory (PROM): It is a blank ROM available in the market for general user. Anyone can purchase this memory and program it as required. Once programmed, it becomes ROM. Thus, this memory can be written *ONCE* only.

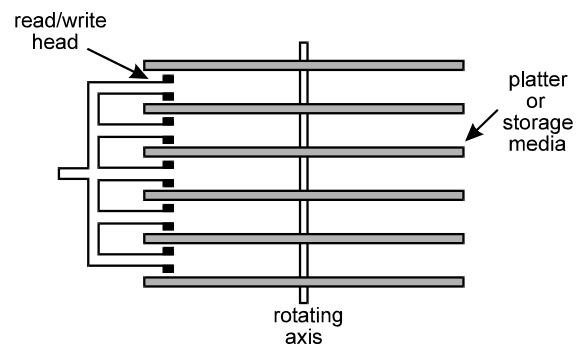
Erasable & Programmable Read Only Memory (EPROM): This memory can be programmed a number of times. Once the data is written in it, it remains intact even if its power supply is cutoff. To reprogram it, it is exposed to ultraviolet light. There are two disadvantages of EPROM: It must be disconnected from the main circuit, before reprogramming. Sometimes the old data is not cleared properly, with UV radiations, and if it is then reprogrammed, we cannot clear old fragments of data.

Electrically Altered Programmable Read Only Memory (EAPROM): In this type of memory the data is altered by applying external electrical voltage. Due to this procedure, it is not necessary to disconnect the memory from the main circuit. The time required for alternating the data is very small.

1.47 SECONDARY MEMORIES (AUXILIARY MEMORIES)

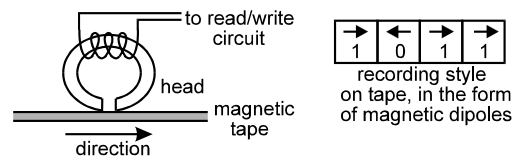
This memory has a very large storage capacity. It is externally connected to CPU. The auxiliary memory is useful for storing large-size programs and data, even after the supply of the computer is switched off. There are many types of such memories available in the market. Some of them are given below –

Hard Disk: It is a magnetic storage device. It contains a number of flexible platters (disks). Each platter is coated with iron oxides on both sides. The data is recorded on the surface of platters, in the form of magnetic impression (*just like the audio/video cassette*). It can be read, retrieved, or altered as and when required. All the platters rotate simultaneously on a common axis, at a speed of about 1800 to 7500 r.p.m. A sectional view of hard disk is shown here. There are six platters parallel to each other and separated by some distance. The read/write heads (*which contain tiny coils*) are independently arranged on both sides of platters. They move to and fro, to read or write the data from/on the disks. The read/write heads are fitted at a distance of $10\mu\text{m}$ - $25\mu\text{m}$ from the surface of each platter. The data transfer on/from the disk is either in serial or in parallel form. The surface of each platter is subdivided into a number of concentric tracks called as sectors. Each sector is further subdivided into number of clusters. The cluster is the smallest amount of disk space that can be allocated to hold a file. A cluster is also called as allocation unit. The total assembly is fitted in a sealed enclosure to protect it from dust.



Floppy disks: A floppy disk is *also used as auxiliary memory*. However, its storage capacity is smaller than the hard disk. It is called as floppy because its disk is made up of flexible plastic. It is coated with iron oxides. The data is recorded on it, in the form of magnetic impressions. A floppy disk is available in two types – 3.5”size (with 1.44MB capacity) and 5.25”size (with 1.2MB capacity). *The floppies are very slow in reading/writing the data*. Their rotating speed is about 366 r.p.m. and the data transfer rate is about 20kB/sec. The flexible disk is enclosed in a square plastic/cardboard envelop i.e. cartridge. The cartridge protects the sensitive disk surface from outer dust and physical damage.

Magnetic tape: It is a sequential accessible auxiliary memory (*its working and read/write style is same as the audio/video cassette*). It is used in *extremely large* storage of data. However, it is non-addressable memory, because the data is written on it one after another in a particular sequence. So if we want to access a particular type of data, the system searches for it by momentarily accessing each cluster of *whole data*. Hence, it is very slow in both reading and writing. It has two reels on both sides on which a plastic tape of $\frac{1}{2}$ ” width is wound. The plastic tape is coated with iron oxides on which the data is recorded by the read/write head, in the form of magnetic impressions of dipoles (either a 1 or a 0) as shown above. *Data is recorded on it in EBCDIC code.*



Compact Disc Read Only Memory (CDROM): It is advanced version of floppy disk, having very large storage capacity. The data is recorded on it in the form of binary codes. The audio/video songs can also be recorded on it. This device uses sharp laser beam to read/write the data on the disc. The disc is coated with laser sensitive material and during writing the data, the material actually burns to store the data on it. Basically, there are two types of CDs available in the market – the CD-R (Writable Once/Read many times) and the CD-RW (Writable & Readable many times). The CDs are available in the storage capacity of up to 750MB. It is the modern type of storage device, which is handy and very easy to operate.

1.48 SPECIFICATIONS OF PC

To purchase a PC the user must know some important specifications of the computer, so that it will be best suited for a particular type of work. Generally, the computer is used in desk-top-processing (DTP) work, various job works, accounting works, graphics works, programming, architecture work etc. While purchasing the computer, one must ask some important questions as –

- What is the speed of the computer i.e. how fast it is?
- What are the types of *peripherals* available with it?
- How latest is the computer and its peripherals used in it?

There are some important terminologies about the PC. They are categorized according to their types and working capacities. In the beginning, the PC was only a standard PC i.e. without hard disk and with a small memory to handle the process. The standard PC then modified to PC-XT (*having multitasking environment*). The XT stands for extended technology. After that, the today's modified version PC-AT is available in the market. The AT stands for Advanced Technology. This PC-AT starts with the processors of 286, 386, and 486, Pentium (plane), Pentium-II, and Pentium-III etc. All these machines are the Intel products, where the 286, 486 etc. are the processor specifications, which gives the idea of its data-address buses capacity. In a general type of computer, the manufacturer gives following specifications –

- Clock frequency:** This specifies the processing speed of the computer.
- Processor type:** Either 286, 486 etc.
- Storage capacity:** The storage capacity of hard disk, type of floppy drive(s) and its size of storage capacity– either 1.2MB or 1.44MB.
- Cache memory:** The size of RAM and BIOS (*Basic Input Output System*).
- Extended memory:** The actual useful part of RAM size.
- Serial and parallel ports:** The different sockets of computer to connect the input–output devices, like printer, MODEM, mouse, keyboard etc.
- Other facilities:** Like multimedia kit, external modem, etc.