

## INTRODUCTION TO COMPUTER PARTS

### Introduction to Input/output devices

**Input / Output devices** are required for users to communicate with the computer. In simple terms, input devices bring information INTO the computer and output devices bring information OUT of a computer system. These input/output devices are also known as **peripherals devices**.

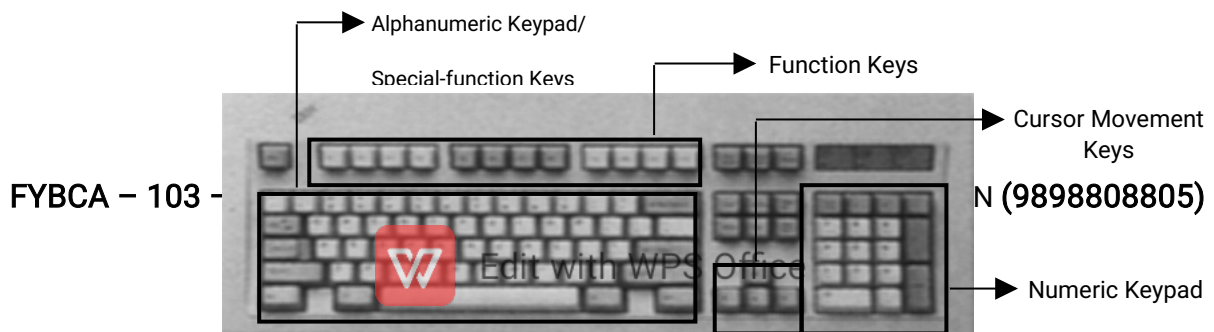
Some commonly used Input / Output devices are listed in table below.

Input Devices	Output Devices
Keyboard	Monitor
Mouse	Printer
Light Pen	Plotter
Joystick	
Scanner	
Voice input system	
Touch Screen	

### INPUT DEVICES (only principles)

#### (1). KEYBOARD

- A keyboard is an external device.
- It is attached by a cable, or it can be attached to the CPU case itself Exa: in laptop computers.
- It is a text base input device that allows the user to input alphabets, numbers and other characters.
- There are 2 types...
  - o **QWERTY Keyboard**
    - Most keyboards today are QWERTY keyboards which take their name from the first six keys at the left of the first row of letters.
  - o **DVORAK Keyboard**
    - An alternative, the DVORAK keyboard, places the most commonly used keys close to the user's fingertips and speeds typing.
- Many keyboards have a separate numeric keypad, like that of a calculator, containing numbers and mathematical operators.



### [Keyboard Layout]

- **Alphanumeric Keypad**

- o It consists of keys for A to Z or a to z English alphabets, 0 to 9 numbers, and special characters like + – / \* ( ) etc.

- **Function Keys**

- o There are twelve function keys labeled F1, F2, F3, ... , F12.
- o The functions assigned to these keys differ from one software package to another.
- o These keys are also user programmable keys.

- **Special-function Keys**

- o These keys have special functions assigned to them and can be used only for those specific purposes.
- o Functions of some of the important keys are defined below.

- **Enter key**

- It is similar to the 'return' key of the typewriter and is used to execute a command or program.

- **Spacebar key**

- It is used to enter a space at the current cursor location.

- **Backspace key**

- This key is used to move the cursor one position to the left and also delete the character in that position.

- **Delete key**

- It is used to delete the character at the cursor position.

- **Insert key**



- Insert key is used to toggle between insert and overwrite mode during data entry.

- **Shift key**

- This key is used to type capital letters when pressed along with an alphabet key.
- It is also used to type the special characters located on the upper-side of a key that has two characters defined on the same key.

- **Caps Lock key**

- Cap Lock is used to toggle between the capital lock features.
- When 'on', it locks the alphanumeric keypad for capital letters input only.

- **Tab key**

- Tab is used to move the cursor to the next tab position defined in the document.
- it is used to insert indentation into a document, also.

- **Ctrl key**

- Control key is used in conjunction with other keys to provide additional functionality on the keyboard. Exa: to applied short cut – CTRL+C Copy the data in Windows.

- **Alt key**

- Also like the control key, Alt key is always used in combination with other keys to perform specific tasks. Exa: to open menu bar – ALT+F to open file menu.

- **Esc key**

- It is used to cancel or abort executing programs.

- **Numeric Keypad**



- o Numeric keypad is located on the right side of the keyboard.
  - o It consists of keys having numbers (0 to 9) and mathematical operators (+ – \* /) defined on them.
  - o This keypad is provided to support quick entry for numeric data.
- **Cursor Movement Keys**
    - o These are arrow keys and are used to move the cursor in the direction indicated by the arrow (up, down, left, right).

