Input Device:

To interact with your computer, you need input devices. An input device for a computer allows you to enter information. The most fundamental pieces of information are keystrokes on a keyboard and clicks with a mouse. These two input devices are essential for you to interact with your computer. Many other input devices exist for entering other types of information, such as images, audio and video. Input devices represent one type of computer peripheral - the other two types are output devices and storage devices.

Keyboard

Keyboard is the most common and very popular input device which helps in inputting data or text to the computer. The layout of the keyboard is like that of traditional typewriter, although there are some additional keys provided for performing additional functions.

Keyboards are of two sizes 84 keys or 101/102 keys, but now keyboards with 104 keys or 108 keys are also available for Windows and Internet.

The keys on the keyboard are as follows:

Sl.No	Keys	Description
1	Alphanumeric/Typing Keys	These keys include the letter keys (A-Z) and digit keys (0-9) which generally give same layout as that of typewriters.
2	Numeric Keypad	It is used to enter numeric data or cursor movement. Generally, it consists of a set of 17 keys that are laid out in the same configuration used by most adding machines and calculators.
3	Function Keys	The twelve function keys (F1 to F12) are present on the keyboard which are arranged in a row at the top of the keyboard. Each function key has unique meaning and is used for some specific purpose.
4	Control keys	These keys provide cursor and screen control. It includes four directional arrow keys. Control keys also include Home, End, Insert, Delete, Page Up, Page Down, Control(Ctrl), Alternate(Alt), Escape(Esc).

5	Special Purpose Keys	Keyboard also contains some special purpose keys such as Enter, Shift, Caps Lock, Num Lock, Space bar, Tab, and Print Screen.

Types of Keyboards

1. Normal Keyboard
2. Multimedia Keyboard

Normal Keyboard

This keyboard is also known as standard keyboard which will have 104 keys. Almost all keyboard should have minimum of 104 keys. This keyboard does not contain any additional keys in it.

Multimedia Keyboard

The multimedia keyboard is specially designed for the people who are much into multimedia designing. This keyboard is just like the standard key board, but composed of additional keys for the multimedia purposes such as multimedia application launch, volume control and mute button.

MOUSE (Manual Operating User Sensitive Equipment):

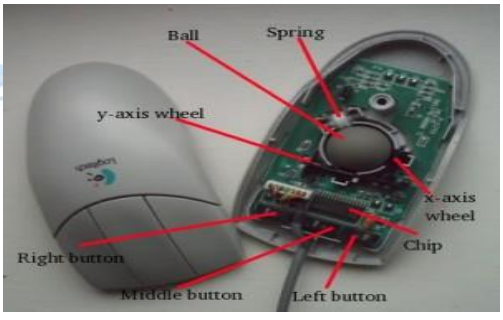
Mouse is most popular pointing device. It is a very famous cursor-control device having a small palm size box with a round ball at its base which senses the movement of mouse and sends corresponding signals to CPU when the mouse buttons are pressed.

Generally, it has two buttons called left and right button and a wheel is present between the buttons. Mouse can be used to control the position of cursor on screen, but it cannot be used to enter text into the computer.

Types of Mouse

Mechanical Mouse

Also called as the ball mouse, a mechanical mouse has rubber or metal ball on it's underside. When the ball rolls, mechanical sensors inside the mouse detect the direction and move the pointer on the screen of the PC. This type of mouse requires a flat surface or a mouse pad to work efficiently. One of the drawbacks of the device is that it is more prone to attracting dust.



Opto mechanical or Optical-mechanical Mouse

An Opto mechanical or optical-mechanical mouse is same as the mechanical mouse except that the sensors used in it are optical and not mechanical. The device is a combination of optical and mechanical technologies, wherein, the ball is present but the mouse movement is detected optically leading to more accuracy.

Optical or Laser Mouse

A laser mouse is the new generation mouse with two necessary components – light emitter and light detector. A laser mouse uses laser as the light emitter and has a precise scanning of mouse movement. You will find a laser mouse ranging anywhere between 1000-5700 dots-per-inch (DPI).

Advantages

- ✓ Easy to use
- ✓ Not very expensive
- ✓ Moves the cursor faster than the arrow keys of keyboard.

Scanner

Scanner is an input device which works more like a photocopy machine. It converts hard copy to soft copy. It is used when some information is available on a paper and it is to be transferred to the hard disc of the computer for further manipulation. Scanner captures images from the source which are then converted into the digital form that can be stored on the disc. These images can be edited before they are printed.

Types of Scanner

1. Handheld Scanner
2. Flat Bed Scanner.
3. Drum Scanner

Handheld Scanner

A scanner that is moved by hand over the material being captured. Handheld scanners ar e small & less expensive than their desktopcounterparts but partially rely on the user's dexterity to move the unit across the paper. Trays are available that keeps the scanner moving in a straight line. Contrast with flatbed scanner, sheet-fed scanner and drum scanner.

