

Introduction to Computer

Computers are seen everywhere around us, in all spheres of life, in the field of **education, research, travel and tourism, weather forecasting, social networking, e-commerce etc**. Computers have now become an indispensable part of our lives.

Computers have revolutionized our lives with their accuracy and speed of performing a job, it is truly remarkable.

Today, no organization can function without a computer. In fact, various organizations have become paperless. **Computers have evolved over the years from a simple calculating device to high speed portable computers.**



Definition: It is an electronic device that processes the input according to the set of instructions provided to it and gives the desired output at a very fast rate

Working: A computer can take data from the user through input devices (Input), process the user given data (Processing), produces the result to the user through output devices (Output) and stores data (Information) for future use

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Block Diagram of Computer

Block diagram of Computer

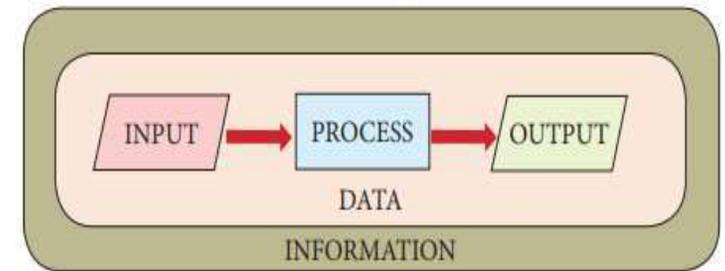
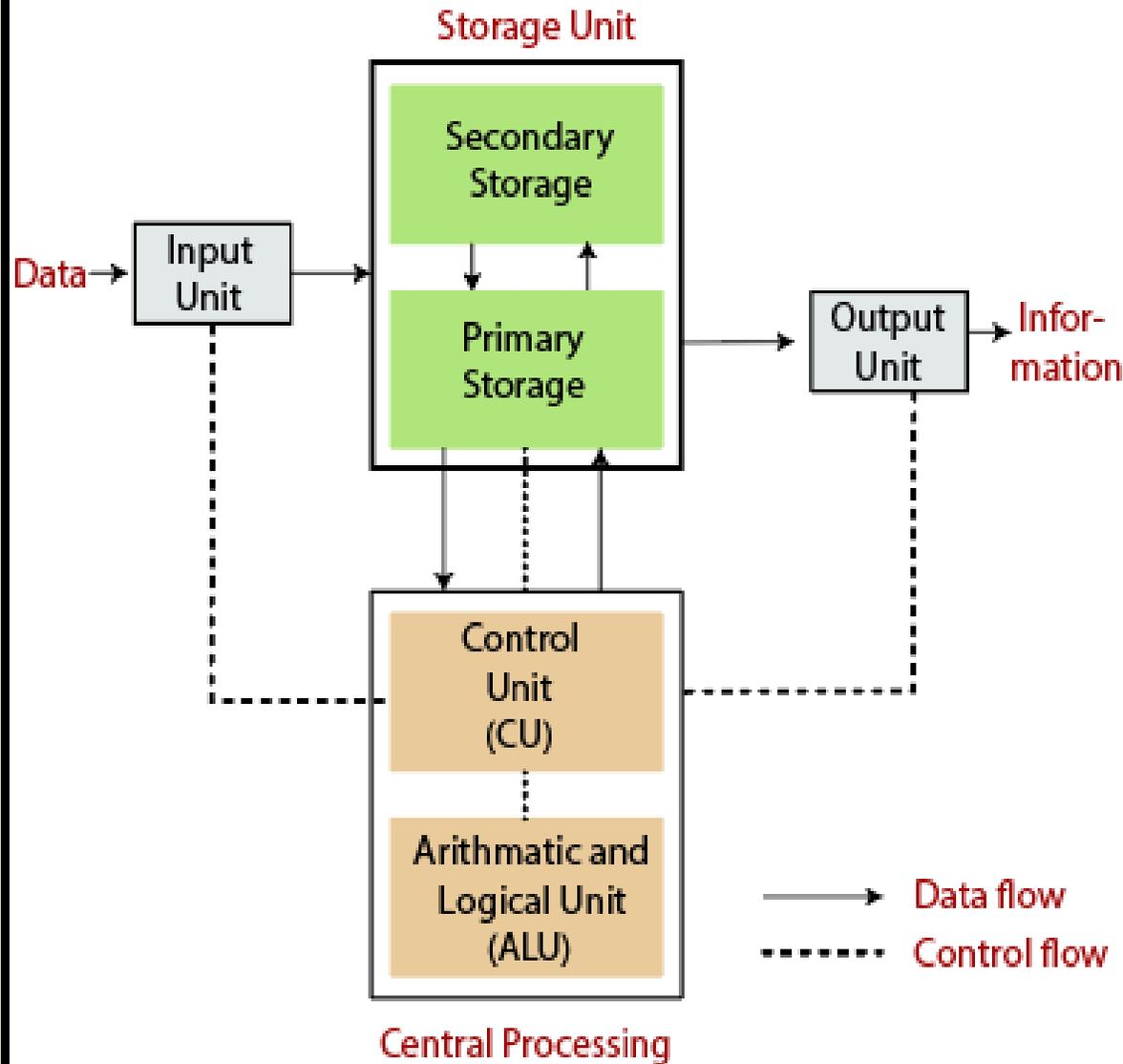
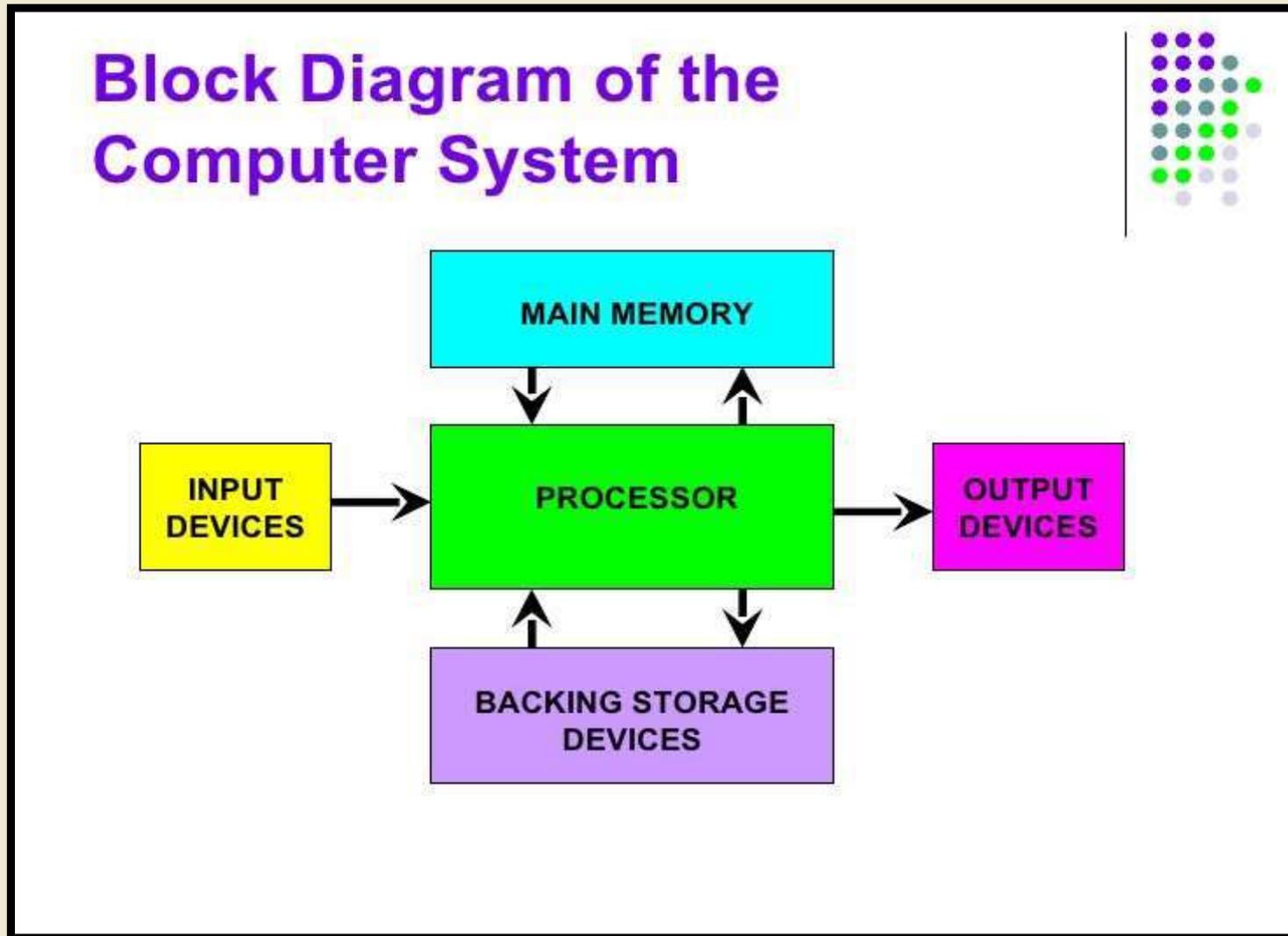