## (2). MOUSE

- The mouse is a small device used to point to a particular place on the screen and select in order to perform one or more actions.
- The mouse is often pointing to and **clicking** on one of these elements. Exa: Buttons, tools, pull-down menus, and icons for file folders, programs, and document files.
- It is more convenient than using the arrow keys on the keyboard.
- It is also called point and draw device.
- The mouse is the second most common input device, after the keyboard.
- A mouse operates by moving the cursor on the computer screen to correspond to movements made with the mouse.
- There are main three buttons on mouse.
  1. Left Button
  2. Middle Button
  3. Right Button
- The Mouse can perform many Actions based on buttons used in applications.
  1. **Left Click:** Used to select an item.
  2. **Double Click:** Used to start a program or open a file.
  3. **Right Click:** Usually used to display a set of commands.
  4. **Drag and Drop:** It allows you to select and move an item from one location to another. To achieve this place the cursor over an item on the screen, click the left mouse button and while holding the button down move the cursor to where you want to place the item, and then



release it.

- lk
- There are three kinds of mouse.

1. Mechanical mouse
2. Optical mouse
3. Opto-Mechanical mouse

- The **mechanical** mouse requires a ball to move the cursor on the screen. To get more efficacies with this type of mice, a flat surface named mouse pads is necessary.
- The **optical** mouse uses a laser; precisely an optical sensor to help detecting the mouse's moving. More expensive than the two other types, the optical mice offer more precision and speed and even can be used on any surface.
- The **Opto-mechanical** or **optical-mechanical** mouse is a combination of the optical and the mechanical technologies. It uses a ball but detects the mouse movement optically. It is now the most commonly used with PC.

- To transmit data to the computer three types of interfaces can be used by mouse:

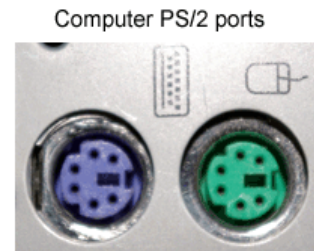
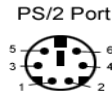
1. RS-232C serial port
2. PS/2 port
3. USB interface

- The **RS-232C serial port** connects the



mouse to the computer through a thin electrical cord using a 9 pin connector. RS-232 stands for Recommended Standard 232.

- The **PS (Parallel to Serial)/2 ports** do the same as the first interface mentioned but using a 6 pin connector.

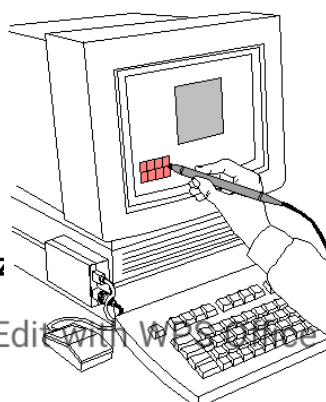


- The **USB (Universal Serial Bus)** interface receives various types of mice through a USB connector. One of these advantages to use the USB mouse is the possibility to plug-and-play (it) in front or in the back of your computer case, when it contains these kinds of port.



### (3). LIGHT PEN

- Light pens provide a very precise pointing capability directly on the screen.
- A light-sensitive stylus wired to a video terminal used to draw pictures or select menu options.
- The user brings the pen to the desired point on screen and presses the pen button to make contact.
- Contrary to what it looks like, the pen does not shine light onto the screen; rather, the screen beams into the pen.
- Screen pixels are constantly being refreshed.
- When the user presses the button, the pen senses light, and the pixel being illuminated at that instant identifies the screen location.



### [Light Pen]

- Nowadays light pen is used for various purposes, out of which few of them are as follows,

#### 1) POINT OF SALE AND PROCESS CONTROL:

A Light Pen allows you to make menu selections directly on your monitor screen! No special overlays are required, which can degrade the image on your monitor and require constant cleaning of the image field.

#### 2) KIOSKS & GAMING:

Light Pens provide Screen Direct interaction with your applications for quick and precise input control. Light Pens, with stainless steel housing, hardened tip and optional armored cabling are virtually immune to harsh environments.

#### 3) GRAPHIC ARTS:

Extend your range of creativity and design techniques. Light Pens provide a more responsive feel and angle of degree, vital for today's multiplatform graphics programs and digital technology.

#### 4) HEALTHCARE APPLICATION:

Light Pens for a variety of Healthcare applications: Hospital patient records, bookkeeping, financial analysis, pharmacy management, dental patient records and numerous other tasks.

### (4). JOYSTICK

- The joystick is a vertical stick which moves the graphic cursor in a direction the stick is moved.
- It typically has a button on top that is used to select the option pointed by the cursor.



