

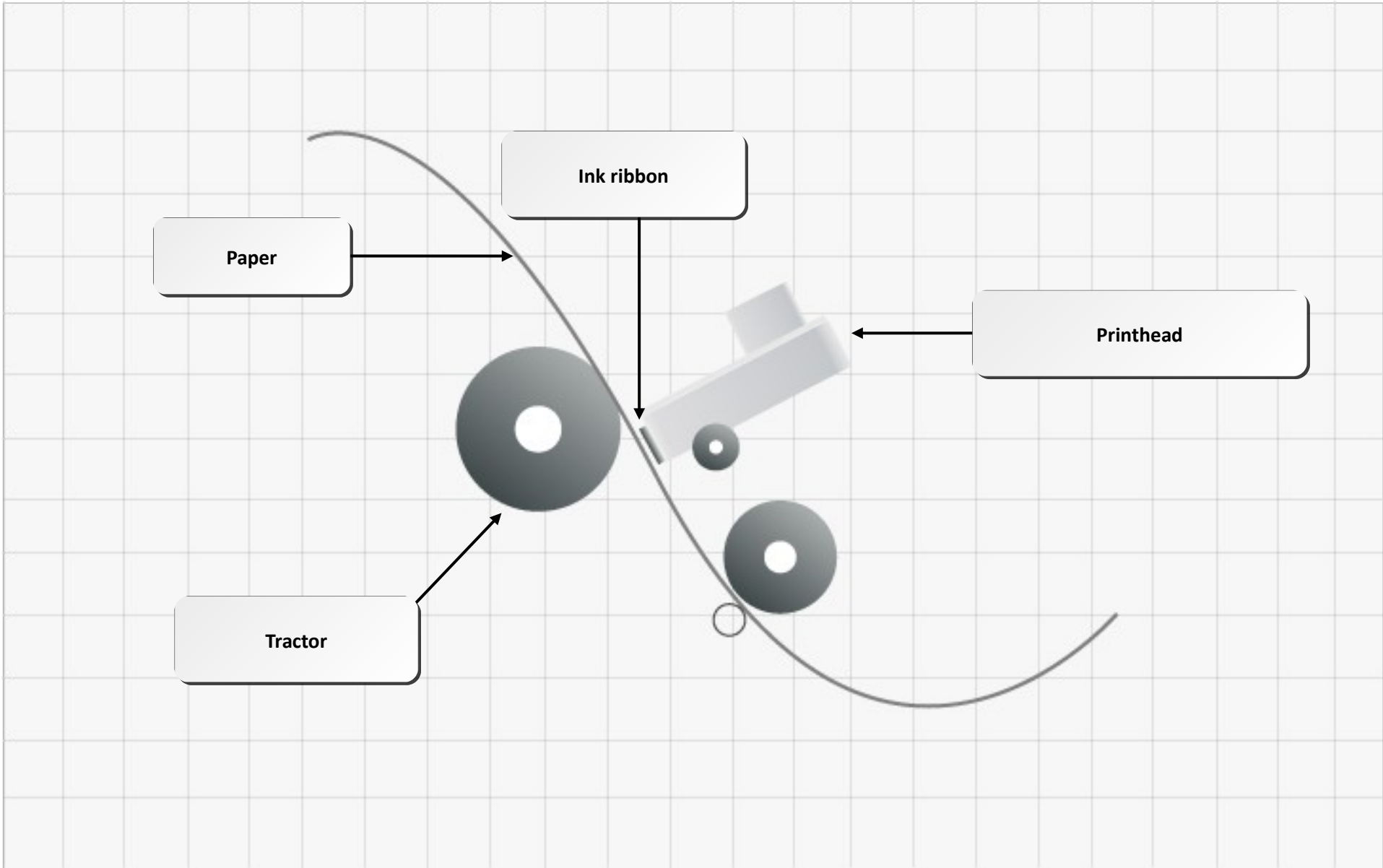
# Installing and Configuring Printers