Figure 1.1 Data and Information

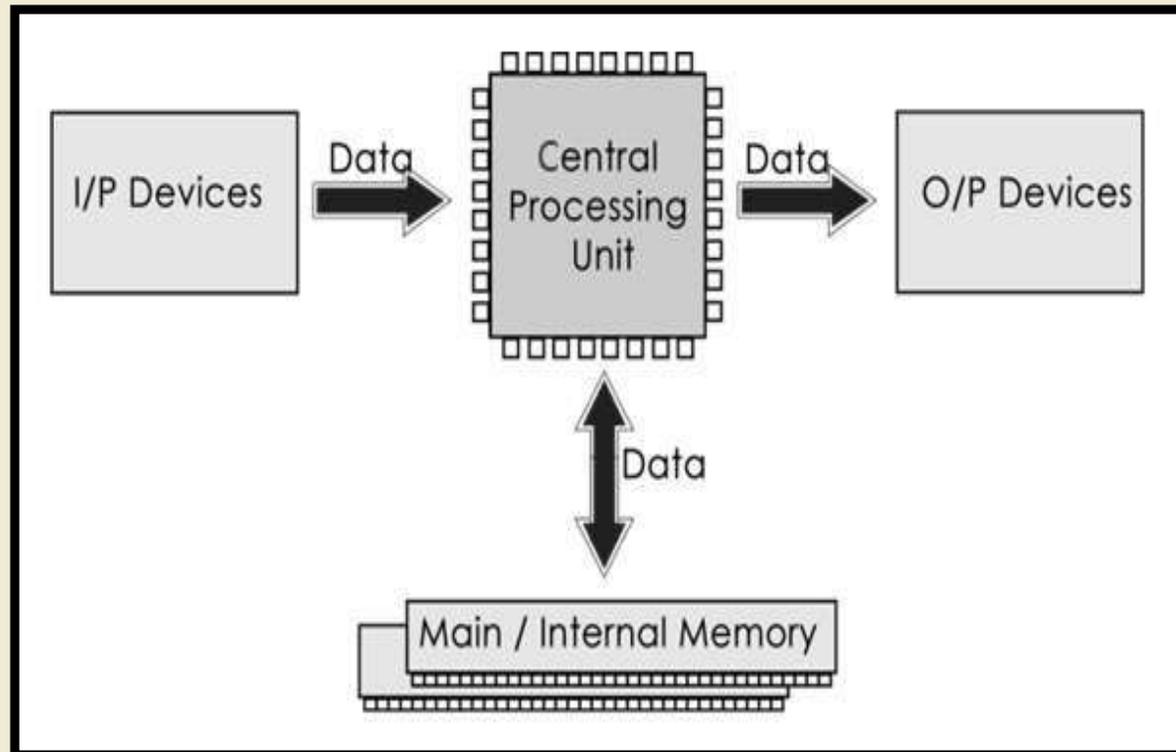
“A Computer is an electronic device that takes raw data (unprocessed) as an input from the user and processes it under the control of a set of instructions (called program), produces a result (output), and saves it for future use.”

