# COMPUTER WORKSHOP

## UNIT -1

Central Processing Unit (CPU) consists of the following features −

- CPU is considered as the brain of the computer.
- CPU performs all types of data processing operations.
- It stores data, intermediate results, and instructions (program).
- It controls the operation of all parts of the computer.



CPU itself has following three components.

- Memory or Storage Unit
- Control Unit
- ALU(Arithmetic Logic Unit)
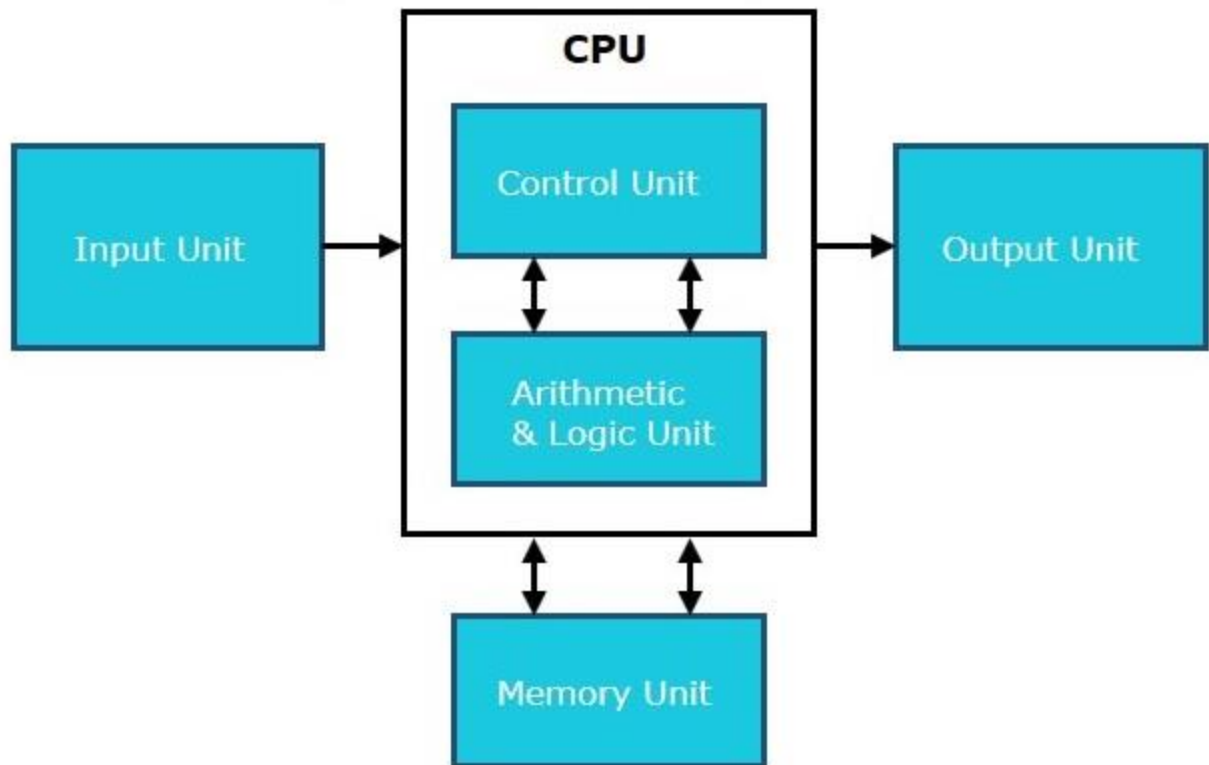
## Memory or Storage Unit

This unit can store instructions, data, and intermediate results. This unit supplies information to other units of the computer when needed. It is also known as internal storage unit or the main memory or the primary storage or Random Access Memory (RAM).

Its size affects speed, power, and capability. Primary memory and secondary memory are two types of memories in the computer. Functions of the memory unit are −

- It stores all the data and the instructions required for processing.
- It stores intermediate results of processing.
- It stores the final results of processing before these results are released to an output device.
- All inputs and outputs are transmitted through the main memory.

## Control Unit

This unit controls the operations of all parts of the computer but does not carry out any actual data processing operations.

Functions of this unit are −

- It is responsible for controlling the transfer of data and instructions among other units of a computer.
- It manages and coordinates all the units of the computer.
- It obtains the instructions from the memory, interprets them, and directs the operation of the computer.
- It communicates with Input/Output devices for transfer of data or results from storage.
- It does not process or store data.

# ALU (Arithmetic Logic Unit)

This unit consists of two subsections namely,

- Arithmetic Section
- Logic Section

## Arithmetic Section

Function of arithmetic section is to perform arithmetic operations like addition, subtraction, multiplication, and division. All complex operations are done by making repetitive use of the above operations.

## Logic Section

Function of logic section is to perform logic operations such as comparing, selecting, matching, and merging of data.

# Microprocessor Tutorial

A microprocessor is a controlling unit of a micro-computer, fabricated on a small chip capable of performing Arithmetic Logical Unit (ALU) operations and communicating with the other devices connected to it.

Microprocessor is a controlling unit of a micro-computer, fabricated on a small chip capable of performing ALU (Arithmetic Logical Unit) operations and communicating with the other devices connected to it.

Microprocessor consists of an ALU, register array, and a control unit. ALU performs arithmetical and logical operations on the data received from the memory or an input device. Register array consists of registers identified by letters like B, C, D, E, H, L and accumulator. The control unit controls the flow of data and instructions within the computer.

## Block Diagram of a Basic Microcomputer
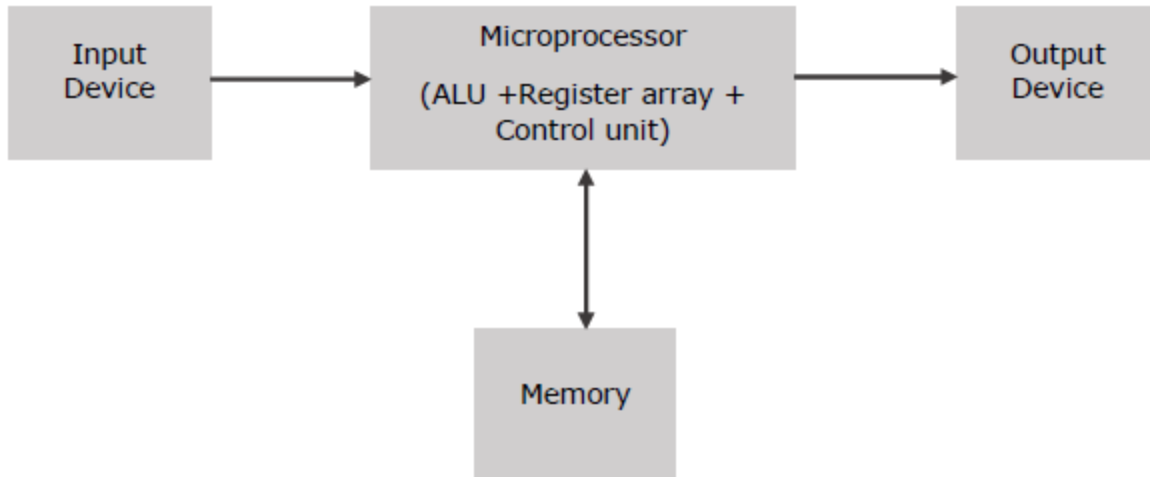
# How does a Microprocessor Work?

The microprocessor follows a sequence: Fetch, Decode, and then Execute.

Initially, the instructions are stored in the memory in a sequential order. The microprocessor fetches those instructions from the memory, then decodes it and executes those instructions till STOP instruction is reached. Later, it sends the result in binary to the output port. Between these processes, the register stores the temporarily data and ALU performs the computing functions.

## List of Terms Used in a Microprocessor

Here is a list of some of the frequently used terms in a microprocessor −

- **Instruction Set** − It is the set of instructions that the microprocessor can understand.
- **Bandwidth** − It is the number of bits processed in a single instruction.
- **Clock Speed** − It determines the number of operations per second the processor can perform. It is expressed in megahertz (MHz) or gigahertz (GHz).It is also known as Clock Rate.
- **Word Length** − It depends upon the width of internal data bus, registers, ALU, etc. An 8-bit microprocessor can process 8-bit data at a time. The word length ranges from 4 bits to 64 bits depending upon the type of the microcomputer.
- **Data Types** − The microprocessor has multiple data type formats like binary, BCD, ASCII, signed and unsigned numbers.

# Features of a Microprocessor

Here is a list of some of the most prominent features of any microprocessor −

- **Cost-effective** − The microprocessor chips are available at low prices and results its low cost.
- **Size** − The microprocessor is of small size chip, hence is portable.

- **Low Power Consumption** − Microprocessors are manufactured by using metaloxide semiconductor technology, which has low power consumption.
- **Versatility** − The microprocessors are versatile as we can use the same chip in a number of applications by configuring the software program.
- **Reliability** − The failure rate of an IC in microprocessors is very low, hence it is reliable.

# What is a computer bus?

A bus is a communication system in computer architecture that transfers data between components inside a computer, or between computers.

The term encompasses all the components related to [hardware (wire, optical fiber, etc.) and software](#), including communication protocol.

The following are a few points to describe a computer bus:-

- A bus is a group of lines/wires which carry computer signals.
- A bus is the means of shared transmission.
- Lines are assigned to providing descriptive names. — carries a single electrical signal, e.g. 1-bit memory address, data bits series, or timing control that turns the device on or off.
- Data can be transferred from one computer system location to another (between different I / O modules, memory, and CPU).
- The bus is not only cable but also hardware (bus architecture), protocol, program, and bus controller.

# What are the different components of a bus?

Each bus possesses three distinct communication channels.

Following are the three components of a bus: –

- The **address** bus, a one-way pathway that allows information to pass in one direction only, carries information about where data is stored in memory.
- The **data** bus is a two-way pathway carrying the actual data (information) to and from the main memory.

- The **control** bus holds the control and timing signals needed to coordinate all of the computer's activities.

Also Read:- [Information Security](#)

# Functions of a computer bus

Below are a few of the functions of a computer bus:-

- **Data sharing** – All types of buses used in the network transfer data between the connected computer peripherals. The buses either transfer or send data in serial or parallel transfer methods. This allows 1, 2, 4, or even 8 bytes of data to be exchanged at a time. (A Byte is an 8-bit group). Buses are classified according to how many bits they can move simultaneously, meaning we have 8-bit, 16-bit, 32-bit, or even 64-bit buses.
- **Addressing** – A bus has address lines that suit the processors. This allows us to transfer data to or from different locations in the memory.
- **Power** – A bus supplies the power to various connected peripherals.

# Structure and Topologies of Computer buses

Lines are grouped as mentioned below –

- **The power** line provides [electrical power](#) to the components connected
- **Data** lines carrying data or instructions between modules of the system
- **Address** lines indicate the recipient of the bus data
- **Control** lines control the synchronization and operation of the bus and the modules linked to the bus

# What are the different types of computer buses?

Computers normally have two bus types:-

- **System bus** – This is the bus that connects the CPU to the motherboard's main memory. The system bus is also known as a front-side bus, a memory bus, a local bus, or a host bus.
- A number of **I / O Buses**, (I / O is an input/output acronym) connect various peripheral devices to the CPU. These devices connect to the

system bus through a 'bridge' implemented on the chipset of the processors. Other I / O bus names include "expansion bus," "external bus" or "host bus"

# Understanding Desktop Computer Components

Understanding computer components is important when deciding if anything needs to be replaced or upgraded. Understanding the basic components like the motherboard and central processing unit (CPU), as well as the RAM and memory, is a good start when learning about desktop parts.

## What's a Motherboard?

At the heart of your computer is a motherboard, a circuit board that contains the units that make your computer run, as well as connections to other elements. All the computer hardware parts within your machine—CPU, hard drives, video cards, and graphics cards—connect to the motherboard. While almost everything you do on your computer involves an interaction with the motherboard, you won't have to make a decision about selecting one unless you're building a system yourself. The right computer for your needs will have a suitable motherboard.

## What's a CPU?

Considered the brain of your computer, the CPU is a small chip that's the control center for all your computer's operations. The CPU processor relays instructions to all the other units. CPU speed is important, but you might not always need the newest, fastest processor. If you're not using large spreadsheets or doing graphics-intensive work, you can consider a slower, less-costly processor. Balance speed, budget, and your computing needs to decide on the right CPU.

## What's the Difference Between Memory and Storage?

Memory and storage both have to do with data retention. The difference is that RAM (Random Access Memory) keeps data only for the short term while storage saves it indefinitely. If your computer activities require frequent opening of programs and quick page transitions, look for higher RAM options. If you have many files, programs, and videos to save, opt for a substantial amount of storage. You can upgrade both storage

and memory. Storage devices are internal or external hard drives, flash drives, or discs, while RAM computer memory comes in the form of memory sticks attached to the motherboard.

## How Important Is Cooling?

When the hardware inside your computer runs, it produces energy, which creates heat. Too much heat inside your desktop's case can damage the parts inside. It's the job of fans and CPU coolers to disperse the heat. Most computers come equipped with enough cooling power to keep your desktop running smoothly. The exception to this is gaming laptops, some of which require cooling pads. If you're a gamer, pay extra attention to the cooling system of any machine under consideration.

Some enthusiasts want the most speed they can get from their desktop computer parts. Other computer users are content with the options manufacturers provide, but may want to change an accessory or two. Whether you want to replace or improve components, B&H Photo and Video's selection can offer the right desktop components to suit your needs.

## Difference between Hardware and Software

### Computer Hardware:

Hardware refers to the physical components of a computer. Computer Hardware is any part of the computer that we can touch these parts. These are the primary electronic devices used to build up the computer. Examples of hardware in a computer are the Processor, Memory Devices, Monitor, Printer, Keyboard, Mouse, and the Central Processing Unit.

### Computer Software:

Software is a collection of instructions, procedures, and documentation that performs different tasks on a computer system. we can say also Computer Software is a programming code executed on a computer processor. The code can be machine-level code or the code written for an operating system. Examples of software are Ms Word, Excel, PowerPoint, Google Chrome, Photoshop, MySQL, etc.

