Input

Output

INPUT DEVICE

- Input device is a device through which data and instruction are entered into computer system. An input devices converts the data and instructions into binary form that computer can understand. This transformation is performed by “Input interface”.

- The data entered through input device can be some text, some graphical image or symbol, sound etc, depending on the form of the raw data the various input devices are available.

INPUT DEVICE

- **Basic Function Performed by Input unit of a computer system –**

1. **It accepts the instruction and data from the user.**
2. **It converts these instruction and data in computer acceptable form.**
3. **It supplies the converted instruction and data to the**

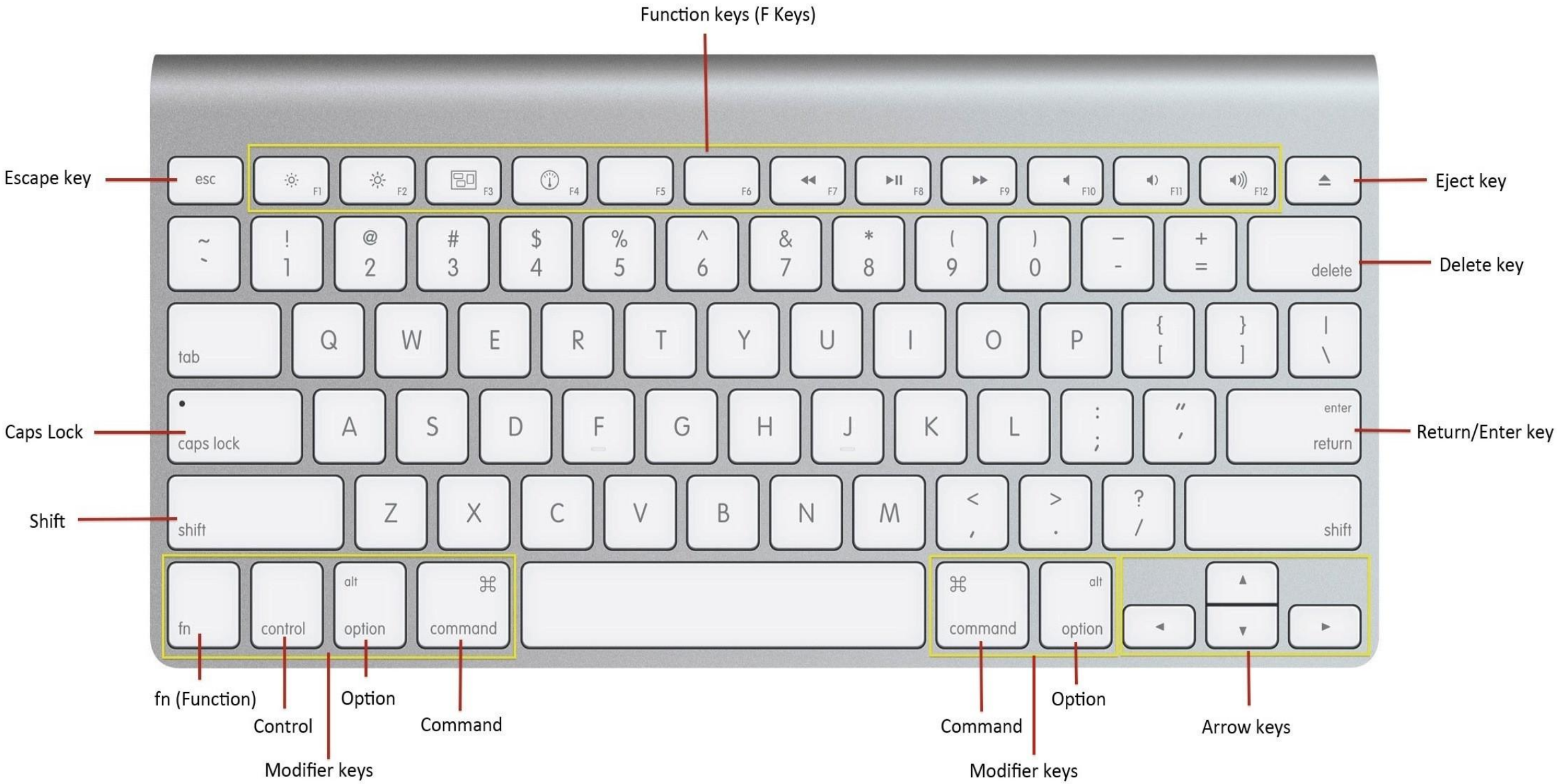
INPUT DEVICE

- Some of the commonly input devices used are:-

1. Keyboard
2. Mouse
3. Joy stick
4. Track ball
5. Touch screen
6. Light Pen
7. Digitizer
8. Scanner
9. Speech Recognition Devices

Keyboard

Keyboard is an input device for entering data and instructions into a computer. Data is entered into the computer by pressing set of keys available with this device. The most popular keyboard used today is the 101-keys QWERTY keyboard but multimedia keyboard is also available which contains more than 101 keys.



Keyboard keys are arranged in 6 groups such as:

1. **Alphanumeric keys: -** The alphanumeric keys are the collection of alphabets A-Z, numerals from 0-9 and punctuation marks that are arranged the same way on almost every keyboard.
2. **Numeric keys: -** It is usually located on right side of keyboard and appears like a non-scientific calculator with ten digits (0-9) and arithmetic operators.
3. **Function keys: -** The Function keys numbered from F1 to F12 are usually arranged in a first row at top of keyboard. Each function key performs different function depending upon the current application being run by user.

4. **Cursor movement keys: -** These keys allows user to change the position of the cursor on the screen. Cursor movement keys move cursor up, down, left and right.

