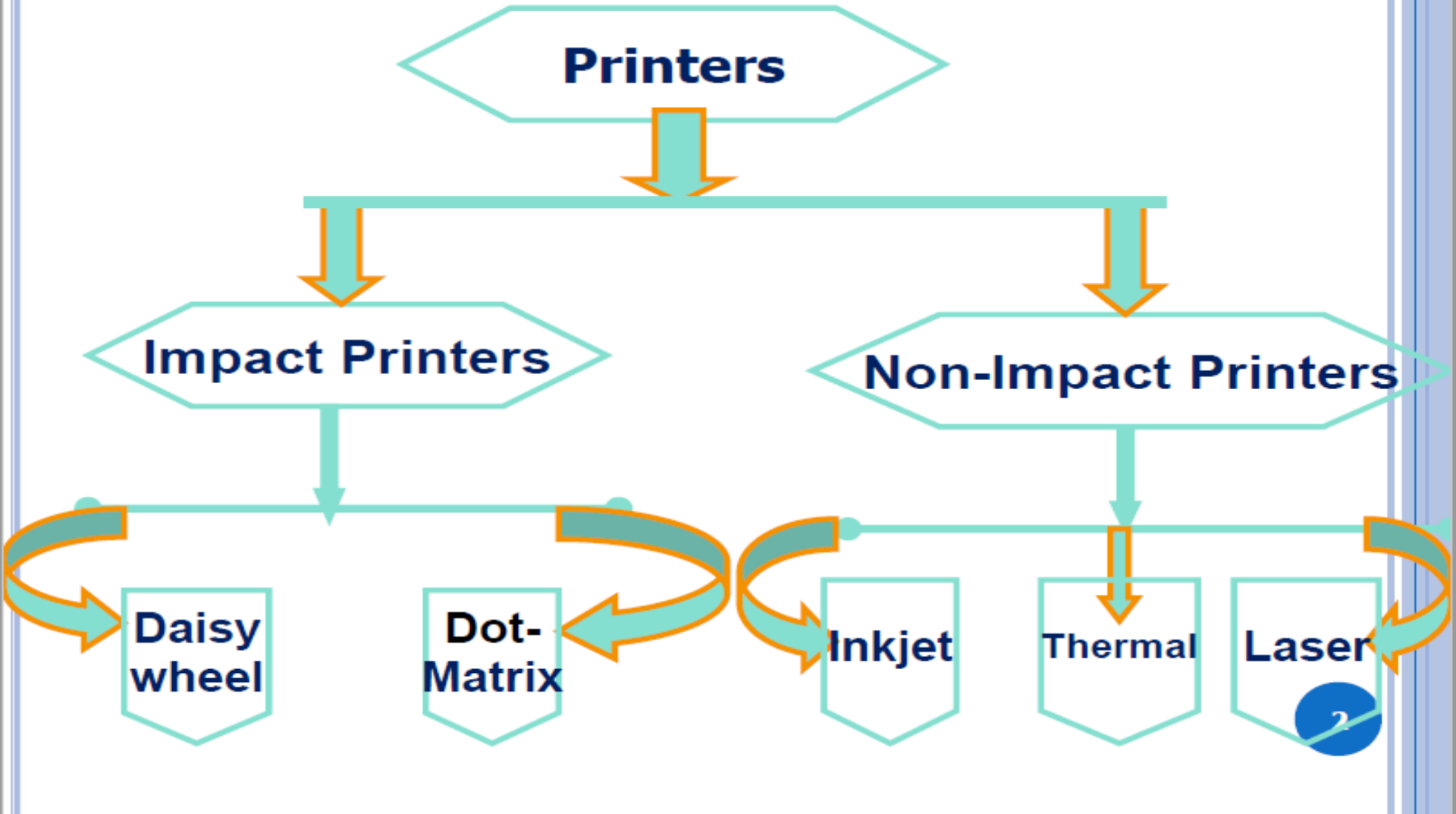
INTERFACING PRINTER

Prepared By: Lec Anika Binte Islam

What is Printer

An external hardware device responsible for taking computer data and generating a hard copy of that data. Printers are one of the most commonly used peripherals and they print text and still images on the paper.