### Difference Between Hardware and Software:

| S. No. | Parameters | Hardware | Software |
|---|---|---|---|
| 1. | **Basic Definition** | Hardware is a physical part of the computer that causes the processing of data. | Software is a set of instructions that tells a computer exactly what to do. |
| 2. | **Development** | It is manufactured. | It is developed and engineered. |
| 3. | **Dependency** | Hardware cannot perform any task without software. | The software can not be executed without hardware. |
| 4. | **Process of creating** | Electronic and other materials are used to create hardware. | Created by utilizing a computer language to write instructions. |
| 5. | **Tangible** | Hardware is tangible as hardware is a physical electronic device, that can be touched. | Software is intangible as we can see and also use the software but can't touch them. |
| 6. | **Durability** | Hardware typically wears out over time. | The software does not wear out with time. However, it may contain flaws and glitches. |
| 7. | **Types** | It has **four** main categories: input devices, output devices, storage, and internal components. | It is mainly divided into System software and Application software. |
| 8. | **Virus effect** | Hardware is not affected by computer viruses. | Software is affected by computer viruses. |
| 9. | **Transfer** | It cannot be transferred from one place to another electrically through the network. | It can be transferred via a network means. |
| 10. | **Machine-Level** | Only machine-level language | The program accepts human- |

| S. No. | Parameters | Hardware | Software |
|---|---|---|---|
|  | **language** | is known to be understood by hardware. | readable input, interprets it in machine-level language, and sends it to hardware for additional processing. |
| **11.** | **Replacement** | If hardware is damaged, it is replaced with a new one. | If the software is damaged, its backup copy can be reinstalled. |
| **12.** | **Failures** | Dust, overheating, humidity and other factors are commonly responsible for hardware failures. | Overloading, systematic error, major-minor version error, and other factors are commonly responsible for software failures. |
| **13.** | **Examples** | Ex: Keyboard, Mouse, Monitor, Printer, CPU, Hard disk, RAM, ROM, etc. | Ex: MS Word, Excel, PowerPoint, Photoshop, MySQL, etc. |

# Laptop

A **laptop**, **laptop computer**, or **notebook computer** is a small, portable personal computer (PC) with a screen and alphanumeric keyboard. Laptops typically have a clam shell form factor with the screen mounted on the inside of the upper lid and the keyboard on the inside of the lower lid, although 2-in-1 PCs with a detachable keyboard are often marketed as laptops or as having a "laptop mode".[1][2] Laptops are folded shut for transportation, and thus are suitable for mobile use.[3] They are so named because they can be practically placed on a person's lap when being used. Today, laptops are used in a variety of settings, such as at work, in education, for playing games, web browsing, for personal multimedia, and for general home computer use.

# Types of laptops[edit]

[Compaq Armada](#) laptop from the late 1990s



Apple [MacBook Air](#), an "ultraportable" laptop weighing under 3.0 lb (1.36 kg)



[Lenovo](#)'s [IdeaPad](#) laptop

Lenovo's ThinkPad business laptop, originally an IBM product



Asus Transformer Pad, a hybrid tablet, powered by Android OS



Microsoft Surface Pro 3, 2-in-1 detachable



Alienware gaming laptop with backlit keyboard and touch pad

[Samsung Sens](#) laptop



[Panasonic Toughbook](#) CF-M34, a rugged laptop/subnotebook

Since the introduction of portable computers during the late 1970s, their form has changed significantly, [spawning](#) a variety of visually and technologically differing subclasses. Except where there is a distinct legal trademark around a term (notably, [Ultrabook](#)), there are rarely hard distinctions between these classes and their usage has varied over time and between different sources. Since the late 2010s, the use of more specific terms has become less common, with sizes distinguished largely by the size of the screen.

## Smaller and larger laptops[[edit](#)]

There were in the past a number of marketing categories for smaller and larger laptop computers; these included "[subnotebook](#)" models, low cost "[netbooks](#)", and "[ultra-mobile PCs](#)" where the size class overlapped with devices like [smartphone](#) and handheld [tablets](#), and "[Desktop replacement](#)" laptops for machines notably larger and heavier than typical to operate more powerful [processors](#) or [graphics hardware](#).[29] All of these terms have fallen out of favor as the size of mainstream laptops has gone down and their capabilities have gone up; except for niche models, laptop sizes tend to be distinguished by the size of the screen, and for more powerful models, by any specialized purpose the machine is intended for, such as a "[gaming laptop](#)" or a "[mobile workstation](#)" for professional use.

**Basic Laptop Components**

**AC Power Adapter**

Laptop power adapters come with many different types of connector heads (the head connect to the laptop). Even when the power adapter head matches the laptop, the power supplied by the power adapters also come in many different kinds. It is very important to find out the exact power needed for the laptop to avoid damaging the laptop. Please refer to the "Choosing Correct AC Adapter" page to find out how to find the exact power adapter for your laptop.

**Hard Drives**

A hard disk drive (sometimes abbreviated as Hard drive, HD, or HDD) is a hardware device that permanently stores and retrieves data on a computer. Therefore, everything you keep on your computer is saved on a hard drive. Hard drive storage is measured in terms of size. It is measured in megabytes (MB), gigabytes (GB), and terabytes (TB.)

The recommended minimum hard drive storage size for a Labdoo laptop is 40GB.

The hard drive comes in two different psychical sizes, 2.5 inches and 3.5 inches. 2.5 inch hard drives aren't just narrower. They're also shorter and thinner, which makes them popular for laptop computers while desktop computers typically use 3.5-inch drives.

The laptop hard drives also come in two different types of connectors, SATA and IDE. SATA stands for Serial Advanced Technology Attachment (or Serial ATA) and IDE is also called Parallel ATA or PATA. SATA is the newer standard which is most of today's laptops use.

**CPU**

CPU, the Central Processing Unit, is the brain of the laptop. It is the hardware device in a computer that executes all of the instructions from the software.

The CPU speed, or processor speed, is the number of cycles that a CPU can perform per second. It is measured in Hertz, generally in gigahertz or GHz. For example, a CPU with a clock rate of 1.8 GHz can perform 1,800,000,000 clock cycles per second.

Our current minimum hardware requirement for a donated laptop is Intel Pentium M CPU (2GHz) or equivalent.

The two main categories of processors are 32-bit and 64-bit since software programs are capable of transferring data 32-bits at a time.

A computer with a 32-bit processor cannot have a 64-bit version of an operating system installed. Windows 95, 98, and XP are all 32-bit operating systems that were common on computers with 32-bit processors. We recommend using 64-bit processor (Window 7 and newer) for Labdoo image installation.

**SDRAM module**

RAM, Random Access Memory, is the hardware device in a computer that stores frequently used program instructions to increase the general speed of a system.

The minimum RAM requirement for a Labdoo laptop is 2GB.

There are many different models of the RAM, every laptop uses different one(s). Not only the memory sizes are different, but the shapes and frequencies are also different as well. You need to search the laptop's document online to find the correct model and size (eg. PC133, DDR, DDR2, DDR3 ...)

## What is the full form of SMPS?

The full form of SMPS is **Switched Mode Power Supply** also known as **Switching Mode Power Supply**. SMPS is an electronic power supply system that makes use of a switching regulator to transfer electrical power effectively. It is a PSU (power supply unit) and is usually used in computers to change the voltage to the appropriate range for the computer.

An SMPS adjusts output voltage and current between different electrical configurations by switching the basics of typically lossless storage such as capacitors and inductors. Ideal switching concepts determined by transistors controlled outside of their active state that have no resistance when 'on' and carry no current when 'off.' It is the idea why switches with an ideal function will operate with 100 per cent output, that is, all input energy is provided to the load; no power is wasted as dissipated heating. In fact, such ideal systems do not exist, which is why a switching power source can not be 100 per cent proficient, but it is still a vital improvement in effectiveness over a linear regulator.

## Working principles of SMPS

In the SMPS device, the switching regulators are used which switches on and off the load current to maintain and regulate the voltage output. Suitable power generation for a system is the mean voltage between off and on. Unlike the linear power supply, the SMPS carry transistor switches among low dissipation, full-on and full-off phase, and spend much less time in high dissipation cycles, which decreases depleted strength.

## Benefits of SMPS

- The switch-mode power source is small in scale.
- The SMPS is very lightweight.
- SMPS power consumption is typically 60 to 70 per cent, which is ideal for use.

- SMPS is strongly anti-interference.
- The SMPS production range is large.

## Limitations of SMPS

- The complexity of SMPS is very large.
- The production reflection is high and its control is weak in the case of SMPS.
- Use of SMPS can only be a step-down regulator.
- In SMPS, the voltage output is just one.

# Key Differences between Online UPS and Offline UPS

1. The key difference between Online UPS and Offline UPS lies in their working. An Online UPS supplies the AC power through a rectifier and inverter circuit even when the AC mains power is available. On the contrary, the offline ups directly supply the AC mains power to the load circuit when the power supply is available.

2. The **transfer time** is the key term which differentiates Online UPS and offline UPS. The transfer time in case of Online UPS is zero as there is no switching between the inverter rectifier path and mains supply path. While Offline Ups possess transfer time of about 5ms.

3. The other significant difference between Online UPS and Offline UPS is that the inverter in online ups is ON all the time while the inverter in offline UPS is on only when the power supply is unavailable.

4. The **cost** of the online UPS is more than the offline UPS.

5. The **efficiency** of the offline UPS is more than the efficiency of online UPS because the inverter and the rectifier circuit is not ON all the time in offline UPS.

**Comparison Chart**

| PARAMETERS | ONLINE UPS | OFFLINE UPS |
|---|---|---|
| Definition | An online UPS is one which | An offline UPS is one which |

| PARAMETERS | ONLINE UPS | OFFLINE UPS |
| --- | --- | --- |
| | supplies the AC power through rectifier and inverter combination circuit in case of power availability as well as in power outage. | supplies the AC mains power directly to the load in case of power availability and whenever there is power outage it supplies power to load through backup battery. |
| Heat dissipation and Operating temperature | Heat dissipation is more in comparison to offline ups because online ups is ON continuously. | Heat dissipation is low because offline ups is switched ON only in case of power outage. |
| Transfer Time | Time required to switch the path during power outage is termed as transfer time. As the transfer switch in case of online ups is always ON thus, transfer time is zero. | Transfer time is about 5 ms. |
| External distortions | Online UPS is immune to external distortions such as surges, spikes and power failure. | Offline UPS is not immune to external distortion. |
| Components | It require more components and thus it is complex to design. | It require less components and thus simpler in design. |

| PARAMETERS | ONLINE UPS | OFFLINE UPS |
| --- | --- | --- |
| Heat Sink | Large heat sink is required in case of online ups. | Small heat sink is required in case of offline ups. |
| Cost | Costly in comparison to offline ups. | Less costly than online ups. |
| On-time of Inverter | The inverter is ON in power outage as well as during power availability. | The inverter is ON only when the power failure occurs. |
| Reliability & efficiency | The online ups is less reliable because it is in ON state always. | The offline UPS is more reliable because it is in ON state only during power outage and thus its efficiency is high. |
| Applications | In medical equipment, in telecommunication equipement etc. | In computers, PCs etc. |

# Techopedia Explains Switched-Mode Power Supply (SMPS)

Switched-mode power supplies are classified according to the type of input and output voltages. The four major categories are:

- AC to DC
- DC to DC
- DC to AC
- AC to AC

A basic isolated AC to DC switched-mode power supply consists of:

- Input rectifier and filter
- Inverter consisting of switching devices such as MOSFETs
- Transformer
- Output rectifier and filter
- Feedback and control circuit

The input DC supply from a rectifier or battery is fed to the inverter where it is turned on and off at high frequencies of between 20 KHz and 200 KHz by the switching MOSFET or power transistors. The high-frequency voltage pulses from the inverter are fed to the transformer primary winding, and the secondary AC output is rectified and smoothed to produce the required DC voltages. A feedback circuit monitors the output voltage and instructs the control circuit to adjust the duty cycle to maintain the output at the desired level.

There are different circuit configurations known as topologies, each having unique characteristics, advantages and modes of operation, which determines how the input power is transferred to the output.

Most of the commonly used topologies such as flyback, push-pull, half bridge and full bridge, consist of a transformer to provide isolation, voltage scaling, and multiple output voltages. The non-isolated configurations do not have a transformer and the power conversion is provided by the inductive energy transfer.

Advantages of switched-mode power supplies:

- Higher efficiency of 68% to 90%
- Regulated and reliable outputs regardless of variations in input supply voltage
- Small size and lighter
- Flexible technology
- High power density

Disadvantages:

- Generates electromagnetic interference
- Complex circuit design
- Expensive compared to linear supplies

Switched-mode power supplies are used to power a wide variety of equipment such as computers, sensitive electronics, battery-operated devices and other equipment requiring high efficiency.

## UNIT -2

Memory is the electronic holding place for the instructions and data a computer needs to reach quickly. It's where information is stored for immediate use. Memory is one of the basic functions of a computer, because without it, a computer would not be able to function properly. Memory is also used by a computer's operating system, hardware and software.

## Types of computer memory

In general, memory can be divided into primary and secondary memory; moreover, there are numerous types of memory when discussing just primary memory. Some types of primary memory include the following

- **Cache memory.** This temporary storage area, known as a cache, is more readily available to the processor than the computer's main memory source. It is also called *CPU memory* because it is typically integrated directly into the CPU chip or placed on a separate chip with a bus interconnect with the CPU.

- **RAM.** The term is based on the fact that any storage location can be accessed directly by the processor.

- **Dynamic RAM.** DRAM is a type of semiconductor memory that is typically used by the data or program code needed by a computer processor to function.

- **Static RAM.** SRAM retains data bits in its memory for as long as power is supplied to it. Unlike DRAM, which stores bits in cells consisting of a capacitor and a transistor, SRAM does not have to be periodically refreshed.

- **Double Data Rate SDRAM.** DDR SRAM is SDRAM that can theoretically improve memory clock speed to at least 200 MHz.