5. **Special purpose keys: -** These keys perform special function i.e. insert, delete, print screen.

6. **Modifier keys: -** These keys are used in conjunction with other keys. Modifier keys include keys such as Alt (Alternate), Shift and Ctrl (Control).

Mouse

Mouse is a pointing device that controls the position of the cursor on a computer screen without using keyboard. It is called pointing device because it is used to point and select option on screen. There are two or more depression switched on the top of mouse.

Types of Mouse: -

1) Mechanical mouse

It has rubber or metal ball on its underside that can roll in all directions. Mechanical sensors within mouse detect the direction the ball is rolling and move the screen pointer accordingly.

2) Optomechanical mouse

It is same as a mechanical mouse but it uses optical sensor to detect motion of the ball.

3) Optical mouse

It uses a laser to detect the mouse's movement. It respond more quickly and precisely than mechanical and Optomechanical mouse, but is more expensive.

Three simple techniques to use mouse: -

1) Clicking: - To click on something with the mouse means, to move the pointer to the item on the screen and to press and release the mouse button once.

2) Double clicking: - To double click on item means, to move the pointer to the item on the screen and to press and release the mouse button twice with quick succession.

3) Dragging: - To drag an item, user position the mouse cursor over the item, the press the mouse button and hold it down as you move mouse.

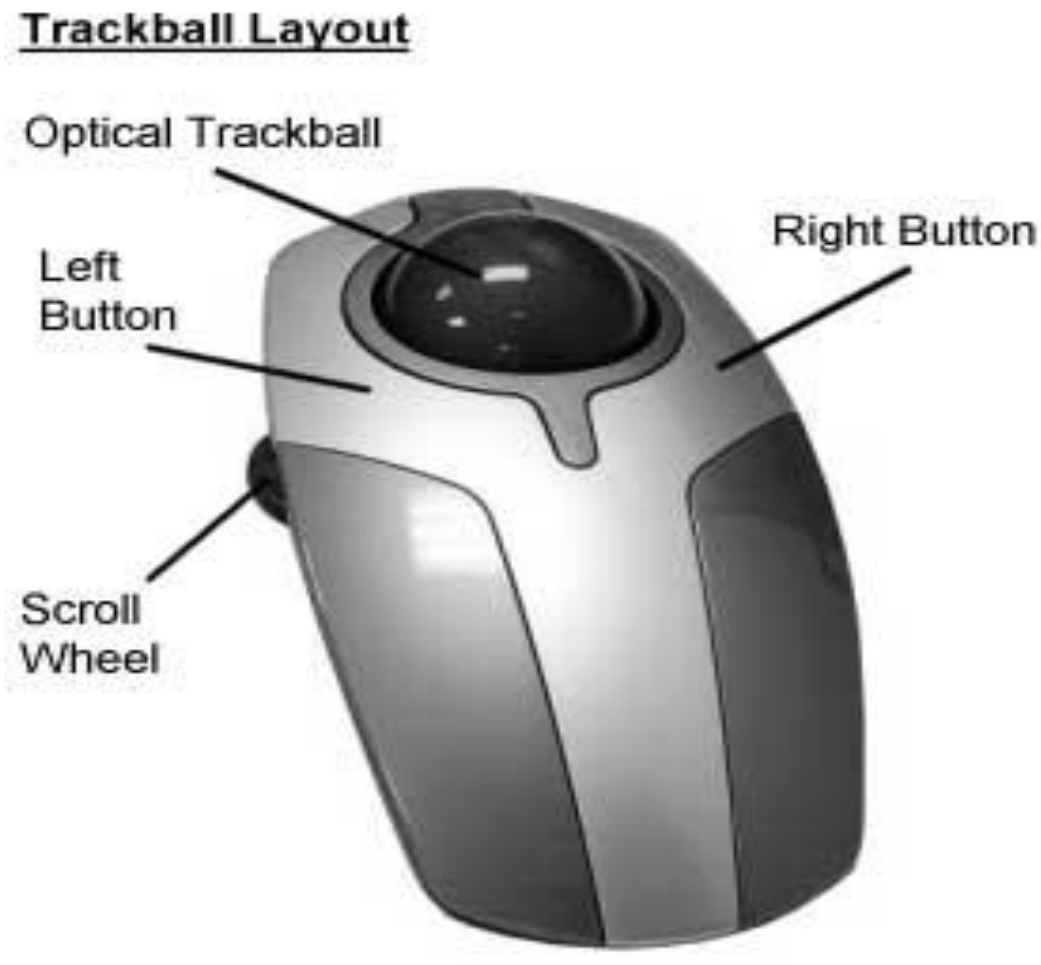
Joy stick

- It is also a pointing device which is used to move cursor position on a monitor screen. It consists of a lever which moves in all directions and controls the movement of pointer. Lever is having spherical ball at its base. When the lever steers the cursor moved in the respective direction. Potentiometers are used to sense the movements. On most of joystick a button at top is provided to select the option.

E.g. It is commonly used with computer games, flight simulators and for controlling robots.

Track ball

- Track ball is pointing device that works like an upside down mouse. The only difference is that the ball in case of the track ball is placed on the top along with the button of the trackball. The movement of cursor is controlled by movement of ball by the fingers.
- Trackball is most commonly used in notebook or laptop instead of a mouse.



Advantages of Trackball

1. Trackball is stationary.
2. Require Less Space.
3. Compact size.
4. Most suitable for portable computers.
5. It can be placed on any type of surface.

Touch Screen

- **Touch Screen is the most simple and easiest to learn of all input devices. It is also a pointing device by which users touch areas of the screen with their fingers to issue commands. Touch screen enables the users to choose from available options by simply touching with their fingers the desired icon or menu displayed on the screen.**

E.g. A common application of touch screen is ATM's installed in banks.