Types of Printer

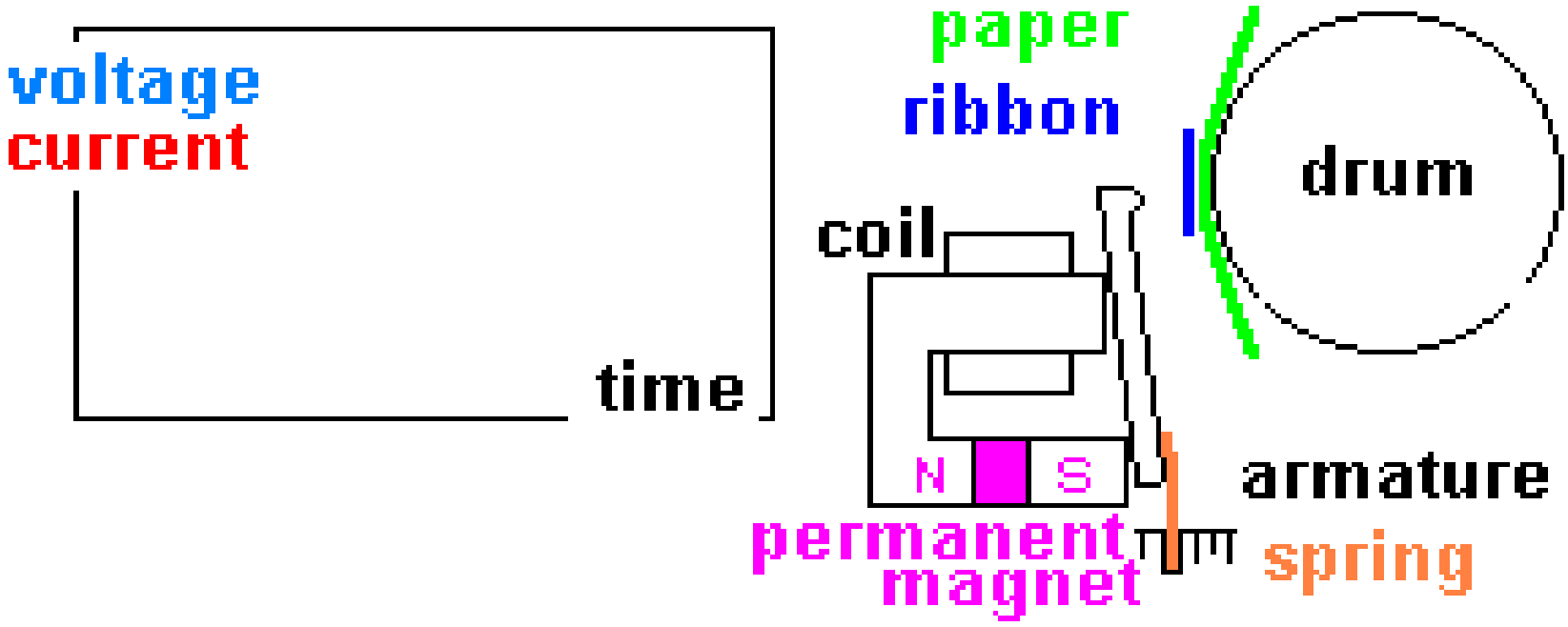


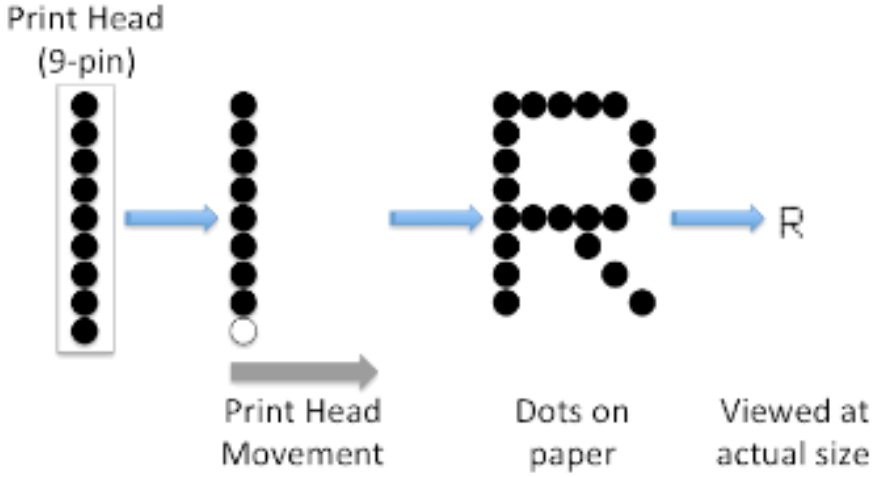
Dot Matrix Printer

- Dot Matrix printer create an image on paper by striking pins against an inked ribbon.
- The ink is transferred to the paper as closely shaped dots that form each character
- Its speed is usually 30 to 1550 characters per second (cps).
- This is the cheapest and the most noisy printer and has a low print quality.

How dot matrix works?

- The dot matrix forms images one character at a time as the print head moves across the paper.
- The head is make up of tiny metal pins, driven by electromagnets, which strike an inked printer ribbon called inked ribbon, located between the head and paper and produce dots on the paper. These combinations of dots form the desired shape on the paper.
- Generally they print with a speed of 50 to 500 characters per second as per the quality of the printing is desired. The quality of print is determined by the number of pins used (varying from 9 to 24).
- The inked ribbon scrolls by so that there is always ink on it. At the end of each line, a roller makes the sheet advance.