- **Double Data Rate 4 Synchronous Dynamic RAM.** DDR4 RAM is a type of DRAM that has a high-bandwidth interface and is the successor to its previous DDR2 and DDR3 versions. DDR4 RAM allows for lower voltage requirements and higher module density. It is coupled with higher data rate transfer speeds and allows for dual in-line memory modules ([DIMMS](#)) up to 64 GB.

- **Rambus Dynamic RAM.** DRDRAM is a memory subsystem that promised to transfer up to 1.6 billion bytes per second. The subsystem consists of RAM, the RAM controller, the bus that connects RAM to the microprocessor and devices in the computer that use it.

- **Read-only memory.** [ROM](#) is a type of computer storage containing nonvolatile, permanent data that, normally, can only be read and not written to. ROM contains the programming that enables a computer to start up or regenerate each time it is turned on.

- **Programmable ROM.** [PROM](#) is ROM that can be modified once by a user. It enables a user to tailor a microcode program using a special machine called a *PROM programmer*.

- **Erasable PROM.** EPROM is programmable read-only memory PROM that can be erased and re-used. Erasure is caused by shining an intense ultraviolet light through a window designed into the memory chip.

- **Electrically erasable PROM.** [EEPROM](#) is a user-modifiable ROM that can be erased and reprogrammed repeatedly through the application of higher than normal electrical voltage. Unlike EPROM chips, EEPROMs do not need to be removed from the computer to be modified. However, an EEPROM chip must be erased and reprogrammed in its entirety, not selectively.

- [**Virtual memory**](#)**.** A memory management technique where secondary memory can be used as if it were a part of the main memory. Virtual memory uses hardware and software to enable a computer to compensate

for physical memory shortages by temporarily transferring data from RAM to disk storage.

# Classification of Memory

The following figure represents the classification of memory:
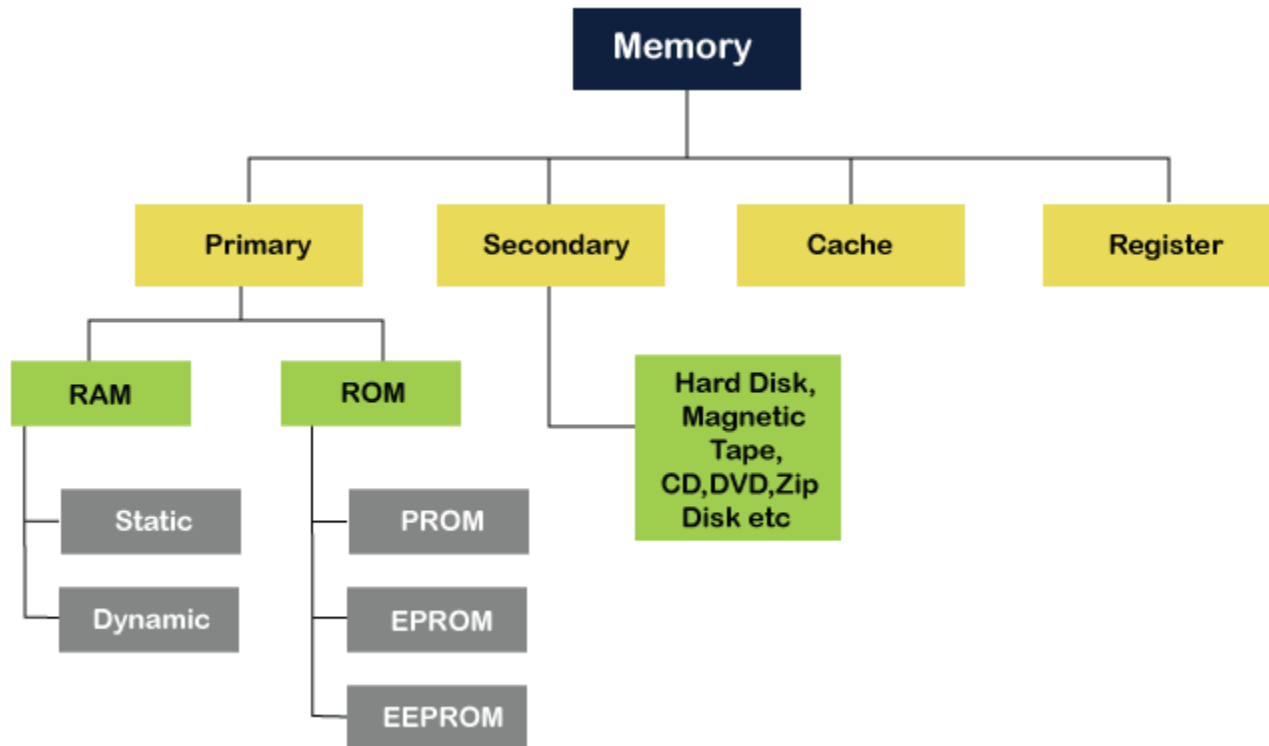


## Primary or Main Memory

Primary memory is also known as the computer system's main memory that communicates directly within the CPU, Auxiliary memory and the Cache memory. Main memory is used to kept programs or data when the processor is active to use them. When a program or data is activated to execute, the processor first loads instructions or programs from secondary memory into main memory, and then the processor starts execution. Accessing or executing of data from primary memory is faster because it has a cache or register memory that provides faster response, and it is located closer to the CPU. The primary memory is volatile, which means the data in memory can be lost if it is not saved when a power failure occurs. It is costlier than secondary memory, and the main memory capacity is limited as compared to secondary memory.

The primary memory is further divided into two parts:

1. RAM (Random Access Memory)
2. ROM (Read Only Memory)

## Random Access Memory (RAM)

Random Access Memory (RAM) is one of the faster types of main memory accessed directly by the CPU. It is the hardware in a computer device to temporarily store data, programs or program results. It is used to read/write data in memory until the machine is working. It is volatile, which means if a power failure occurs or the computer is turned off, the information stored in RAM will be lost. All data stored in computer memory can be read or accessed randomly at any time.
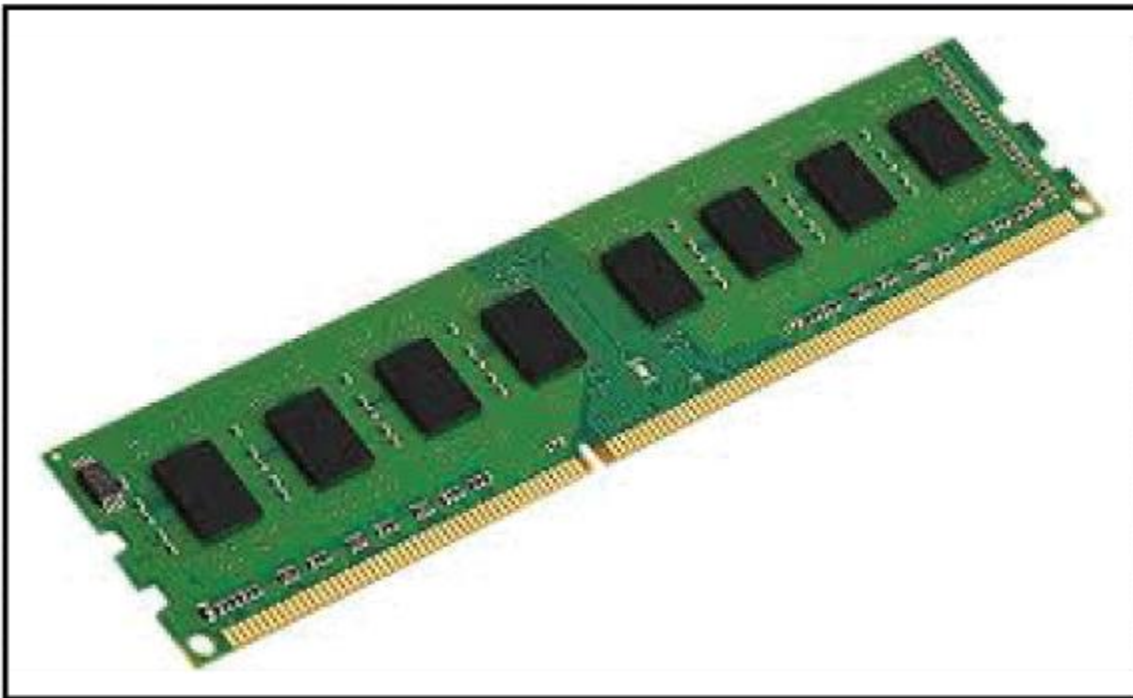


There are two types of RAM:

- o SRAM
- o DRAM

**DRAM:** DRAM **(Dynamic Random-Access Memory)** is a type of RAM that is used for the dynamic storage of data in RAM. In DRAM, each cell carries one-bit information. The

cell is made up of two parts: a **capacitor** and a **transistor**. The size of the capacitor and the transistor is so small, requiring millions of them to store on a single chip. Hence, a DRAM chip can hold more data than an SRAM chip of the same size. However, the capacitor needs to be continuously refreshed to retain information because DRAM is volatile. If the power is switched off, the data store in memory is lost.

**Characteristics of DRAM**

1. It requires continuously refreshed to retain the data.
2. It is slower than SRAM
3. It holds a large amount of data
4. It is the combination of capacitor and transistor
5. It is less expensive as compared to SRAM
6. Less power consumption

**SRAM:** SRMA **(Static Random-Access Memory)** is a type of RAM used to store static data in the memory. It means to store data in SRAM remains active as long as the computer system has a power supply. However, data is lost in SRAM when power failures have occurred.

**Characteristics of Static Ram**

1. It does not require to refresh.
2. It is faster than DRAM
3. It is expensive.
4. High power consumption
5. Longer life
6. Large size
7. Uses as a cache memory

## SRAM Vs. DRAM

| SRAM | DRAM |
|---|---|
| It is a Static Random-Access Memory. | It is a Dynamic Random Access Memory. |

| | |
|---|---|
| The access time of SRAM is slow. | The access time of DRAM is high. |
| It uses flip-flops to store each bit of information. | It uses a capacitor to store each bit of information. |
| It does not require periodic refreshing to preserve the information. | It requires periodically refreshing to preserve the information. |
| It uses in cache memory. | It is used in the main memory. |
| The cost of SRAM is expensive. | The cost of DRAM is less expensive. |
| It has a complex structure. | Its structure is simple. |
| It requires low power consumption. | It requires more power consumption. |

**Advantages of RAM**

- o It is a faster type of memory in a computer.
- o It requires less power to operate.
- o Program loads much faster
- o More RAM increases the performance of a system and can multitask.
- o Perform read and write operations.
- o The processor can read information faster than a hard disc, floppy, USB, etc.

**Disadvantages of RAM**

- o Less RAM reduces the speed and performance of a computer.
- o Due to volatile, it requires electricity to preserve the data.
- o It is expensive than ROM
- o It is unreliable as compared to ROM
- o The Size of RAM is limited.

## Read-Only Memory (ROM)

ROM is a memory device or storage medium that is used to **permanently** store information inside a chip. It is a read-only memory that can only read stored

information, data or programs, but we cannot write or modify anything. A ROM contains some important instructions or program data that are required to start or boot a computer. It is a **non-volatile** memory; it means that the stored information cannot be lost even when the power is turned off or the system is shut down.



**Types of ROM**

There are five types of Read Only Memory:

1. **MROM           (Masked          Read          Only          Memory):**
   MROM is the oldest type of read-only memory whose program or data is pre-configured by the integrated circuit manufacture at the time of manufacturing. Therefore, a program or instruction stored within the MROM chip cannot be changed by the user.

2. **PROM           (Programmable          Read          Only          Memory):**
   It is a type of digital read-only memory, in which the user can write any type of information or program only once. It means it is the empty PROM chip in which the user can write the desired content or program only once using the special PROM programmer or PROM burner device; after that, the data or instruction cannot be changed or erased.

3. **EPROM (Erasable and Programmable Read Only Memory):** It is the type of read only memory in which stored data can be erased and re-programmed only once in the EPROM memory. It is a non-volatile memory chip that holds data when there is no power supply and can also store data for a minimum of 10 to 20 years. In EPROM, if we want to erase any stored data and re-programmed it, first, we need to pass the ultraviolet light for 40 minutes to erase the data; after that, the data is re-created in EPROM.

4. **EEPROM (Electrically Erasable and Programmable Read Only Memory):** The EEROM is an electrically erasable and programmable read only memory used to erase stored data using a high voltage electrical charge and re-programmed it. It is also a non-volatile memory whose data cannot be erased or lost; even the power is turned off. In EEPROM, the stored data can be erased and reprogrammed up to 10 thousand times, and the data erase one byte at a time.

5. **Flash                                                                                          ROM:** Flash memory is a non-volatile storage memory chip that can be written or programmed in small units called Block or Sector. Flash Memory is an EEPROM form of computer memory, and the contents or data cannot be lost when the power source is turned off. It is also used to transfer data between the computer and digital devices.

**Advantages of ROM**

1. It is a non-volatile memory in which stored information can be lost even power is turned off.
2. It is static, so it does not require refreshing the content every time.
3. Data can be stored permanently.
4. It is easy to test and store large data as compared to RAM.
5. These cannot be changed accidently
6. It is cheaper than RAM.
7. It is simple and reliable as compared to RAM.
8. It helps to start the computer and loads the OS.

**Disadvantages of ROM**

1. Store data cannot be updated or modify except to read the existing data.
2. It is a slower memory than RAM to access the stored data.
3. It takes around 40 minutes to destroy the existing data using the high charge of ultraviolet light.

## RAM Vs. ROM

| RAM | ROM |
|---|---|
| It is a Random-Access Memory. | It is a Read Only Memory. |
| Read and write operations can be performed. | Only Read operation can be performed. |
| Data can be lost in volatile memory when the power supply is turned off. | Data cannot be lost in non-volatile memory when the power supply is turned off. |
| It is a faster and expensive memory. | It is a slower and less expensive memory. |
| Storage data requires to be refreshed in RAM. | Storage data does not need to be refreshed in ROM. |
| The size of the chip is bigger than the ROM chip to store the data. | The size of the chip is smaller than the RAM chip to store the same amount of data. |
| Types of RAM: DRAM and SRAM | Types of ROM: MROM, PROM, EPROM, EEPROM |

# Secondary Memory

Secondary memory is a **permanent storage** space to hold a large amount of data. Secondary memory is also known as external memory that representing the various storage media (hard drives, USB, CDs, flash drives and DVDs) on which the computer data and program can be saved on a long term basis. However, it is cheaper and slower than the main memory. Unlike primary memory, secondary memory cannot be accessed directly by the CPU. Instead of that, secondary memory data is first loaded into the RAM (Random Access Memory) and then sent to the processor to read and update the data. Secondary memory devices also include magnetic disks like hard disk and floppy disks, an optical disk such as CDs and CDROMs, and magnetic tapes.

