10 Inside a Computer

You are familiar with the general structure and functions of a computer. A computer is a system formed by assembling a number of components.

The system unit, monitor, keyboard, mouse etc. are the essential components of a computer and this functions are regulated by electronic parts. Before going into their details, let us recollect our ideas about computers.

What we have already learnt

- *Computers of different types and sizes are available today.*
- *The commonly used computers come under the category of 'Personal Computer' (PC).*
- *Parts of a personal computer are controlled by the system unit.*
- *Keyboard, mouse, scanner, track ball, digital camera, web camera, joy stick etc. are input devices and monitor, printer, speaker, LCD projector etc. are output devices.*
- *Hard disk, floppy disk, compact disk, memory stick etc. are the storage media.*
- *Modem is both an input and output device.*
- *The efficiency of a computer depends on the complementary functioning of hardware and software.*
- *Units like Mega Hertz (MHz), Giga Hertz (GHz) etc. are used to indicate the speed of a computer.*
- *Units like Mega Bytes (MB), Giga Bytes (GB) etc. indicate the storage capacity of the Hard disc, and memory in a computer.*
- *The most important part of a computer is its processor.*

All the parts of a computer are internally built by using electronic components. The electronic components and their internal connection with in the system unit of a computer is discussed in this chapter.

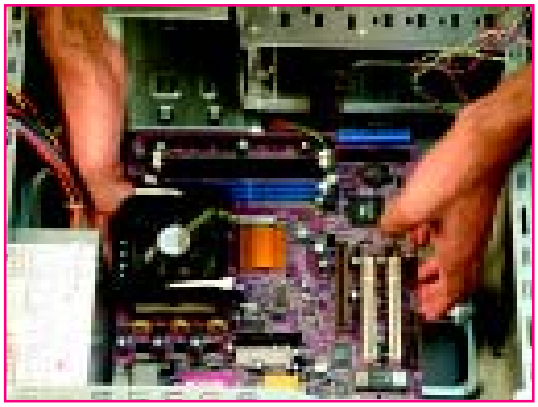


Figure 10.1 Components of a computer

1. Mother Board

The mother board is a circuit board to which all the electronic components of a computer are connected. These include both internal parts of the system unit like processor, display card of the monitor, sound card, memory etc. and external parts like mouse, keyboard etc. The 'ports' and 'slots' which connect these components also exist in the motherboard. The circuits in the motherboard help in data transfer among the components. The important parts of a mother board are:

- Processor socket
- Memory slots
- Interfase slots
- Ports

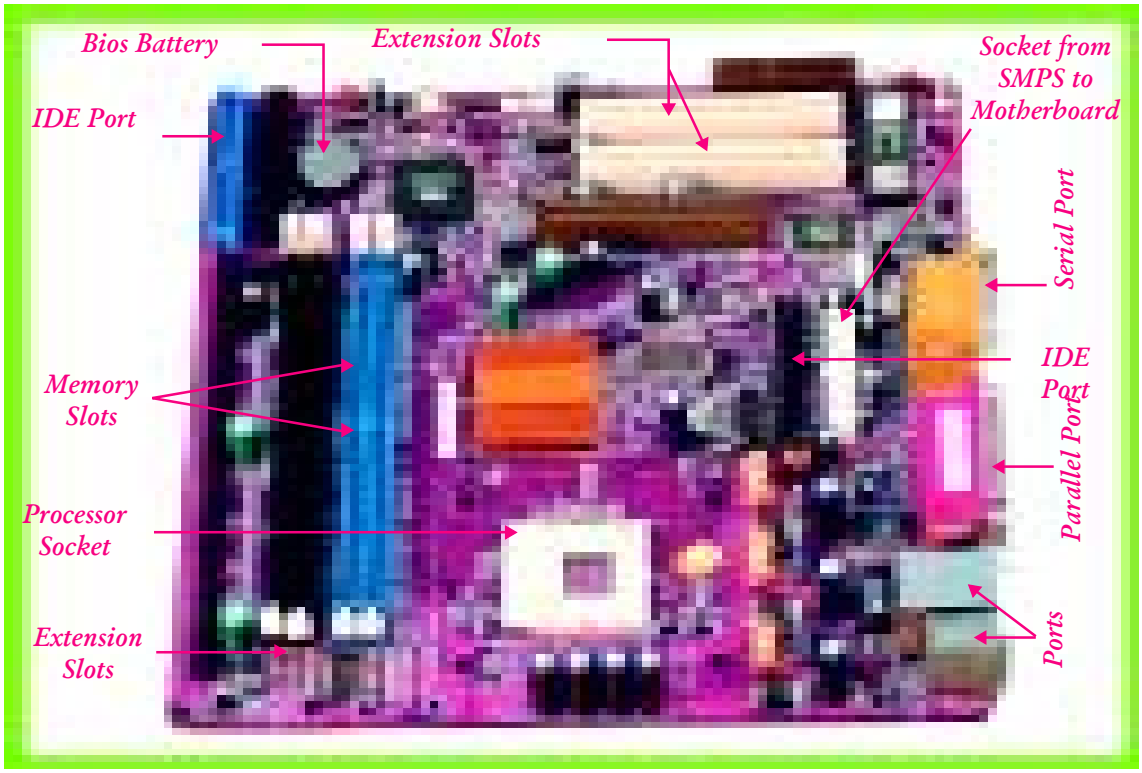


Figure 10-2 Motherboard of a computer

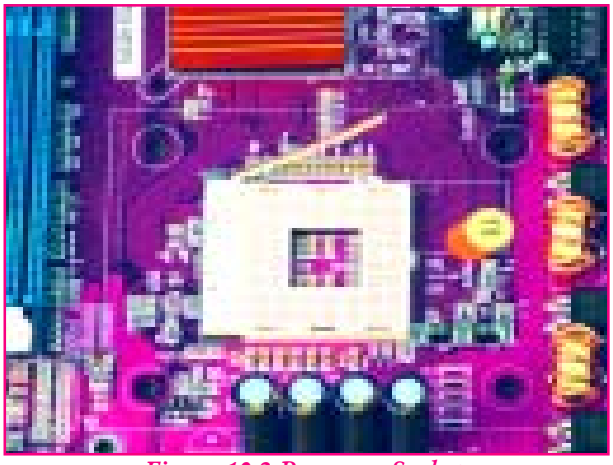


Figure 10-3 Processor Socket

2. Processor Socket

The processor socket is used to fix the processor in a computer. Different kinds of mother boards are available today, depending upon the size and the number of pins in a processor.

3. Processor

The brain of a computer is its processor. The processor in a modern computer is an Integrated Circuit (IC) chip. A chip consists of millions of transistors and capacitors which can process the data obtained through input devices and transfer the result to the output units.

Figure 10-4 Processor

Processors from different companies are available today. Intel-Pentium IV, Xeon, Celeron, AMD-Athlon, Cyrix M3 etc. are popular among them.

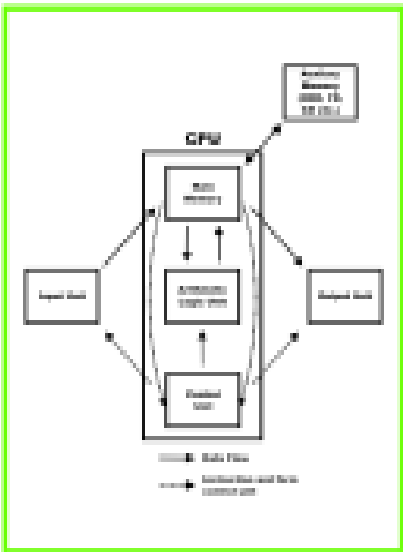


Figure 10-5 Block Diagram showing the workig of units of a processor

Arithmetic and Logic Unit & Control Unit (ALU & CU)

The two main parts of a processor are Arithmetic and Logic Unit (ALU) and Control Unit (CU). The function of the ALU is to do the processing and mathematical calculations of the information obtained through input devices. The control unit sorts this information and sends it to the different parts of the computer like the manager of an office. The control unit organises and coordinates various functions of a computer. The orderly and fast functioning of a computer indicates the efficiency of the control unit.

A fan is often fixed on the processor to remove the heat generated by continuous activity. This is known as the processor fan.

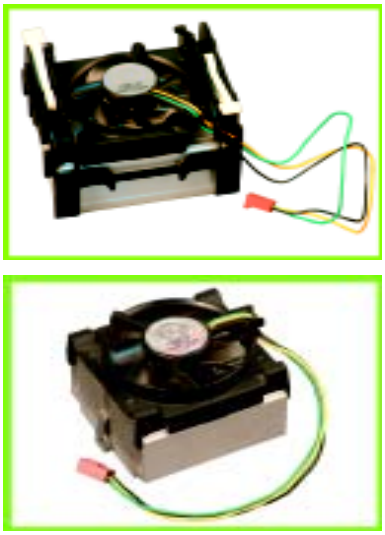


Figure 10-6 Processor Fan

Interface Cards or Add-on Cards

Interface cards are the circuit boards which connect the equipment outside the system unit with the mother board. These are connected to the slots of the mother board in such a manner that the ports to which the external equipment are to be connected can be seen externally. The TV tuner card used to watch television programmes in a computer, the sound card is used to hear and record sounds, the network card is used to interconnect several computers are examples of add-on-cards.