- Joystick is used as an input device primarily used with video games, training simulators and controlling robots.
- With a joystick, the pointer continues moving in the direction the joystick is pointing.
- To stop the pointer, you must return the joystick to its upright position.
- Most joysticks include two buttons called *triggers*.



[Joystick]

- In order to communicate a full range of motion to the computer, a joystick needs to measure the stick's position on two axes -- the X-axis (left to right) and the Y-axis (up and down).
- Some joysticks use an additional potentiometer for a Z-axis, activated by rotating the stick itself.
- Two main types of joysticks take over the market; there is a wired and a wireless version available.

- **Wireless Joystick:**

A wireless joystick will perform slowly if the life of the batteries is nearing its end. If batteries are new or still full up you will hardly experience any trouble.

- **Wired Joystick:**

The range of a wireless joystick is often limited. The device will have to be used within reach of its base control station, attached to the computer.



**(5). SCANNER**

- Scanner is an input device.
- Scanners used to transfer images or text into a computer.
- There are special models for scanning photo negatives, or to scan books.
- In the computer, the signal from the scanner is transferred to a digital image.
- This image can then be edited using desktop publishing software and printed using printer.
- Once an image is scanned into an image scanner, the data must be processed and sent to a computer.
- Most scanners read red-green-blue color from the color array.
- The depth of color depends on the array characteristics, but is typically 24 bits at least.
- Higher quality models have a color depth of 48 bits or more.
- The pixel per inch measures the resolution of the image.
- All scanners have special parts which are used to take a picture from an object.
- There are following types of scanner...

**1) Flatbed Scanner**

- Flatbed scanners, also called desktop scanners, are the most versatile and commonly used scanners.

**[Flat bed Scanner]****2) Sheet fed Scanner**

- Sheet-fed scanners are similar to flatbed scanners except the document is moved and the scan head is immobile. A sheet-fed scanner looks a lot like a small portable printer.

**[Sheet fed Scanner]**

### 3) Handheld Scanner

- Handheld scanners use the same basic technology as a flatbed scanner, but rely on the user to move them instead of a motorized belt. This type of scanner typically does not provide good image quality. However, it can be useful for quickly capturing text.



[Handheld Scanner]

### 4) Drum Scanner

- It is also called rotary scanner.
- Drum scanners are used by the publishing industry to capture incredibly detailed images.

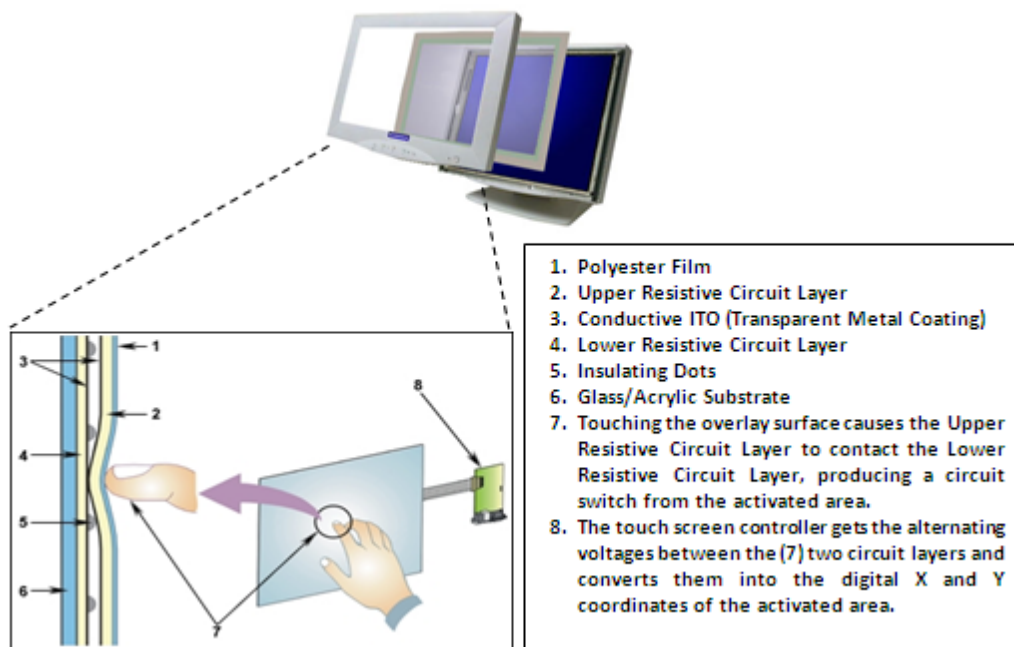


[Drum Scanner]

## (6). TOUCH SCREEN

- A Touch screen is a display which can detect the location of touches within the display area.
- This allows the display to be used as an input device.
- Here, no other devices are used to interacting with the display's content except fingers.
- Touch screens also have assisted in recent changes in the design of personal digital assistant (PDA), satellite navigation and mobile phone devices, making these devices more usable.
- **There are following limitation for touch screen devices...**
  - It is not mostly used for writing documents in office.
  - This technology more costly than routine devices.
  - The touch screens users must care of it.