## Features of Secondary Memory

- Its speed is slower than the primary/ main memory.
- Store data cannot be lost due to non-volatile nature.
- It can store large collections of different types, such as audio, video, pictures, text, software, etc.
- All the stored data in a secondary memory cannot be lost because it is a permanent storage area; even the power is turned off.
- It has various optical and magnetic memories to store data.

## Types of Secondary Memory

The following are the types of secondary memory devices:

**Hard Disk**

A hard disk is a computer's permanent storage device. It is a non-volatile disk that permanently stores data, programs, and files, and cannot lose store data when the computer's power source is switched off. Typically, it is located internally on computer's motherboard that stores and retrieves data using one or more rigid fast rotating disk platters inside an air-sealed casing. It is a large storage device, found on every computer or laptop for permanently storing installed software, music, text documentation, videos, operating system, and data until the user did not delete.

**Floppy Disk**

A floppy disk is a secondary storage system that consisting of thin, flexible magnetic coating disks for holding electronic data such as computer files. It is also known as Floppy Diskette that comes in three sizes like 8 inches, 5.5 inches and 3.5 inches. The stored data of a floppy disk can be accessed through the floppy disk drive. Furthermore, it is the only way through a new program installed on a computer or backup of the information. However, it is the oldest type of portable storage device, which can store data up to 1.44 MB. Since most programs were larger, that required multiple floppy diskettes to store large amounts of data. Therefore, it is not used due to very low memory storage.

**CD (Compact Disc)**

A CD is an optical disk storage device, stands for Compact Disc. It is a storage device used to store various data types like audio, videos, files, OS, Back-Up file, and any other information useful to a computer. The CD has a width of 1.2 mm and 12 cm in height, which can store approximately 783 MB of data size. It uses laser light to read and write data from the CDs.

**Types of CDs**

<div style="background-color:gray; text-align:center;">Learn more</div>

1. **CD-ROM (Compact Disc Read Only Memory):** It is mainly used for bulk size mass like audio CDs, software and computer games at the time of manufacture. Users can only read data, text, music, videos from the disc, but they cannot modify or burnt it.

2. **CD-R (Compact Disc Recordable):** The type of Compact Disc used to write once by the user; after that, it cannot be modified or erased.

3. **CD-RW (Compact Disc Rewritable):** It is a rewritable CD disc, often used to write or delete the stored data.

**DVD Drive/Disc**

DVD is an optical disc storage device, stands for **Digital Video Display or Digital Versatile Disc**. It has the same size as a CD but can store a larger amount of data than a compact disc. It was developed in **1995** by Sony, Panasonic, Toshiba and Philips four electronics companies. DVD drives are divided into three types, such as DVD ROM (Read Only Memory), **DVD R** (Recordable) and **DVD RW** (Rewritable or Erasable). It can store multiple data formats like audio, videos, images, software, operating system, etc. The storing capacity of data in DVD is 4.7 GB to 17 GB.



**Blu Ray Disc (BD)**

Blu Ray is an Optical disc storage device used to store a large amount of data or high definition of video recording and playing other media files. It uses laser technology to read the stored data of the Blu-ray Disk. It can store more data at a greater density as compared to CD/ DVD. For example, compact discs allow us to store 700 MB of data, and in DVDs, it provides up to 8 GB of storage capacity, while Blu-ray Discs provide 28 GB of space to store data.

**Pen Drive**

A pen drive is a portable device used to permanently store data and is also known as a USB flash drive. It is commonly used to store and transfer the data connected to a computer using a USB port. It does not have any moveable part to store the data; it uses an integrated circuit chip that stores the data. It allows the users to store and transfer data like audio, videos, images, etc. from one computer to any USB pen drive. The storing capacity of pen drives from 64 MB to 128 GB or more.



**Cache Memory**

It is a small-sized chip-based computer memory that lies between the CPU and the main memory. It is a faster, high performance and temporary memory to enhance the performance of the CPU. It stores all the data and instructions that are often used by computer CPUs. It also reduces the access time of data from the main memory. It is faster than the main memory, and sometimes, it is also called CPU memory because it is very close to the CPU chip. The following are the levels of cache memory.

1. **L1 Cache:** The L1 cache is also known as the onboard, internal, or primary cache. It is built with the help of the CPU. Its speed is very high, and the size of the L1 cache varies from 8 KB to 128 KB.

2. **L2 Cache:** It is also known as external or secondary cache, which requires fast access time to store temporary data. It is built into a separate chip in a motherboard, not built into the CPU like the L1 level. The size of the L2 cache may be 128 KB to 1 MB.

3. **L3 Cache:** L3 cache levels are generally used with high performance and capacity of the computer. It is built into a motherboard. Its speed is very slow, and the maximum size up to 8 MB.

**Advantages of Cache Memory**

1. Cache memory is the faster memory as compared to the main memory.
2. It stores all data and instructions that are repeatedly used by the CPU for improving the performance of a computer.
3. The access time of data is less than the main memory.

**Disadvantage of Cache Memory**

1. It is very costly as compared to the Main memory and the Secondary memory.

2. It has limited storage capacity.

**Register Memory**

The register memory is a temporary storage area for storing and transferring the data and the instructions to a computer. It is the smallest and fastest memory of a computer. It is a part of computer memory located in the CPU as the form of registers. The register memory is 16, 32 and 64 bits in size. It temporarily stores data instructions and the address of the memory that is repeatedly used to provide faster response to the CPU.

## Primary Vs. Secondary Memory

| Primary Memory | Secondary Memory |
|---|---|
| It is also known as temporary memory. | It is also known as a permanent memory. |
| Data can be access directly by the processor or CPU. | Data cannot be accessed directly by the I/O processor or CPU. |
| Stored data can be a volatile or non-volatile memory. | The nature of secondary memory is always non-volatile. |
| It is more costly than secondary memory. | It is less costly than primary memory. |
| It is a faster memory. | It is a slower memory. |
| It has limited storage capacity. | It has a large storage capacity. |
| It required the power to retain the data in primary memory. | It does not require power to retain the data in secondary memory. |
| Examples of primary memory are RAM, ROM, Registers, EPROM, PROM and cache memory. | Examples of secondary memory are CD, DVD, HDD, magnetic tapes, flash disks, pen drive, etc. |

## Input and Output Devices

An input/output device, often known as an IO device, is any hardware that allows a human operator or other systems to interface with a computer. Input/output devices, as the name implies, are capable of delivering data (output) to and receiving data from a computer (input).

An input/output (I/O) device is a piece of hardware that can take, output, or process data. It receives data as input and provides it to a computer, as well as sends computer data to storage media as a storage output.

There are many IO Devices available, some of them are:

### Input Devices

### Keyboard

The keyboard is the most frequent and widely used input device for entering data into a computer. Although there are some additional keys for performing other operations, the keyboard layout is similar to that of a typical typewriter.

Generally, keyboards come in two sizes: 84 keys or 101/102 keys, but currently keyboards with 104 keys or 108 keys are also available for Windows and the Internet.



**Types of Keys**
- **Numeric Keys:** It is used to enter numeric data or move the cursor. It usually consists of a set of 17 keys.
- **Typing Keys:** The letter keys (A-Z) and number keys (09) are among these keys.

- **Control Keys:** These keys control the pointer and the screen. There are four directional arrow keys on it. Home, End, Insert, Alternate(Alt), Delete, Control(Ctrl), etc., and Escape are all control keys (Esc).
- **Special Keys:** Enter, Shift, Caps Lock, NumLk, Tab, etc., and Print Screen are among the special function keys on the keyboard.
- **Function Keys:** The 12 keys from F1 to F12 on the topmost row of the keyboard.

## Mouse

The most common pointing device is the mouse. The mouse is used to move a little cursor across the screen while clicking and dragging. The cursor will stop if you let go of the mouse. The computer is dependent on you to move the mouse; it won't move by itself. As a result, it's an input device.

A mouse is an input device that lets you move the mouse on a flat surface to control the coordinates and movement of the on-screen cursor/pointer.

The left mouse button can be used to select or move items, while the right mouse button when clicked displays extra menus.
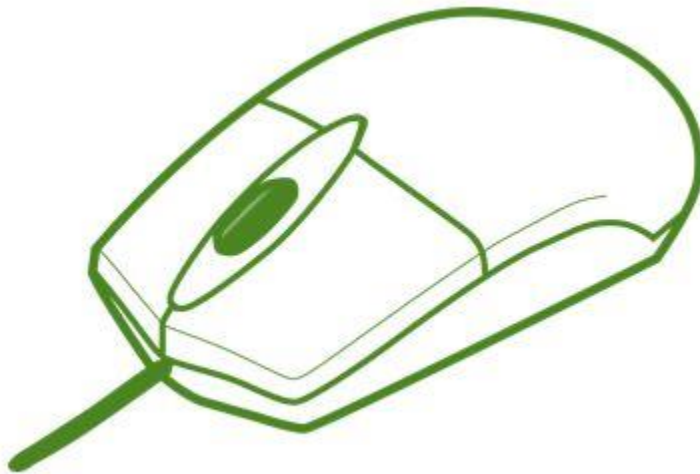


## Joystick

A joystick is a pointing device that is used to move the cursor on a computer screen. A spherical ball is attached to both the bottom and top ends of the stick. In a socket, the lower spherical ball slides. You can move the joystick in all four directions.

The joystick's function is comparable to that of a mouse. It is primarily used in CAD (Computer-Aided Design) and playing video games on the computer.

**Light Pen**

A light pen is a type of pointing device that looks like a pen. It can be used to select a menu item or to draw on the monitor screen. A photocell and an optical system are enclosed in a tiny tube.

When the tip of a light pen is moved across a monitor screen while the pen button is pushed, the photocell sensor element identifies the screen location and provides a signal to the CPU.

**Scanner**

A scanner is an input device that functions similarly to a photocopier. It's employed when there's information on paper that needs to be transferred to the computer's hard disc for subsequent manipulation.

Scanner collects images from the source and converts them to a digital format that may be saved on a disc. Before they are printed, these images can be modified.

## OCR
OCR stands for optical character recognition, and it is a device that reads printed text. OCR optically scans the text, character by character, turns it into a machine-readable code, and saves it to the system memory.

## Bar Code Reader
A bar code reader is a device that reads data that is bar-coded (data that is represented by light and dark lines).
Bar-coded data is commonly used to mark things, number books, and so on. It could be a handheld scanner or part of a stationary scanner.
A bar code reader scans a bar code image, converts it to an alphanumeric value, and then sends it to the computer to which it is connected.

## Web Camera

Because it records a video image of the scene in front of it, a webcam is an input device. It is either built inside the computer (for example, a laptop) or attached through a USB connection.

A webcam is a computer-connected tiny digital video camera. It's also known as a web camera because it can take images and record video. These cameras come with software that must be installed on the computer in order to broadcast video in real-time over the Internet. It can shoot images and HD videos, however, the video quality isn't as good as other cameras (In Mobiles or other devices or normal cameras).

**Output Devices**

## Monitor

Monitors, also known as Visual Display Units (VDUs), are a computer's primary output device. It creates images by arranging small dots, known as pixels, in a rectangular pattern. The amount of pixels determines the image's sharpness.

The two kinds of viewing screen used for monitors are:

**(1) Cathode-Ray Tube (CRT):** Pixels are minuscule visual elements that make up a CRT display. The higher the image quality or resolution, the smaller the pixels.

**(2) Flat-Panel Display Cathode-Ray Tube Monitor:** In comparison to the CRT, a flat-panel display is a type of video display with less volume, weight, and power consumption. They can be hung on the wall or worn on the wrist.

Flat-panel displays are currently used in calculators, video games, monitors, laptop computers, and graphical displays.

## Printer

Printers are output devices that allow you to print information on paper.

There are two types of printers:

**(a) Impact Printer:**
Characters are printed on the ribbon, which is subsequently crushed against the paper, in impact printers. The following are the characteristics of impact printers:

- Exceptionally low consumable cost.
- Quite noisy
- Because of its low cost, it is ideal for large-scale printing.
- To create an image, there is physical contact with the paper.