Light Pen

- **Light is pointing device which is used to select a displayed menu item or draw pictures on the monitor screen. It is connected by a cable to the display device. The light pen consists of a light sensing element (photo diode) at the tip of pen and a cable through which the signal is transmitted. When the screen touched with the tip of pen, pen gets activated light spots are sensed and a signal sent to the system indicating the position.**

E.g. Used for corrections in architectural designs.

Speech recognition system

- **These devices are used to recognize the voice and translate it into the text using speech recognition system. Speech recognition software is loaded into the machine which gathers sound waves remove unwanted noise and compare the incoming signal against a pattern stored in memory. If sound is similar or almost similar then the voice is translated into text otherwise it is ignored.**
- **Speech recognition system equipped with the following components:**

a) **Computer system with sound card**

b) **Speech Recognition software**

c) **Microphone**

Scanner

- **“A scanner is an input device which translates paper documents into an electronic format, which can be stored in a computer.”**
- **Input documents may be typed text, pictures, graphics or handwritten material. Scanner is helpful in preserving paper documents in electronic format.**

Characteristics of Scanner

1. Human efforts required for manually entry of data is eliminated by scanner.
2. The reduction in human intervention improves the data accuracy.
3. Scanner requires high quality of input document.
4. Most of these device are not economical feasible.

Types of scanner

- Scanner comes in various shapes and sizes following are its category :-

1. Flatbed scanner
2. Sheet-fed Scanners
3. Hand-held scanner
4. Drum Scanners

Optical mark reader (OMR)

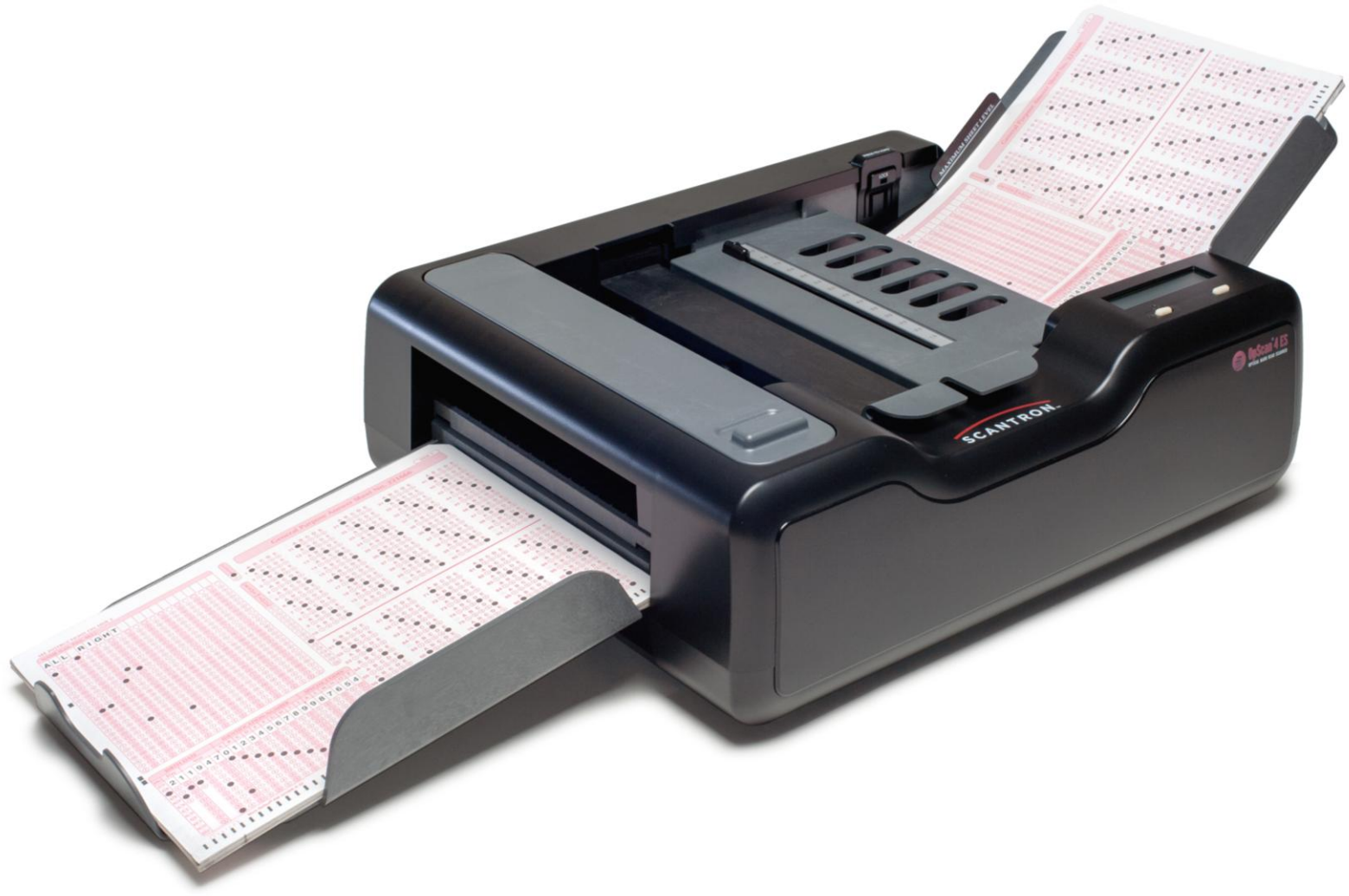
Optical Mark Recognition is the process of gathering data with an optical scanner (Optical mark reader) by measuring the reflectively of light at predetermined positions on a surface. Optical mark reader is commonly used to check special examination sheets.