- o It is not portable like mouse.



### [Touch Screen]

- A basic touch screen has three main components:
  - o A touch sensor.
  - o a controller
  - o A software driver.
- The touch screen is an input device, so it needs to be combined with a display and a PC or other device to make a complete touch input system.

## **OUTPUT DEVICES (only principles)**

### **Introduction to output devices**

To get information into a computer, a person uses an input device. To get information out, a person uses an output device. Some common output devices include monitors, printers, plotters and speakers.

All the output that coming from computer in the form of binary signals, so we need convert that data into human readable form i.e graphical, alphanumeric in human being languages, audio and video. Such type of functions provides by output devices. Output devices are used to understand based required data.

- 1) Output on screen i.e Monitor**
- 2) Output on paper in printed form i.e. Printers**
- 3) Output on paper in graphic form i.e. Plotters**
- 4) Output in sound i.e. Speakers.**

As you know very well, based on above category the output may be on screen and on paper. So, if we think that above category in narrow form then there are originally two types of output devices.

#### **1) Hard copy devices**

- Hard copy means output that direct usable form i.e. in printed or plotted form.
- These kinds of output devices are produce permanent record.
- It is very slow to perform any operations.
- Exa: Printers, Plotters, Punch card.

#### **2) Soft copy devices**

- Soft copy means output that indirect usable form i.e. on written magnetic form.
- These kinds of output devices are produce temporary record.
- It is fast to perform any operations.
- Exa: Speaker, Monitor (VDU – Visual Display Unit)



## (1). MONITOR

- A monitor, or screen, is the most common output device.
- It is used with a personal computer and uses a Cathode Ray Tube (CRT) to display information.



*LCD monitor*



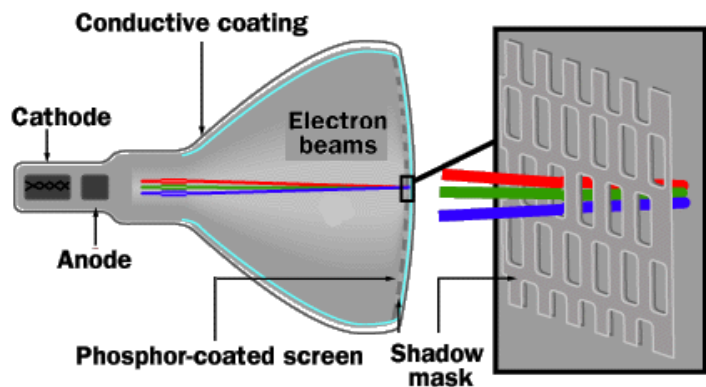
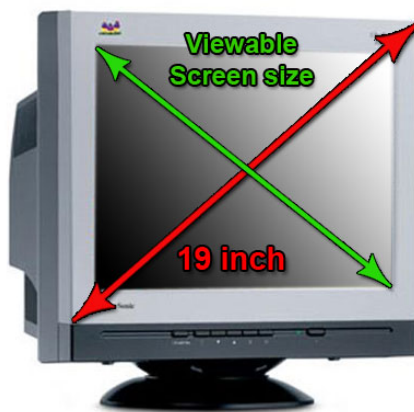
*CRT monitor*

### ***[Types of Monitors]***

- There are main two types based on technology.
  - Monochrome monitor (Black & white)
  - Color monitor
- Most monitors make use of a cathode-ray tube, or CRT, much like the tube found in a conventional television (TV).

## CRT monitor

- CRT stands for Cathode Ray Tube.
- The CRT takes up a lot of room and extends toward the back.
- CRT monitors were the only choice consumers had for monitor technology for many years.
- CRT technology has been in use for more than 100 years.
- It is found in most televisions and computer monitors.
- For CRT monitors, screen size is measured diagonally from outside edges of the display casing.



*[CRT Monitors]*

*[Internal structure of CRT]*

- A CRT works by moving an electron beam back and forth across the back of the screen.
- Each time the beam makes a pass across the screen, it lights up phosphor dots on the inside of the glass tube, thereby illuminating the active portions of the screen.