Figure 10-7 Different types of interfase cards

Interface Slots

How will you connect an add-on-card to the mother board? Interface slots will help you. The slots present in a motherboard used to connect add-on-cards to it are called interface slots. (Figure 10.8)

Memory Slots and Memory Cards

You know how important memory is for a computer. Information for the functioning of a computer is temporarily stored in a chip called RAM (Random Access Memory). The slot where by which the RAM board which has to interact constantly with the motherboard is fixed to the motherboard is called memory slot. Among the various kinds of RAM in use, DDR (Double Data Rate) is presently the most popular. RAM is also an integrated circuit. There are several RAM slots in a motherboard.

Figure 10-8 Interfase slots in a motherboard

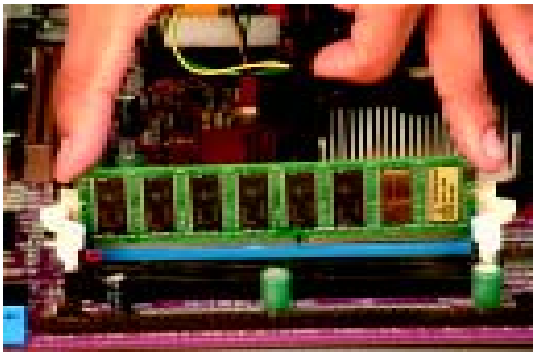


Figure 10-9 Connecting a memory card to a memory slot

Ports (Connectors)

A computer system becomes complete only when different parts are put together and they communicate properly. The connection of the parts within and outside the system unit is done using ports or connectors.

These ports are connected directly to the motherboard or through add-on-cards. The internal communication in a motherboard takes place through the tiny circuits printed on it.

We can connect a computer to another computer to an input-output device or to a data storage device. Let us study the different kinds of ports.

Figure 10-10 (a) Hard Disc Drive

Figure 10-10(b) CD Drive

1. IDE Port

Integrated Device Electronics (IDE) port is used to connect a hard disc, CD Rom drive, CD writer or a DVD drive to a motherboard. There are two such ports in a motherboard – primary and secondary. Two devices can be connected to each port.

Figure 10-11 Connecting IDE cable to IDE port

2. FDD Connector

The Floppy Disk Drive (FDD) connector is used to connect a floppy drive to the mother board. The size of the FDD connector and the number of pins in it are smaller than those of an IDE connector.

Figure 10-12 FDD Connector

3. Serial Port or Communication Port

Serial port is used to connect the

mouse and modem. They are called Com 1 and Com 2. 'Com' is the short form of communication. Usually, in a communication port there are either nine or twenty five pins.

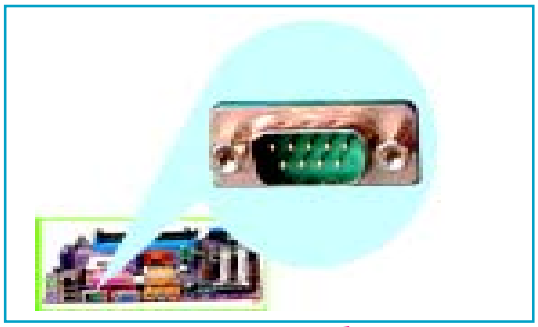


Figure 10-13 Serial Port

4. Parallel Port

In a parallel port, there are holes to connect pins. Subsidiary gadgets like printer, scanner etc. are connected though the parallel ports.

Figure 10-14 Parallel Port

5. USB Port

Universal Serial Bus (USB) port is a kind of port available in modern computers. Many devices can be connected in series on the same USB. In comparison with serial and parallel ports, a large amount of data can be transferred at a very high speed though USB ports. All peripherals like printer, modem and scanner are now available in versions that can be connected to the USB port. Two or more USB ports are normally seen in a motherboard.

Figure 10-15 USB Port

6. Power Port

The electrical supply for the working of the computer can be provided through the power port. Power port is located at SMPS, the power monitoring unit of the system of a computer.