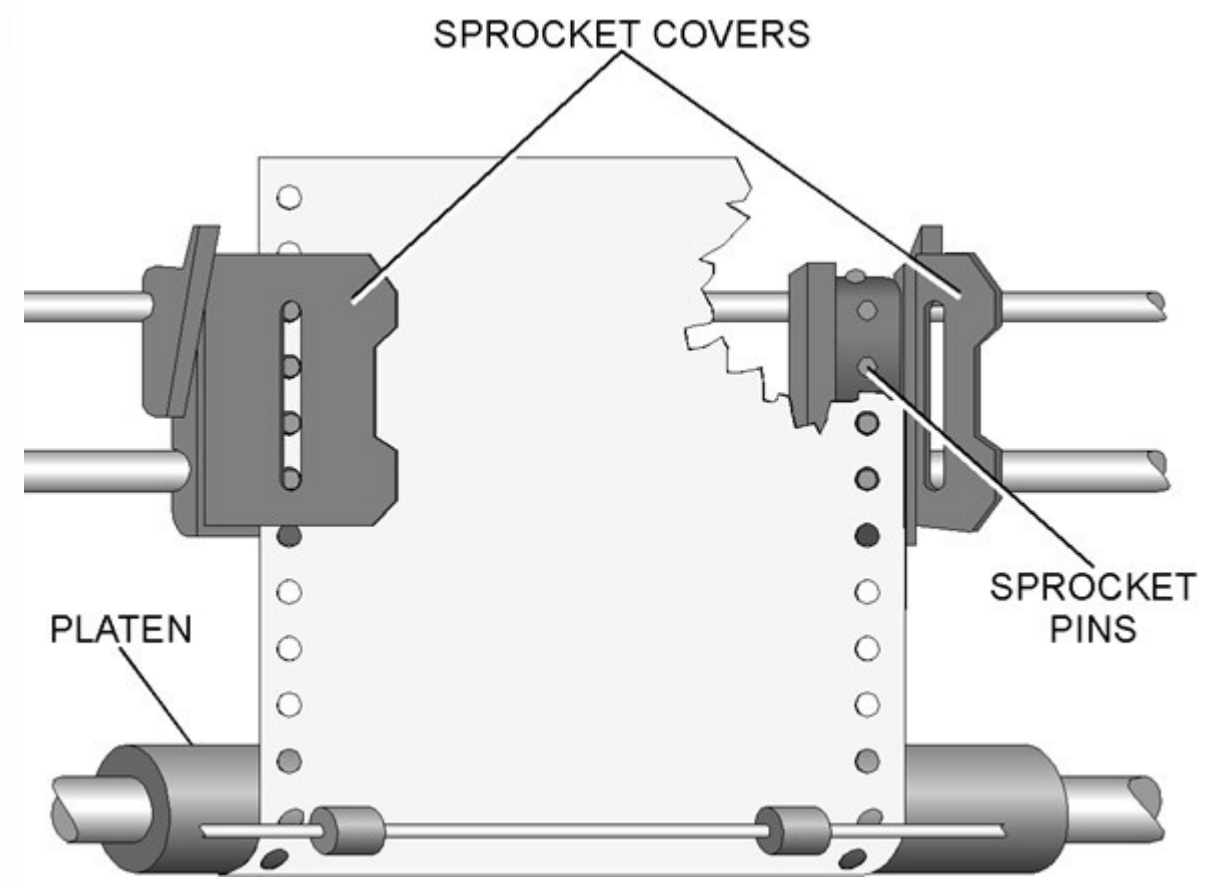
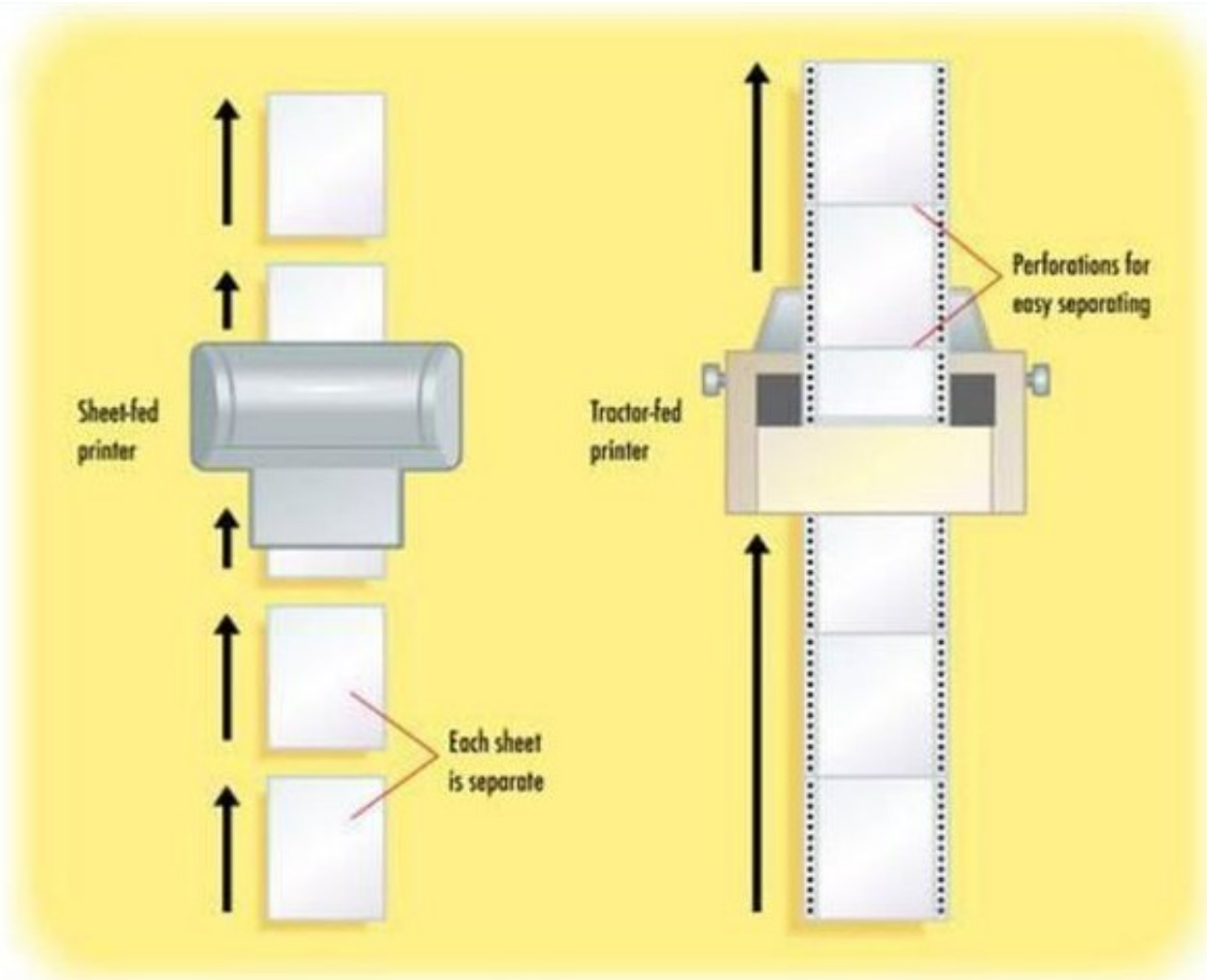
# Types of MFDs