- By drawing many such lines from the top to the bottom of the screen, it creates an entire screen of images.
  - They consume more power and are prone to screen sparkle.
  - A CRT monitor contains millions of tiny red, green, and blue phosphor dots that glow when struck by an electron beam that travels across the screen to create a visible image.
  - The illustration below shows how this works inside a CRT.
- 
- The terms anode and cathode- are used in electronics as synonyms for positive and negative terminals.
  - For example, you could refer to the positive terminal of a battery as the anode and the negative terminal as the cathode.
  - In a cathode ray tube, the "cathode" is a heated filament.
  - The heated filament is in a vacuum created inside a glass "tube."
  - The "ray" is a stream of electrons generated by an electron gun that naturally pour off a heated cathode into the vacuum.
  - Electrons are negative.
  - The anode is positive.
  - So it attracts the electrons pouring off the cathode.
  - This screen is coated with phosphor, an organic material that glows when struck by the electron beam.
  - There are three ways to filter the electron beam in order to obtain the correct image on the monitor screen: shadow mask, aperture grill and slot mask.
  - These technologies also impact the sharpness of the monitor's display.

### Advantages of CRT Monitors

- o **Less expensive** - Although LCD monitor prices have decreased, comparable CRT displays still cost less.
- o **Better color representation** - CRT displays have historically represented colors and different gradations of color more accurately than LCD displays.
- o **More responsive** - Historically, CRT monitors have had fewer problems with ghosting and blurring because they redrew the screen image faster than LCD monitors.
- o **Multiple resolutions** - If you need to change your display's resolution for different applications, you are better off with a CRT monitor because LCD

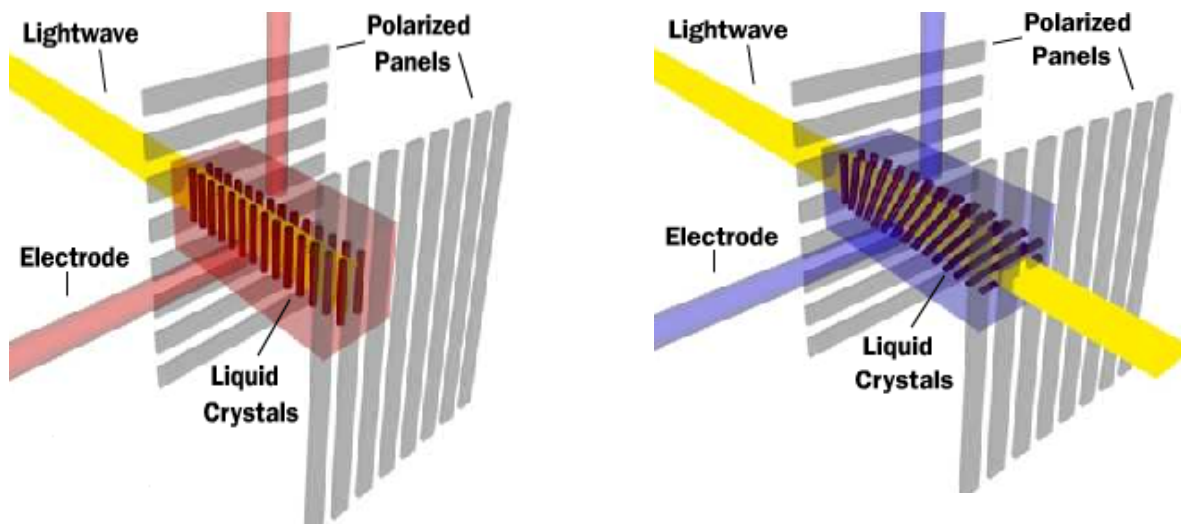


monitors don't handle multiple resolutions as well.

- o **More rugged** - Although they are bigger and heavier than LCD displays, CRT displays are also less breakable and harder to damage.

## LCD monitor

- LCD stands for Liquid Crystal Display (LCD) Monitor
- LCD was introduced in the 1970s.
- It is also called Flat panel monitor.
- It is now applied to display terminals also.
- Its advantages like low energy consumption, smaller and lighter have smooth its way for usage in portable computers (laptops).
- LCD technology can be found in digital watches and computer monitors.

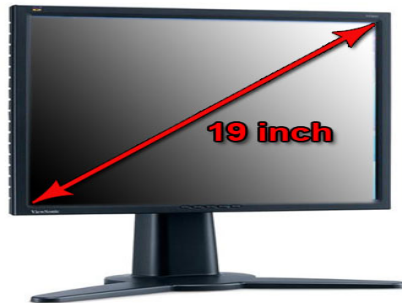


*[(a) Off status (b) On status for LCD Monitor]*

- LCD displays use two sheets of polarizing material with a liquid crystal solution between them.
- An electric current passed through the liquid causes the crystals to align so that light cannot pass through them.