Flat Bed Scanner

Flatbed scanners will take up some desktop space but provide a lot of bang for the buck. They look like miniature printers with a flip-up cover protecting the glass platen. Depending on its size, a flatbed scanner can fit standard or legal-sized documents, and the flexible cover allows you to scan large items such as books. These scanners are great for scanning the occasional newspaper article, book chapter, or photograph; or for those who may need to scan or bulky items such as the cover of a DVD.

Drum Scanner

A type of scanner used to capture the highest resolution from an image. Photographs and transparencies are taped, clamped or fitted into a clear cylinder (drum) that is spun at speeds exceeding 1,000 RPM during the scanning operation. A light source that focuses on one pixel is beamed onto the drum and moves down the drum a line at a time.

Joystick

Joystick is also a pointing device which is used to move cursor position on a monitor screen. It is a stick having a spherical ball at its both lower and upper ends. The lower spherical ball moves in a socket. The joystick can be moved in all four directions.

The function of joystick is similar to that of a mouse. It is mainly used in Computer Aided Designing (CAD) and playing computer games.

Light Pen

Light pen is a pointing device which is similar to a pen. It is used to select a displayed menu item or draw pictures on the monitor screen. It consists of a photocell and an optical system placed in a small tube. When the tip of a light pen is moved over the monitor screen and pen button is pressed, its photocell sensing element detects the screen location and sends the corresponding signal to the CPU.

Track Ball

Track ball is an input device that is mostly used in notebook or laptop computer, instead of a mouse. This is a ball which is half inserted and by moving fingers on ball, pointer can be moved. Since the whole device is not moved, a track ball requires less space than a mouse. A track ball comes in various shapes like a ball, a button and a square.

Microphone

Microphone is an input device to input sound that is then stored in digital form. The microphone is used for various applications like adding sound to a multimedia presentation or for mixing music.

Digitizer

Digitizer is an input device which converts analog information into digital form. Digitizer can convert a signal from the television or camera into a series of numbers that could be stored in a computer. They can be used by the computer to create a picture of whatever the camera had been pointed at.

Magnetic Ink Character Recognition (MICR)

MICR input device is generally used in banks because of a large number of cheques to be processed every day. The bank's code number and cheque number are printed on the cheques with a special type of ink that contains particles of magnetic material that are machine readable. This reading process is called Magnetic Ink Character Recognition (MICR). The main advantages of MICR is that it is fast and less error prone.

Optical Character Recognition (OCR)

OCR is an input device used to read a printed text. OCR scans text optically character by character, converts them into a machine readable code and stores the text on the system memory.

Bar Code Readers

Bar Code Reader is a device used for reading bar coded data (data in form of light and dark lines). Bar coded data is generally used in labelling goods, numbering the books etc. It may be a hand held scanner or may be embedded in a stationary scanner. Bar Code Reader scans a bar code image, converts it into an alphanumeric value which is then fed to the computer to which bar code reader is connected.

Optical Mark Reader (OMR)

OMR is a special type of optical scanner used to recognize the type of mark made by pen or pencil. It is used where one out of a few alternatives is to be selected and marked. It is specially used for checking the answer sheets of examinations having multiple choice questions.

Web Camera or Digital Camera

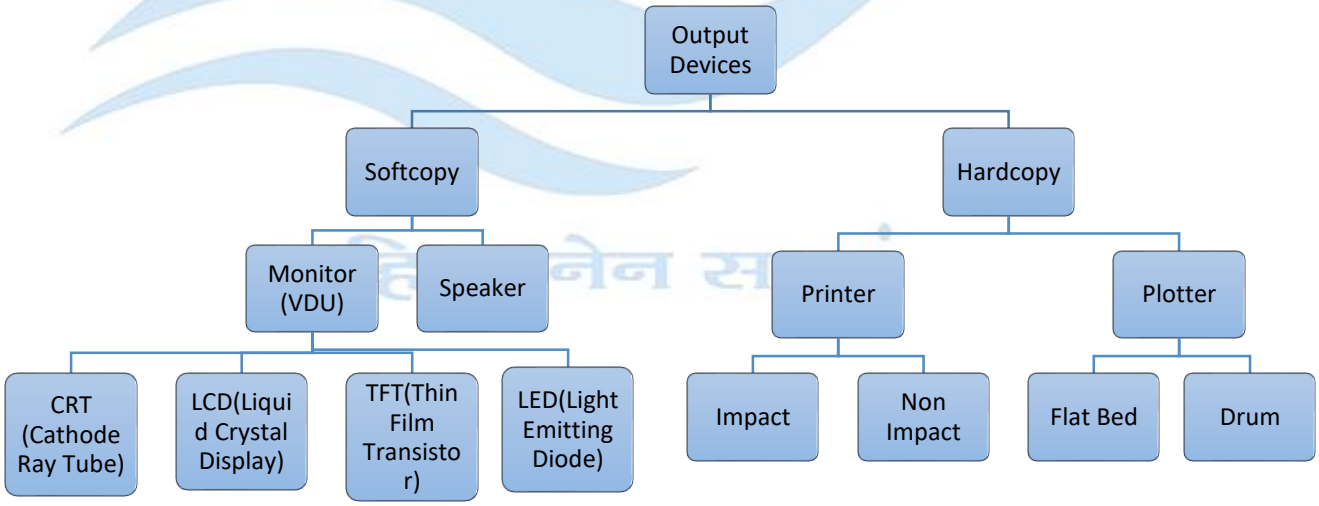
A webcam is a hardware camera connected to a computer that allows anyone connected to theInternet to view either still pictures or motion videoof a user or other object. The picture of theLogitech Webcam C270 is a good example of what a webcam may look. Today, most webcams are either embedded into the display with laptopcomputers or connected to the USB or FireWire port on the computer.