Block Diagram of Computer: How Data Flows



Components of Computer

The computer is the combination of **hardware and software**. Hardware is the **physical component of a computer** like motherboard, memory devices, monitor, keyboard etc., while **software is the set of programs or instructions**. Both hardware and software together make the computer system to function.

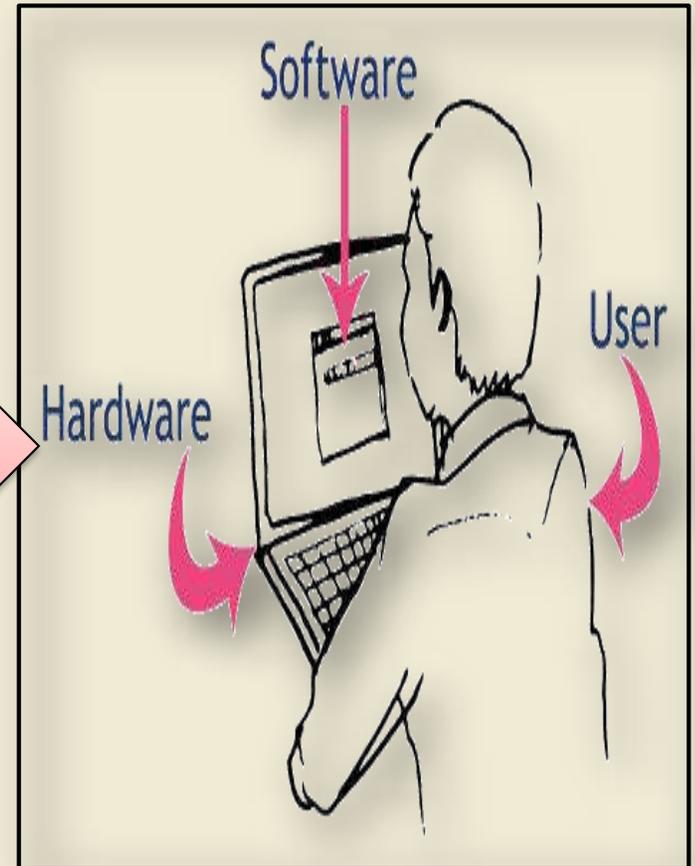


Components of Computer

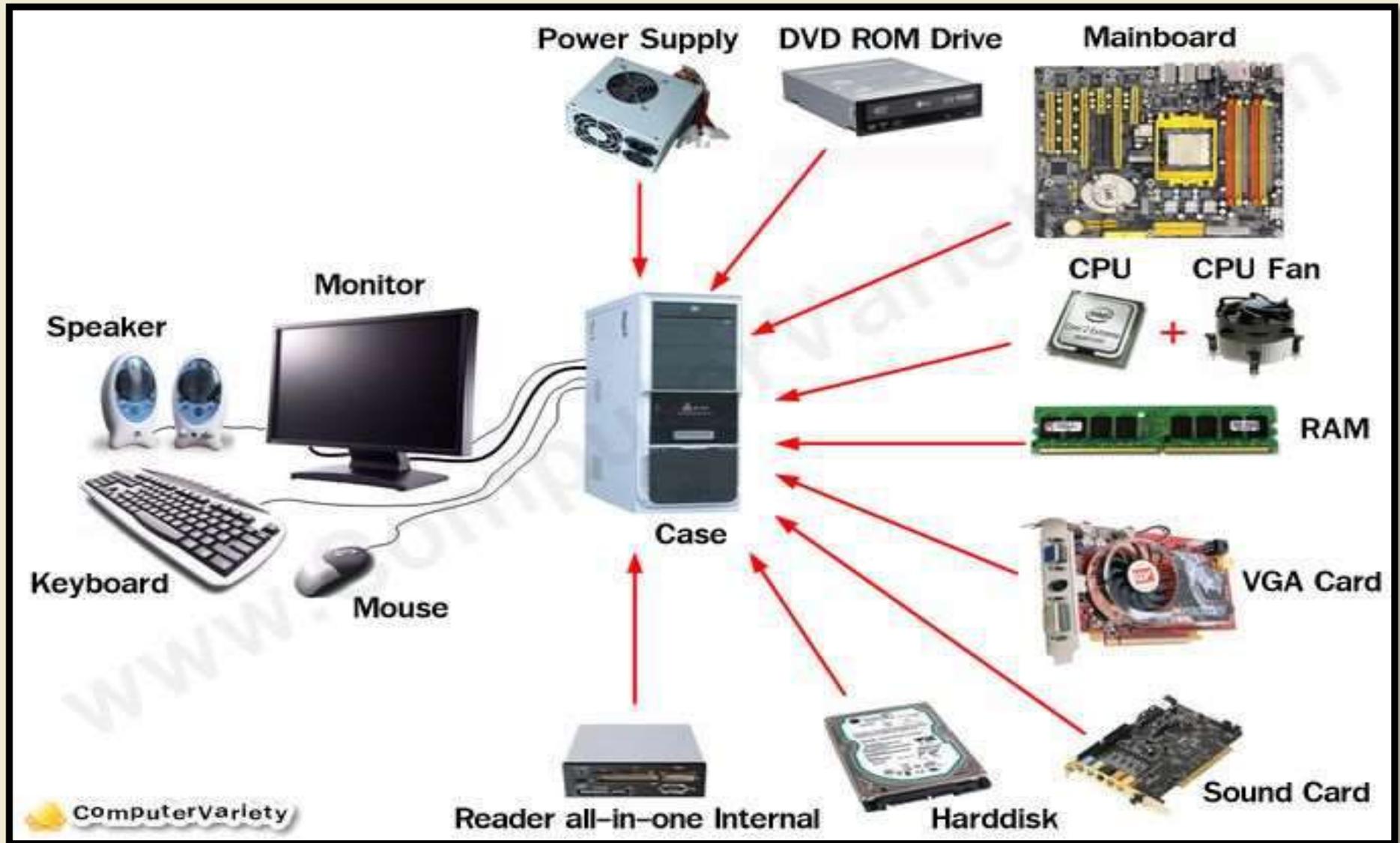
What does a computer consist of?