- Each crystal, therefore, is like a shutter, either allowing light to pass through or blocking the light.
- Color LCD displays use two basic techniques for producing color:
  - o **Passive matrix display:**
  - o **Active matrix display:**
- For LCD monitors, screen size is measured diagonally from the inside of the beveled edge. The measurement does not include the casing as indicated in the image below.



[LCD monitor]

- **Advantages of LCD Monitors**
  - o **Require less power** - CRT displays are somewhat power-hungry, at about 100 watts for a typical 19-inch display. The average is about 45 watts for a 19-inch LCD display. LCDs also produce less heat.
  - o **Smaller and weigh less** - An LCD monitor is significantly thinner and lighter than a CRT monitor, typically weighing less than half as much. In addition, you can mount an LCD on an arm or a wall, which also takes up less desktop space.
  - o **More adjustable** - LCD displays are much more adjustable than CRT displays.
  - o **Less eye strain** - Because LCD displays turn each pixel off individually, they do not produce a flicker like CRT displays do.

### CRT Vs. LCD

- There are major following differences between them.

Characteristics	CRT	LCD
Picture Quality (Resolution)	Up to 1600 * 1200	Fixed within each monitor
Refresh rate	Bit of an annoying flicker	Flicker-free
Dot pitch	More space	Less space
Screen Size	In 17" CRT monitor, you	In 17" LCD monitor, you

	usually get 16.1"	usually get close to 17"
Physical size	CRT monitors are big, bulky and heavy.	Small, compact and lightweight.
Cost	Less expensive	More expensive
Color	Can't maximum color	Better then CRT
Viewable Angle	From any angle	From front end side only

## **Plasma display**

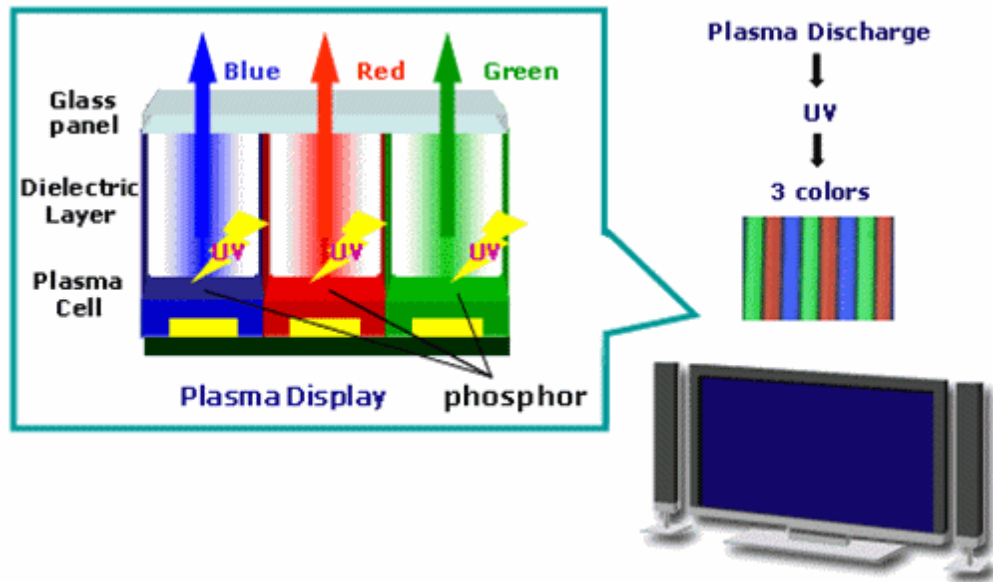
- A new alternative option for us in monitor category is: plasma flat panel display or plasma display panel (PDP).
- These monitor have wide screens, comparable to the largest CRT sets, but they are only about 6 inches (15 cm) thick.
- In the CRT, lights up thousands of tiny dots (called pixels) with a high-energy beam of electrons.
- In most systems, there are three pixel colors -- red, green and blue.
- By combining these colors in different proportions, the monitor can produce the entire color spectrum.
- The basic idea of a plasma display is to light up tiny, colored fluorescent lights to form an image.

### ***[Internal structure of Plasma Monitor]***

- Each pixel is made up of three fluorescent lights -- a red light, a green light and a blue light.
- The central element in a fluorescent light is called plasma.
- The plasma means a gas made up of free-flowing ions and electrons.
- Under normal conditions, a gas is mainly made up of uncharged particles.
- That is, the individual gas atoms include equal numbers of protons and electrons.
- The negatively charged electrons perfectly balance the positively charged protons, so the atom has a net charge of zero.
- The main advantage of plasma display technology is that you can produce a very wide screen using extremely thin materials.
- The biggest drawback of this technology has been the price.