Touch Screen Sensitive or ATM(Automatic Teller Machine)

A touchscreen is a display that also serves as an input device. Some touchscreens require a proprietary pen for input, though most modern touchscreens detect human touch. Since touchscreen devices accept input directly through the screen, they do not require external input devices, such as miceand keyboards. This makes touchscreens ideal for computer kiosks, as well as portable devices, such as tablets and smartphones. It is basically used in **ATM (Automatic Teller Machine)** centers.

Output devices

It is device which display or prints the output from the computer. Electronic or electromechanical equipment connected to a computer andused to transfer data out of the computer in the form of text, images,sounds or other media to a display screen, printer, loudspeaker or storagedevice. Most modern storage devices such as diskdrives and magnetic tapedrives act as both input and output devices, others such as CD-ROM areinput only.



Types of Output Devices

1. Softcopy
2. Hardcopy

Softcopy Output Device

Softcopy devices give screen displayed output which is lost when the computer is turned off. Softcopy devices enable viewing of work, which allow correction and rearrangement of materials to suit specific needs. Monitor, PC, projectors and VDT (Video Display Terminals) are the example of softcopy devices.

Hardcopy Output Device

HardCopy devices give the output in a hardcopy like printed in the paper. The output is permanent. Printers, plotters are the examples of hardcopy O\P devices because they print the output in hard paper.

Monitors or VDU

Monitors, commonly called as Visual Display Unit (VDU), are the main output device of a computer. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image depends upon the number of pixels.

Types of Monitors

1. CRT (Cathode Ray Tube)
2. LCD (Liquid Cr;ystal Display)
3. TFT (Thin Film Transistor)
4. LED (Light Emitting Diode)

Cathode-Ray Tube (CRT) Monitor

The CRT display is made up of small picture elements called pixels. The smaller the pixels, the better the image clarity, or resolution. It takes more than one illuminated pixel to form whole character, such as the letter 'e' in the word help.These are all old model monitors

A finite number of characters can be displayed on a screen at once. The screen can be divided into a series of character boxes - fixed location on the screen where a standard character can be placed. Most screens are capable of displaying 80 characters of data horizontally and 25 lines vertically. There are some disadvantages of CRT:

- ✓ Large in Size
- ✓ High power consumption

Flat-Panel Display Monitor

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

The flat-panel display is divided into two categories:

Non-Emissive Displays - The Non-emissive displays use optical effects to convert sunlight or light from some other source into graphics patterns. Example is **LCD** (Liquid-Crystal Device)

Emissive Displays - The emissive displays are devices that convert electrical energy into light. Example are plasma panel and **LED** (Light-Emitting Diodes).

LCD (Liquid Crystal Display)

LCD stands for Liquid Crystal Display. the main advantage of LCDs are light weighy, occupy less place, 12v power consumption, low radiation and supports high resolutions. Some major advantages of using an LCD monitor include:

- These monitors are compact, lightweight, and do not consume much desk space.
- Secondly, these monitors do not consume much electricity and can even be operated by using batteries.
- Also, the images transmitted by these monitors do not get geometrically distorted and have little flicker.

TFT (Thin Film Transistor)

These transistors are used in high-quality flat panel liquid-crystal displays (LCDs). TFT-based displays have a transistor for each pixel on the screen. This allows the electrical current that illuminates the display to be turned on and off at a faster rate, which makes the display brighter and shows motion smoother.

LED (Light Emitting Diode)

LED monitors are the latest types of monitors in the market today. Like LCD, it is again a flat panel display making use of light-emitting diodes for back-lightning instead of Cold Cathode Fluorescent (CCFL) back-lightning used in LCDs. Primarily, the display is of LCD only but the back-lightning is done by LEDs.