- MFD – MultiFunctioning Device
  - AIO MFD – All in one. Small sized. Home users.
  - SOHO MFD – Medium sized. Some have duplex scanning.
  - Heavy Duty MFD – Large and large number of users connected. Stapler. Automatic document feeder.

# Impact Printers

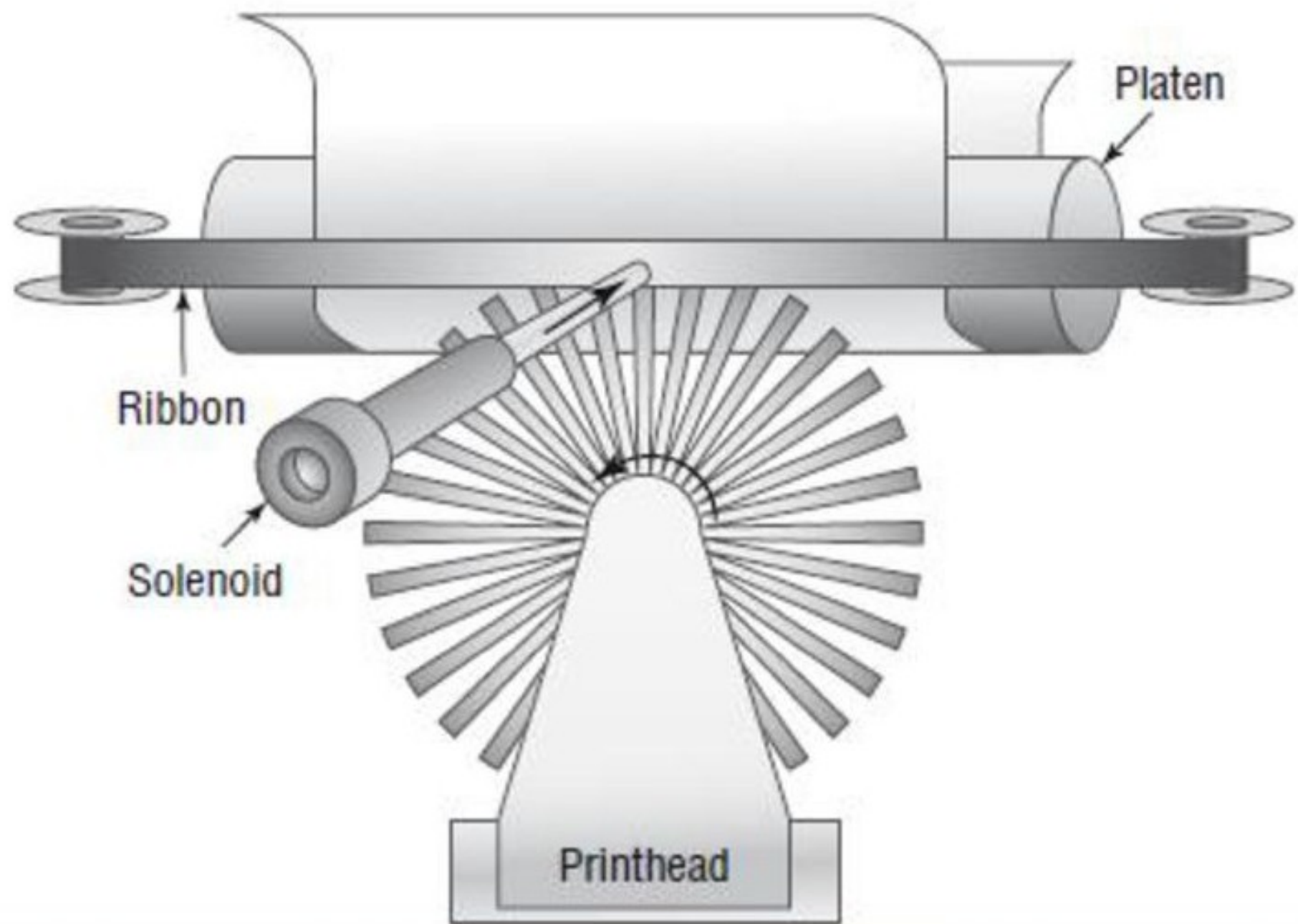
- Use a ink ribbon
- Characters are impacted onto the ribbon to print onto paper
- Tractor feed paper (Continuous with holes)
- Daisy Wheel and Dot Matrix