Although every computer mainly consists of two things hardware and software but the user who access it also sometimes regarded as computer components so we can include its overall components are..

- ❖ Hardware
- ❖ Software
- ❖ User



Detailed View of Hardware Components



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C.P.U (Central Processing Unit)

CPU is the major component which interprets and executes software Instructions. It also control the operation of all other components such as memory, input and output units. It accepts binary data as input, process the data according to the instructions and provide the result as output.

The CPU has three components which are Control unit, Arithmetic and logic unit (ALU) and Memory unit.

Arithmetic and Logic Unit: The ALU is a part of the CPU where various computing functions are performed on data. The ALU performs arithmetic operations such as addition, subtraction, multiplication, division and logical operations. The result of an operation is stored in internal memory of CPU.

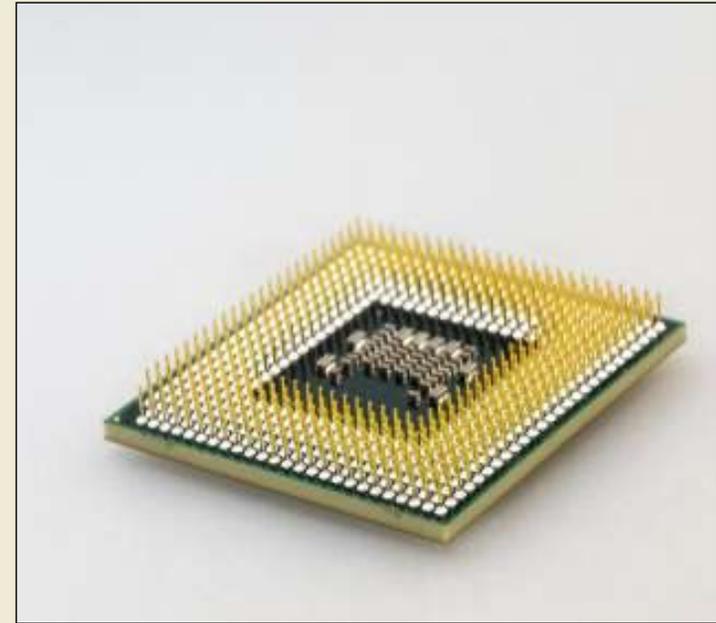
Control Unit: The control unit controls the flow of data between the CPU, memory and I/O devices. It also controls the entire operation of a computer.

Memory Unit: To Store the result of all the processed data by ALU we need a temporary storage place that is called as memory unit of CPU. It has various registers that are limited in numbers to hold that data temporary for other process.

Central Processing Unit Types

Types of CPU

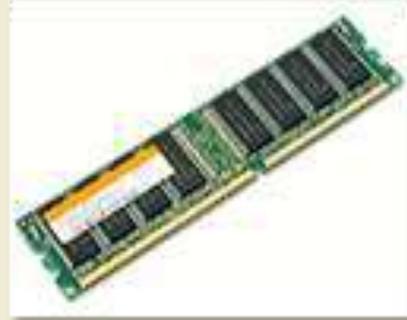
- 1. Single-core CPU:** it is the oldest type of CPU which is available and employed in most of the personal and official computers. ...
- 2. Dual-core CPU.** It is a single CPU that comprises of two strong cores and functions like dual CPU acting like one. ...
- 3. Quad-core CPU. ...**
- 4. Hexa Core processors. ...**
- 5. Octa-core processors. ...**
- 6. Deca-core processor.**



Memory Devices (Primary and Secondary)



Hard Disk



RAM



ROM



CD/DVD



Floppy



Memory Card



Pen Drive



Tape

Memory Unit (Primary and Secondary)