LED monitors are said to use much lesser power than CRT and LCD. Thus, they are also considered environmental friendly. Other core advantages of LED monitors are:

1. They produce images with higher contrast
2. They have less negative environmental impact when disposed
3. Lifespan and durability of LED monitors is more than CRT or LCD monitors
4. Because of the technology, the monitor panels can be made very thin
5. Do not produce much heat while running

Speaker

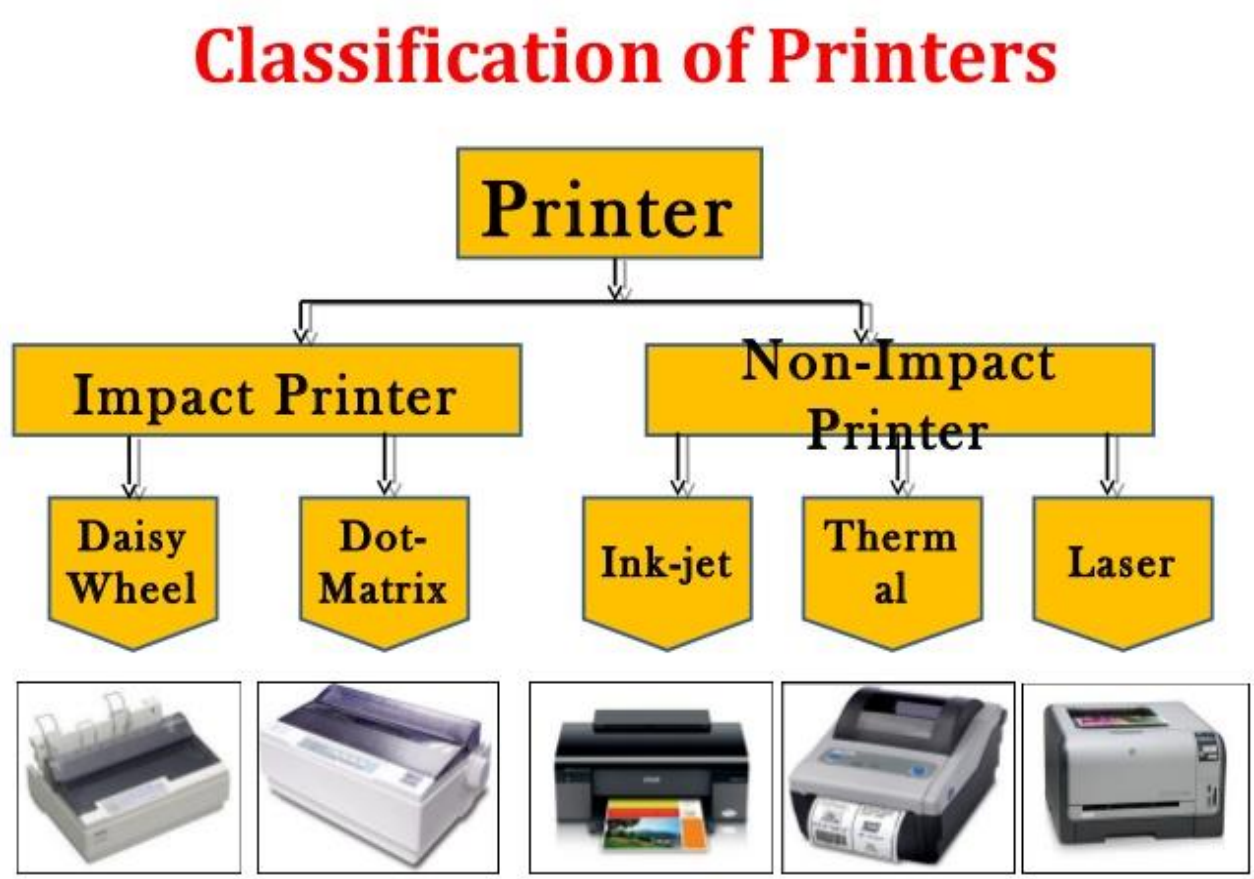
Speakers are one of the most common output devices used with computer systems. Some speakers are designed to work specifically with computers, while others can be hooked up to any type of sound system. Regardless of their design, the purpose of speakers is to produce audio output that can be heard by the listener.

Printer

A printer is an output device that prints paper documents. This includes text documents, images, or a combination of both.The printed output produced by a printer is often called a **hard copy**, which is the physical version of an electronic document.

There are two types of printers:

- Impact Printers
- Non-Impact Printers



Impact Printers

The impact printers print the characters by striking them on the ribbon which is then pressed on the paper. Here the paper and printer will in contact. It usually forms the print image by pressing an inked ribbon against the paper using a hammer or pins. Following are some examples of impact printers.

Characteristics of Impact Printers are the following:

- Very low consumable costs
- Very noisy
- Useful for bulk printing due to low cost
- There is physical contact with the paper to produce an image

These printers are of two types

- Character printers
- Line printers

Daisy Wheel Printer

Head is lying on a wheel and pins corresponding to characters are like petals of Daisy (flower name) that is why it is called Daisy Wheel Printer. These printers are generally used for word-processing in offices which require a few letters to be sent here and there with very nice quality.

Advantages

- More reliable than DMP
- Better quality
- The fonts of character can be easily changed

Disadvantages

- Slower than DMP
- Noisy
- More expensive than DMP

Dot Matrix Printer (DMP)

In the market one of the most popular printers is Dot Matrix Printer. These printers are popular because of their ease of printing and economical price. Each character printed is in form of pattern of dots and head consists of a Matrix of Pins of size (5*7, 7*9, 9*7 or 9*9) which come out to form a character that is why it is called Dot Matrix Printer.