voltage
current
time
paper
ribbon
drum
coil
N
S
armature
permanent
magnet
spring

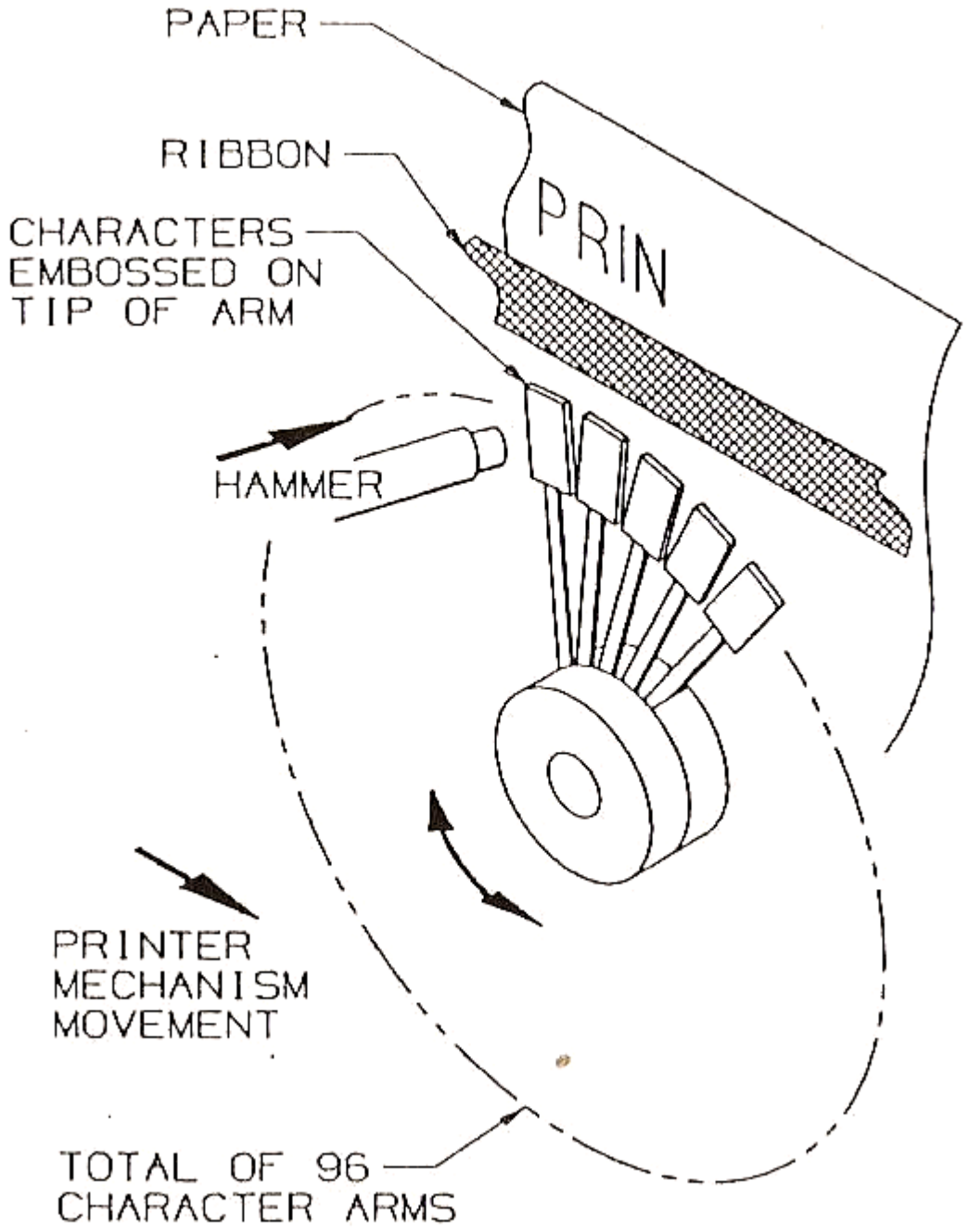

Print Head
(9-pin)
R
Print Head
Movement
Dots on
paper
Viewed at
actual size

Advantages/ Disadvantages

- Advantages
  - Inexpensive
  - Low per page cost
  - Energy efficient
- Disadvantages
  - Noisy
  - Low resolution
  - Limited fonts flexibility
  - Poor quality graphics output