**(b) Non-Impact Printers:**
Characters are printed without the need for a ribbon in non-impact printers. Because these printers print a full page at a time, they're also known as Page Printers. The following are the characteristics of non-impact printers:

- Faster
- They don't make a lot of noise.
- Excellent quality
- Supports a variety of typefaces and character sizes

## Sample Questions

### Question 1. List Disadvantages of CRT Monitor.
**Answer:**
*Some of the disadvantages of CRT are :*

- *High power consumption*
- *Big back and take up a lot of desk space.*
- *Because it is less bright than an LCD, it is not ideal for excessively bright environments.*
- *They're big, heavy, and clumsy.*

**Question 2. Compare input & Output Devices.**
**Answer.**

| S.No | Input Device | Output Device |
|---|---|---|
| 1. | Data is accepted from the user of the device | It shows the data after processing to the user |
| 2. | It accepts the user's data and transmits it to the processor for saving in the secondary memory or processing. | It receives the data from the processor and returns it to the user. |
| 3. | More complex designing | Less complex designing |
| 4. | These devices are used to accept the data | These devices are used to display or show the data |
| 5. | Example: Keyboard, mouse, etc. | Example: Monitor, Printer, etc. |

**Question 3. What are the types of flat-panel displays?**
**Answer:**
*There are 2 types of flat-panel displays :*
*(a) Emissive Display: Devices that turn electrical energy into light are known as emissive displays. Example: LEDs, Plasma panels, thin film electroluminescent displays etc.*
*(b) Non- Emissive Display: Optical effects are used in Non-Emissive displays to turn sunshine or light from another source into graphical patterns. LCDs are a good example (Liquid Crystal Device).*

**Question 4. Explain the output device: Plotter.**
**Answer:**
*A plotter is a device that prints graphics in a variety of color formats with high-quality images. It's similar to a printer, but with more advanced capabilities.*
*Plotter allows us to create pictures, 3D postcards, advertising signs, charts, and various designs of the internal structure of building machines, as well as print large maps, architectural drawings, large-format printing, and create pictures, 3D postcards, advertising signs, charts, and various designs of the internal structure of building machines.*

**Question 5. Compare Impact & Non-Impact Printers.**
**Answer:**

| S.No | Impact Printers | Non-Impact Printers |
|------|-----------------|---------------------|
| 1. | Slow Speed | Fast Speed |
| 2. | Makes a lot of Noisy | They are less Noisy |
| 3. | Cheap | Costly |
| 4. | Poor quality as compared to non-impact printers. | Good quality printing |
| 5. | It works by hammering a set of metal pins or a character set into the paper. | Ink is deposited in several forms during printing. |

# Difference between an input and output device?

There are many input devices such as a keyboard, mouse, webcam, microphone and more, which send information to a computer system for processing. An output device, like Monitor, printer and more, displays the result of processing generated by input devices. Input devices only work for giving input of data to the system, and output devices accept the output after processing of data from other devices.

## Input Example
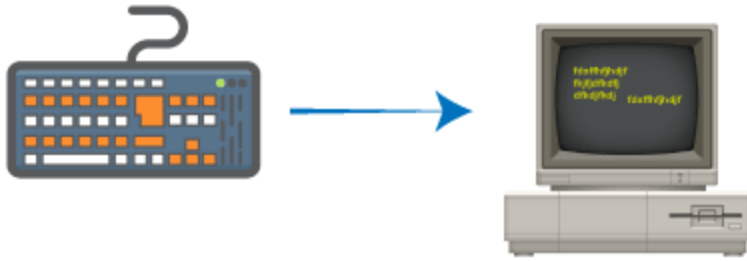


## Output Example



One of the main differences between input and output devices is that input devices are ones that are used to give input to the system by the users, whereas output devices are those, which are used to reproduce the output signals for the user.

There are various devices that are used to accept input of data from user or output data generated by a computer; therefore, they are known as input devices or output devices. However, some devices are referred to as Input/output devices, as they can receive input and reproduce output.

For instance, as shown in the above image, a keyboard is an input device, sending an electrical signal to the computer system. A computer system accepts these signals as input, then translates them and produces or displays output to the user on the monitor as text or images. In the lower half of the image, it is also shown that after processing, the computer sends data or output to the printer. Then, once the computer sends output to the printer, it is printed onto the piece of paper that is also considered output.

# Input devices

An input device can receive instructions from users or forward information to another device, but it is not able to accept data from another system. After receiving input, it translates these data into the electrical signals in binary code, which cannot be understandable by humans, and only a digital computer can understand it. There are many examples of input devices, which are discussed below:

- **Keyboard and Mouse:** These are the input devices that are used by the users to give input to the computer. They send the received input (Data) from users to the system. As these are input devices, they cannot receive or display output (information) from the computer.

- **Microphone:** Another input device is a microphone that accepts sound generated by an input source and allows users to send audio into their computers. In the microphone, the accepted signal may be converted into a digital signal or can be amplified as an analog signal.

- **Webcam:** A webcam is a video camera that connects to a computer and faces the user, which is used to capture pictures, make a video by a computer system. It takes images as input from where it is pointed and used for calling and taking selfies. However, most modern webcams have a microphone, which offers users a better sound quality while making videos. Webcams are attached to the monitor of a desktop computer and also built into laptops.

# Output devices

Output devices are the section of a computer device that receives data from another device and produces output with the information. Although it cannot send data to another device, it has the ability to forward data from a computer to another computer system. It functions to take data from input devices and translate the digitized signals into a form that can be understandable by users. There are various examples of output devices; some are discussed below:

- o **Monitor:** A monitor is a piece of computer hardware that accepts data from a computer (output) and displays it on the system screen through the computer's video card. Monitors have the ability to display information at a much higher resolution. Additionally, these are much like televisions and also known as video screen, display, video display terminal, or video display unit.

- o **Speakers:** The most common output devices, speakers accept sound data from a computer and play the sounds for users to hear. Although speakers can be used with any type of sound system, some speakers are manufactured only for computers. It is a device that cannot receive sound generated by users as well as refer that sound to another device. The main objective of the speakers is to produce sound or audio output for the listener.

- o **Projector:** A projector is an output device that accepts data from a computer (output) and projects that data or information as a picture onto a wall or screen or any large surface. It does not have the ability to receive data from a user and also not capable of sending that data to another device. When you are showing video or images to a large group of people, a projector is more beneficial to use instead of a monitor because it displays data on a large surface that can be visible to a large number of people clearly.

## Input/output devices

An input/output device has the ability to accept data from users or another device (input), as well as forward data to another device (output). Some examples of input/output devices are discussed below:

- o **CD-RW drive and DVD-RW drive:** These drives functions for accepting data from a computer as an input to copy onto a writable CD or DVD. And, this data contained on a CD or DVD is sent by the drive to the computer.

- o **USB flash drive:** It is also referred to as a keychain drive, data stick, USB flash drive, thumb drive, memory unit, pen drive. It is a portable storage device that saves or accepts

data from a computer (input). It connects to a computer via a USB port and forwards data to a computer or another device (output).

## Difference between Input and Output devices.

The below table contains major key points of the difference between both Input and Output devices.

| Input device | Output device |
|---|---|
| The input device receives data from users. | An output device displays data on the screen for users. |
| It works for translating user-friendly instructions into a machine friendly. | It works for translating the machine's instructions to user intelligible. |
| An input device can be commanded by the user. | Processor commands output device. |
| It accepts data from the user as an input and forwards it to the processor for further processing. | The data, which is processed by the processor, is sent to the output device for sending it back to the user; it means that the output device takes the processed data from the processor. |
| Its design is more complex. | As compared to input devices, its design is less complex. |
| Input device helps the computer to receive instructions from users. | The output device helps the computer to produce or display the information to the users. |
| There are various input devices available like Microphone, Joystick, Keyboard, Pointing device, Image Scanner, Graphics tablet, and more. | There are several output devices available such as Speakers, Printers, Plotters, Projector, Monitor and more. |

# Light Emitting Diode (LED)

It is most widely used semiconductor which emit either visible light or invisible infrared light when forward biased. Remote controls generate invisible light. A Light emitting diodes (LED) is an optical electrical energy into light energy when voltage is applied.



diode



light emitting diode
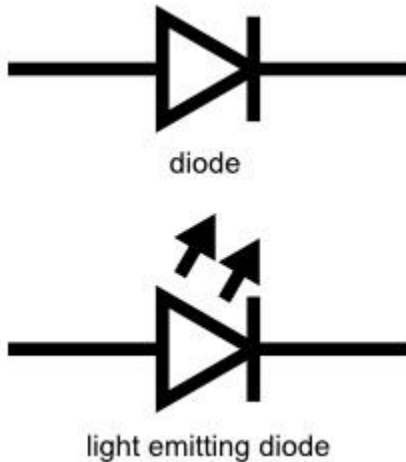
In forward biased, energy is released in the form of light when free electrons in conduction band recombines with holes in the valence band. This process is called electroluminescence. Like a normal p-n junction diode allows electric current only in direction, LEDs also operates only in forward bias condition. The n-type material should be negatively charged and p-type material should be positively charged to create an LED.

# Layers of LED

There are three layers in a light emitting mode (LED). These are

### P-type semiconductor
Trivalent impurities are added to the intrinsic or pure semiconductor. Holes are majority charge carriers.

### N-types semiconductor
Pentavalent impurities are added to the intrinsic semiconductor. Free electrons are majority charge carriers.

### Depletion layer or region
It is a region or layer between p-type and n-type semiconductor where no charge carriers (free electrons or holes) are present. It is a barrier to current. To overcome this barrier, we need to apply voltage which is greater than barrier potential of this layer.

# Working of LED

Light Emitting Diode (LED) works only in forward biased condition where free electrons are from n-side and the holes from p-side are pushed towards the junction. The recombination of free electrons and holes takes place in depletion region as well as in p-type and n-type semiconductor. The free electrons in conduction band releases energy in the form of light before they recomine with holes in the valence band.

When external voltage is applied to valence electrons, the valence electrons which breaks bonding with parent atom are called free electrons and that empty space is called a hole. The grouping the range of energy levels of all the valence is called valence band.

Since energy of free electrons is always more than the energy of valence electrons or holes, so it need to lose energy in order to recombine with holes. Hence each recombination of charge emits energy in the form of light. The brightness of the emitted light is depends on the materials used for conducting LED and forward current flow through the LED.
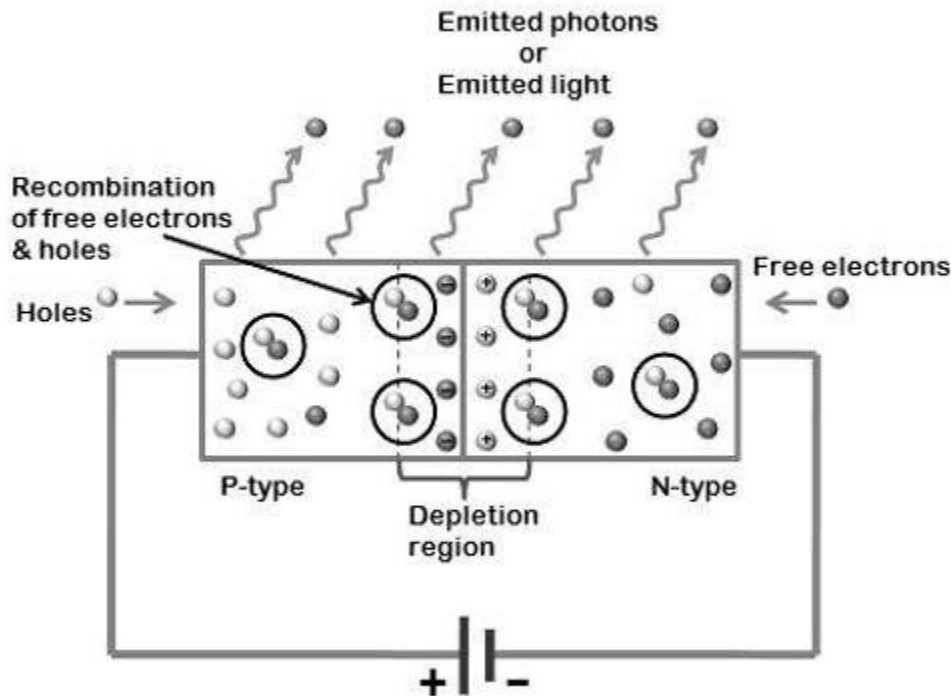


In normal silicon diodes, energy gap between conduction and valence band is less, so low energy photons are released which low frequency and invisible to human eye. Whereas, in LED, energy gap between conduction and valence band is very large so high energy photons released and visible to human eye.

Since LEDs are operate only forward bias condition, so if reverse bias voltage is applied to LED, it may be damaged. LEDs can switched ON and OFF at a very fast speed of 1 ns. The most common colors of LEDs are green, red, orange, and yellow but schematic symbol is same.

# Biasing of LED

The safe forward voltage and current of most LED is from 1V to 3V and 200 mA to 100mA respectively. To avoid destruction of device because of more voltage, we need to place a register (Rs) in series with LED which is placed between LED and voltage source (Vs) and this register is called as current limiting resistor. So we can protect LED from damage by using this current limiting register. The current flowing through LED is mathematically written as,

$I_F = V_S - V_D/R_S$

Where, $I_F$ is forward current, $V_S$ is source or supply voltage, $V_D$ is voltage drop across LED, and $R_S$ is register or current limiting register.

The amount of output light emitted by LED is directly proportional to the amount of forward current flowing through the LED.

## Types of LED

There are two classes of light emitting diodes, these are visible LEDs and invisible LEDs. Also, the wavelength or color of emitting light depends on the forbidden gap or energy gap of the materials. These are various types of light emitting diodes:

- Gallium Arsenide (GaAs) – infrared
- Gallium Arsenide Phosphide (GaAsP) – red to infrared, orange
- Aluminium Gallium Arsenide Phosphide (AlGaAsP) – high-brightness red, orange-red, orange, and yellow
- Gallium Phosphide (GaP) – red, yellow and green
- Aluminium Gallium Phosphide (AlGaP) – green
- Gallium Nitride (GaN) – green, emerald green
- Gallium Indium Nitride (GaInN) – near ultraviolet, bluish-green and blue
- Silicon Carbide (SiC) – blue as a substrate
- Zinc Selenide (ZnSe) – blue

## Advantages of LED

These are following advantages of light emitting diodes:

- Brightness of LED can be easily controlled by varying the current.
- These are smaller in size, light in weight and have longer in lifetime.
- These are very cheap, readily available and consume low energy.
- LEDs operate very fast.
- These can emit different colors of light.
- LEDs do not contain toxic material like mercury which is used in fluorescent lamps.

## Disadvantages of LED

Main disadvantages of LEDs are efficiency is low and need more power to operate than normal p-n junction diodes.

## Applications of LED

These are various applications of LEDs:

- Digital computers and calculators
- Traffic signals and Burglar alarms systems
- Microprocessors and multiplexers
- Picture phones and digital watches
- Camera flashes and automotive heat lamps
- Aviation lighting

# What is the full form of LCD

## LCD: Liquid Cristal Display

**LCD** is *a flat panel display* or video display which uses the light modulating property of liquid crystals. It is used to display images use in many electronic devices available in the market today. LCDs display the arbitrary images and fixed images both. Arbitrary images are the general purpose computer display images and the fixed images are used in digital clocks and calculators etc. It is mostly used as a computer monitor and Television set in the household. It has replaced the old Cathode Rays Tubes (CRTs) and reduces the power consumption.