How it works ?

Sheet may contain square or bubble that is marked by pen/pencil. The actual technique used for OMR device for recognition of marks involves focusing a light source on page. The reflected light is detected by OMR and corresponding signals are sent to processor. The change in light detects the presence of mark.

Advantages of OMR

1. Large volumes of data can be collected quickly and easily without the need for specially trained staff.
2. The cost of inputting data and the chance of data input errors can be reduced.
3. Only one computer needed to collect and process data.



OCR

- It is used to recognize alphanumeric characters printed or typewritten on paper. The scanner detects the light reflected from the paper. The change in the reflected light is converted to binary data which is sent to processor.
- OCR can recognize text written in two font format specified by ANSI (American National Standard Institute) that are OCR-A (American standard) and OCR-B (European standard).

Application of OCR

These devices are used in bank, insurance companies, air lines and some retail outlets.

Advantages of OCR

1. It reduces manual key stroke operation.
2. It can also read the hand written characters.
3. It saves time and money in transforming the data.
4. It can easily & quickly convert printed text into an electronic.

OBR

It is photoelectric device that scans a set of vertical bars of different width by means of reflected light. These vertical lines are called Bar codes that are used to represent alpha numeric data by varying the width and combination of adjacent vertical lines. Bar code reading is done by scanner connected to a computer.

Bar code structure

These bars are detected at ten digits. The first five digits identify the supplier or manufacturer of item. The second five identify individual product.

Advantage of Barcode reader

Accuracy, Speed, Cost effective, Ease of implementation (Can be easily operated)

Disadvantage of barcode reader

If the code becomes damaged or blur it may not be read.

MICR

- **MICR stands for Magnetic Ink Character Recognition. It is a character recognition technology used to scan and read the information directly into a data-collection device. MICR characters can be read easily by humans and it is printed on documents using a magnetic ink.**

- **E.g. MICR is primarily by the banking industry to facilitate the processing of cheques.**

How it works

- MICR scan document written with magnetic ink which contain iron oxide particles in it. When a MICR document needs to be read, it passes through a machine, which magnetizes the ink and then translates the magnetic information into characters.
- There are two major MICR fonts in use: **E-13B** and **CMC-7**

Output device

- An output device is an electromechanical device which accepts data from a computer and translates them into a human acceptable form.
- Output generated by output device classified into two types:

1) Soft-copy output – Output which is not produced on a paper is known as soft-copy output. They are temporary in nature.

Output device

2) Hard-copy output – Output which is produced on a paper is known as hard-copy output. They are permanent in nature.

Following is list of most commonly used output device.

1) Monitor

2) Printer

3) Plotter

4) Speaker

5) Projector

Monitor

Monitor is an output device which is used for producing soft-copy output. It is also known as VDU i.e. Visual Display Unit. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image depends upon the no. of the pixels.

Factors for considering display:-

1. Dot pitch is amount of space between the centers of adjacent pixels. Closer the dots crisper the image.

2. Refresh rate is the number of times per second that the pixels are recharged so that their glow remains bright. (In general it is 45-100 times per second).

3. Resolution is the image sharpness. Resolution is expressed in terms of formula horizontal pixels X vertical pixels. (e.g. 800 X 600 pixels)

On the basis of volume monitor is of two types-

a) Cathode-Ray Tube (CRT)

CRT's Screen display is made up of small picture elements called pixels. The smaller the pixels the better the image clarity or resolution. CRT is the large bulky sized monitor. It has high power requirement so it is not appropriate for portable devices.

How it works

- A monochrome CRT contains single electron gun which emits beam of electrons. These electrons are attached towards positive phosphorous screen. When an electron strikes the screen it glows and emits light. A small area in which an electron strikes is known as pixel. To display a screen all the pixel are strike by electrons. Accelerating anode varies the speed of the electron and deflecting system changes the path of the electron.

In short

- A heated cathode emits a high-speed electron beam onto phosphor-coated glass screen. Glass screen glows when they are struck by electron beam.

b) Flat- Panel Display

- Flat panel monitors are thinner and lighter and commonly used with portable computer systems.
- Following are Flat-Panel display:

1. Light emitting diode

- LED contains multiple small bulbs. The contents are displayed by turning the bulbs “on” and “off”. Initially it was used only for simple digital displays like in calculator, digital watch, etc. At present it is also used in television, desktop PC, laptop, etc.

2. Liquid crystal display

LCD contains liquid crystals in between two plates of the screen. The plates are made by either glass or plastic. The front plate is transparent and the back plate is reflective. Liquid crystals are charged electronically to display the content.

3. Plasma display

It contains neon gas in between the two plates of the screen in place of liquid crystals of LCD. It has larger viewing angle but is expensive than LCD. It is smaller in size, light in weight and it has low power requirement and low brightness.

Types of monitor on the basis of color display are:

1. Monochrome monitor

It is a single colored monitor. It can display only text and images of a single color against a contrasting background. The first monitor displayed text and images of light green color against black background.

2. Gray scale monitor

It can display 256 different variations of black and white color. It can also display video. The first television set was gray scale.

3. Color monitor

It can display 16-42 million colors. It uses 3 basic colors Red, Blue and Green. All the other colors are the combination of these colors. Color monitor is also known as RGB monitor.

Printers

- Printers are the most popular output devices. They produce hard-copy output.
- Printers are broadly classified into two categories:

a) Impact printer: - Impact printers are those printers that print the characters by striking hammers or pins against ribbon onto paper. Impact printers are noisy printers.

Characteristics of Impact Printers are following

- Less expensive
- Impact printers are very noisy
- Useful for bulk printing due to low cost
- There is physical contact with the paper to produce a pattern

Non-impact Printers

The printers that print the characters without striking against the ribbon and onto the paper are called Non-impact Printers.