Advantages

- Inexpensive
- Widely Used
- Other language characters can be printed

Disadvantages

- Slow Speed
- Poor Quality

Line Printers

Line printers are the printers which print one line at a time. In business where enormous amount of material is printed, the character-at-a-time printers are too slow; therefore, these users need line-at-a-time printers. Line printers, or line-at-a-time printers, use special mechanism that can print a whole line at once; they can typically print the range of 1,200 to 6,000 lines per minute. Drum, chain, and band printers are line-at-a-time printers.

These are of further two types

- Drum Printer
- Chain Printer

Drum printer

This printer is like a drum in shape so it is called drum printer. The surface of drum is divided into number of tracks. Total tracks are equal to size of paper i.e. for a paper width of 132 characters, drum will have 132 tracks. A character set is embossed on track. The different character sets available in the market are 48-character set, 64 and 96 characters set. One rotation of drum prints one line. Drum printers are fast in speed and can print 300 to 2000 lines per minute.

Advantages

- Very high speed

Disadvantages

- Very expensive
- Characters fonts cannot be changed

Chain printer

In this printer, chain of character sets is used so it is called Chain Printer. A standard character set may have 48, 64, or 96 characters.

Advantages

- Character fonts can easily be changed.
- Different languages can be used with the same printer.

Disadvantages

- Noisy

Non-impact Printers

Non-impact printers print the characters without using ribbon. These printers print a complete page at a time so they are also called as Page Printers. This printer prints without making contact with the paper. They are generally quieter and more efficient than their impact counterparts. These printers do not use a striking device to produce characters on the paper; and because these printers do not hammer against the paper they are much quieter. Following are some non-impacted printers.

These printers are of two types

- Inkjet Printers
- Thermal printers
- Laser Printers

Characteristics of Non-Impact Printers

- Faster than impact printers.
- They are not noisy.
- High quality.
- Support many fonts and different character size.

Inkjet Printers

Ink-jet printer is type of non-impact printer. It creates output on paper by spraying tiny drops of liquid ink. Inkjet printer has print-head that can spray very fine drops of ink. It consists of print cartridge filled with liquid ink and has small nozzles in form of matrix. Like dot matrix printer, the combination of nozzles is activated to form the shaper of character or image on the paper by spraying the liquid ink. These printers have resolution ranging from 300 to 720 dpi. The ink-jet printers have low price than laser printers. They are also slower and have low print quality than laser printer. However, They are faster and have high print quality than dot matrix printers. The printing speed of ink-jet printer is from 1 to 6 pages per minute.

Advantages

- High quality printing
- More reliable

Disadvantages

- Expensive as cost per page is high
- Slow as compared to laser printer

Thermal Printer

Thermal printer is another type of non-impact printer. It can only print output on a special heat sensitive waxy paper. The image if the output is created on the waxy paper by burning dots on it. For colored output, colored waxy sheets are used. Thermal Printer produces a high quality printout. It is quite expansive as compared to other non-impact printers.

Advantages

- No issues with ribbons wrinkling when printing
- Less physical inventory to store
- Eliminates issue of ordering/using wrong label and ribbon sizes
- Direct Thermal Printers don't need capacity for ribbons so they are more compact

There are a couple disadvantages to consider when using direct thermal labels.

Disadvantages:

- Labels cannot withstand long exposure to sunlight or extreme heat. Leave a gas station receipt on your dashboard and you will see it fade from the exposure. These receipts use similar direct thermal technology.
- Even without sun exposure, the labels will fade over long periods of time. For labeling boxes kept in inventory for years, direct thermal is not the best choice.
- Print speeds tend be slower.
- Putting acrylic adhesive tape over a direct thermal label will cause the label to fade.

Laser Printer

Laser stands for Light Amplification by Simulated Emission of Radiation. A laser printer is the fastest and high quality non-impact printer. It works like a photocopier. The laser printer transfers the image of output on paper using LASER technology and toner. Toner is an ink powder. It is used in laser printers and photocopiers also

Advantages of Laser Printer

- The main advantage of Laser printer is its speed & efficiency at which it prints high-quality quality graphics & text.
- Laser printers produce high-quality output as compared to other printers.
- Laser printers are quite and does not produce disturbing sounds.
- They are also capable to produce color prints.

Disadvantages of Laser Printer

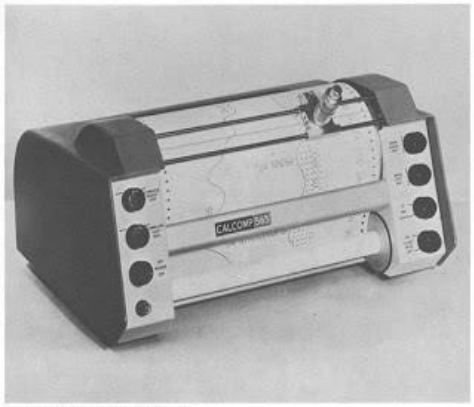
- The main disadvantage of Laser printer is its cost; they are relatively costly as compared to other printers.
- The maintenance, repair & servicing charges are also high of these printers.
- Laser printers emit small amount of ozone and are hazardous to health and the atmosphere.