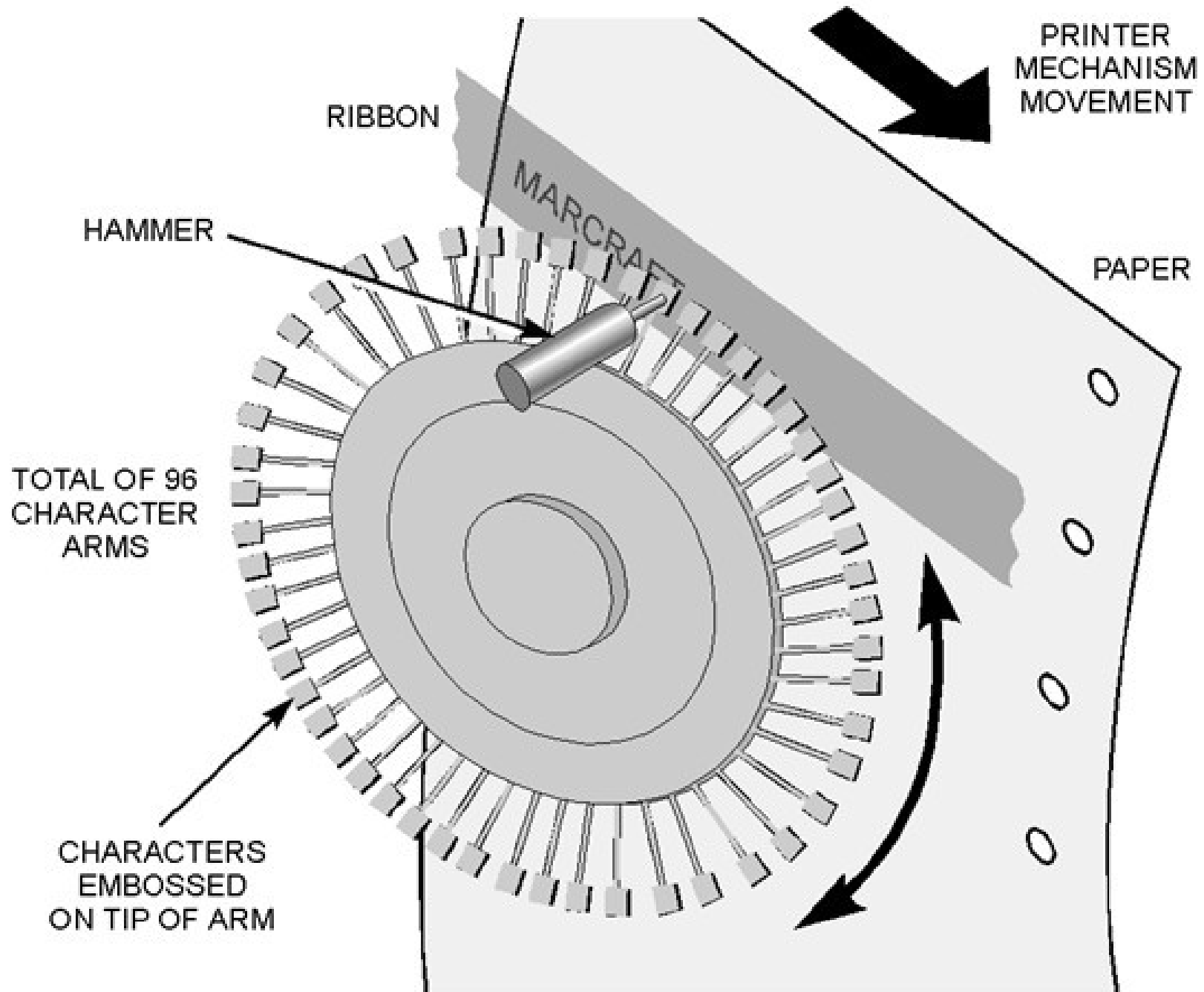




# Daisy Wheel

- Wheel – Called Daisy
- Letters on each Petal
- Print head has a hammer operated electromechanically
- Character pushes against ink ribbon between the paper
- 2 to 4 characters per second
- Very noisy
- Single font
- No graphics
- Carbon copy paper can be used (impact paper)