(2).



## Printer

- Printers are used to produce paper (commonly known as hardcopy devices) output.
- Printers are available in market with different size, speed and cost.
- Based on printing technology speed, they are categorized as...

<i>Serial or character printer</i>	<i>Line printer</i>	<i>Page printer</i>
<ul style="list-style-type: none"> <li>• Dot matrix printer</li> <li>• Daisy wheel printer</li> </ul>	<ul style="list-style-type: none"> <li>• Chain printer</li> <li>• Drum printer</li> </ul>	<ul style="list-style-type: none"> <li>• Laser printer</li> </ul>

- Based on the technology used, they can be classified as Impact or Non-impact printers.

## Impact printer

FYBCA – 103 – Computer Organization [UNIT – 2], SHAHNAVAJKHAN (9898808805)



- The first impact printer was put into use in 1953 by the Remington Rand computer-manufacturing company.
- IBM created the first dot-matrix printer in 1957.
- It is used the typewriting printing mechanism wherein a hammer strikes the paper through a ribbon in order to produce output.
- These printers have a mechanism that touches the paper in order to create an image through striking hammer.
- These Printers produce much noise when printing and called noisy Printers.
- Exa: Line printer and Character printers fall under this category.

#### o Character Printers

- A character printer is capable to print only one character at a time.
- These printers have only one printing head.
- Normally a character printer prints 120 characters in one second.
- **Examples:** Dot Matrix, Daisy wheel Printers

#### o Line Printers

- A Line printer can print an entire line at a time.
- It can print normally covers 80 or 132 characters.
- These printers have 80 or 12 printing heads for each character.
- A normally line printer can print 2500 lines per minute.
- **Examples:** Drum Printers, Chain Printers

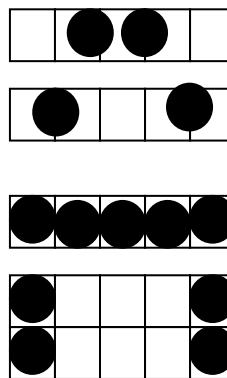
### Nonimpact printer

- It is does not touch the paper while printing because it will used to spray or laser technology.
- These printers are also called Quite Printers because they do not produce noise when printing.
- They use chemical, heat or electrical signals to scratch the symbols on paper.
- Exa: Inkjet, DeskJet, Laser, Thermal printers fall under this category printer.



**(1). Dot matrix printer**

- o Dot Matrix means no. of rows dots and no. of columns dots are collected together to print a single character on paper.
- o As name suggest, a printer can printing all the matter using small DOTS together.
- o Exa: 5 dot rows \* 5 dot columns matrixes to print letter 'A'.

***[Representation of Character in Dot matrix]***

- o They are inexpensive.
- o It can support a letter quality output.
- o In this printer, individual character is printed on paper when hammer strike on it.
- o They are versatile because font sets depends on software.
- o They are capable to faster printing speed Exa: 35 to 600 cps (character per second)
- o They are very useful for high volume work.

**Advantages:**

- o They can print on multi-part stationery or make carbon-copies.

- o Impact printers have one of the lowest printing costs per page.
- o They are able to use continuous paper rather than requiring individual sheets, making them useful for data logging.
- o They are good, reliable workhorses ideal for use in situations where printed content is more important than quality.
- o The ink ribbon also does not easily dry out for this printer.

### Disadvantages:

- o Impact printers create noise when the pins or typeface strike the ribbon to the paper.
- o They can only print lower-resolution graphics, with limited color performance, limited quality, and lower speeds compared to non-impact printers.

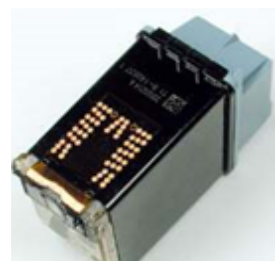
### (2). Inkjet printer

- o It is also called bubbled jet printer because they print by spraying tiny ink drop on paper.
- o They are non impact printer because they can print data silently with high quality as compared to dot matrix printer.



#### *[Types of Ink jet printers]*

- o This printer can print with 92 cps speed.
- o It generally provides at least 300 dpi resolution, although



high-resolution inkjets are available.

- o An inkjet printer can use black & white or color cartridges and so provides affordable color printing suitable for home and small office use.

*[Cartridge of ink jet printer]*

- o Such a cartridges has Cyan, Magenta and Yellow with Black inks with Separate boxes.
- o You can refill the cartridges but they can't print high quality output as compared to original cartridge.
- o The parallel port is still used by many printers, but most new printers use the USB (Universal Serial Bus) port.
- o A few printers connect using a serial port or Small Computer System Interface (SCSI) port.