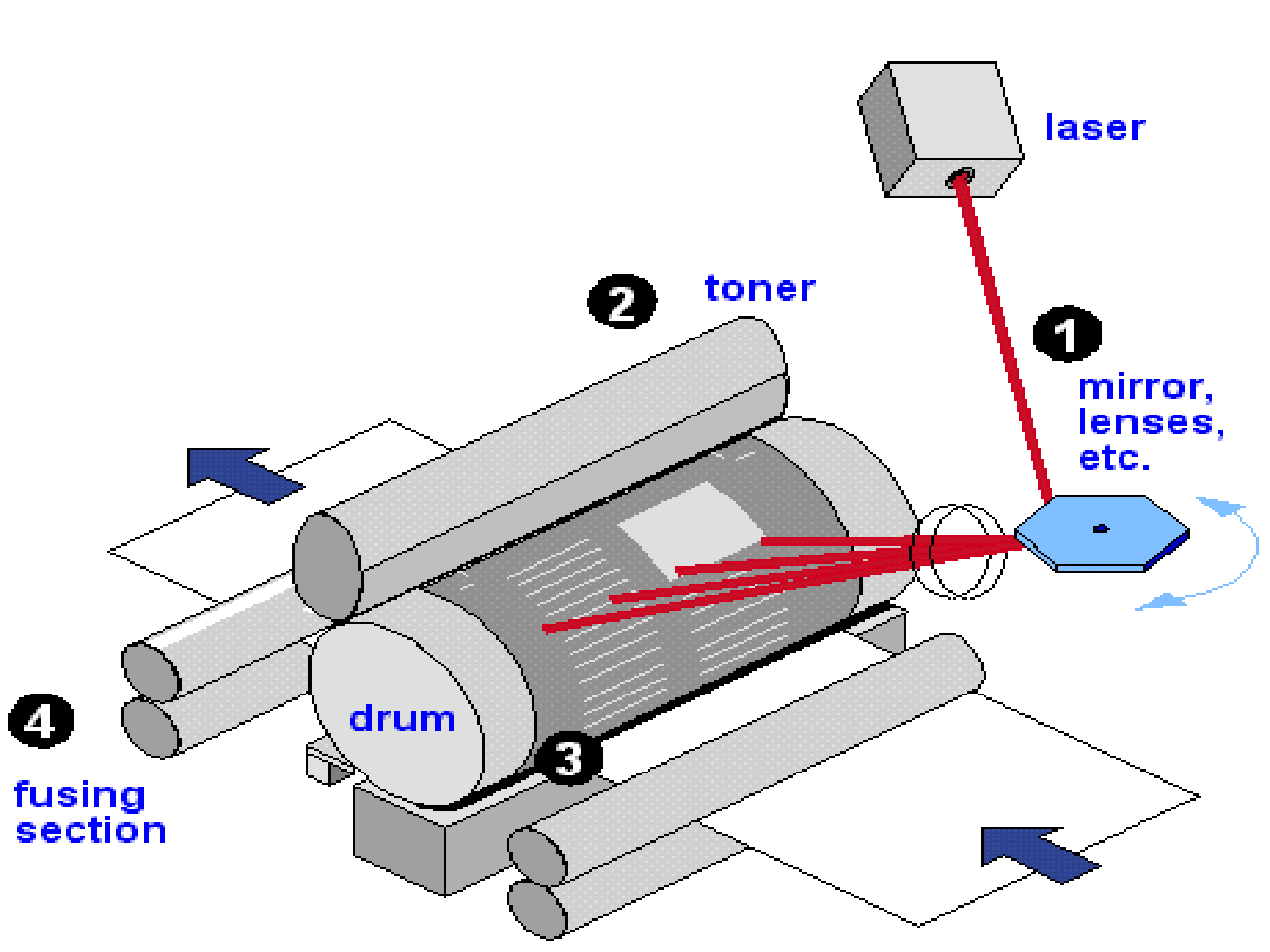
Daisy Wheel Printer

- Daisy wheel printers print only characters and symbols and cannot print graphics.
- They are generally slow with a printing speed of about 10 to 75 characters per second.
- **Working of daisy wheel printers** is very similar to typewriters.
  - A circular printing element (known as daisy wheel) contains all text, numeric characters and symbols mould on each petal on the circumference of the circle.
  - The printing element rotates rapidly with the help of a servo motor until the desired letter is facing the paper. Then the hammer strikes the disk, forcing the character to hit an ink ribbon, leaving an impression of the character on the paper.


