

WEEK 1 - SESSION 1

I/O devices and Interfaces

I/O device

I/O device, an input/output device is any hardware used by a human operator or other systems to communicate with a computer. Input/output devices are capable of sending data (output) to a computer and receiving data from a computer (input).

Input Device

- An input device is any hardware device that sends data to a computer, allowing you to interact with and control it.
- Following are some of the important input devices which are used in a computer –
 - Keyboard
 - Mouse
 - Joy Stick
 - Light pen
 - Track Ball
 - Scanner
 - Graphic Tablet
 - Microphone
 - Magnetic Ink Card Reader(MICR)
 - Optical Character Reader(OCR)
 - Bar Code Reader
 - Optical Mark Reader(OMR)



Output Device

- An output device is any hardware device used to send data from a computer to another device or user.
- Following are some of the important output devices which are used in a computer –
 - Monitor
 - Printer
 - Headphones
 - Computer Speakers
 - Projector
 - GPS
 - Sound Card
 - Video Card
 - Braille Reader



Ports on Computer

- A connection point that acts as interface between the computer and external devices like mouse, printer, modem, etc. is called port.
- Ports are of two types –
 1. Internal port
 2. External port
- Internal ports are for the core components of a computer which reside inside the case.
- External ports are for peripherals and they reside outside the case, usually at the rear.

1. Internal port

- It connects the motherboard to internal devices like hard disk drive, CD drive, internal modem, ATX power port, SATA port, PATA port etc.
- Some of the most common internal ports on a modern motherboard:
 1. CPU socket – Where the CPU or processor plugs in.
 2. CPU power connector – Power cable connection for the CPU.
 3. ATX power connector – Power cable connection for the system.

4. DIMM/RAM Memory slots - Connectors for system memory or RAM.
 5. PCIe slots – Expansion card slots, including the graphics card.
 6. M.2 connection – Solid-state drive connection.
 7. SATA ports – Modern internal hard drive ports.
 8. PATA ports – Older internal hard drive ports
 9. Front panel connector – Connection for USB, and audio ports on the front or top of the case.
 10. Front panel header – Connection for LED/RGB lighting, power switch, and reset switch.
 11. USB headers (3.1, 2. etc.) – Connection for rear USB ports on the motherboard.
 12. CMOS battery – Bios battery for when there's no system power.
 13. Fan headers – Connection for the case and system fans.
- There may be additional ports such as a COM/Serial header, TPM header, or RGB headers. Some ports will not be used, and sometimes there are redundant connections.



2. External port

- It connects the motherboard to external devices like modem, mouse, printer, scanner, etc.
- Some of the most common external ports on a modern motherboard:
 1. PS/2 – Used for older PS/2 interface keyboards.

2. USB – Connection for USB peripherals including keyboards, mice, hard drives, audio equipment, and more.
3. Video port – video or display connectors to output video or audio to a monitor.

Different types of video ports are

- a) HDMI port
 - b) DVI port
 - c) VGA port
4. Ethernet /RJ-45/Network – Connection for wired internet.
 5. Analog/Digital Audio – Connections for speakers and digital audio equipment, including home theater systems. The 6 connectors are color coded as Blue, Lime, Pink, Orange, Black and Grey. These 6 connectors can be used for a surround sound configuration of up to 8 channels.
 - a) Blue – Line in
 - b) Lime – Line out/Front Speakers
 - c) Pink – Mic In
 - d) Orange – Center/Subwoofer
 - e) Black – Rear Speakers
 - f) Grey – Side Speakers
 6. Serial Port – Serial Port are usually 9-pin or 25-pin male connectors. They are also known as COM (communication) ports or RS232C ports
 7. Parallel Port – Parallel Ports come in form of 25-pin female pins. This port is also called as LPT (Line Print Terminal)



Serial ports



- Serial ports are the types of computer ports through which the data bits are transmitted as a single stream of binary 0s and 1s in the form of electric signals.
- Serial ports provide only a single transmission path that can be a single wire, a pair of wires, or a single channel in case of wireless communication.
- Serial ports are the oldest communication interfaces that are mainly used to connect printers and modem to the computer system.
- But in modern computers, serial ports are used to connect modern devices like flat-screen monitors, security cameras, GPS devices, etc.
- Serial ports are sometimes also called COM Ports (or Communication Ports).
- A serial port uses a DB-9 connector, a 9-pin D-Shaped Connector which connects to the transmission line.
- A serial port provides serial communication using one line and thus has no dependency on other wire's speed and its length can be extended as per the need.

Parallel Ports

Parallel Port (DB25)



- A parallel port is another type of computer port to connect a peripheral device to the computer system.
- A parallel port can transmit multiple bits of data all together at the same time.
- Therefore, in the case of parallel ports, the rate of data transmission is relatively high as compared to series ports because these transmit data without any hold-up.
- Parallel ports are mainly used to connect those computer peripheral devices that require high bandwidth.
- The most common examples of such devices are printers, monitors, projectors, hard-drives, CD-drives etc.
- Parallel ports provide an interface to connect multiple lines to prepare a parallel communication to send large data at a time.
- A parallel port uses a D-25 connector, a 25 pin D-Shaped connector that connects to the transmission wires.