Characteristics of Non-impact Printers

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

Printers can be further classified into the different categories:-

a) Character Printer

i. Dot Matrix Printer (Impact printer)

ii. Daisy wheel Printer (Impact printer)

iii. Inkjet printer (Non-impact printer)

b) Line Printer

i. Drum printer (Impact printer)

ii. Chain printer (Impact printer)

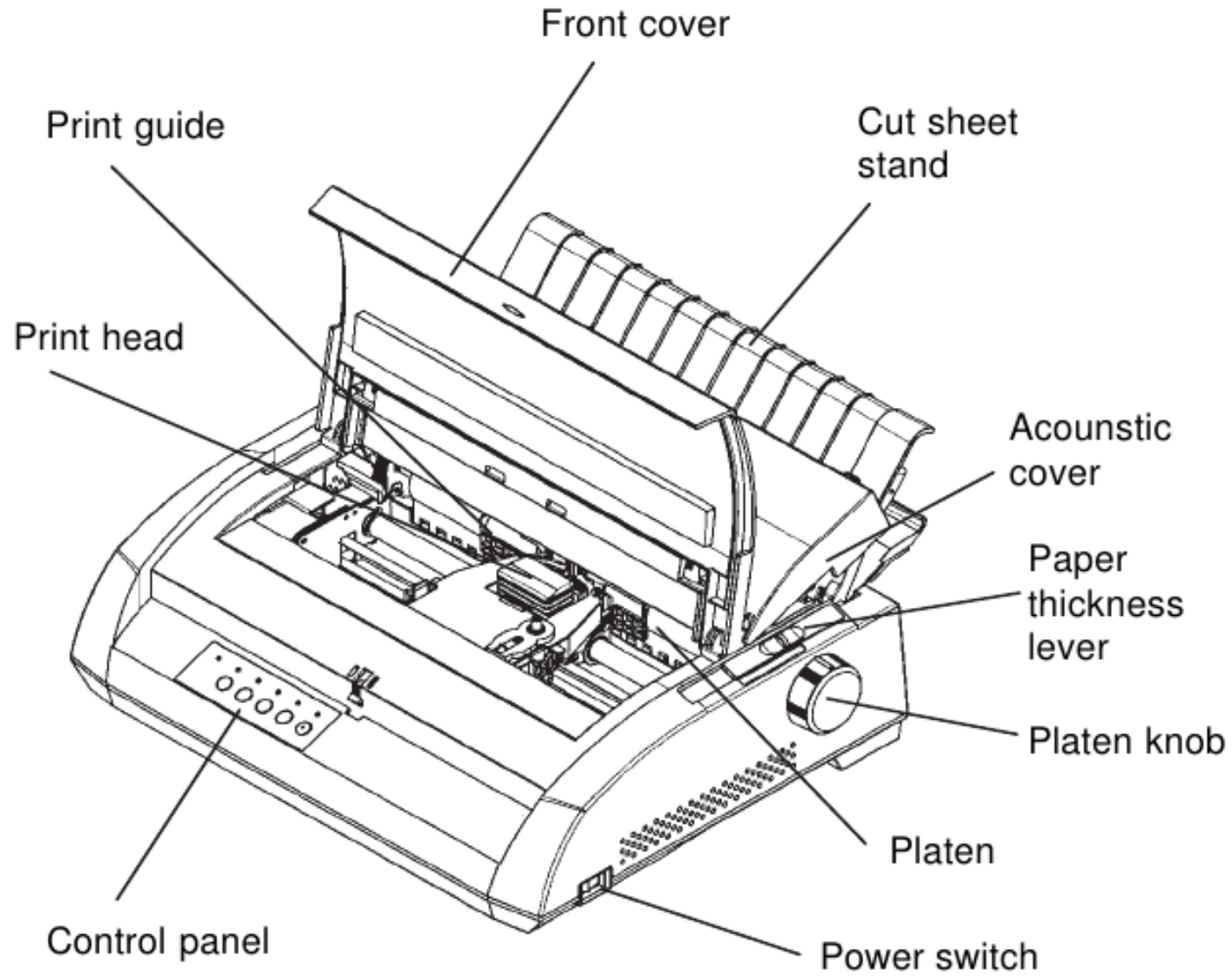
c) Page printer

i. Laser printer (Non-impact printer)

1) Character printer prints only one character at a time. This types of printer is described as follows-

a) Dot matrix

Dot matrix is an impact printer and it prints one character at a time in the form of dots. Its speed is usually ranges from 30 to 550 characters per second (cps). Dot matrix is the cheapest and the noisiest printer and has a low print quality. It was 1st introduced by Centronics in 1970.



How it works

1. In this printer an inked ribbon between paper and the print head. The print head moves across the paper and goes on printing the information.

2. Uses tiny pins to hit an ink ribbon and the paper. 9 to 24 vertical column pins are contained in a rectangular print head.

3. When print head moves across the paper, pins are activated to form a dotted character image. When pins get activated they strike on paper along with ribbon. These printers can produce carbon copies along with the originals..