PAPER
RIBBON
CHARACTERS EMBOSSED ON TIP OF ARM
PRIN
HAMMER
PRINTER MECHANISM MOVEMENT
TOTAL OF 96 CHARACTER ARMS

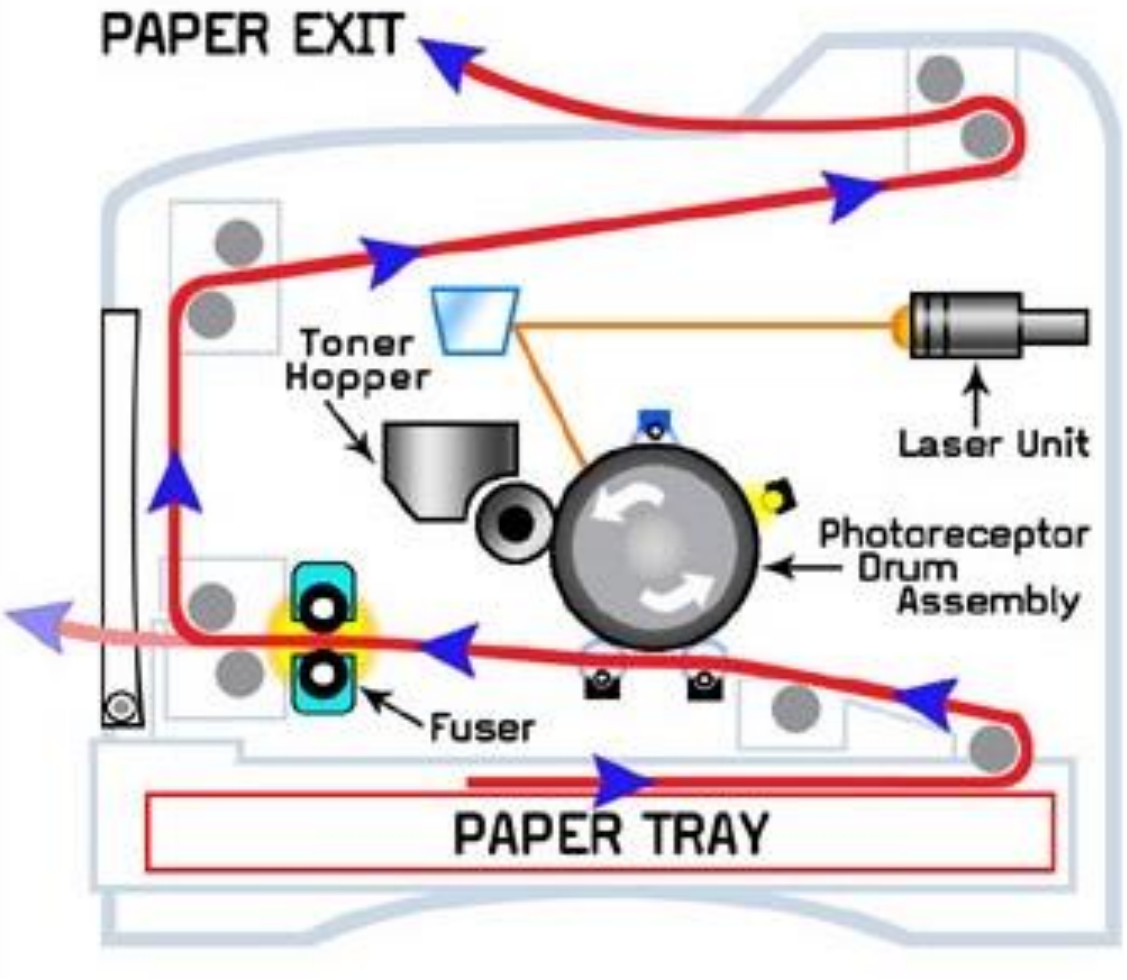
Laser Printer

- Made for
  - High speed
  - High volume production
- Critical component: Photosensitive drum
  - Sensitive to light
  - In dark- it has a high resistance
  - Acts as a capacitor which is charged by charging wire
- Other components:
  - Laser
  - Polygonal mirror
  - Toner
  - Corona wire
  - Fusing roller


laser
2
toner
1
mirror,
lenses,
etc.
drum
4
3
fusing
section

Laser Printer

- A laser beam is reflected off a rotating polygonal mirror which causes the beam to scan along a line on the drum.
- Since the drum is rotating the beam passes over its complete surface.
- The corona wire charges up the **photosensitive drum** so the drum gains a positive charge spread uniformly across its surface.
- Where the laser beam hits the drum, it erases the positive charge that was there and creates an area of negative charge instead. . Gradually, an image of the entire page builds up on the drum: where the page should be white, there are areas with a positive charge; where the page should be black, there are areas of negative charge.
- As the drum passes the toner reservoir, the charged areas attract particles of the dry powder ink which stick to its surface. The toner has been given a positive electrical charge, so it sticks to the parts of the drum that have a negative charge. No ink is attracted to the parts of the drum that have a positive charge. An inked image of the page builds up on the drum.