Serial Port

Versus



Parallel Port

Parameter	Serial Ports	Parallel Ports
Definition	A series port is one that transmits one data at a time in a single stream of 0s and 1s.	A parallel port is one that transmits multiple data bits at a time.
Purpose	Serial Port is used for serial data transmission.	Parallel Port is used for parallel data transmission.
Transmission Speed	Transmission speed of a serial port is slow as compared to a parallel port.	Transmission speed of a parallel port is quite high as compared to a serial port.

No. of Data Bits	A serial port can transmit one bit at a time through a single wire.	A parallel port can transmit a set of data bits (like 8-bits, 16-bits) at the same time through separate wires.
Bandwidth	Serial ports are used to connect those peripheral devices that require low bandwidth.	Parallel ports are used to connect those devices that require relatively high bandwidth.
Connector	A serial port uses DB-9 connector, a 9 pin D-Shaped Connector which connects to the transmission line.	A parallel port uses D-25 connector, a 25 pin D-Shaped connector which connects to the transmission wires.
Redundancy	Bottom-Up model is better suited as it ensures minimum data redundancy and focus is on reusability.	Top-down model has high ratio of redundancy as the size of project increases.
No. of Wires	Wire connections to serial port are quiet less as compared to parallel port.	No. of wires that are connected to parallel port are quiet high as compared to serial port.
Capability	A serial port is able to transmit a single stream of data at a time.	A parallel port is able to transmit multiple data streams at a time.
Data Sending Mechanism	A serial port sends data bit by bit after sending a bit at a time.	A parallel port sends data by sending multiple bits in parallel fashion.
Port Type	A serial port uses Male ports.	A parallel port uses Female ports.
Applications	Modems, security cameras, device controllers use serial ports.	Printers, Hard Drives, CD drives use parallel ports.

Basic Cable Types

In the field of computers, we have following cable types

1. Network Cables
2. Video Cables
3. Multipurpose Cables
4. Peripheral Cables
5. Hard drive Cables and
6. Adapters

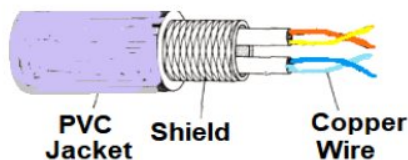
Network Cables

- Networking cables are networking hardware used to connect one network device to other network devices or to connect two or more computers
- Networking cables can be used to share printers, scanners etc.,
- Different types of network cables are,
 - a. Twisted Pair Cables
 - b. Co-axial Cables and
 - c. Optical Fiber Cables
- Networking cables are also called as Ethernet Cables.

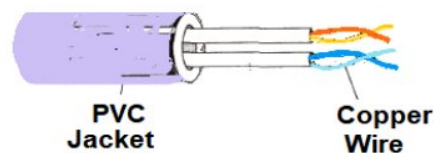
Twisted Pair Cables

Twisted pair cables are of two types.

- a. Shielded Twisted pair cable (STP)
- b. Unshielded Twisted pair cable (UTP)

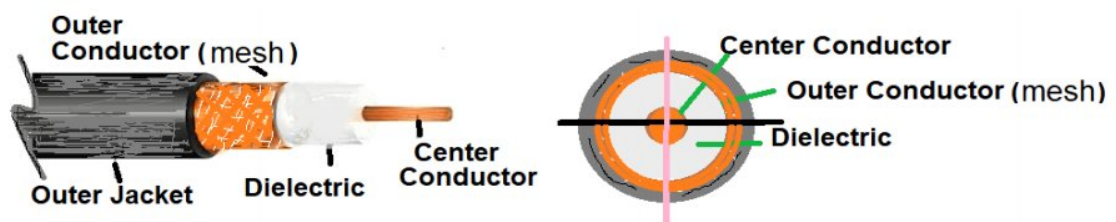


Shielded Twisted Pair (STP)



Unshielded Twisted Pair (UTP)

Coaxial Cable



Coaxial Cable

Optical Fiber Cable



Video Cables

- ✓ Type of video cable needed depends on the purpose of the connection and the kind of data we are transmitting.
- ✓ Commonly used Video cables are VGA, DVI, HDMI, and Display-Port

Connector	Signal Type	Base Resolution	Maximum Resolution (60Hz refresh rate)	HDCP Support	3D Support	Audio
VGA	Analog	640x480 graphics, 720x480 text	2048x1536	No	No	No
HDMI	Digital, analog	VGA	1920x1200, 4K	Yes	Yes	Yes
DVI	Digital, analog	VGA	1920x1200, 2560x1600	Varies	No	No
DisplayPort	Digital, analog	VGA	4K	Yes	Yes	Yes
BNC	Analog	VGA	1080p	No	No	No
Composite	Analog	480i	480i	No	No	No
S-Video	Analog	480i	480i	No	No	No
Component	Analog	720p	1080i	No	No	No

Video Connector Types Overview

VGA

- ✓ A Video Graphics Array is a standard connector used for computer analog video output.
- ✓ A VGA card on a standard analog monitor uses a DB15F 15-pin female connector, which plugs into the DB15M male connector of a VGA cable.
- ✓ By varying the levels of red, green, or blue per dot (pixel) onscreen, a VGA port and monitor can display an unlimited number of colors, but practical color limits are based on the video card's memory and the desired screen resolution.
- ✓ The base resolution (horizontal x vertical dots) of VGA is 640×480.
- ✓ An enhanced version of VGA is Super VGA, or SVGA, which typically refers to 800×600 VGA resolution.