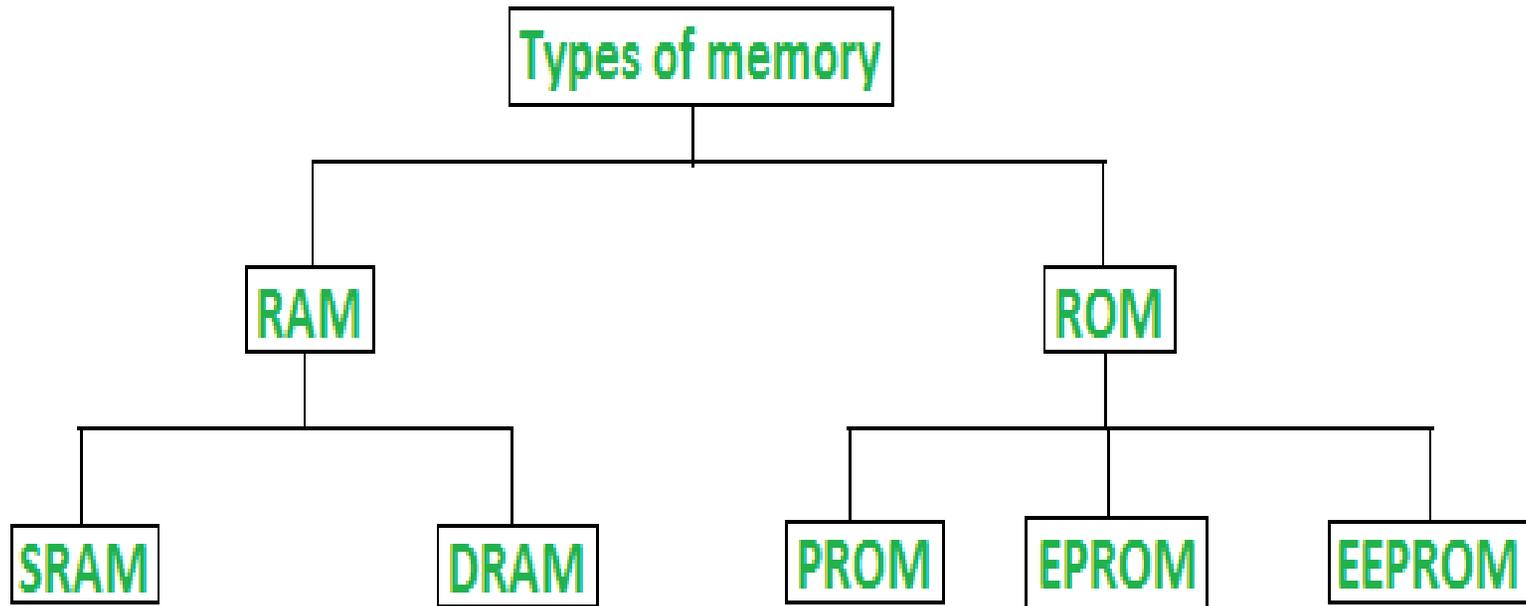
Memory is the most essential element of a computing system because without it computer can't perform simple tasks. The Memory Unit is of two types which are **primary memory and secondary memory**.

The primary memory is used to temporarily store the programs and data when the instructions are ready to execute. The secondary memory is used to store the data permanently.

The Primary Memory is **volatile, that is, the content is lost when the power supply is switched off**. The Random Access Memory (RAM) is an primary-volatile memory and Read Only Memory (ROM) is primary-non-volatile memory.

The Secondary memory is **non volatile, that is the content is available even after the power supply is switched off**. Hard disk, CD-ROM and DVD ROM are examples of secondary memory.

Classification of Primary Memory



Classification of computer memory

Random Access Memory (RAM): In Detail

It is also called as **read write memory** or the **main memory** or the **primary memory**. The programs and data that the CPU requires during execution of a program are stored in this memory. It is a volatile memory as the data loses when the power is turned off. RAM is further classified into two types-

SRAM (Static Random Access memory) and **DRAM (Dynamic Random Access Memory)**.

DRAM	SRAM
1. Constructed of tiny capacitors that leak electricity.	1. Constructed of circuits similar to D flip-flops.
2. Requires a recharge every few milliseconds to maintain its data.	2. Holds its contents as long as power is available.
3. Inexpensive.	3. Expensive.
4. Slower than SRAM.	4. Faster than DRAM.
5. Can store many bits per chip.	5. Can not store many bits per chip.
6. Uses less power.	6. Uses more power.
7. Generates less heat.	7. Generates more heat.
8. Used for main memory.	8. Used for cache.

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Read Only Memory (ROM) in Detail

Read Only Memory (ROM) –Stores crucial information essential to operate the system, like the program essential to boot the computer. It has following features:

1. **It is not volatile.**
2. **Always retains its data.**
3. **Used in embedded systems or where the programming needs no change.**
4. **Used in calculators and peripheral devices.**
5. **ROM is further classified into 4 types- ROM, PROM, EPROM, and EEPROM.**

Types of Read Only Memory (ROM) –

1. **PROM (Programmable read-only memory)** – It can be programmed by user. Once programmed, the data and instructions in it cannot be changed.
2. **EPROM (Erasable Programmable read only memory)** – It can be reprogrammed. To erase data from it, expose it to ultra violet light. To reprogram it, erase all the previous data.
3. **EEPROM (Electrically erasable programmable read only memory)** – The data can be erased by applying electric field, no need of ultra violet light. We can erase only portions of the chip.

Difference between RAM AND ROM

RAM	ROM
1. Temporary Storage.	1. Permanent storage.
2. Store data in MBs.	2. Store data in GBs.
3. Volatile.	3. Non-volatile.
4. Used in normal operations.	4. Used for startup process of computer.
5. Writing data is faster.	5. Writing data is slower.

Difference between RAM and ROM

Hard Disk Drive (HDD)

A **hard disk drive (HDD)**, **hard disk**, **hard drive**, or **fixed disk** is an electro-mechanical data storage device that stores and retrieves digital data using magnetic storage and one or more rigid rapidly rotating platters coated with magnetic material.

It stores digital content, documents, pictures, music, videos, programs, application preferences, and operating system

Hard drives can be **external or internal**. A hard drive determines the size of digital files in terms of **megabytes (MB)**, **gigabytes (GB)**, and **terabytes (TB)**



Pen Drive

A **pen drive, or a USB flash drive, is a portable data-storage device.** Pen drives have replaced the floppy drives of old and have become the most popular data-storage devices among consumers.

Micro, lightweight and handy, a pen drive can be easily carried from place to place by students, professionals, academicians and independent tech consultants.

Currently available pen drives with storage capacities ranging from 8GB and 32GB can be used to store graphics-heavy documents, photos, music files and video clips.



INPUT DEVICES



Keyboard



Mouse



Joy Stick



Mic



Barcode Reader



Stylus/Pen



Web Camera



Touch pad



Touch Screen



Finger Print reader

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Keyboard

Keyboard: Keyboard (wired / wireless, virtual) is the most common input device used today. The individual keys for letters, numbers and special characters are collectively known as character keys. keyboard layout is derived from the keyboard of original typewriter. The data and instructions are given as input to the computer by typing on the keyboard. Apart from alphabet and numeric keys, it also has Function keys for performing different functions. There are different set of keys available in the keyboard such as character keys, modifier keys, system and GUI keys, enter and editing keys, function keys, navigation keys, numeric keypad and lock keys.