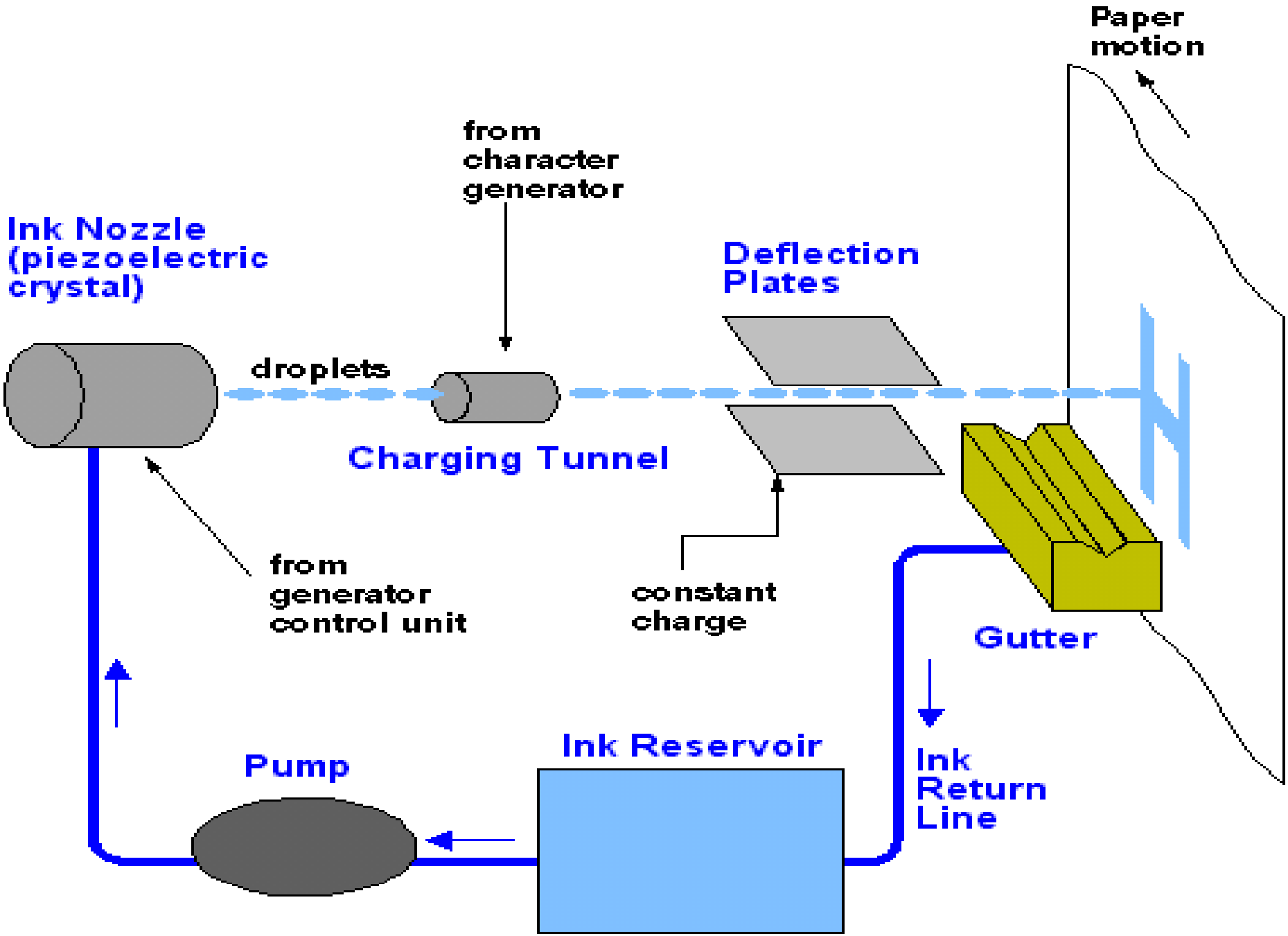

PAPER EXIT
Toner Hopper
Laser Unit
Photoreceptor Drum Assembly
Fuser
PAPER TRAY

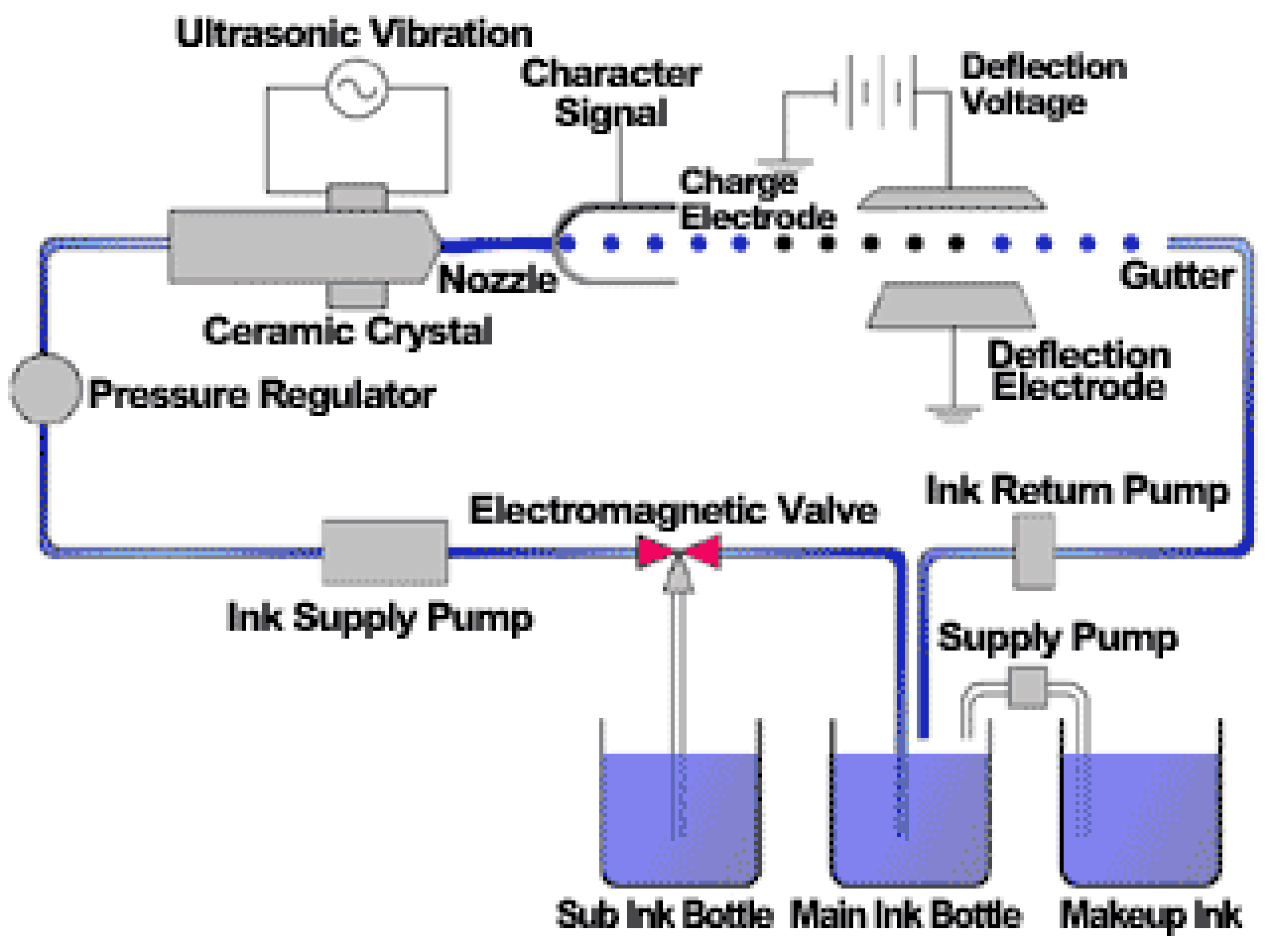
Laser Printer

- The paper is given a charge as it passes the corona wire so that as it passes the drum, the toner is transferred to the paper.
- When the paper moves near the drum, its positive charge attracts the negatively charged toner particles away from the drum. The image is transferred from the drum onto the paper
- A hot fusing roller at about 260 degree melts the toner particles so that in combination with the pressure of the rollers, they are permanently stuck to the paper.
- **Limitations**
  - Not well suited for industrial environments
  - Wasteful in small operations

Ink Jet Printer

- Conductive ink is forced through a very small nozzle to produce high speed drops of ink
- Nozzle compartment is vibrated at an ultrasonic frequency
  - Piezo crystal is mounted
  - Size and spacing of drops are made constant
- Charging tunnel : ink drops are charged
- Deflection Plates: drops are deflected and strike the paper
- With no charge- no deflection
  - These drops are collected in a gutter


Paper motion
from character generator
Ink Nozzle (piezoelectric crystal)
Deflection Plates
droplets
Charging Tunnel
from generator control unit