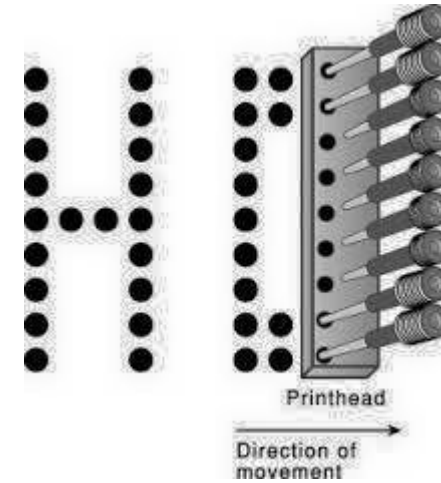






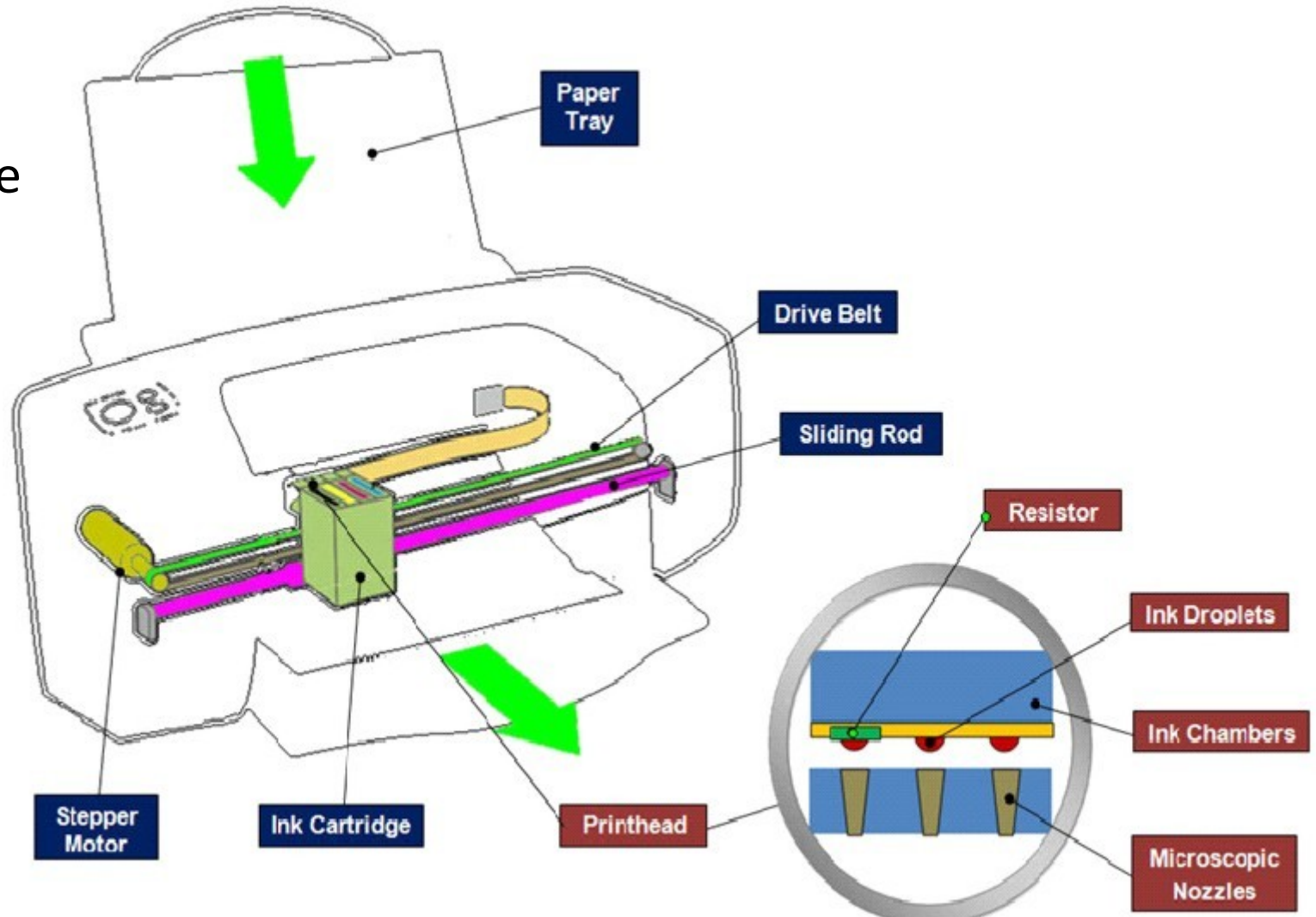
# Dot Matrix

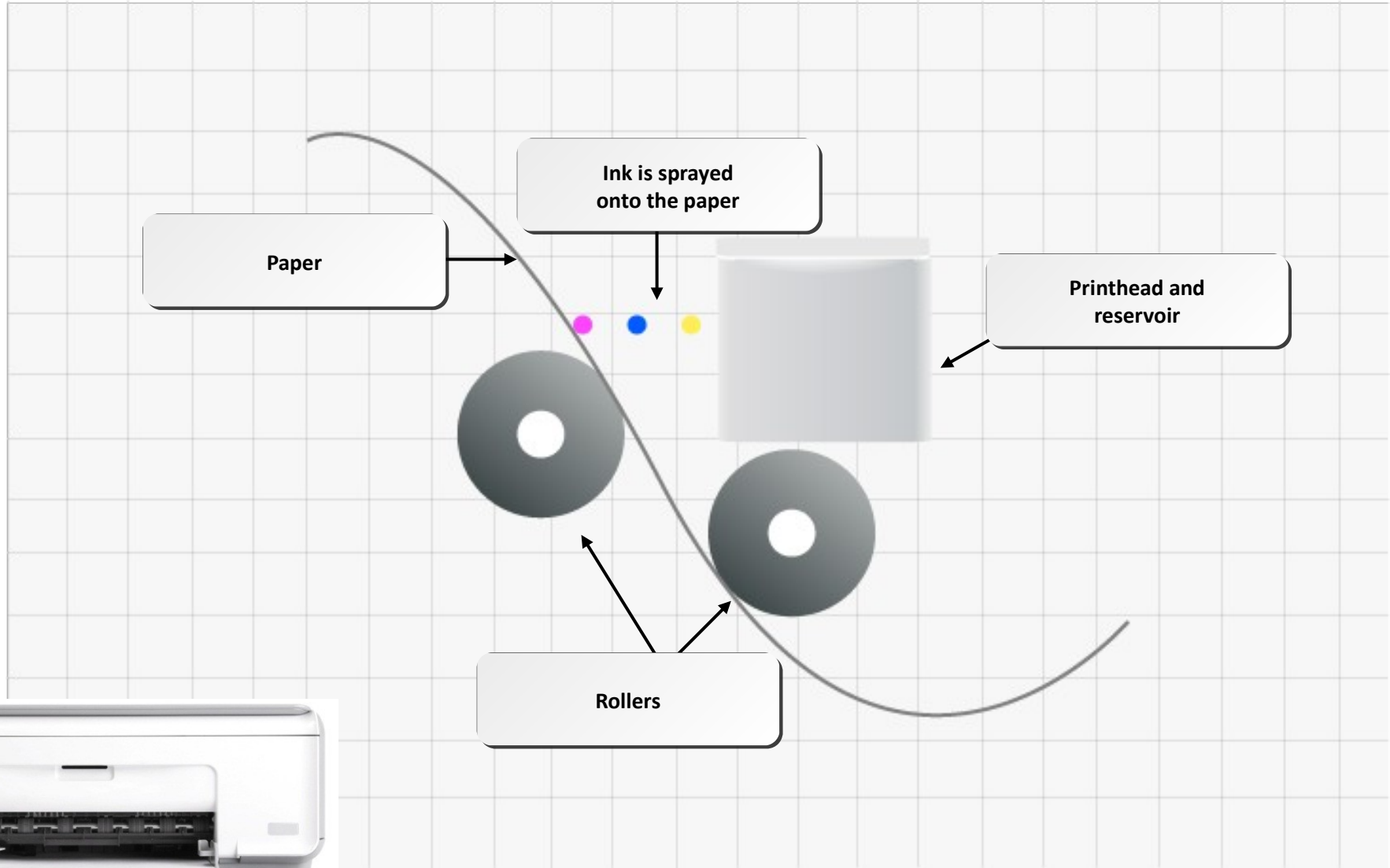
- Similar to Daisy Wheel
- Head is a row of pins
- Poorer quality than daisy wheel
- 24 pins on print head now
  - NLQ – Near Letter Quality
- Noisy
- 72 cps