LCD screens are more energy efficient and it can be disposed more safely than CRT. It is always preferred to use in battery powered equipments due to its energy efficiency.

## How it works

It works on the principle of color emission of liquid crystals. Liquid crystals were discovered in 1888. LCD is an electronically modulated optical device made up of segments filled with liquid crystals. LCDs used liquid crystals and polarized light to display the pictures. When the electric current applied to LCD TVs, there is a large bright light that shines towards the viewer. It creates millions of pixels that generates images.

LCDs provide better clarity and efficiency than CRTs. It is also more trendy and fashionable.

LCD is used in devices like:

- o Televisions
- o Calculators
- o Digital clocks
- o Computers
- o Laptops
- o Gaming Devices
- o Mobile Phones
- o Smart Phones etc.

# What is the full form of TFT

## TFT: Thin Film Transistor

TFT stands for Thin Film Transistor. It is a display screen technology used in liquid crystal display (LCD). TFTs are the active elements that act as switches turning each pixel on and off. These are made of a wide variety of semiconductor materials like silicon.

In TFT, each pixel is controlled by one to four transistors. The TFT technology is known for its best resolution among all the flat-panel techniques, but it is also the most expensive. TFT screens are also known as active-matrix LCDs because they use a transistor at each pixel, which is arranged in form of matrix.

## Advantage

The main advantage of TFT technology is that it has a separate, tiny transistor for each pixel on the display. It makes the screen refresh very quickly as the image is refreshed several times per second.

Following are the main devices that use Thin Film Transistor Technology:

- o Computer monitors
- o Laptops
- o Television
- o Personal digital assistants (PDAs)
- o Smart phones
- o Video gaming systems
- o Navigation systems
- o AMOLED screens also contain a TFT layer

# UNIT -4

**BIOS Full Form**

**BIOS** stands for **Basic Input/Output System.** BIOS is the first program to run when the computer starts. It is a ROM chip (EEPROM chip) found on motherboards and is used for hardware initialization during the booting process. It is pre-installed in the computer system.

When a computer system is turned on it requires a series of initialization and test before the user can work on it. This process is called booting.

**Basic Input Output System (BIOS) :**
It provides a set of instructions and is responsible for booting the computer. The BIOS performs all the test needed at startup time. These tests are collectively known as Power On Self Test(POST) .The computer contains hardware like keyboard, monitor, disk drives, etc. there functioning requires interfacing with the operating system. The BIOS provides drivers for basic hardware like keyboard and monitor, mouse, etc. The operating system provides hardware for printer, modem, etc. Drivers for some hardware may not be available in the operating system hence these have to be explicitly installed by the user.
**Power On Self Test (POST) :**
POST consists of a series of diagnostic test that runs automatically when a user

turns on the computer. The actual test may differ depending on the configuration of the BIOS. However, the usual test includes testing of the RAM, keyboard and the disk drives. If these tests are successful the computer boots itself and loads the operating system but if these tests are unsuccessful, the computer reports the errors through a series of beeps to draw the operator's attention and finally an error message is displayed on the monitor.
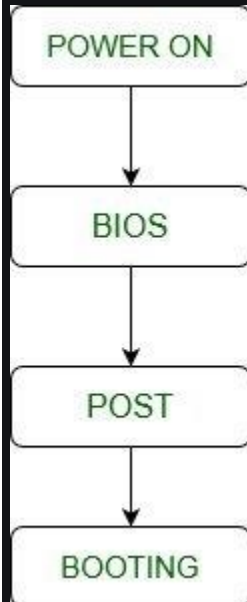


**Location Of BIOS :**
BIOS is typically placed in a chip known as Read Only Memory(ROM) that comes with the computer. This ensures that the BIOS will always be available even if the hard disk is formatted or replaced. However, in many cases the content of the ROM is transferred to the RAM when the system is started. This is because the RAM allows quicker access as compared to the ROM. Copying of the content of the ROM to the RAM is known as shadowing.

**Complementary Metal Oxide Semiconductor RAM :**
As the BIOS will interface the hardware with the operating system, it will require configurations of the hardware components like hard disk, monitor, etc. This information is permanently saved in an area known as Complementary Metal Oxide Semiconductor Random Access Memory (CMOS RAM). Power is supplied to the CMOS from a small battery so its contents will not be lost after the PC is turned off. Therefore, there is a battery and a small RAM memory on the board which stores information in a permanent manner. The CMOS needs very little power so there is not much of strain on the computer's battery. Even then the battery is rechargeable is recharged every time the computer is turned on.

# What is Booting? Type of Booting

**There are two Types of Booting**

1) **Warm Booting**: when the System Starts from the Starting or from initial State Means when we Starts our System this is called as warm Booting. In the Warm Booting the System will be Started from its beginning State means first of all, the user will press the Power Button , then this will read all the instructions from the ROM and the Operating System will b Automatically gets loaded into the System.

2) **Cold Booting**: The Cold Booting is that in which System Automatically Starts when we are Running the System, For Example due to Light Fluctuation the system will Automatically Restarts So that in this Chances Damaging of system are More. and the System will no be start from its initial State So May Some Files will b Damaged because they are not Properly Stored into the System.

A computer's Basic Input-Output System (BIOS) is embedded software on a motherboard. It is the first software your PC loads so that it can use things like CD drives, mice, and keyboards practically from the moment you turn it on.

This guide will help you flash (update) your BIOS by taking the right precautions and walking you through each step. Not all computers will have the same BIOS manufacturer, let alone the same exact process, but they all share similar steps and precautions.

Steps

1.
   1 **Find your current BIOS version.** You'll want this information when you visit the manufacturer's website.

- Open the System Information app in Windows. For Windows Vista and Windows7, enter *msinfo32* into the search bar (or the Run box in Windows XP), then click **System Summary**.
- Your BIOS version will be displayed under your computer's processor speed. Write down the version number and date (if it appears).

2.
 2 **Determine your system's origins.** This is an important first step to determine where to locate and download the correct BIOS update version.
- Did you purchase the computer as a bundled, pre-built system, or was it assembled from purchased components? If it's a bundled system—for example, a Dell—check their website; if the computer was custom assembled, visit the website of the motherboard manufacturer. Look for something like "Drivers and Downloads."
- Be sure to download the BIOS update for the model you own. If the updater is not written well, it could write over your BIOS with another model's BIOS, and hello, paperweight!
- Also be sure to download any Read Me files and other documentation— and then read it! This is not the time to just wing it. There may be important precautions that you should know before updating, and ignoring those could ruin your whole day.

3.

   3 **Backup your existing BIOS first!** If using BIOS update software executed from Windows or another operating system, backup the existing BIOS image first. Most BIOS updater have this functionality built-in (e.g., "Save" or "Backup"), and will advise you to perform a backup first. Check your manufacturer's website for information on their recommended way to backup the BIOS.

4.

   4 **Prepare your system.** The biggest danger with flashing a BIOS comes in the event of power loss during the procedure. You may not be able to control the power company, but you *can* control how it affects you.

- o If you are updating a laptop, first make sure the battery is fully charged, and then plug into the wall power so you are not running off the battery. In the event of power failure, your battery will keep things running.
- o If you are updating a desktop computer, it's best if you are plugged into an uninterruptible power supply (UPS). Like the laptop's battery, the UPS will keep everything running, while others are running around in the dark.

5.

 5 **Perform the update.** Run the downloaded installer or .exe file for the BIOS updating software.
- o If the software prompts you for a floppy, use a formatted1.44MB3.5" floppy disk.Insert it into the drive and restart the system to boot from it. Some floppy images contain an "autoexec.bat" file to automatically run the BIOS update. Others will just have the update software, the updated BIOS image, and possibly a 'readme' text file containing directions. If there are no directions, but there are at least two files (ie: "A06_123.bin" and "awflash.exe"), follow this example: Enter a command such as "awflash

A06_123.bin" and press enter. This will execute the update software and specify the A06_123.bin file to flash the BIOS.
- o Compare the two versions. Most BIOS update software will read the existing BIOS image and determine its version, then compare this to the downloaded BIOS image. If the system's existing BIOS version is older, perform the update. The user interface of BIOS software may vary greatly, yet typically menu buttons or selections such as "Write", "Update", or "Confirm" will perform the BIOS update.

6.
   6 **Restart the computer.** After the update is completed, many update programs will automatically restart the computer. Some updaters will request your permission to do so while others will warn about this before starting the update. A few will prompt you to power cycle the system yourself. To perform the power cycling procedure manually:
- o Completely power down the PC by either pressing the power button or initiating the power off sequence from the operating system.
- o Flip the master power switch on the back of your PC to the off position, if applicable.
- o Wait a minute.
- o Flip the master power switch back into the on position, if applicable.
- o Power up the PC.

7.
   **7 Clear existing BIOS settings if recommended.** This is not always necessary, depending on what features have changed between the existing version and the updated version. To do so:

- When the PC is powering up, immediately initiate execution of the BIOS utility. For most systems, this is done by pressing the Delete key on the keyboard within the first2 to10 seconds of turning the computer. Some systems might use different keys such as F2, F10, CTRL, Enter, etc.
- If you don't know the keystroke sequence for entering the BIOS utility, watch the monitor to see if the computer displays it.

- To clear the BIOS settings, look for an option to "Restore Defaults" or "Load Fail-Safe Defaults". This may be on the main page of the BIOS utility or on the last page of a tabbed menu. Use the arrow keys to navigate, and follow the on-screen instructions. When complete, save the settings and exit the BIOS utility.

-
-

 **8 Configure the BIOS.** If you know the settings you want, change them now. If you have never changed BIOS settings before, it is not required to do so. Most PCs will function just fine using the default BIOS settings.

While booting, press [**F2**] key to start BIOS setup menu.

1. Check Time and date wether they are correct. If not, they should be adjusted to the correct values.
2. Press [**F9**] key and choose "**Yes**" to set the BIOS to default settings. Press [**F10**] key and choose "**Yes**" to save the settings.
3. Update process finished.

# Definition of Computer Viruses

A computer virus is a type of malicious software, or malware, that spreads between computers and causes damage to data and software.

Computer viruses aim to disrupt systems, cause major operational issues, and result in data loss and leakage. A key thing to know about computer viruses is that they are designed to spread across programs and systems. Computer viruses typically attach to an executable host file, which results in their viral codes executing when a file is opened. The code then spreads from the document or software it is attached to via networks, drives, file-sharing programs, or infected email attachments.

# Common Signs of Computer Viruses

A computer virus will more than likely have an adverse effect on the device it resides on and may be discoverable through common signs of performance loss, including:

## Speed of System

A computer system running slower than usual is one of the most common signs that the device has a virus. This includes the system itself running slowly, as well as applications and internet speed suffering. If a computer does not have powerful applications or programs installed and is running slowly, then it may be a sign it is infected with a virus.

## Pop-up Windows

Unwanted pop-up windows appearing on a computer or in a web browser are a telltale sign of a computer virus. Unwanted pop-ups are a sign of malware, viruses, or spyware affecting a device.

## Programs Self-executing

If computer programs unexpectedly close by themselves, then it is highly likely that the software has been infected with some form of virus or malware. Another indicator of a virus is when applications fail to load when selected from the Start menu or their desktop icon.

## Accounts Being Logged Out

Some viruses are designed to affect specific applications, which will either cause them to crash or force the user to automatically log out of the service.

## Crashing of the Device

System crashes and the computer itself unexpectedly closing down are common indicators of a virus. Computer viruses cause computers to act in a variety of strange ways, which may include opening files by themselves, displaying unusual error messages, or clicking keys at random.

## Mass Emails Being Sent from Your Email Account

Computer viruses are commonly spread via email. Hackers can use other people's email accounts to spread malware and carry out wider cyberattacks. Therefore, if an email

account has sent emails in the outbox that a user did not send, then this could be a sign of a computer virus.

### Changes to Your Homepage

Any unexpected changes to a computer—such as your system's homepage being amended or any browser settings being updated—are signs that a computer virus may be present on the device.

## How Do Computer Viruses Attack and Spread?

In the early days of computers, viruses were spread between devices using floppy disks. Nowadays, viruses can still be spread via hard disks and Universal Serial Bus (USB) devices, but they are more likely to be passed between devices through the internet.

Computer viruses can be spread via email, with some even capable of hijacking email software to spread themselves. Others may attach to legitimate software, within software packs, or infect code, and other viruses can be downloaded from compromised application stores and infected code repositories. A key feature of any computer virus is it requires a victim to execute its code or payload, which means the host application should be running.

## Types of Computer Viruses

There are several types of computer viruses that can infect devices. This section will cover computer virus protections and how to get rid of computer viruses.

### Resident Virus

Viruses propagate themselves by infecting applications on a host computer. A resident virus achieves this by infecting applications as they are opened by a user. A non-resident virus is capable of infecting executable files when programs are not running.

### Multipartite Virus

A multipartite virus uses multiple methods to infect and spread across computers. It will typically remain in the computer's memory to infect the hard disk, then spread through and infect more drives by altering the content of applications. This results in performance lag and application memory running low.

Multipartite viruses can be avoided by not opening attachments from untrusted sources and by installing trusted antivirus software. It can also be prevented by cleaning the boot sector and the computer's entire disk.

### Direct Action

A direct action virus accesses a computer's main memory and infects all programs, files, and folders located in the autoexec.bat path, before deleting itself. This virus typically alters the performance of a system but is capable of destroying all data on the computer's hard disk and any USB device attached to it. Direct action viruses can be avoided through the use of antivirus scanners. They are easy to detect, as is restoring infected files.

### Browser Hijacker

A browser hijacker manually changes the settings of web browsers, such as replacing the homepage, editing the new tab page, and changing the default search engine. Technically, it is not a virus because it cannot infect files but can be hugely damaging to computer users, who often will not  be able to restore their homepage or search engine. It can also contain adware that causes unwanted pop-ups and advertisements.

Browser hijackers typically attach to free software and [malicious applications](#) from unverified websites or app stores, so only use trusted software and reliable antivirus software.