Plotter

A plotter is a special output device used to produce hardcopies of graphs and designs on the paper. A plotter is typically used to print large-format graphs or maps such as construction maps, engineering drawings and big posters. Plotters are divided into two types:

1. Drum plotters
2. Flatbed plotters

Drum Plotter



1. CalComp model 565, 12-inch drum plotter.

A drum plotter is also known as Roller Plotter. It consists of a drum or roller on which a paper is placed and the drum rotates back and forth to produce the graph on the paper. It also consists of mechanical device known as Robotic Drawing Arm that holds a set of colored ink pens or pencils. The Robotic Drawing Arm moves side to side as the paper are rolled back and forth through the roller. In this way, a perfect graph or map is created on the paper. This work is done under the control of computer. Drum Plotters are used to produce continuous output, such as plotting earthquake activity.

Flatbed Plotter

A flatbed plotter is also known as Table Plotter. It plots on paper that is spread and fixed over a rectangular flatbed table. The flatbed plotter uses two robotic drawing arms, each of which holds a set of colored ink pens or pencils. The drawing arms move over the stationary paper and draw the graph on the paper. Typically, the plot size is equal to the area of a bed. The plot size may be 20- by-50 feet. It is used in the design of cars, ships, aircrafts, buildings, highways etc. Flatbed plotter is very slow in drawing or printing graphs. The large and complicated drawing can take several hours to print. The main reason of the slow printing is due to the movement mechanical devices.

Today, mechanical plotters have been replaced by thermal, electrostatic and ink jet plotters. These systems are faster and cheaper. They also produce large size drawings.

Secondary or Auxiliary Memory or Storage Units

Auxiliary memory is much larger in size than main memory but is slower. It normally stores system programs, instruction and data files. It is also known as secondary memory. It can also be used as an overflow/virtual memory in case the main memory capacity has been exceeded. Secondary memories cannot be accessed directly by a processor. First the data/information of auxiliary memory is transferred to the main memory and then that information can be accessed by the CPU.

Characteristics of Auxiliary Memory are following −

- **Non-volatile memory** − Data is not lost when power is cut off.
- **Reusable** − The data stays in the secondary storage on permanent basis until it is not overwritten or deleted by the user.

- **Reliable** − Data in secondary storage is safe because of high physical stability of secondary storage device.
- **Convenience** − With the help of a computer software, authorized people can locate and access the data quickly.
- **Capacity** − Secondary storage can store large volumes of data in sets of multiple disks.
- **Cost** − It is much lesser expensive to store data on a tape or disk than primary memory.

Magnetic Tape

- Magnetic tape and the tape drives are analogous to a home tape recorder system. It uses the same reading and recording techniques as that of the magnetic disk as the medium used in it is a flexible tape that is coated with magnetic oxide.

- Since sequential access device means that for n records, where n = 0, 1, 2, 3, …… if the tape head is positioned at record number 1 then in order to read the nth record, it is necessary to read all the physical records from 1st to nth records one at a time. If the head position is beyond the desired record, it is necessary to rewind the tape for a specific distance and begin reading forward.

- In contrast to the magnetic disk, which is a direct access device, a tape is sequential in nature. A disk drive doesn't read all the sectors on a disk sequentially to get to the desired record, whereas magnetic tape drive read all the sectors b/w the starting and the desired location of data. Magnetic tape was the first kind of secondary memory and is still widely used for its lowest cost; however, it is very slow in speed than all of the secondary storage devices.

Magnetic Disk

The primary computer storage device. Like tape, it is magnetically recorded and can be rerecorded over and over. Disks are rotating platters with amechanical ar m that moves a read/write head between the outer and inner edges of the platter's s urface. It can take as long as one second to find a location on a floppy disk to aslittle as a couple of milliseconds on a fast hard disk. See **hard disk** for more details.

Tracks and Spots

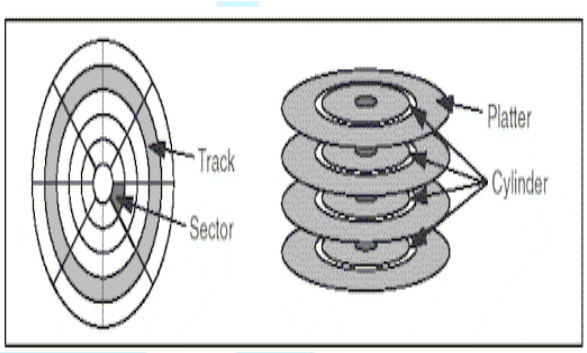
The disk surface is divided into concentric tracks (circles within circles). The thinner the tracks, the more storage. The data bits are recorded as tiny magnetic spots on the tracks.The smaller the spot, the more bits per inch and the greater the storage.