# Inkjet

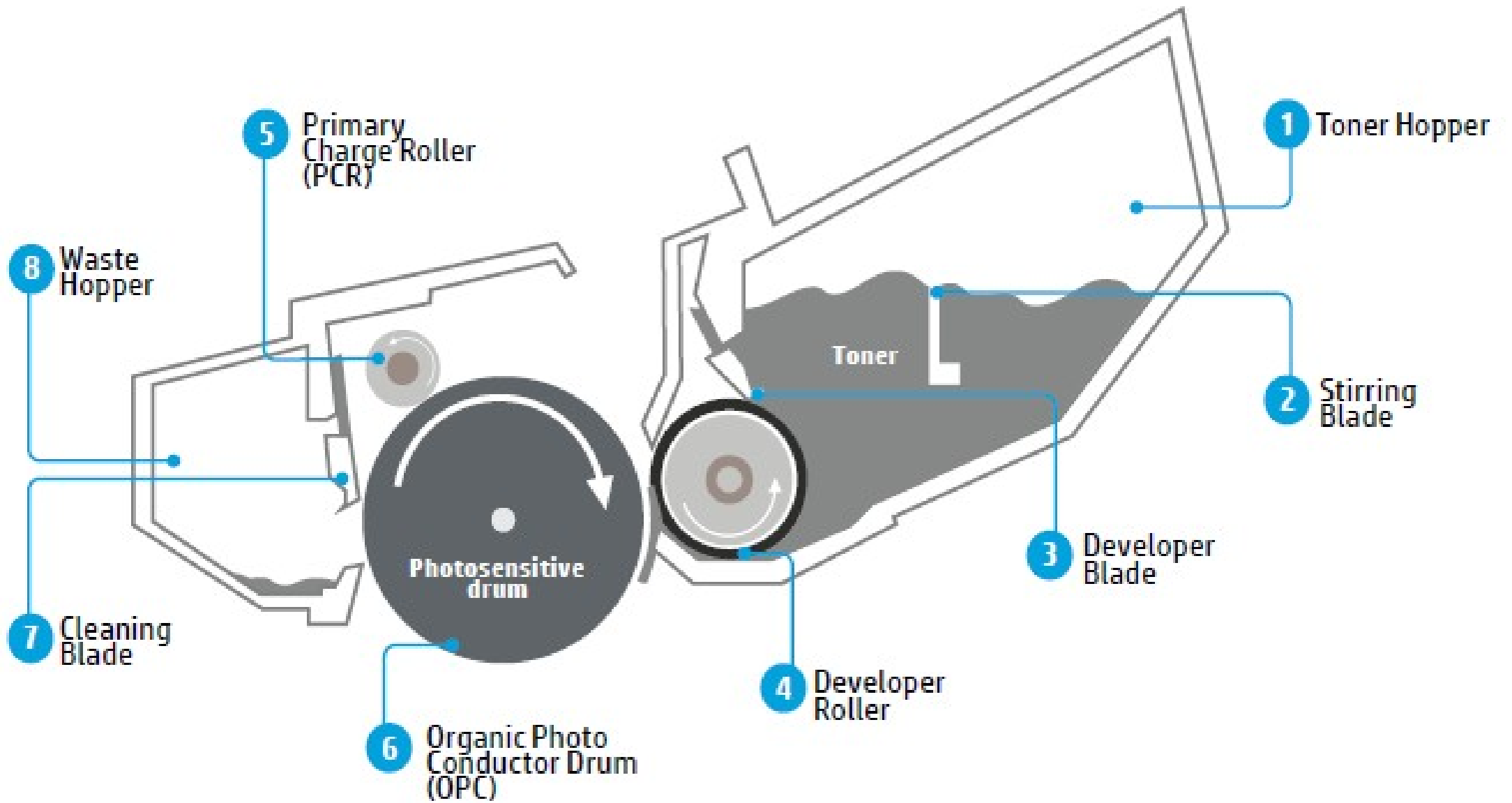
- Spray drops of ink onto page
- Inexpensive
- Printer head
  - Sometimes On Cartridge
- Uses 12v and 5v DC
- Uses print buffer
- Needs alignment
- Cleaning Cycle
  