## Overwrite Virus

Overwrite viruses are extremely dangerous. They can delete data and replace it with their own file content or code. Once files get infected, they cannot be replaced, and the virus can affect Windows, DOS, Linux, and Apple systems. The only way this virus can be removed is by deleting all of the files it has infected, which could be devastating. The best way to protect against the overwrite virus is to use a trusted antivirus solution and keep it updated.

## Web Scripting Virus

A web scripting virus attacks web browser security, enabling a hacker to inject web-pages with malicious code, or client-side scripting. This allows cyber criminals to attack major websites, such as social networking sites, email providers, and any site that enables user input or reviews. Attackers can use the virus to send spam, commit fraudulent activity, and damage server files.

Protecting against web scripting is reliant on deploying real-time web browser protection software, using cookie security, disabling scripts, and using malicious software removal tools.

## File Infector

A file infector is one of the most common computer viruses. It overwrites files when they are opened and can quickly spread across systems and networks. It largely affects files with .exe or .com extensions. The best way to avoid file infector viruses is to only download official software and deploy an antivirus solution.

## Network Virus

Network viruses are extremely dangerous because they can completely cripple entire computer networks. They are often difficult to discover, as the virus could be hidden within any computer on an infected network. These viruses can easily replicate and spread by using the internet to transfer to devices connected to the network. Trusted, robust antivirus solutions and advanced firewalls are crucial to protecting against network viruses.

## Boot Sector Virus

A boot sector virus targets a computer's master boot record (MBR). The virus injects its code into a hard disk's partition table, then moves into the main memory when a computer restarts. The presence of the virus is signified by boot-up problems, poor system

performance, and the hard disk becoming unable to locate. Most modern computers come with boot sector safeguards that restrict the potential of this type of virus.

Steps to protecting against a boot sector virus include ensuring disks are write-protected and not starting up a computer with untrusted external drives connected.

# nstall the antivirus program

The installation process of an antivirus program is not different from installing any other application or program. Follow the instructions given below to install an antivirus program on your computer.

1. If you bought antivirus software on a CD or DVD from a store, you must first put the CD or DVD into your computer's disc drive. However, in any case, you can also get the program set up in your USB drive, like Pen drive. When you install the program, through the install process, a window will open that helps guide you, and the installation process should start automatically.

2. If you did not buy a CD or DVD and instead downloaded an antivirus application from the Internet, you must now locate the downloaded file on your computer. If you downloaded the zip file for the program setup, you are required to unzip the file to access the installation files. Then, find the file that has a name like install.exe, setup.exe, or a similar name, and double-click on that file to start the installation process of the antivirus program. When you install the program, through the install process, a window will open that helps guide you, and the installation process should start automatically.

3. Follow the steps for installing the antivirus program in the installation process window. The recommended options are provided by the install process, which helps the antivirus program to work properly. There is one exception that the install process recommends installing any helpful program for your computer or any toolbar for the Internet browser. Whenever you are installing an antivirus program and if prompted to install other software, in this condition, you need to decline the install of those other programs or uncheck all boxes. Also, the antivirus program does not require any additional software to install and run successfully on the computer.

4. Close out the install window when you have completed the installation process of an antivirus.

5. If you installed the software with a CD or DVD, remove it from the computer's disc drive.

After following all the above steps, the antivirus program will be installed successfully and ready to use. Restart your computer system; however, it is not required. However, if you restart the computer, any changes to the operating system will be applied appropriately.

## Once Installed, Scan for Viruses!

You will need to scan your system for finding threats in your computer after you installed antivirus software. Mainly, three kinds of scan options are provided by most security suites, either manual or automatic. A different depth of inspection is offered by three scan options.

1. **Quick Scan:** Usually, a quick scan only checks the common areas where are most chances to be infected, and it takes around 10 to 20 minutes. In this mode of the scan, the scanner passes around most of your network that reduces processing power but increases speed; therefore, you need to leave your computer alone at the time it is running. This option is often appropriate for highlighting any problems.

2. **Full Scan:** If you have quickly scanned your computer, you are still encountering the problem of viruses. Then, you must go for a full scan. The full scan option examines all areas of your computer system to identify if there is no virus; however, it can take more time, even many hours, to complete. In a quick scan, the spyware or other complex malware threats may not be obvious. They need an in-depth check to uncover. Although a full scan option is a slow process, it provides surety your system has not any kind of threats.

3. **A Scheduled Scan:** The schedule scan option provides real-time security for your computer by scanning files for viruses as you use them.

## Update the antivirus program after installation

Antivirus applications that come out of the box don't have the latest spyware and virus definitions and are not up to date. The antivirus software will work improperly and not know about the recently created spyware and viruses, which makes your computer insecure and vulnerable to infection.

It is advised that you update your antivirus application with the most recent virus and spyware definitions after it has been installed on your computer. Your antivirus application will safeguard your computer from all viruses and malware if you maintain it up to date.

The antivirus program, in many cases, checks and installs the current updates automatically If you are offered to pick an antivirus update automatically, choose Yes to update your antivirus application. If it does not urge you to update automatically, you must do it right away.

## Enable automatic updates for the antivirus program

Generally, most antivirus applications have the automatic update function activated by default. It is strongly recommended, you must keep your antivirus program up-to-date at all times; therefore, automatic updates feature should be enabled in your antivirus program settings.

The procedures outlined below will assist you in determining whether or not automatic updates are enabled in your antivirus application.

- o First, you need to *open the antivirus program*.
- o Locate the Settings or Advanced Settings button or link in the antivirus program's interface. If you are unable to see such an option, you can find Updates or something similar options.
- o Now, in the Updates or Settings box, look for an option called Automatically download and apply updates. Also, instead of updates, it may refer to virus definitions.
- o Next, check if the automatic updates option is checked or not; check it for automatic update the program if not already checked.
- o Finally, click on the Apply or Save button to save the settings that you made changes to.

# Troubleshooting I/O devices

Last Updated: 2022-04-07

You can determine the cause of device problems.

# Device software check

Correct a device software problem by:

- Checking the Error Log
- Listing All Devices
- Checking the State of a Device
- Checking the Attributes of a Device
- Changing the Attributes of a Device
- Using a Device with Another Application
- Defining a New Device

## roubleshooting Output Device Problems

### Last Updated February 8, 2022

If you are having trouble printing output from

Applications Manager

, use the following table as a troubleshooting guide.

| Symptoms | Causes | Action |
|---|---|---|
| Printing to most Output Devices is successful. However, one or more devices do not print, and don't give any error messages. | The **Inactive** radio button is selected in the Output Device's **Auto Output Options** box. | Make sure the **Active** radio button is selected in the Output Device's **Auto Output Options** box. |
| | The interface script assigned to the Output Device's Output Interface is not defined correctly. | 1. Verify that the interface script has execute permissions for Applications Manager |

| Symptoms | Causes | Action |
|---|---|---|
| | | . |
| | | 2. After the interface script to echo its command line to a log file rather than executing the command. |
| | | For example change |
| | | **eval "lp $\* $file"** |
| | | to |
| | | **echo "lp $\* $file" > $AW_HOME/exec/LPP.log** |
| | | . |
| | | **3.** Look at the log file (for example, |
| | | **LPP.log** |
| | | ) to check that the syntax of the com is correct. |
| | | 4. Execute the log file to see if it prints document. |
| | | If it prints, then the problem may be |
| | | Applications Manager |
| | | . Call Broadcom Support. |
| | | If the file does not print, then the pro is with your system. |
| An Applications Manager error message states that printing was unsuccessful. | Any | Record the details of the message, then cal Broadcom Support. |
| Output files are not being created. | Permissions on the output directory may not be set | Verify that |

| Symptoms | Causes | Action |
|---|---|---|
| | correctly. | Applications Manager has write permission in the output directory |
| | New files cannot be written to the output directory because:<br><br>• There is no free disk space<br>• There are too many files already in the directory. | Verify that Applications Manager can write a file to the output directory. Free some disk space or clean out unneeded file necessary. |
| | The task failed before it could generate any output. | Check the Backlog or History to see if the ta aborted. Determine why the task aborted. |
| Output files can be viewed from the **Explorer** window, but they do not appear on the **Output** window. | The output was generated with an output function of PRINT or STORE. | To view the output, query the **Output** window for status codes of PRINT and/or STORE.<br><br>To make the output files viewable by default the **Output** window, set the output function for the Job LOG. |
| | The SYSOUT Output Device was assigned to the Job or Process Flow. | Select a different Output Device. |

When troubleshooting printing issues, it's probably best to start by debugging the task's system output file (the o file) in addition to screen shots of the printer and the spooler from the

Applications Manager

client. Make sure the Output Interface's (spooler's) print command works from the command line. Check the configuration settings before getting debug.

To turn on printing debug, create the following 0-byte files in the

**debug**

directory (notice that here

**AWMAIL**

 and

**SYS_PRINT**

 are listed to cover both

**AWMAIL**

 printing problems and system printing problems):

- PRINTEM
- PRINTEM2
- AWMAIL
- SYS_PRINT

Then run the task and look for a
**awprint*log**

 file in the

**log**

 directory.

# Troubleshooting

Do you know what to do if your screen goes blank? What if you can't seem to close an application, or can't hear any sound from your speakers? Whenever you have a problem with your computer, don't panic! There are many basic troubleshooting techniques you can use to fix issues like this. In this lesson, we'll show you some simple things to try when troubleshooting, as well as how to solve common problems you may encounter.

## General tips to keep in mind

There are many different things that could cause a problem with your computer. No matter what's causing the issue, troubleshooting will always be a process of **trial and error**—in some cases, you may need to use several different approaches before you can find a solution; other problems may be easy to fix. We recommend starting by using the following tips.

- **Write down your steps**: Once you start troubleshooting, you may want to **write down** each step you take. This way, you'll be able to remember exactly what you've done and can avoid repeating the same mistakes. If you end up asking other people for help, it will be much easier if they know exactly what you've tried already.

- **Take notes about error messages**: If your computer gives you an **error message**, be sure to write down as much information as possible. You may be able to use this information later to find out if other people are having the same error.

- **Always check the cables**: If you're having trouble with a specific piece of computer **hardware**, such as your monitor or keyboard, an easy first step is to check all related cables to make sure they're properly connected.

- **Restart the computer**: When all else fails, **restarting the computer** is a good thing to try. This can solve a lot of basic issues you may experience with your computer.

# Using the process of elimination

If you're having an issue with your computer, you may be able to find out what's wrong using **the process of elimination**. This

means you'll make a list of things that could be causing the problem and then test them out one by one to eliminate them. Once you've identified the source of your computer issue, it will be easier to find a solution.

## Scenario:

Let's say you're trying to print out invitations for a birthday party, but the printer won't print. You have some ideas about what could be causing this, so you go through them one by one to see if you can **eliminate** any possible causes.

First, you check the printer to see that it's turned on and plugged in to the **surge protector**. It is, so that's not the issue. Next, you check to make sure the printer's **ink cartridge** still has ink and that there is paper loaded in the **paper tray**. Things look good in both cases, so you know the issue has nothing to do with ink or paper.

Now you want to make sure the printer and computer are **communicating correctly**. If you recently downloaded an **update to your operating system**, it might interfere with the printer. But you know there haven't been any recent updates and the printer was working yesterday, so you'll have to look elsewhere.

You check the printer's **USB cord** and find that it's not plugged in. You must have unplugged it accidentally when you plugged something else into the computer earlier. Once you plug in the

USB cord, the printer starts working again. It looks like this printer issue is solved!

This is just one example of an issue you might encounter while using a computer. In the rest of this lesson, we'll talk about other common computer problems and some ways to solve them.

# Simple solutions to common problems

Most of the time, problems can be fixed using simple troubleshooting techniques, like **closing** and **reopening** the program. It's important to try these simple solutions before resorting to more extreme measures. If the problem still isn't fixed, you can try other troubleshooting techniques.

## Problem: Power button will not start computer

- **Solution 1**: If your computer **does not start**, begin by checking the power cord to confirm that it is plugged securely into the back of the computer case and the power outlet.

- **Solution 2**: If it is plugged into an outlet, make sure it is a **working outlet**. To check your outlet, you can plug in another **electrical device**, such as a lamp.

- **Solution 3**: If the computer is plugged in to a **surge protector**, verify that it is turned on. You may have to **reset** the surge protector by turning it off and then back on. You can also plug a lamp or other device into the surge protector to verify that it's working correctly.

- **Solution 4**: If you are using a **laptop**, the **battery** may not be charged. Plug the **AC adapter** into the wall, then try to turn on the laptop. If it still doesn't start up, you may need to wait a few minutes and try again.

## Problem: An application is running slowly

- **Solution 1**: Close and reopen the application.
- **Solution 2**: Update the application. To do this, click the **Help** menu and look for an option to check for **Updates**. If you don't find this option, another idea is to run an online search for application updates.

## Problem: An application is frozen

Sometimes an application may become stuck, or frozen. When this happens, you won't be able to close the window or click any buttons within the application.

- **Solution 1**: Force quit the application. On a PC, you can press (and hold) **Ctrl+Alt+Delete** (the Control, Alt, and Delete keys) on your keyboard to open the **Task Manager**. On a Mac, press and hold **Command+Option+Esc**. You can then select the unresponsive application and click **End task** (or **Force Quit** on a Mac) to close it.

- **Solution 2**: Restart the computer. If you are unable to force quit an application, **restarting** your computer will close all open apps.

## Problem: All programs on the computer run slowly

- **Solution 1**: Run a **virus scanner**. You may have **malware** running in the background that is slowing things down.

- **Solution 2**: Your computer may be running out of hard drive space. Try **deleting** any files or programs you don't need.

- **Solution 3**: If you're using a **PC**, you can run **Disk Defragmenter**. To learn more about **Disk Defragmenter**, check out our lesson on **Protecting Your Computer**.

## Problem: The computer is frozen

Sometimes your computer may become completely unresponsive, or frozen. When this happens, you won't be able to click anywhere on the screen, open or close applications, or access shut-down options.

- **Solution 1 (Windows only)**: Restart Windows Explorer. To do this, press and hold **Ctrl+Alt+Delete** on your keyboard to open the **Task Manager**. Next, locate and select **Windows Explorer** from the **Processes** tab and click **Restart**. You may need to click **More Details** at the bottom of the window to see the Processes tab.