Advantages

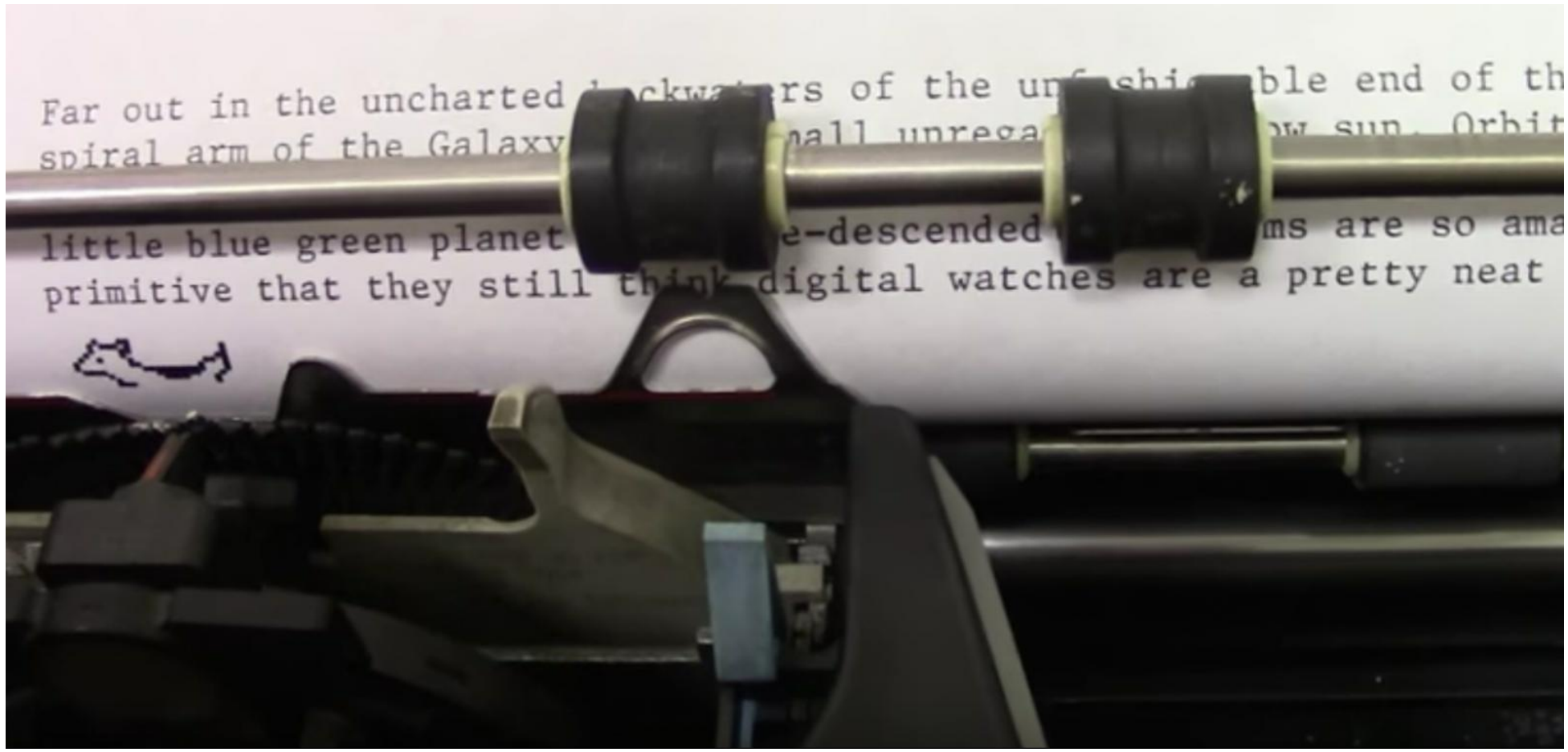
1. Less-expensive.
2. Low per page cost.
3. Energy efficient.
4. Multipage forms can be printed on this printer.

Disadvantages:

1. Noisy
2. Low resolution
3. Limited fonts flexibility
4. Poor quality graphics output.

Daisy wheel printer

- A daisy wheel printer is basically an impact printer consisting of a wheel and attached extensions on which molded metal characters are mounted. A daisy wheel printer produces letter quality print and it can’t produce graphics output. It speed is around 90 cps.



How it works

1. In Daisy wheel printer each petal of wheel has a character embossed on it.
2. A hammer presses the wheel against a ribbon which in turn makes an ink stain on the paper
3. A motor spins the wheel rapidly and when the desired character spins to the correct position, a print hammer strikes it to produce the output.