VGA Connector

DVI

- ✓ DVI was designed to replace VGA while also being compatible with VGA signals.
- ✓ It was developed to be an industry standard for transmitting digital video content to display devices at resolutions as high as 2560×1600.
- ✓ Common devices that utilize the DVI connection are computer monitors & projectors.

The DVI connector may have one of *three* names depending on the signals it supports:

- a. DVI-A (analog only)
- b. DVI-D (digital only)
- c. DVI-I (both digital and analog)



DVI Connector

HDMI

- ✓ **H**igh-**d**efinition **m**ultimedia **i**nterface is a connector and cable, capable of transmitting high-quality and high-bandwidth streams of audio and video between devices.
- ✓ HDMI was originally developed for use with HDTVs; it is now a common feature on laptops, desktops, & monitors as well as HDTVs and HD projectors.
- ✓ HDMI is available in various versions, but older HDMI cables might not support advanced functions such as 3D or resolutions beyond 1080p.
- ✓ The most recent HDMI standard, version 2.1, supports video resolutions and refresh rates including 8K60 and 4K120, as well as resolutions up to 10K.
- ✓ The earlier version, version 1.4b, supports 1080p HDTV and resolutions up to 4096×2160 (also known as 4K x 2K), 48-bit color depths, various types of uncompressed and compressed digital audio, 3D over HDMI, and Fast Ethernet.
- ✓ The most common HDMI port is Type A, which has 19 pins. It is used to achieve high-definition resolutions such as 1920×1080 (known as 1080p or 1080i).



HDMI

Mini-HDMI

- ✓ The HDMI 1.3 and later specifications also define a mini-HDMI connector (Type C).
- ✓ It is smaller than the Type A plug, but has the same 19-pin configuration.
- ✓ The HDMI 1.4 specification defines a micro-HDMI connector (Type D), which uses the same 19-pin configuration but in a connector, the size of a micro-USB plug is less.



Various HDMI Cables

Display-Port

- ✓ Display-Port is a digital display interface primarily used to connect to a video source to a display device such as a computer monitor.
- ✓ It can also be used to carry audio, USB and other forms of data.
- ✓ Display-Port has similar resolution and audio/video features of HDMI, but with 2 major differences:
 - a. Display-Port is a royalty-free video standard
 - b. Display-Port 1.2 and later support daisy-chaining of displays.
- ✓ Display-Port offers a maximum transmission distance of 3m over passive cable and in theory up to 33m over active cable.
- ✓ There are 20 pins in a Display-Port connector, with pins 19 and 20 being used for 3.3V, 500mA power on active cables.
- ✓ Display-Port cables can be up to 15m long, but quality decreases with length.

Display-Port is currently available in **three** versions:

- a. **Display-Port 1.1:** Maximum data transfer rate of 8.64Gbps
- b. **Display-Port 1.2:** Maximum data transfer rate of 17.28Gbps; introduces Mini Display-Port connector, and support for 3D
- c. **Display-Port 1.3:** Maximum data transfer rate of 32.4Gbps with support for 4K, 5K, and 8K UHD displays.



Display-Port & Mini Display-Port (MiniDP or mDP)

Multipurpose Cables

Cables that can perform more than one function are called multipurpose cables.

These cables have the ability to charge batteries and transfer data.

USB

- ✓ **Universal Serial Bus** is a plug-and-play interface that allows a computer to communicate with peripheral and other devices.
- ✓ USB ports can be used for input devices such as keyboards, mice, and scanners; storage devices such as flash drives, optical drives, and external hard

drives; output devices such as printers, multifunction devices, and even displays; and adapters for both wired and wireless networks.

- ✓ A single USB port (also known as a root hub) can connect to multiple devices when a USB hub is connected to the port.



Typical USB Type A Connector

USB 2.0, USB 3.0, and USB 3.1

There are three standards for USB ports:

- a. **USB 2.0** (Hi-Speed)
- b. **USB 3.0** (SuperSpeed); also known as USB 3.1 Generation 1
- c. **USB 3.1** (SuperSpeed+); also known as 3.1 Generation 2

USB Version	Also Known As	Maximum Speed	Color Marking on Computer*
2.0	Hi-Speed USB	480Mbps	Black
3.0**	SuperSpeed USB	5Gbps	Blue
3.1 Gen 2	SuperSpeed+ USB	10Gbps	Red

Current USB Versions

- ✓ With any version of USB, a single USB port on an add-on card or motherboard is designed to handle up to 127 devices through the use of multiport hubs and daisy chaining hubs.
- ✓ USB devices are Plug and Play (PnP) devices that are hot swappable.

USB-C

- ✓ USB-C is an industry standard connector for transmitting both data & power on a single cable.
- ✓ The USB-C connector is easier to connect (reversible; no up or down side to the plug) and with the appropriate adapter allows backward compatibility to USB 2.0.
- ✓ USB-C can handle any data rate from USB-2 to USB-3.1.