Sectors

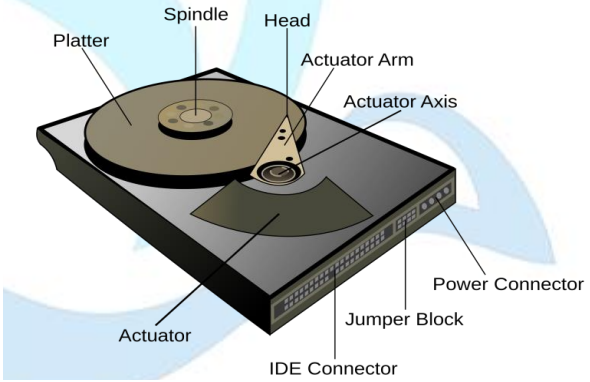
Tracks are further divided into sectors, which hold a block of data that is read or writ ten at one time; for example, READ SECTOR 782, WR
ITE SECTOR 5448. In order to update thedisk, one or more sectors are read into the c omputer, changed and written back to disk. The operating system figures out how to fit data into these fixed spaces

Modern disks have more sectors in the outer tracks than the inner ones because the o uter radius of the platter is greater than the inner radius (see **CAV**). See **magnetic tape** and **optical disc**.

Hard Disk



It is a magnetic disk on which you can sto re computer data. The term hard is used to distinguish it from a soft, or floppy, disk. Hard disks hold more data and are faster than floppy disks. A hard disk, for example, can store anywhere from 10 megabytes to several gigabytes, whereas most floppies have a maximum storage capacity of 2.4 megabytes.



A single hard disk usually consists of several platters. Each platter requires two read/write heads, one for each side. All the read/write heads are attached to a single access arm so that they cannot move independently. Each platter has the same number of tracks, and a track location that cuts across all platters is called a **cylinder**. For example, a typical 84-megabyte hard disk for a PC might have two platters (four sides) and 1,053 cylinders. Its rotates **7200rpm (Rotation per Minute)**

Note:

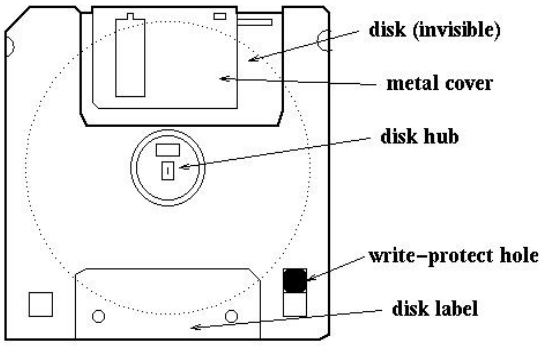
1956 *On September 13, 1956, the IBM 305 RAMAC is the first computer to be shipped with a hard drive. The drive contained 50 24-inch platters, was the size of two refrigerators, and weighed a ton. It could store only* ***5 megabytes*** *of information and each megabyte cost $10,000.*

In general, hard disks are less portable than floppies

Advantage of hard disk over floppy disk:

- Hard-disk can store more data than floppy disk.
- Hard-disk (say 3,600 revolutions per minutes) can access data 10 times faster than floppy disk (360 rpm).

Floppy Disk



A soft magnetic disk. It is called floppy because it flops if you wave it (at least, the 5¼-inch variety does). Unlike most hard disks, floppy disks (often called floppies or diskettes) are portable, because you can remove them from a disk drive. Disk drives for floppy disks are called floppy drives. Floppy disks are slower to access than hard disks and have less storage capacity, but they are much less expensive. And most importantly, they are portable.

Types of Floppy Disks

5 ¼ -Inch Drive

A 5 ¼-inch floppy disk drive was common on personal computers that were produced during the 1980's and were still included on computers in the early 1990's. A 5 ¼ -inch floppy disk could store between 360 kilobytes and 1.2 megabytes of data. Some 5 ½-floppy disks could be modified and used to write data to both sides of the disk. This led to manufacturers producing double-sided drives that could read both sides of the disk.

3 ½ -Inch Drive

A 3 ½-inch floppy drive is considered a floppy drive because the diskette uses a magnetic floppy disk that is encased in plastic. A 3 ½-inch floppy disk is capable of storing 730 kilobytes on a double density disk and 1.44 megabytes on a high density disk. On older computers the only way to load programs such as Windows 3.0 was to use multiple disks to install the program.

Zip Drive

Zip drives were introduced by the Iomega corporation in the mid-1990s. A zip disk was capable of storing 100 megabytes, 250 megabytes and even 750 megabytes on a single disk. Zip drives were mainly available as a peripheral that could be added to an existing system. A zip drive carried a high price tag which limited its use and eventually led to its decline as a popular storage medium.

Advantage of floppy disks compared with magnetic tape

- Random-access processing is possible.
- Quick and direct inquiry to records is possible.

Disadvantage of floppy disks

- Disk packs are more expensive than tape (for the same storages capacity).
- The sequential processing using disks may be slower and less efficient than sequential processing using tapes.