Advantages

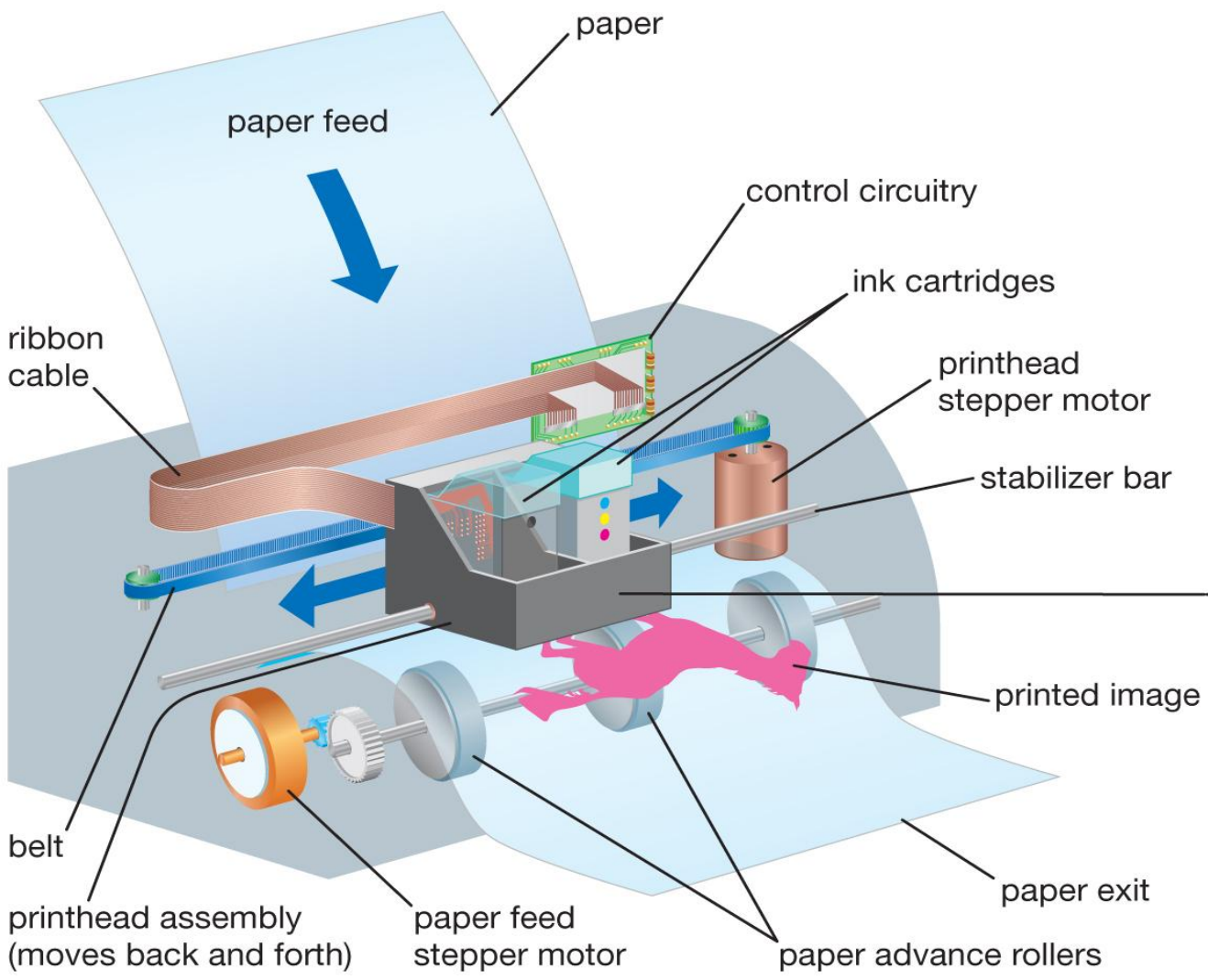
1. Quality output is produced
2. The font of character can be easily changed
3. More reliable than DMP.

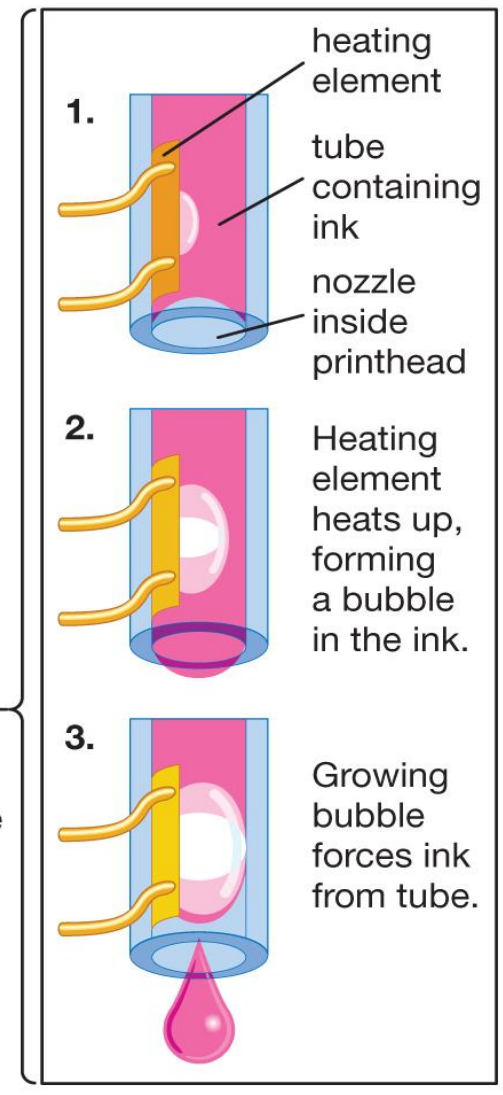
Disadvantages

1. Slower than DMP.
2. Produce noise while printing.
3. More expensive than DMP.

Inkjet printer

It is a non-impact printer producing a high quality print. Multipage forms cannot be printed by these printers. Its speed ranges from 40 to 300 characters per second with a resolution of from 300 dpi to 1200 dpi.





How it works

1. Print head having four ink cartridges moves.
2. Software instructs where to apply dots of ink, which color and what quantity to use.
3. Electrical pulses are sent to the resistors behind each nozzle.
4. Vapor bubbles of ink are formed by resistors and the ink is forced to the paper through nozzles.
5. A matrix of dots forms characters and pictures.