*USB-C connector***Lightning**

- ✓ The Lightning connector is used for both charging batteries and transferring data.
- ✓ Apple iOS devices up through the iPhone 4 and 3rd-generation iPad used Apple's 30-pin connector.
- ✓ In 2012, iOS devices began using the 8-pin reversible Lightning connector.
- ✓ The data transfer rates are about the same as with the USB 2.0 standard.

*iOS Lightning Connector***Thunderbolt**

- ✓ Thunderbolt is a high-speed peripheral connection standard originally introduced by Apple for its macOS desktop and laptop computers.
- ✓ Thunderbolt has also been adopted by some manufacturers of computers and motherboards that use Microsoft Windows.
- ✓ Thunderbolt 1 & 2 use the same connector as Mini Display-Port (MDP), whereas Thunderbolt 3 re-uses the USB-C connector from USB.
- ✓ Thunderbolt is also used for high-speed storage, including external drives, network attached storage (NAS), and Redundant Array of Independent Disks (RAID), as well as for high-resolution video.

Version	Maximum Speed	Connection Type
Thunderbolt 1	10Gbps	Mini DisplayPort*
Thunderbolt 2	20Gbps	Mini DisplayPort*
Thunderbolt 3	30Gbps	USB-C

Thunderbolt Versions

**The connectors are the same shape, but the cables are not interchangeable.*



USB-A & Thunderbolt Cables

Peripheral Cables

Serial

- ✓ A serial cable is a cable used to transfer information between two devices using a serial communication protocol.
- ✓ The form of connectors depends on the particular serial port used, although serial cables comply with RS-232 standard.
- ✓ Serial means that the data bits flow in a line, one after the other, over the cable.
- ✓ Serial connections were designed for the relatively low speed of telephone modem communication but were also used for other devices, such as keyboards, mice, and other peripheral devices.



RS-232 Serial Cable

Hard Drive Cables

Hard drive cables are built to carry data to and from the motherboard.

There are commonly three types of hard drive cables viz,

- a. SATA Cables
- b. IDE or PATA Cables
- c. SCSI Cables

SATA Cable

- ✓ Serial ATA [Advanced Technology Attachment] is a computer bus interface that connects host bus adapters to mass storage devices such as hard disk drives, optical drives, and solid-state drives.
- ✓ SATA cables are next-generation serial cables that carry high-speed data.
- ✓ Presently SATA & SSD storage drives are more common.
- ✓ SATA cables can be used internally or externally.



SATA Cable

IDE Cable

- ✓ An Integrated Drive Electronics cable (also known as an ATA or PATA [parallel ATA] cable) is a ribbon cable containing 40 pins.
- ✓ We can attach two hard drives to a motherboard with only one cable.
- ✓ Either one or two devices may be connected to an IDE/PATA cable, and the devices need not be of the same type.
- ✓ For example, an IDE/PATA DVD-R drive may be connected along with an IDE/PATA hard drive on the same cable.



IDE Cable/Connectors

SCSI

- ✓ Small Computer System Interface is a set of standards for physically connecting and transferring data between computers and peripheral devices.
- ✓ SCSI cables have mostly been replaced by SATA cables inside of computers.
- ✓ The advantages of a SCSI drive system is that up to 7 (or sometimes 15) SCSI drives can be daisy chained together in comparison to an IDE connector that supports only 2 drives.



SCSI Cable and Ports

Adapters

Physical cable adapters are often the short-term (and economical) answer to technical compatibility problems during an upgrade cycle.

DVI to HDMI

- ✓ Due to HDMI using the same video signals as DVI, DVI to HDMI cables and adapters are widely available.
- ✓ Typically these adapters only allow for video signals to be transmitted, but some newer graphic cards allow for HDMI audio over DVI.



DVI to HDMI adapter

USB to Ethernet

- ✓ USB to Ethernet adapters enable a device without an Ethernet port to connect to a wired network.
- ✓ Newer Laptops lack Ethernet port, to connect such devices to a wired network this adaptor will be the solution.



USB to Ethernet adapter

DVI-I to VGA

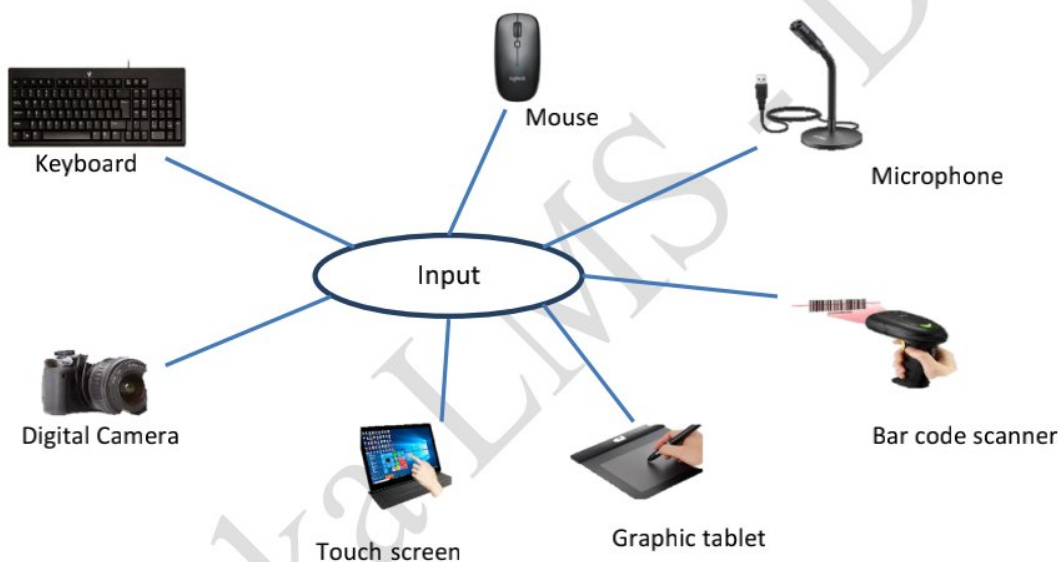
- ✓ DVI-I includes both VGA-compatible analog video and DVI digital video.
- ✓ If the Projector won't have a VGA port and supports only DVI then this adapter will be very much useful.