- **Solution 2 (Mac only):** Restart Finder. To do this, press and hold **Command+Option+Esc** on your keyboard to open the **Force Quit Applications** dialog box. Next, locate and select **Finder**, then click **Relaunch**.
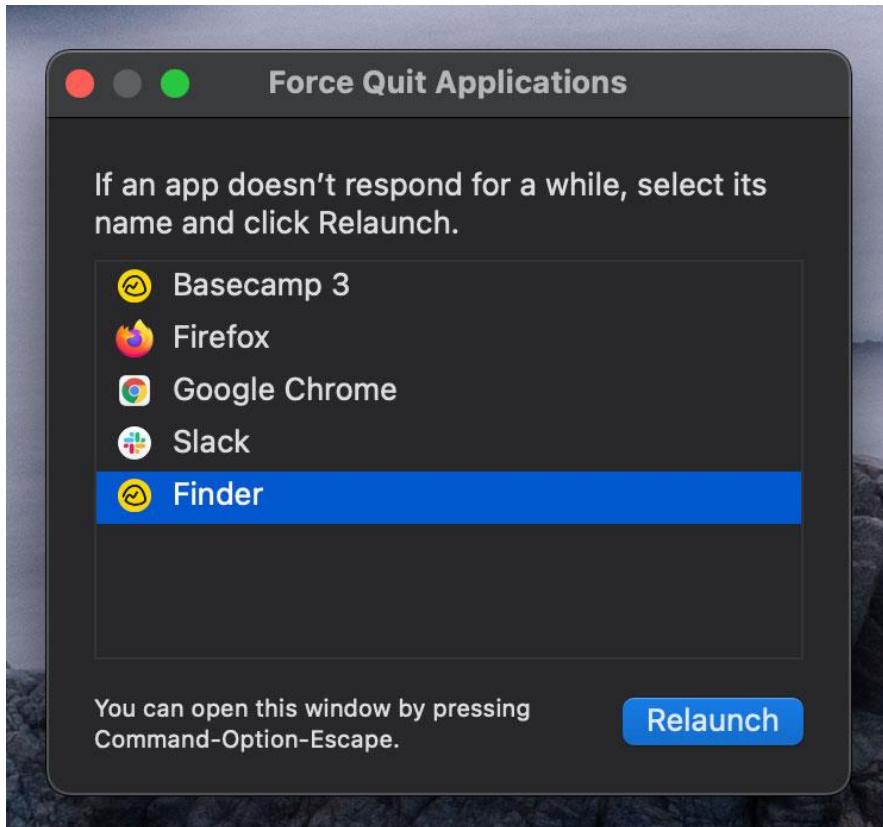
- **Solution 3**: Press and hold the Power button. The Power button is usually located on the front or side of the computer, typically indicated by the **power symbol**. Press and hold the Power button for **5 to 10 seconds** to force the computer to shut down.

- **Solution 4**: If the computer still won't shut down, you can **unplug the power cable** from the electrical outlet. If you're using a laptop, you may be able to remove the battery to force the computer to turn off. **Note**: This solution should be your **last resort** after trying the other suggestions above.

# Problem: The mouse or keyboard has stopped working

- **Solution 1**: If you're using a **wired** mouse or keyboard, make sure it's correctly plugged into the computer.

- **Solution 2**: If you're using a **wireless** mouse or keyboard, make sure it's turned on and that its batteries are charged.

## *Problem: The sound isn't working*

- **Solution 1**: Check the volume level. Click the audio button in the top-right or bottom-right corner of the screen to make sure the sound is turned on and that the volume is up.

- **Solution 2**: Check the audio player controls. Many audio and video players will have their own separate audio controls. Make sure the sound is turned on and that the volume is turned up in the player.

- **Solution 3**: Check the cables. Make sure external speakers are plugged in, turned on, and connected to the correct audio port or a USB port. If your computer has **color-coded** ports, the audio output port will usually be **green**.

- **Solution 4**: Connect headphones to the computer to find out if you can hear sound through the headphones.

## *Problem: The screen is blank*

- **Solution 1**: The computer may be in **Sleep** mode. Click the mouse or press any key on the keyboard to wake it.

- **Solution 2**: Make sure the monitor is **plugged in** and **turned on**.

- **Solution 3**: Make sure the computer is **plugged in** and **turned on**.

- **Solution 4**: If you're using a desktop, make sure the monitor cable is properly connected to the computer tower and the monitor.

# Solving more difficult problems

If you still haven't found a solution to your problem, you may need to ask someone else for help. As an easy starting point, we'd recommend **searching the Web**. It's possible that other users have had similar problems, and solutions to these problems are often posted online. Also, if you have a friend or family member who knows a lot about computers, they may be able to help you.

Keep in mind that most computer problems have simple solutions, although it may take some time to find them. For difficult problems, a **more drastic solution** may be required, like reformatting your hard drive or reinstalling your operating system. If you think you might need a solution like this, we recommend **consulting a professional** first. If you're not a computer expert, it's possible that attempting these solutions could make the situation worse.

**WEBSITE:**

[https://edu.gcfglobal.org/en/computerbasics/basic-troubleshooting-techniques/1/](https://edu.gcfglobal.org/en/computerbasics/basic-troubleshooting-techniques/1/)

## UNIT – V

*am a computer engineer in India with a special interest in computer programming.*



This process is a part of computer maintenance.

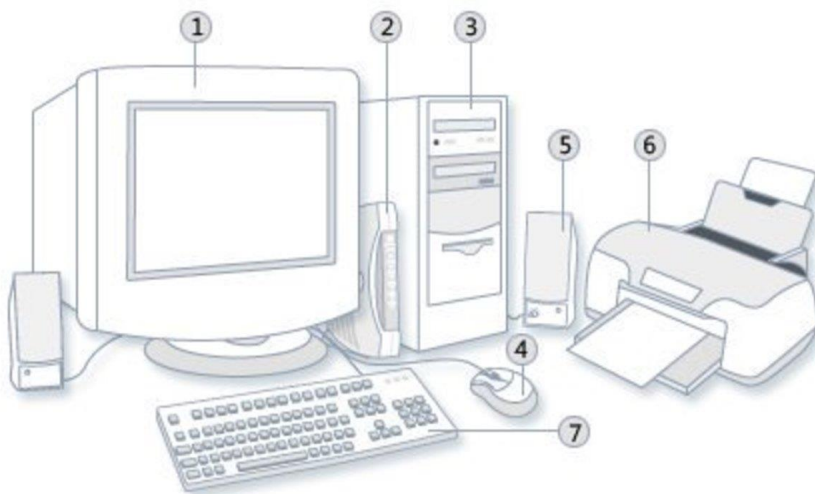## A Step-by-Step Guide to Personal Computer Disassembly and Assembly

In this article, we'll learn:

1. The Parts of a Computer
2. How to Disassemble a Computer
3. How to Assemble a Computer

# Parts of Computer System

The computer system is made up of following external devices:

- CPU cabinet
- Monitor
- Keyboard
- Mouse
- Printer/scanner (if attached)



| | | | |
|---|---|---|---|
| ① Monitor | ③ System unit | ⑤ Speaker | ⑦ Keyboard |
| ② Modem | ④ Mouse | ⑥ Printer | |

Computer System
windows.microsoft.com

# How to Disassemble a Computer

Follow these seven steps carefully.

## Step 1: Detach the Power Cable

The disassembling of the computer system starts with externally connected device detachment. Make sure the computer system is turned off, if not then successfully shut down the system and then start detaching the external devices from the computer system. It includes removing the power cable from electricity switchboard, then remove the cable from SMPS (switch mode power supply) from the back of the CPU Cabinet. Do not start the disassembling without detaching the power cable from the computer system. Now remove the remaining external devices like keyboard, mouse, monitor, printer or scanner from the back of CPU cabinet.

## Step 2: Remove the Cover

The standard way of removing tower cases used to be to undo the screws on the back of the case, slide the cover back about an inch and lift it off. The screwdrivers as per the type of screw are required to do the task.

## Step 3: Remove the Adapter Cards

Make sure if the card has any cables or wires that might be attached and decide if it would be easier to remove them before or after you remove the card. Remove the screw if any, that holds the card in place. Grab the card by its edges, front and back, and gently rock it lengthwise to release it.

## Step 4: Remove the Drives

Removing drives is easier. There can be possibly three types of drives present in your computer system, Hard disk drive, CD/DVD/Blu-ray drives, floppy disk drives (almost absolute now a day). They usually have a power connector and a data cable attached from the device to a controller card or a connector on the motherboard. CD/DVD/Blu-ray drive may have an analog cable connected to the sound card for direct audio output.

The power may be attached using one of two connectors, a Molex connector or a Berg connector for the drive. The Molex connector may require to be wiggled slightly from side to side and apply gentle pressure outwards. The Berg connector may just pull out or it may have a small tab which has to be lifted with a screwdriver.

Now pull data cables off from the drive as well as motherboard connector. The hard disk drive and CD/DVD drives have two types of data cables. IDE and SATA cables. The

IDE cables need better care while being removed as it may cause the damage to drive connector pins. Gently wiggle the cable sideways and remove it. The SATA cables can be removed easily by pressing the tab and pulling the connector straight back.

Now remove the screws and slide the drive out the back of the bay.

## Step 5: Remove the Memory Module

Memory modules are mounted on the motherboard as the chips that can be damaged by manual force if applied improperly. Be careful and handle the chip only by the edges. SIMMs and DIMMs are removed in a different way:

- **SIMM** - Gently push back the metal tabs while holding the SIMM chips in the socket. Tilt the SIMM chip away from the tabs until a 45% angle. It will now lift out of the socket. Put SIMM in a safe place.
- **DIMM** - There are plastic tabs on the end of the DIMM sockets. Press the tabs down and away from the socket. The DIMM will lift slightly. Now grab it by the edges and place it safely. Do not let the chips get dust at all.

## Step 6: Remove the Power Supply

The power supply is attached into tower cabinet at the top back end of the tower. Make sure the power connector is detached from the switchboard. Start removing the power connector connected to motherboard including CPU fan power connector, cabinet fan, the front panel of cabinet power buttons and all the remaining drives if not detached yet.

Now remove the screws of SMPS from the back of the cabinet and the SMPS can be detached from the tower cabinet.

## Step 7: Remove the Motherboard

Before removing all the connectors from the motherboard, make sure you memorize the connectors for assembling the computer if required, as that may require connecting the connectors at its place. Remove the screws from the back of the motherboard and you will be able to detach it from the cabinet. Now remove the CPU fan from the motherboard. The heat sink will be visible now which can be removed by the pulling the tab upward. Finally, the processor is visible now, which can be removed by the plastic tab which can be pulled back one stretching it side way.
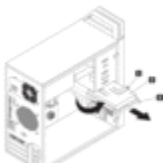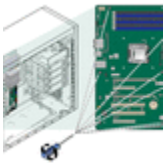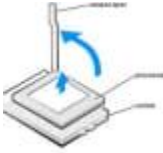
switch off the power supply and detach power cable

*tqn.com*

# How to Assemble a Computer

The assembling of the computer system is exactly the opposite of disassembling operation. Before starting assembling the computer system, make sure you have the screws and a screwdriver for those.

## Step 1: Mount the Processor

The first step for assembling the computer system starts with mounting the processor on the processor socket of the motherboard. To mount the process, you don't need to apply any force. The special ZIF (zero insertion force) sockets are usually used to prevent any damage to the processor pins. Once the processor is mounted, the heat sink will be attached on top of the processor. The CPU fan is also attached on top of the heat sink.

## Step 2: Fix the Motherboard in the Tower Case

Now the motherboard is to be fixed vertically in the tower case and the screws are fixed from behind of the motherboard.

## Step 3: Connect the Power Supply

Now line up the power supply at the top back end of the cabinet and screw it. The power connectors for motherboard power supply and CPU fan power supply are to be connected. If the cabinet cooling FAN is required then it is to be screwed at the back end grill of the cabinet and its power connector is to be connected from SMPS.

## Step 4: Install the Drives

Install the CD/DVD drives at the top front end of the cabinet and screw it. Install the Hard disk drive and floppy disk drive below CD/DVD drive and screw it. Make sure once screwed there is no vibration in either of the CD/DVD, hard disk or floppy disk drives.

## Step 5: Connect Cables

Now select the appropriate data cable and connect one end of the cable to its drive socket and another end at its appropriate connector on the motherboard. For SATA hard disk drive or CD/DVD drives use SATA cable and its power cable, else use IDE data cable. Do the proper jumper settings as per the usage requirement.

## Step 6: Mount the Memory Modules

It is time now to mount the memory modules on the motherboard by aligning the RAM to its socket on the motherboard and press it downward. Make sure the side tab are fixed into the RAM notch. If not, you may still have to press a bit.

## Step 7: Install the Internal Cards

Install the internal cards to its socket and attach the cables or power cable to it. The selection of right socket or slot is required as per the type of socket.

## Step 8: Cover the Tower

Cover the tower by placing it and pressing towards front side and screw it.

## Step 9: Connect the External Devices and Power

Connect the external devices with CPU at its appropriate socket. It includes mouse and keyboard at PS2 or USB connectors. Monitor at the video output socket. Connect the power cable to the back of tower in SMPS. Plug in the power cable to the electric board.

[https://www.youtube.com/watch?v=XiEPlSHsyr4&ab_channel=SalmanisEduTech](https://www.youtube.com/watch?v=XiEPlSHsyr4&ab_channel=SalmanisEduTech)

## INSTALL OF PRINTER

[https://www.youtube.com/watch?v=Y-jAdy1Kw8g&ab_channel=CompleteTechnology](https://www.youtube.com/watch?v=Y-jAdy1Kw8g&ab_channel=CompleteTechnology)

## HOW TO INSTALL WINDOW STEP BY STEP

[https://www.youtube.com/watch?v=4Ai8nM1869Y&ab_channel=CompleteTechnology](https://www.youtube.com/watch?v=4Ai8nM1869Y&ab_channel=CompleteTechnology)