Optical Disk

These storage devices work on a principle similar to magnetic storage devices; however, they use light as a media to represent binary information. A very fine laser beam is projected on the reflecting surface to read data from the disk. By detecting the light intensity reflected from the surface, the information stored on the disk can be accessed. Optical disks have a greater memory capacity than most magnetic disks; the largest ones can store 1.5 gigabytes of information, which is equal to about 700,000 pages of printed material. Optical disks come in sizes ranging from 3.5 to 12 inches (30 cm). They are widely used as auxiliary memory when large memory capacity is required. Optical Disks can be found in these two forms:

1. Compact Disk (CD-ROM)
2. Digital Versatile/Video Disk (DVD).

Compact Disk (CD-ROM)

The most popular among all optical storage devices is the Compact Disk Read Only Memory (CD-ROM) types which are found in almost all computers. It is non-volatile optical data storage medium using the same physical format as audio compact disk, readable by a computer with a CD-ROM drive. CD-ROM is popular for distribution of large databases, software and especially multimedia applications. The standard 12 cm diameter CD-ROM stores about 650MB to 700MB.

A CD-ROM disk is formed from a resin, such as polycarbonate. It consists of aluminum coated plastic, which reflects light differently for lands or pits, which are smooth or pitted areas, respectively, that are created in the stamping process.

Advantages of CD-ROM:

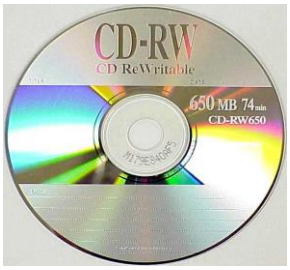
a. The storage capacity is enormous.
b. The storage cost is low and access time is relatively fast.
c. Data can be stored for an extended period of time.
d. It is reliable.

The major disadvantage is that CD-ROM cannot be erased and hence the disk cannot be reused. They are vulnerable to physical damages such as scratches (especially on the data surface). High temperatures can damage them and strong light sources.

Note:

WORM (Write Once Read Many): WORM (Write-once read-many) is a variation of CD-ROM that allows a user to write information on each disk only once, with no subsequent erasing possibility. A low intensity laser in the CD controller writes onto the optical disk (but only once for each bit location).

Compact Disk (CD-RW)



The users may read and write data many times on Read/Write optical disks. Usually, magneto-optical method is used to read and write data on this type of disks. Therefore, they are also called magneto-optical disks. Magneto-optical disks can be erased and rewritten. The information is written into or read from the disk by means of the magnetic properties of spots on its surface. The standard 12 cm diameter CD-RW stores about 650MB to 700MB.

Digital Versatile/Video Disc (DVD-R)

DVD ("digital versatile disc" or "digital video disc") is a digital optical disc storage format, invented and developed by Philips, Sony, Toshiba, and Panasonic in 1995. One of the most common DVD's is the single-sided, single-layer disc, capable of holding **4.7 GB.** Today they are widely used for storing and viewing movies and other data. To play DVDs on a computer, you must have a DVD drive and software DVD player. The picture is an example of what a DVD movie may look like, in this example it is a picture of the Matrix movie.

Digital Versatile/Video Disc (DVD-RW)

Stands for "Digital Versatile Disk Rewritable." A DVD-RW is like a DVD-R but can be erased and written to again. Like CD-RWs, DVD-RWs must be erased in order for new data to be added. DVD-RWs can hold 4.7GB of data and do not come in double-layered or double-sided versions like DVD-Rs do. Because of their large capacity and ability to be used multiple times, DVD-RW discs are a great solution for frequent backups. To record data onto a DVD-RW disc, you'll need a DVD burner that supports the DVD-RW format.

Removable Storage:

Removable storage is any type of storage device that can be removed from a computer while the system is running.

Example: USB Drive (Universal Serial Bus)

Pen Drive

A pen drive being inserted into a USB port. The definition of a pen drive is small storage device shaped like a pen with built-in data storage that connects to a computer by a USB port. An example of a pen drive is a pen with a hidden USB port for saving data. It is also known as USB flash drive.

Memory Card

A memory card (sometimes called a flash memory card or a storage card) is a small storage medium used to store data such as text, pictures, audio, and video, for

use on small, portable or remote computing devices. Most of the current products use flash memory, although other technologies are being developed.

Difference between Primary memory and Secondary memory

Primary memory

- Primary memory is purely made of electronic devices either by transistor or capacitor.
- It can directly communicate with CPU (Central Processing Unit) hence it is called main memory.
- It is relatively faster than secondary memory.
- It is needed basically by the system itself for processing functions.
- It is relatively much costly than secondary memory.
- It has less memory space as compared to the secondary memory.

Secondary memory

- It is not purely made of electronic devices.
- It cannot directly communicate with CPU hence it is called auxiliary memory.
- It is comparatively slower than primary memory.
- It is needed basically by users for storing of data and information permanently.
- It is comparatively much cheaper than primary memory.
- It has a huge memory space as compared to primary memory.