DVI to VGA adapter

WEEK-01**SESSION-03****Knowledge Criteria: - I/O DEVICES AND INTERFACES**CO-01; PO-01,04**Working of common Input/Output devices: -****Input device: -**

An input device is a device that sends data to a computer, allowing you to interact with computer and control it.

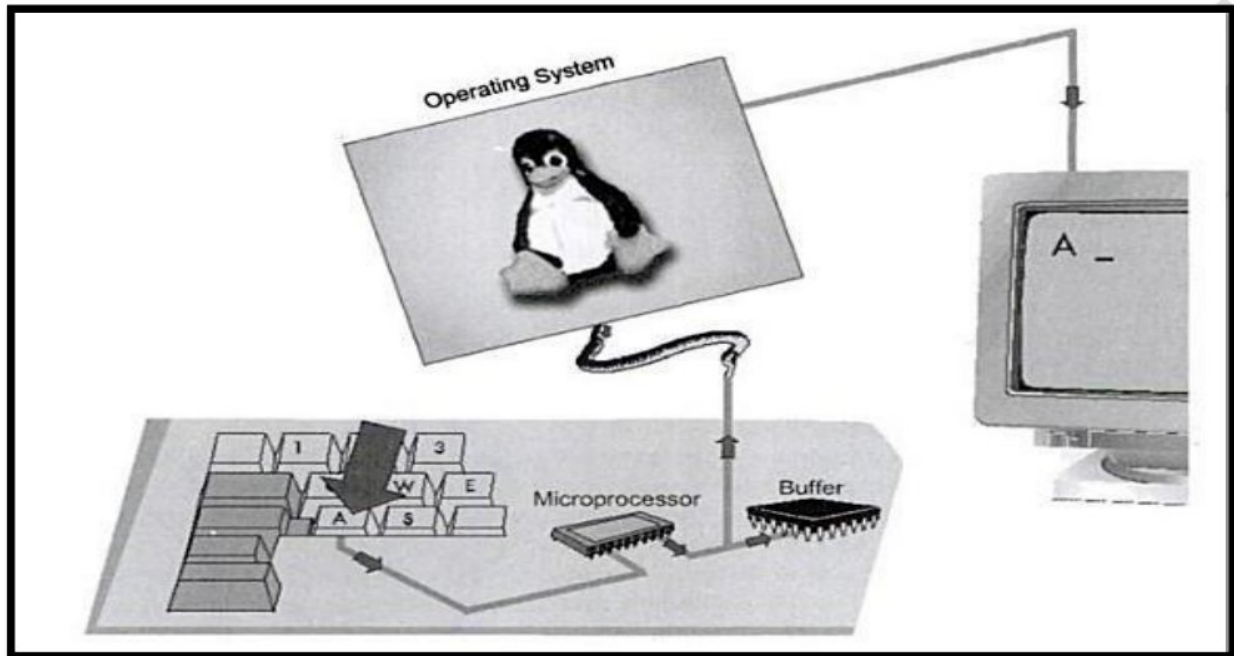
Example:**Output device: -**

An output device is a device that receives data from a computer and present it to the user.

Example:

Working of KEYBOARD: -

- ✓ A **computer keyboard** is an input device that allows the user to enter characters (letters, numbers, and other symbols) into a computer.
- ✓ It is one of the most common used input devices for computers.