constant charge
Gutter
Pump
Ink Reservoir
Ink Return Line


Ultrasonic Vibration
Character Signal
Deflection Voltage
Charge Electrode
Nozzle
Gutter
Ceramic Crystal
Deflection Electrode
Pressure Regulator
Ink Return Pump
Electromagnetic Valve
Ink Supply Pump
Supply Pump
Sub Ink Bottle
Main Ink Bottle
Makeup Ink

Ink Jet Printer- Working Principle

- Ink is pressured by a ink supply pump and flows from the ink bottle to the nozzle.
- The nozzle uses ultrasonic vibration to break a pressurized ink stream into small droplets as it leaves the nozzle.
- The drops are ejected from the nozzle at high speed. They pass through the charge electrode tunnel / and then on between the deflection electrode.
- Here the drops are deflected, by an amount which depends on the charge they were given by the charge electrode.
- After the drops leave the region of the deflection electrode they continue to travel in their new direction until they pass out of the print head and to the substrate.
- Drops that aren't required for printing are caught by the gutter and subsequently recycled back to the ink bottle.

Advantages and Disadvantages

- Advantages:
  - High resolution output
  - Energy Efficient
- Disadvantages:
  - Expensive
  - Time consuming incase of graphics printing
  - Special paper required for high resolution output.