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Keyboard Keys

Sr. No.	Keys	Description
1	Typing Keys	These keys include the letter keys (A-Z) and digits keys (0-9) which are generally give same layout as that of typewriters.
2	Numeric Keypad	It is used to enter numeric data or cursor movement. Generally, it consists of a set of 17 keys that are laid out in the same configuration used by most adding machine and calculators.
3	Function Keys	The twelve functions keys are present on the keyboard. These are arranged in a row along the top of the keyboard. Each function key has unique meaning and is used for some specific purpose.
4	Control keys	These keys provides cursor and screen control. It includes four directional arrow key. Control keys also include Home, End, Insert, Delete, Page Up, Page Down, Control(Ctrl), Alternate(Alt), Escape(Esc).
5	Special Purpose Keys	Keyboard also contains some special purpose keys such as Enter, Shift, Caps Lock, Num Lock, Space bar, Tab, and Print Screen.

Keyboard's Key Description

Alphabet Keys

Alphabet keys have alphabets, from A to Z, written on them. By pressing these keys, you can type alphabets, words, sentences etc. in lower case. For example, when you press 'A' key, 'a' gets typed. To type the alphabet in upper case, you need to press Shift key along with the alphabet key. For example, if you press 'A' key along with Shift key, letter 'A' gets typed.

Number Keys

Number keys have digits, from 0 to 9, written on them. These keys are used for typing the numbers. Note that each number key also has a special character written just above the number. To type this character, you will have to press the number key along with the Shift key. For example, number 5 key has % sign marked on it. When you press number 5 key, 5 will get typed. If you press the same key, along with Shift key % sign will get typed.

Special Character Keys

Few keys of the keyboard have special characters like semicolon (;), comma (,), dot (.) etc. marked on them. Such keys are called special character keys. When you press special character key, character marked on it gets typed at current cursor position.

Function Keys

There are 12 function keys present on the keyboard. They are named as F1, F2, F3F12. When you press these keys they perform special functions.

Cursor Keys

Four cursor keys are there on the keyboard. They are marked with arrows on them, pointing in four different directions. Using cursor keys, you can move the cursor from one place to another.

1.1.1 Keyboard's Key Description

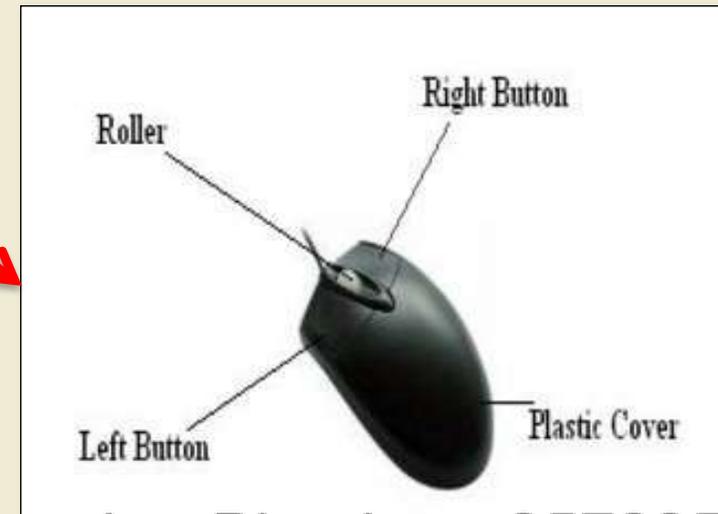
- ✓ **Action Keys:** Keyboard has many action keys. When you press an action key, a special event takes place. Most commonly used action keys of the keyboard are described below.
- ✓ **Caps Lock Key:** When you press this key, capital lock becomes on. When you press an alphabet key, while capital lock is on, the letter written on it gets typed in upper case.
- ✓ **Shift Key:** Shift key is always pressed along with other keys. When you press this key along with number key then the symbol written on upper part of the key gets typed. When you press Shift key along with alphabet key then the alphabet gets typed in upper case.
- ✓ **Enter Key:** Enter key is used to start a new line. When you press this key; cursor comes to the next line. Whatever you type now, gets typed in the next line.
- ✓ **Space Bar :** This key is used to put blank spaces between the two characters.
- ✓ **DEL Key:** This key is used to rub a character from current cursor position.
- ✓ **Backspace Key:** This key removes one character from the left side of the cursor.
- ✓ **Insert Key:** This key is used to insert characters in between the two characters, which have already been typed.
- ✓ **Page Keys:** There are two page keys on the keyboard, named as PgDn (i.e. Page Down) and PgUp (i.e. Page Up). When you press PgUp key, previous page gets displayed on the screen. When you press PgDn key, next page gets displayed on the screen.
- ✓ **Tab Key:** This key is used for making the cursor jump in forward direction, by many places.
- ✓ **ESC Key:** This key is called Escape key. Currently on-going activity gets cancelled when this key is pressed.

MOUSE

Mouse: Mouse (wired/wireless) is a pointing device used to control the movement of the cursor on the display screen. It can be used to **select icons, menus, command buttons or activate something on a computer.** Some mouse actions are move, click, double click, right click, drag and drop.

Different types of mouse available

are: **Mechanical Mouse, Optical, Laser Mouse, Air Mouse, 3D Mouse, Tactile Mouse, Ergonomic Mouse and Gaming Mouse**



Scanners

Scanner: A Scanner is an input device and is used to input data into the computer system in the form of pictures. It optically scans images, printed text, handwriting, or an object, and converts it to a digital image. Examples of scanners are a desktop or flatbed scanner.

This device works like a Xerox machine. The scanner any converts type of printed or written information including photographs into a digital format, which can be manipulated by the computer.