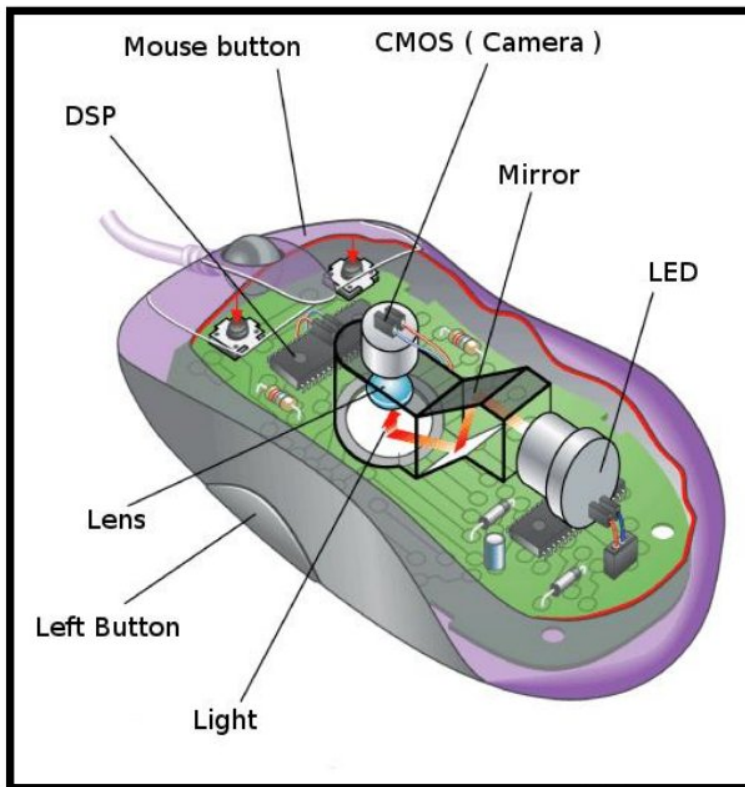


WORKING OF THE KEYBOARD

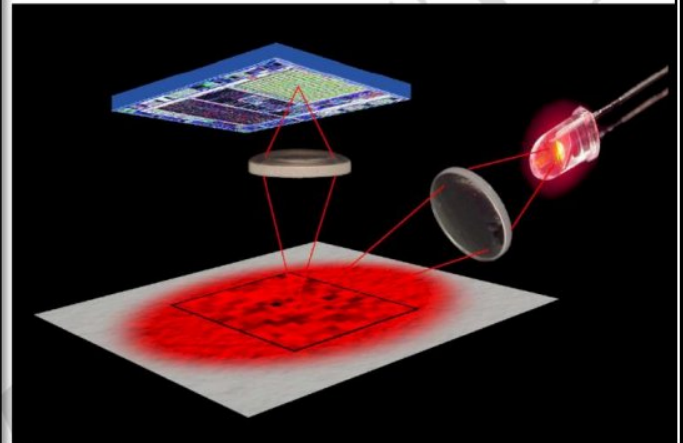
- ✓ A keyboard consists of a series of switches connected to a small keyboard microprocessor that monitors the state of each switch and initiates a specific response to a change in that state.
- ✓ When the user presses a key, it causes a change in the amount of current flowing through the circuit associated with that key.
- ✓ The keyboard microprocessor detects this change in the current flow. By doing this, the processor can tell when a key has been pressed and when it is being released.
- ✓ The processor generates an associative code depending upon the keys with which the circuit carries a signal to the microprocessor which is known as **scan code** of the key and sends it to the operating system.
- ✓ A copy of **scan code** is also stored in the memory of the keyboard. When the operating system reads the scan code, it informs the same to the keyboard
- ✓ And the scan code stored in the memory of the keyboard is later erased.

Working of MOUSE: -

- ✓ An optical mouse is the input device that uses light-emitting diode (LED), and a light detector (photodiodes) as the light source, to detect movement relative to a surface.



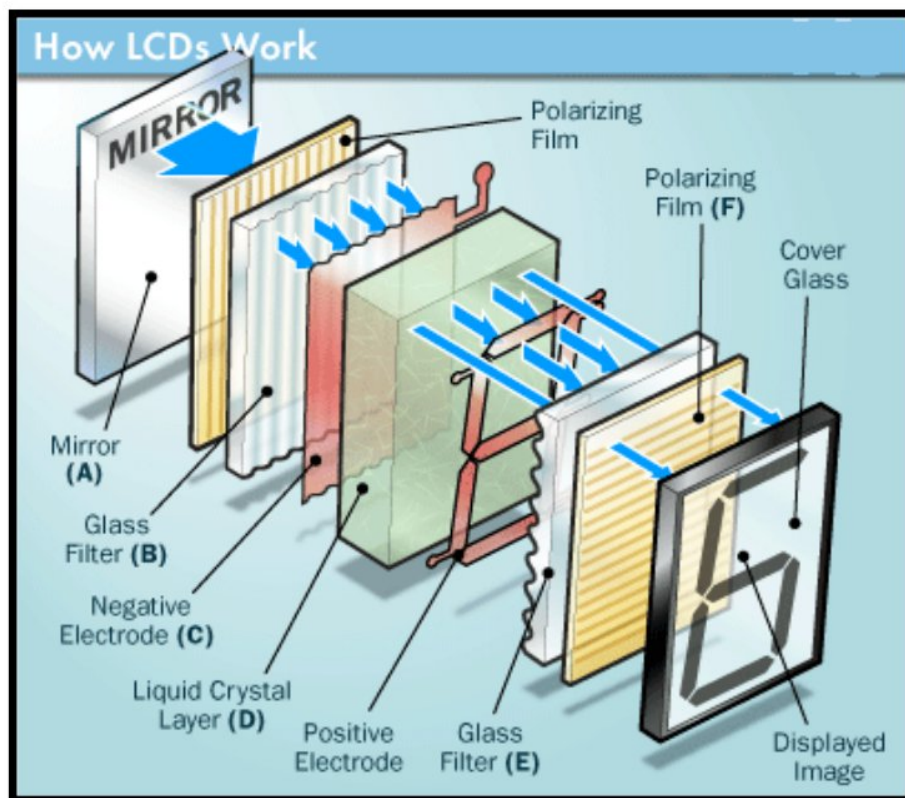
(a) Components of optical mouse



(b) Working of optical mouse

- ✓ To detect the movement, an optical mouse uses a light source (LED or Laser), a photodetector and a digital signal processor (DSP).
- ✓ First, the light source produces light that shines onto the surface.
- ✓ The light is reflected back and picked up by the CMOS sensor forming an image of the local surface.
- ✓ Thousands of images are taken every second by the CMOS sensor and these images are sent to the DSP for analysis.
- ✓ The DSP compares these images to determine whether the mouse has moved, in what direction and at what speed.
- ✓ These information are then sent to the computer, which updates the position of cursor on the screen accordingly.