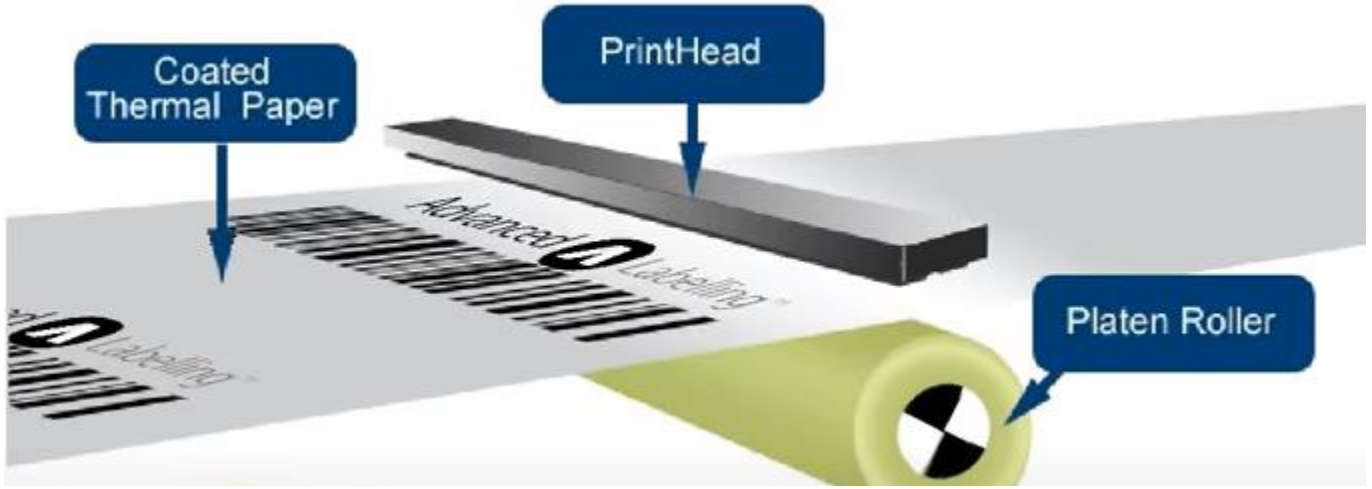
Thermal Printer

- A printer that makes use of heat in order to produce the image on paper.
- It is used most commonly to create labels, safety signs, way finding markers, barcodes, shipping labels, and other heavily-used items.

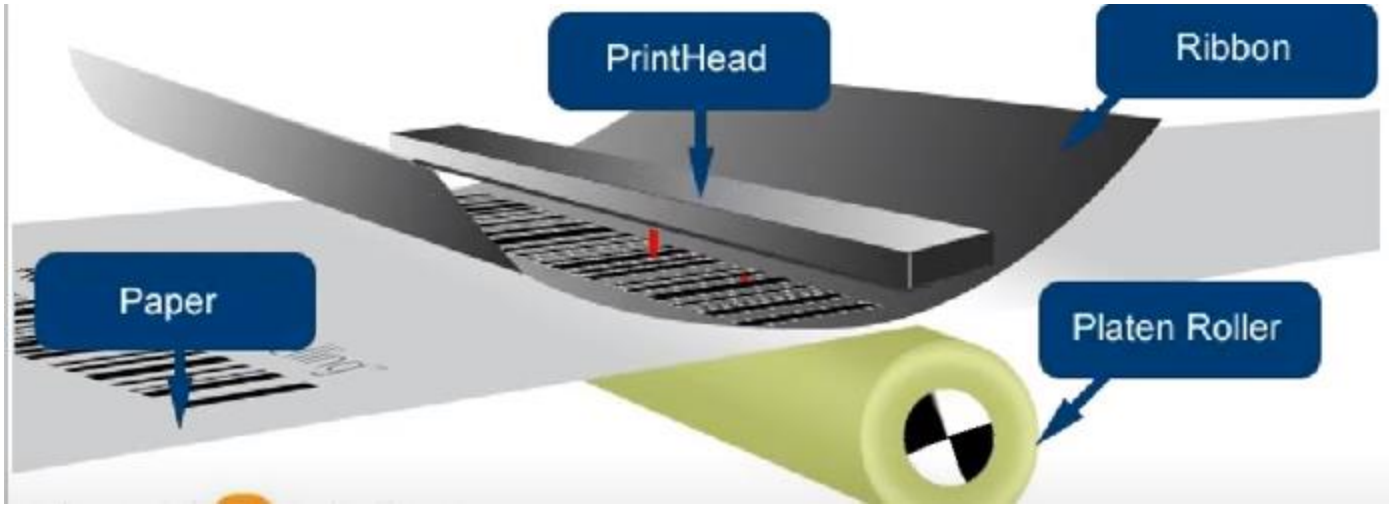
How does a Thermal printer works

There are two distinct categories of thermal printers:

- **Direct thermal printers**
  - Direct thermal printing uses a print head to generate images.
  - But instead of using ribbons to transfer ink, it creates an image directly on the label.
  - This print technology uses chemically treated, heat-sensitive paper that turns black when it passes under a heated print head. The heat burns images directly onto the label. Therefore, no ribbons, ink, or toner is needed
- **Thermal transfer printers**
  - Uses ribbons, ink, and print heads.
  - Thin ribbons with wax, resin, or wax/resin coatings on one side pass under a heated print head. The heat melts the coating and transfers ink onto the label.



Direct Thermal Printer



Thermal Transfer Printer

Advantages & Disadvantages

Advantages:

- Durable
  - Last longer and stand up to a wider variety of weather conditions.
- Versatile
  - Print documents, labels, and signs that meet various needs.
- Less maintenance
  - With fewer moving parts-last longer, easier to maintain, and run more reliably than inkjet printers.

Disadvantages:

- Cost
  - Materials used are more expensive than ink jet printer
- Color choice
  - Print fewer colors and high heat limit wax and resin choices. That's why user can not print high quality photographs.

"Be healthy and stay safe"