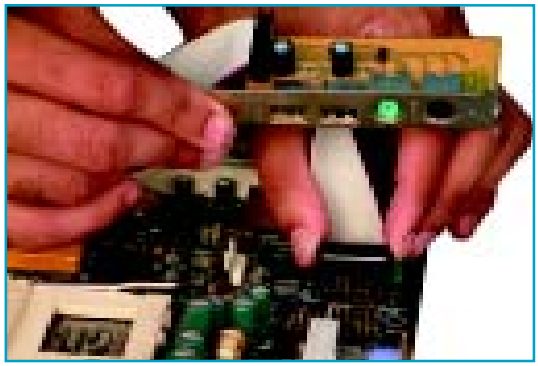


Figure 10-16 A USB port connected with many equipments

SMPS

Each port of a computer requires electric current in different quantities. The power unit of the computer namely the

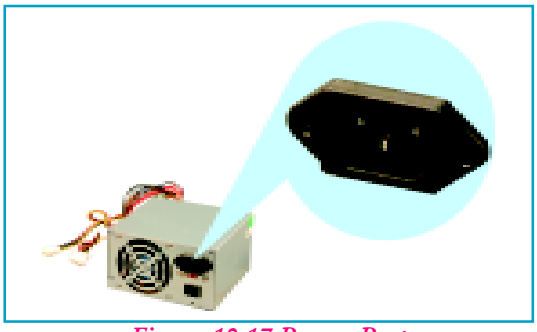


Figure 10-17 Power Port

Switched Mode Power Supply (SMPS) converts the current obtained form a line into small units required for each of the components like motherboard, hard disk, floppy disk, CD drive etc. We can see an electric connection port and a switch at the back of the SMPS. For heat radiation a small fan is also attached in an SMPS.

Figure 10-18 SMPS

BIOS

The process of activating a computer after switching on is called 'Booting'. How does the computer get the commands for booting? These commands are permanently recorded in a separate chip called BIOS and it is fixed in the motherboard. BIOS is the short form of Basic Input Output System. When we switch on a computer the BIOS first checks the working condition of each part of the computer. BIOS checks the hard disk and the memory during booting. Activation of BIOS is otherwise called POST (Power On Self Test).

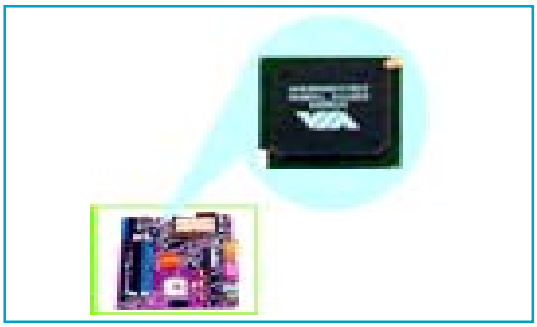


Figure 10.19 BIOS Chip

Being a ROM, the commands in a BIOS are permanent and will be safe even during a sudden power failure.

Device Drivers

We studied about the various devices that form the different parts of a computer. Simply interconnecting of these parts will not make a computer function. The 'Operating System' of the computer must know how to establish communication with each part. For each component, the path of communication may be different. For example, the communication methods to a printer won't be the same as that to a scanner.

Device Drivers are the software that directs the communication between a computer and an associated equipment. When an external equipment is connected to a computer, the specific device drivers required to operate it must be installed. Device Drivers for each device will be provided in CDs or floppies by the manufacturers along with the machine. We can even download the device drivers from the website of the manufacturing company.

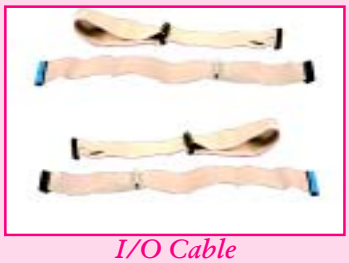
The Operating systems like Windows and GNU/Linux already contain the device drivers of all the computer equipments now available in the market. So the connection of these external equipments are very convenient.

Trouble Shooting

Trouble shooting is a speciality in computer maintenance through which we can identify the problems of a system and solve them.

Communication Paths of a Computer (BUS)

Data transfer in a computer is possible only when the ports and connectors in the motherboard and add-on-cards are connected to the devices in the system unit and to the attached instruments outside. Usually input-output devices like monitor, keyboard, mouse, printer etc. are connected behind the system unit using wires or cables.



I/O Cable

The components inside the system unit like floppy drive, hard disk drive, CD ROM drive etc. are connected to the respective ports of the motherboard using broad cables that look like tapes. These cables are called I/O cables. These I/O cables and the circuits in the motherboard together form the communication path or BUS of the computer.

The following chart (Figure 10.20) shows the common problems of a computer system, their causes and their remedies.