Working of DISPLAY MONITOR: -



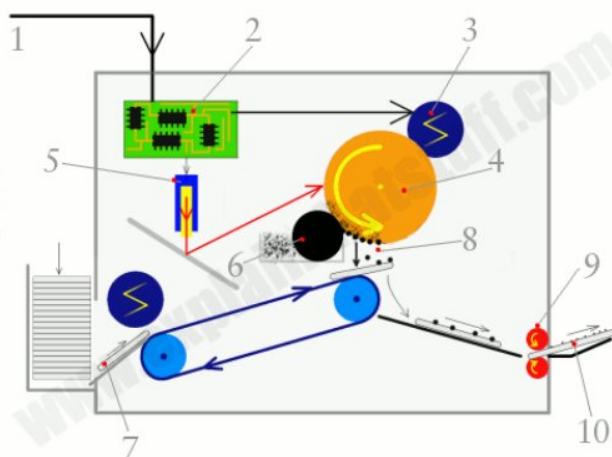
- ✓ An LCD monitor is the output device that is composed of two specially treated plates of polarized glass pressed together.
- ✓ Between these plates is a liquid crystal material which responds to current and allows different wavelengths of light.
- ✓ The first filter will naturally be polarized as the light strikes it at the beginning.
- ✓ Light passes through each layer and is guided on to the next with the help of molecules.
- ✓ The principle behind the LCDs is that when the current is applied to the liquid crystal molecule, the molecule tends to untwist.
- ✓ This causes the change in the angle of light which is passing through the molecule of the polarized glass and also causes a change in the angle of the top polarizing filter.
- ✓ As a result, a little light is allowed to pass the polarized glass through a particular area of the LCD. Thus, that area becomes darker comparing to others.

Working of PRINTER: -

✓ Laser printer is an output device that turns the digital data on computer into letters and images on the paper using light.

✓ **Working:**

1. The data is sent to the printer from your computer.
2. An electronic circuit in the printer figures out how to print this data onto the page.
3. Now the electronic circuit activates the corona wire. (This is a high-voltage wire that gives a static electric charge to anything nearby)
4. The corona wire charges up the photoreceptor drum so the drum gains a positive charge spread uniformly across its surface.
5. At the same time, the circuit activates the laser to make it draw the image of the page onto the drum. Where the laser beam hits the drum, it erases the positive charge that was there and creates an area of negative charge instead. Gradually, an image of the entire page builds up on the drum: where the page should be white, there are areas with a positive charge; where the page should be black, there are areas of negative charge.
6. An ink roller touching the photoreceptor drum coats it with tiny particles of powdered ink (toner). The toner has been given a positive electrical charge, so it sticks to the parts of the photoreceptor drum that have a negative charge. An inked image of the page builds up on the drum.
7. A sheet of paper from a hopper on the other side of the printer feeds up toward the drum. As it moves along, the paper is given a strong negative electrical charge by another corona wire.
8. When the paper moves near the drum, its negative charge attracts the positively charged toner particles away from the drum. The image is transferred from the drum onto the paper.
9. The inked paper passes through two hot rollers (the fuser unit). The heat and pressure from the rollers fuse the toner particles permanently onto the paper.