Advantages

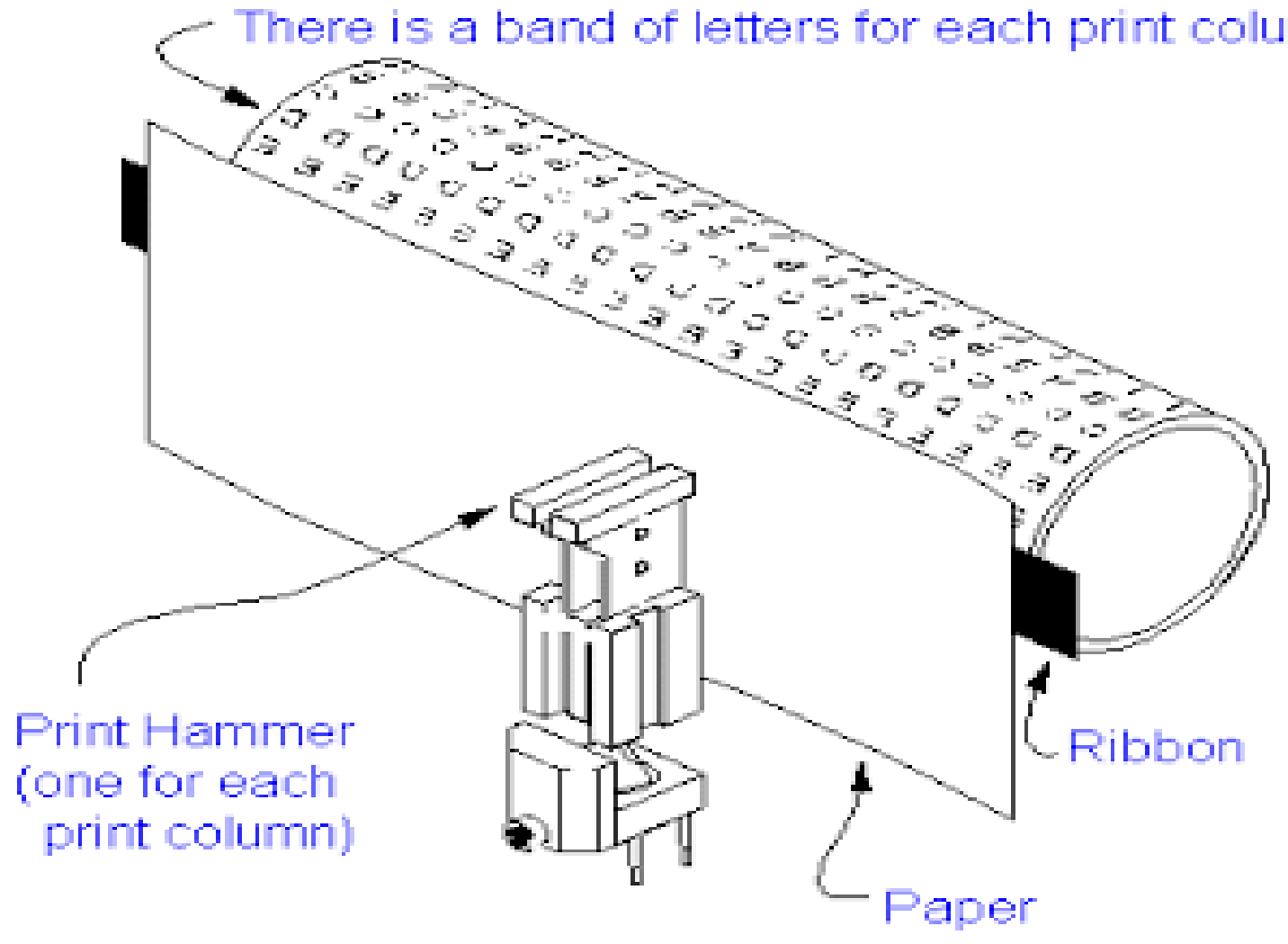
1. High quality of printing.
2. More reliable.
3. Energy efficient.

Disadvantages

1. Expensive as cost per page is high.
2. Slow as compare to laser printer.

Line printers

Line printers are the impact printers and are used for producing high volume paper output. These printers print the complete line at a time so that's why they are called line printers. They are faster printers having speed in the range of 300 to 2500 lines per minute.



Types of line printers

a) Drum printers

- Drum printers print one line at time. It consists of a solid cylindrical drum with character embossed on its surface in the form of circular bands. Each band contains numerals, alphabets and special characters.
- In addition to drum a set of hammer mounted in front of drum in manner that an inked ribbon and paper can be placed between hammers and the drum. It is very fast and also expensive. It speed ranges from 300 to 2000 lines per minute.

Types of line printers

b) Chain printer

Chain/band printers are line printers which print one line at a time. It consists of a metallic chain on which all the characters of the character set supported by printer is embossed. A charcter set may have 48, 64, or 96 characters. Its speed ranges from 400 to 3000 line per minute.

How it works

Chain rotates rapidly and a character at print position is printed by activating the appropriate hammer, which is embossed on the chain pass below it.

Advantages

1. Fast than drum printers
2. Chain or chain printer can be easily changed. This allows the use of different font with same printer.

Disadvantage

1. It does not have ability to print graphics such as charts and graphs.
2. Slower as compare to laser printer.

Page printer

Page printer is a very high speed non impact printer and prints the entire page at a time. The quality of these printers is the best quality but there cost is much higher.

Laser printer

- Laser printers are page printers which print one page at a time. The main components of laser printers are a laser beam source, multi-sided mirror, a drum and a toner.
- Laser printer produces very high quality output. Its print speed ranges from 4 to 12 pages per minute in case of low speed laser printer and 500 to 1000 pages per minute in case of high speed laser printer. It has resolution 600 dpi

How it works

1. Paper is fed and the drum rotates.
2. A laser beam conveys information from the computer to a rotating mirror and thus an image is created on the drum.
3. The charges on the drum are ionized and the toner sticks to the drum.
4. Toner is transferred from drum to paper.
5. Heat is applied to fuse the toner on the paper

Plotter

A plotter is a computer hardware device much like a printer that is used for printing vector graphics. Instead of toner, plotters use a pen, pencil, marker, or another writing tool to draw multiple, continuous lines onto paper rather than a series of dots like a traditional printer.

Speaker

A loudspeaker is an electro acoustic transducer; a device which converts an electrical audio signal into a corresponding sound.

Projector

- A projector or image projector is an optical device that projects an image (or moving images) onto a surface, commonly a projection screen.

- Video projectors are digital replacements for earlier types of projectors such as slide projectors and overhead projectors.