Figure 1.5 Scanner



Figure 1.8 Retinal Scanner



Figure 1.6 Fingerprint Scanner

Bar Code reader

Bar Code / QR Code Reader: A Bar code is a pattern printed in lines of different thickness. The Bar code reader scans the information on the bar codes transmits to the Computer for further processing. The bar code is 13 digits long and it has four main divisions.

The First two digits of a bar code represent the country, the second part represents the manufacturer's code (five digits) the third part represents the product code (five digits) and the last digit is a check digit. The system gives fast and error free entry of information into the computer.

QR (Quick response) Code: The QR code is the two dimension bar code which can be read by a camera and processed to interpret the image.



Web Camera

A **webcam** is input device that is like a [video camera](#) that feeds or [streams](#) an image or video in real time to or through a [computer](#) to a [computer network](#), such as the [Internet](#). Webcams are typically small cameras that sit on a desk, attach to a user's monitor, or are built into the hardware. Webcams can be used during a video chat session involving two or more people, with conversations that include live audio and video.

Webcams typically include a lens, an [image sensor](#), support electronics, and may also include one or even two [microphones](#) for sound.



Typical low-cost webcam used with many personal computers (2007)

OUTPUT DEVICES



Monitor



Printer



Speakers



Head Set



Projector



Plotter

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DISPLAY Unit

Display: it is also **called Monitor** that is the most commonly used output device to display the information. It looks like a TV. Pictures on a monitor are formed with picture elements called **PIXELS**.

Monitors may either be **Monochrome** which display text or images in **Black and White** or can be **color**, which display results in **multiple colors**.

There are many types of monitors available such as **CRT (Cathode Ray Tube)**, **LCD (Liquid Crystal Display)** and **LED (Light Emitting Diodes)**. The monitor works with the **VGA (Video Graphics Array) card**.



1.1.1 DISPLAY Unit

Monitors

Monitor commonly called as Visual Display Unit (VDU) is the main output device of a computer. It forms images from tiny dots, called pixels, that are arranged in a rectangular form. The sharpness of the image depends upon the no. of the pixels.

There are two kinds of viewing screen used for monitors.

- Cathode-Ray Tube (CRT)
- Flat- Panel Display

Cathode-Ray Tube (CRT) Monitor

In the CRT display is made up of small picture elements called pixels for short. The smaller the pixels, the better the image clarity, or resolution. It takes more than one illuminated pixel to form whole character, such as the letter e in the word help.

A finite number of character can be displayed on a screen at once. The screen can be divided into a series of character boxes - fixed location on the screen where a standard character can be placed.

The most screens are capable of displaying 80 characters of data horizontally and 25 lines vertically. There are some disadvantage of CRT

- Large in Size



1.1.1 DISPLAY Unit

Flat-Panel Display Monitor

The flat-panel display refers to a class of video devices that have reduced volume, weight and power requirement compare to the CRT. You can hang them on walls or wear them on your wrists. Current uses for flat-panel displays include calculators, videogames, monitors, laptop computer, graphics display.

The flat-panel display are divided into two categories

- **Emissive Displays** - The emissive displays are devices that convert electrical energy into light. Example are plasma panel and LED(Light-Emitting Diodes).
- **Non-Emissive Displays** - The Non-emissive displays use optical effects to convert sunlight or light from some other source into graphics patterns.Example is LCD(Liquid-Crystal Device)



Printers

Printers: Printers are used to print the information on papers. Printers are divided into two main categories:

- **Impact Printers**
- **Non Impact printers**

Impact Printers : these printers print with striking of hammers or pins on ribbon. These printers can print on multi-part (using carbon papers) by using mechanical pressure. For example, Dot Matrix printers and Line matrix printers are impact printers.

A **Dot matrix printer** that prints using a fixed number of pins or wires. Each dot is produced by a tiny metal rod, which works by the power of a tiny electromagnet or solenoid, either directly or through a set of small levers. It generally prints one line of text at a time. The printing speed of these printers varies from 30 to 1550 CPS (Character Per Second).



Printers

Line matrix printers use a fixed print head for printing. Basically, it prints a page-wide line of dots. But it builds up a line of text by printing lines of dots. These printers are capable of printing much more than 1000 Lines Per Minute, that result in thousands of pages per hour. These printers also uses mechanical pressure to print on multi-part (using carbon papers).



Printers

Non-Impact Printers These printers do not use striking mechanism for printing. They use electrostatic or laser technology. Quality and speed of these printers are better than Impact printers. For example, **Laser printers and Inkjet printers are non-impact printers.**

Laser Printers: Laser printers mostly work with similar technology used by photocopiers. It makes a laser beam scan **back and forth** across a drum inside the printer, building up a pattern. **It can produce very good quality of graphic images.** One of the chief characteristics of laser printer is their resolution – how many **Dots per inch(DPI)**. The available resolution range around 1200 dpi. Approximately it can print 100 pages per **minute(PPM)** .