Common Problems of a Computer System

Problem	Problem Reason	Remedy
Monitor does not come on; system does not come on.	No power supply to the monitor or system unit	Check the power cable to the monitor; check the cable connection to the system unit
Indicator at the bottom of the monitor works, system unit is working, but nothing is visible in the monitor.	Data cable connection of monitor is not correct	Make sure that the data cable of the monitor is properly connected to the back of the system unit
POST and Booting doesn't take place after on of the system unit is switched on.	BIOS programme got corrupted or motherboard is not functioning	Approach computer experts
A message 'Key board not found' appears on the monitor screen; no booting	Keyboard is not connected properly	Connect the keyboard properly

Figure 10-20

* *We must be very vigilant to cut off the electric supply when we add or remove any additional instruments to a computer system.*

More activities for you

1. Make a labeled album of paper cuttings of pictures and news items of the components of a system unit.
2. Observe the parts of an open computer with the help of your teacher. Make a note on each part. Modify the notes prepared by viewing the internal parts of a computer from the resource CD supplied.
3. Learn more about the features in a mother board to accommodate additional facilities and note them down in your workbook.
4. Practice the 'computer assembling' demonstrated in the resource CD.
5. Draw a graphical representation of a motherboard using the software 'Paint' and label the position of various sockets, slots and ports.

6. You are not able to listen to music using your computer. What may be the reasons? List them.
   - Speakers are switched off.
   - Non availability of music files.
   -
   -
7. Describe a computer in your imagination which can provide more facilities to a user. Explain the features you proposes.
8. Collect the leaflets / brochures from different computer firms and compare the features with their prices. Conduct a seminar based on it in the class.
9. Observe a computer assembling process and note the mode of connecting different equipments to the motherboard.
10. Which of the following ports and slots have to be used when a computer is connected to another one. Put a ✓ mark in the box against each.
    - IDE Port ☐
    - Interface Slot ☐
    - Memory Slot ☐
    - SerialPort ☐
    - Network Port ☐
    - Communication Port ☐
11. Identify from among the following those that are not add-on-cards.
    - Display card
    - Sound card
    - Graphic card
    - Internal modem
    - Memory
    - Processor
12. Draw the diagram of a motherboard connected to the different components of a computer in your workbook and label the parts.
13. Identify from the following devices that can be connected to the different ports; write the letter to represent each against them in Fig. 10.21.

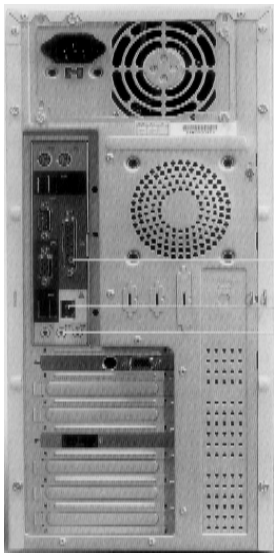


Figure 10-21 Picture which shows the different ports at the back of a system unit of a computer

(a) Monitor (b)Network Cable

(c) Mouse (d)Printer

(e) Modem (f) Speaker

(g) Joystick (h)Mike

(i) USB Modem (j) Keyboard

(k) Power cable

14. Identify the types of connection wires used to connect the following pairs of instruments. Use the symbols of connection wires given to connect them.

	Circuit 	**Cable** 
(a)	Display card	Monitor
(b)	CD Drive	Motherboard
(c)	Processor	RAM
(d)	Hard disk	IDE port
(e)	Power plug	Power port
(f)	FDD Connector	Floppy drive

15. Answer in two or three sentences.

(a) Processor fan is necessary – Why?

(b) What do you mean by a processor socket?

(c) What are the major parts of a processor?

(d) Distinguish between a processor socket and an interface slot.

(e) Display card, Network cards etc are add-on-cards – Why?

(f) Is there any problem in fixing memory cards in interface slots?

(g) What is BIOS?

(h) What is the function of BIOS?

(i) How does a control unit regulate the functions of a processor? Illustrate with a figure.

(j) What is the role of SMPS?

(k) Give the difference between an add on card and a memory card.

(l) State the need of interface slots on a motherboard.

16. Match the following:

Interface slot	-	Power chord
Processor socket	-	Display card
Serial port	-	Hard disk
Power port	-	Mouse
IDE connector	-	Micro processor
	-	Floppy drive

What we have learnt? A self assessment

1. Need of a motherboard in a computer.
2. Processor acts as the brain of a computer.
3. Functions of ALU and CU.
4. Need of Interface cards.
5. Use of Interface slots and ports in a motherboard.
6. Means of establishing communication with the different parts of a computer.
7. Need of SMPS
8. Function of a BIOS chip
9. Method by which an operating system recognizes the mode of communication with the external devices attached to a computer.
10. Common problems in the operation of a computer system.