### **Advantages**

- 1) Low cost
- 2) High quality of output, capable of printing fine and smooth details
- 3) Capable of printing in brilliant color, good for printing pictures
- 4) Easy to use
- 5) Reasonably fast
- 6) Quieter than dot matrix printer
- 7) No warm up time

### **Disadvantages**

- 1) Print head is less durable, prone to clogging and damage
- 2) Expensive replacement ink cartridges
- 3) Not good for high volume printing
- 4) Printing speed is not as fast as laser printers
- 5) Ink bleeding, ink carried sideways causing blurred effects on some papers
- 6) Aqueous ink is sensitive to water, even a small drop of water can cause blurring or

Running

- 7) Cannot use highlighter marker on inkjet printouts

### **(3). Laser printer**

- o Laser printers are non-impact printers.
- o It can print text and images in high speed and high quality resolution.
- o It ranging from 600 to 1200 dpi (Dots per Inch).



- o Unlike inkjet printers, laser printer use toner (black or colored powder) instead of liquid inks cartridges.



***[Laser printer]***

- o It uses a laser beam to create points of electrical charge on a cylindrical drum.
- o Toner, composed of particles of ink with an opposite electrical charge, sticks to the charged points on the drum.
- o As the page moves past the drum, heat and pressure fuse the toner to the page.
- o The cost of the laser printer's toner is higher than an inkjet cartridge.
- o The big toner has advantageous because it allows you to print 10 times more pages than the inkjet cartridge.
- o Laser printer has a higher PPM (Page Per Minute).
- o A laser printer consists of these major components: drum cartridge, rotating mirror, toner cartridge and roller.
- o The drum cartridge rotates as the paper is fed through.
- o The mirror deflects laser beam across the surface of the drum.
- o Laser beam creates charge that causes the toner to stick to the drum.
- o As the drum rotates and presses on paper, toner is transferred from the drum to paper, creating images.
- o Most new printers use the USB (Universal Serial Bus) port.

### **Advantages**

- 1) High resolution
- 2) High print speed
- 3) No smearing
- 4) Low cost per page (compared to inkjet printers)
- 5) Printout is not sensitive to water
- 6) Good for high volume printing





**Disadvantages**

- 1) More expensive than inkjet printers
- 2) Except for high end machines, laser printers are less capable of printing brilliant  
Colors and high quality images such as photos.
- 3) The cost of toner replacement and drum replacement is high
- 4) Bulkier than inkjet printers
- 5) Warm up time needed

**(4). Plotter**

- Plotters are used to print graphical output on paper.
- It is capable of producing graphs, drawings, charts, maps etc.
- They are used to produce drawings like architectural drawing and engineering applications in a more efficient way than printers.
- A plotter uses pen/pens to draw images on the paper instead of dots like printer.
- It produces smooth and sharp drawing of objects which is not possible to print using printers.
- It uses multiple pens to plot colored drawings.
- Plotters can plot any size of images with same efficiency and accuracy.
- In a single pen plotter pen can be changed manually for change of color or on requirement of replacement.
- In a multi pen plotter a number of pens are placed in a pen changing assembly and one pen is held at a time in the main pen holder.
- Plotters are serial device and are connected through a serial port interface to a computer.
- The pen speeds of plotters vary between 15 to 30 inches per second and for complex graphical images it may reduce up to 10 inches per second.
- Plotter move pen or pencil according to the instruction received from the computer in plotter control language. The most common plotter control language is HPGL i.e. Hewlett Packard Graphic Language. Other languages are DMPL (Digital Microprocessor Plotter Language), HILOT (Houseton Instruments Plotter Language) etc.
- Exa: Computer Aided Engineering (CAE) applications like CAD (Computer Aided Design) and CAM (Computer Aided Manufacturing) are typical usage areas for plotters.
- There are a number of different types of plotters:



### o Drum plotter:

- A drum plotter is pen plotter that wraps the paper around a drum with a pin feed attachment.
- The drum then rotates the paper as pens move across it and draw the image.
- It was the first output device used to print graphics and large engineering drawings.
- There are two types of drum plotters, external and internal.
- The external drum plotter, the paper is wrapped around its external surface
- The internal drum plotter uses a sheet of paper wrapped around its internal surface.



*[Drum plotter]*

### o Flatbed plotter:

- A flat-bed plotter is a mechanical drafting device used with many CAD programs for designers.
- The paper remains stationary on a flat surface while a pen moves across it horizontally and vertically.
- This plotter may use several different colors of pens to create the graphics.
- The size of the graphic is limited to the size of the flat-bed plotter's surface.



*[Flat bed plotter]*

- As a rule, plotters are much more expensive than printers.