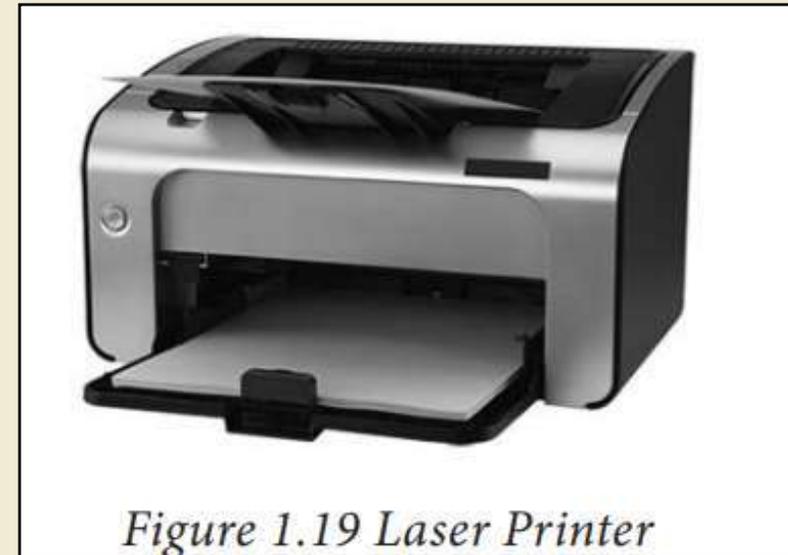


Figure 1.19 Laser Printer

1.1.3 Printers

Inkjet Printers: Inkjet Printers use **color cartridges which combined Magenta, Yellow and Cyan inks to create color tones**. A black cartridge is also used for monochrome output. Inkjet printers work by spraying ionized ink at a sheet of paper. The speed of Inkjet printers generally range from **1-20 PPM (Page Per Minute)**.



Figure 1.20 Inkjet Printer

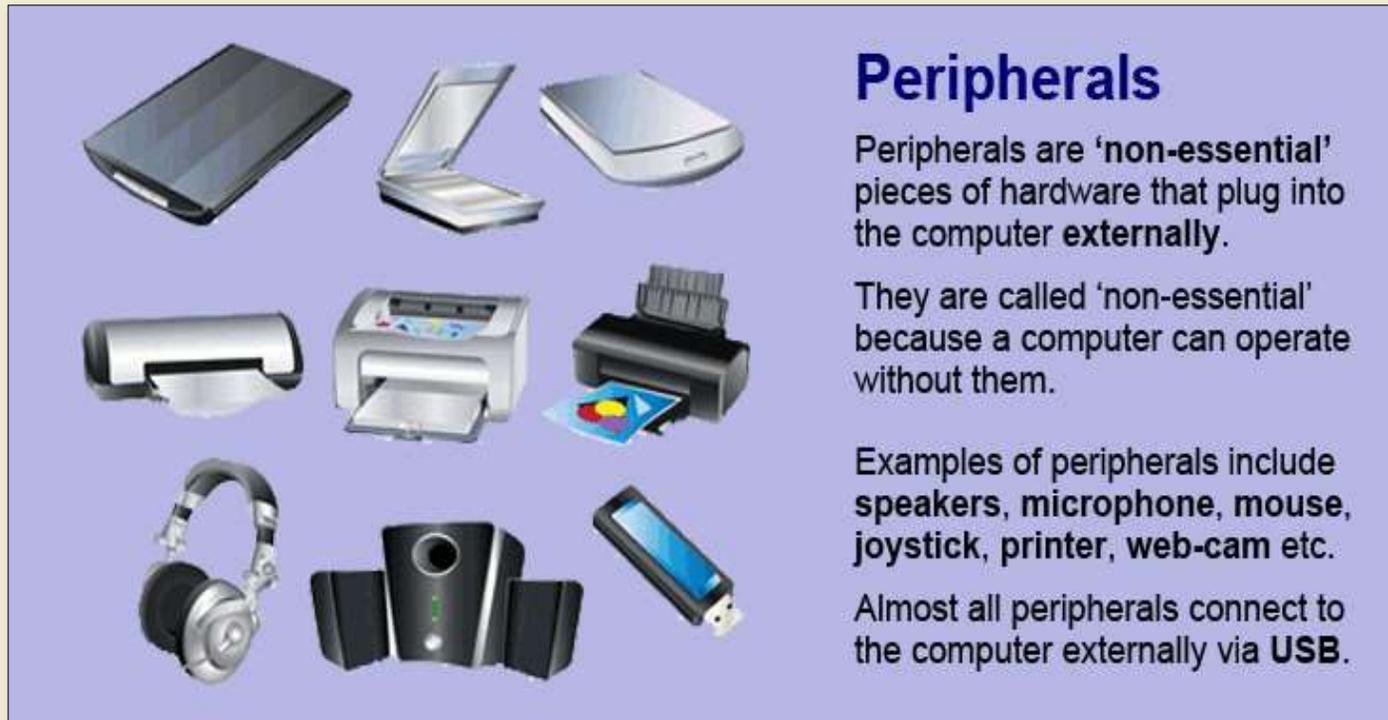
They use the technology of **firing ink by heating it so that it explodes towards the paper in bubbles or by using piezoelectricity in which tiny electric currents** controlled by electronic circuits are used inside the printer to spread ink in jet speed. An Inkjet printer can spread millions of dots of ink at the paper every single second

Peripheral Devices

A peripheral device, also sometimes called an auxiliary device, is any connected device (internal or external) that provides a computer with additional functionality.

Peripheral devices fall into three main categories:

1. Input devices, which send data to the computer.
2. Output devices, which receive data from the computer.
3. Input/output devices, such as storage devices



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Motherboard

Motherboard

The motherboard serves as a single platform to connect all of the parts of a computer together. A motherboard connects CPU, memory, hard drives, optical drives, video card, sound card and other ports and expansion cards directly or via cables. It can be considered as the backbone of a computer.



Motherboard varies greatly in supporting various types of components.

Normally a motherboard supports a single type of CPU and few types of memories.

Video Cards, Hard disks, Sound Cards have to be compatible with motherboard to function properly.

Motherboards, cases and power supplies must be compatible to work properly together .

Mother board description

The motherboard is mounted inside the case and is securely attached via small screws through pre-drilled holes that contains ports to connect all of the internal components. It provides a single socket for CPU.

For memory, normally one or more slots are available. It provide ports to attach floppy drive, hard drive and optical drives via ribbon cables. Mother board carries fans and a special port designed for power supply.

On left side, motherboards carries a number of ports. These ports connect monitor, printer, mouse, keyboard, speaker, network cables and all to the motherboard.

Motherboards also provide USB ports which allows compatible devices to be connected in plug-in/plug-out fashion. For example, pen drive, digital cameras etc.