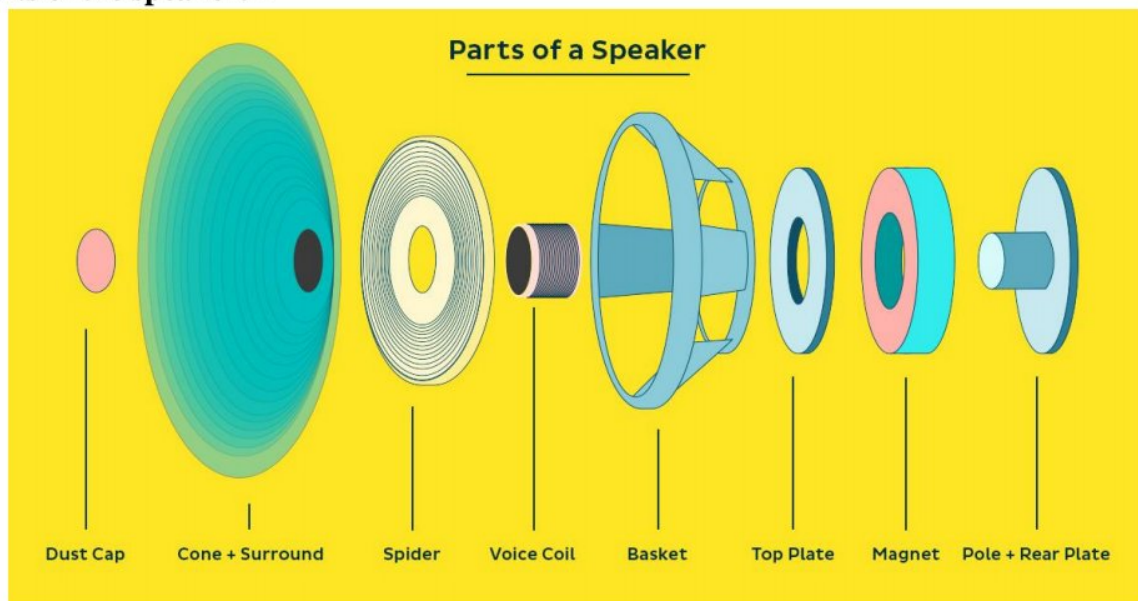


Working of Printer

1. Data
2. Electronic circuit
3. Corona wire
4. Photoreceptor drum
5. Laser
6. Ink roller
7. Paper
8. Toner particles
9. Fuser unit
10. Printout

Working of SPEAKER: -

- ✓ A computer **speaker** is an output device that connects to a computer to generate sound.
- ✓ **Parts of the speaker: -**



- Diaphragm (cone): Moves in and out to push air and make sound.
- Cap (dome): Protects the voice coil from dust and dirt.
- Spider (suspension): A flexible support that holds the voice coil in place.
- Basket: The sturdy metal framework around which the speaker is built.
- Top plate: Made of soft iron.
- Bottom plate: Made of soft iron.
- Pole piece: Concentrates the magnetic field produced by the voice coil.
- Coil: The coil that moves the diaphragm back and forth.
- Cables: Connect stereo amplifier unit to voice coil.

✓ Working: -

- Speakers work by converting electrical energy into mechanical energy (motion). The mechanical energy compresses air and converts the motion into sound energy.
- In speakers, a current is sent through the voice coil which produces an electric field that interacts with the magnetic field of the permanent magnet attached to the speaker.
- As an audio signal is sent through the voice coil and the musical waveform moves up and down, the voice coil is attracted and repelled by the permanent magnet.
- This makes the cone that the voice coil is attached to move back and forth. The back-and-forth motion creates pressure waves in the air that we perceive as sound.

Performance criteria

I. Installation of a local printer: -

Procedure:

1. Turn on the computer and the printer.
2. Insert the CD containing the printer driver.
3. Double click on the driver and click yes.
4. Click on setup.
5. Now select the printer's name and click ok.
6. Accept the license agreement and click install.
7. Select the region & click ok.
8. Connect the printer to the computer.
9. Printer installation will complete.
10. Print the test page to make sure printer is working.

II. Shared Printer

Procedure:

There are two ways to share your printer: using Settings or Control Panel.

A) Using Settings

1. Select the **Start** button, then select **Settings -> Devices -> Printers & scanners**.
2. Choose the printer you want to share, then select **Manage**.
3. Select **Printer Properties**, then choose the **Sharing** tab.
4. On the Sharing tab, select **Share this printer**.
5. If you want, edit the share name of the printer. You'll use this name to connect to the printer from a secondary PC.

B) Using Control panel

1. In the search box on the taskbar, type **control panel** and then select **Control Panel**.
2. Under Hardware and Sound, select **View devices and printers**.
3. Select and hold (or right-click) the printer you want to share, select **Printer properties**, and then choose the **Sharing** tab.
4. On the Sharing tab, select **Share this printer**.
5. If you want, edit the share name of the printer. You'll use this name to connect to the printer from a secondary PC.

III. Installing wireless and cloud printers.

Wireless printer: -

1. Wi-Fi printers

1. Windows 10 easily find any printer connected to the same local network via Wi-Fi.
2. Goto **Start** menu and click **Settings** -> **Devices** -> **Printers & Scanners**
3. Select **Add a Printer or Scanner** and wait for your printer to appear in the list, then select it and hit **Add Device**
4. If Windows doesn't find your printer, then select the printer from the list & click ok

2. Bluetooth printers

1. First, make sure your printer is open to new **Bluetooth** pairings.
2. To enable Bluetooth on your windows computer, click on notification icon in the bottom-right corner of the screen and check that Bluetooth is toggled on, click on Expand to see Bluetooth control.
3. To find printer, goto **Start** menu and select **Settings** -> **Devices** -> **Printers & Scanners** -> **Add a Printer or Scanner**
4. Now your printer should appear in the list. Select it and hit Add device
5. Windows should download and install the drivers if you don't have them already. If not get them from the manufacturer's website.

Cloud Printer

- **Cloud printing** is the technology that enables printers to be accessed over a network through cloud computing.
- There are two kinds of cloud printing. On the one hand, consumer-based cloud printing connects any application to cloud-enabled home printers that people own or have access to.
- On the other hand, professional cloud printing enables publishers, companies and content owners to print their digital publications through cloud computing technology.
- Benefits
 - For consumers, cloud ready printers eliminate the need for PC connections and print drivers, enabling them to print from mobile devices.
 - As for publishers and content owners, cloud printing allows them to "avoid the cost and complexity of buying and managing the hardware, software" required for the production of professional print products.
 - Leveraging cloud print for print on demand also allows businesses to cut down on the costs associated with mass production.

- Cloud printing can be considered more eco-friendly, as it significantly reduces the amount of paper used and lowers carbon emissions from transportation.

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