- Duplexing units optional





# Laser Printer (page printers)

- EP – Electrophotographic
- Two types
  - Laser to scan image onto drum
  - LED's to create image on drum
- Focus on laser
- OPC – Organic Photo Conductor
  - Do not touch!
- Ozone Filter
  - High voltages create ozone

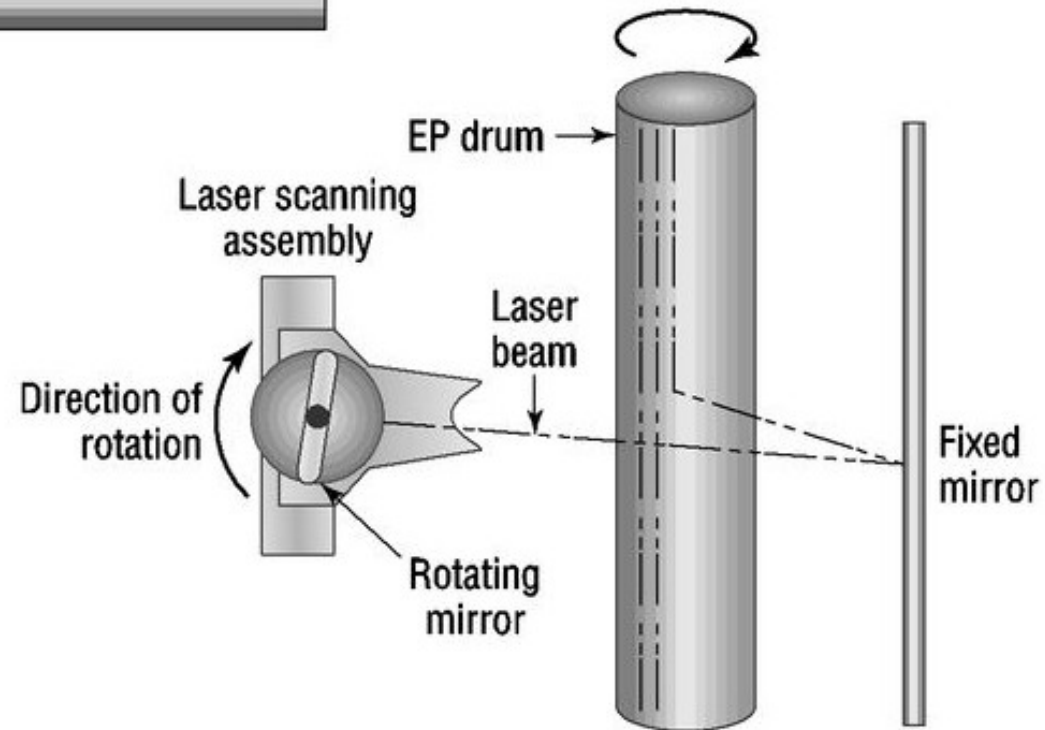
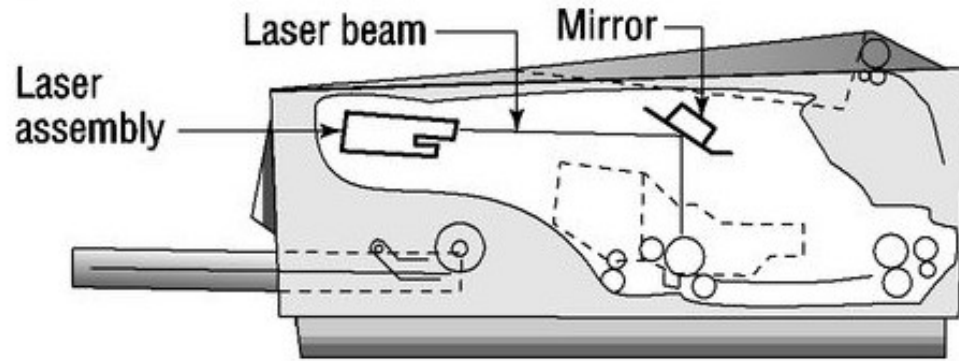


# EP Drum and Toner

- EP drum – holds charge when NOT exposed to light
  - Exposing to dust and light can damage drum
  - Never ship a printer with toner cartridge installed
- Toner
  - So fine its like a liquid
  - Never use a standard vacuum to clean it up
  - Will absorb moisture and make a mess

# Laser Scanning Assembly

## SIDE VIEW



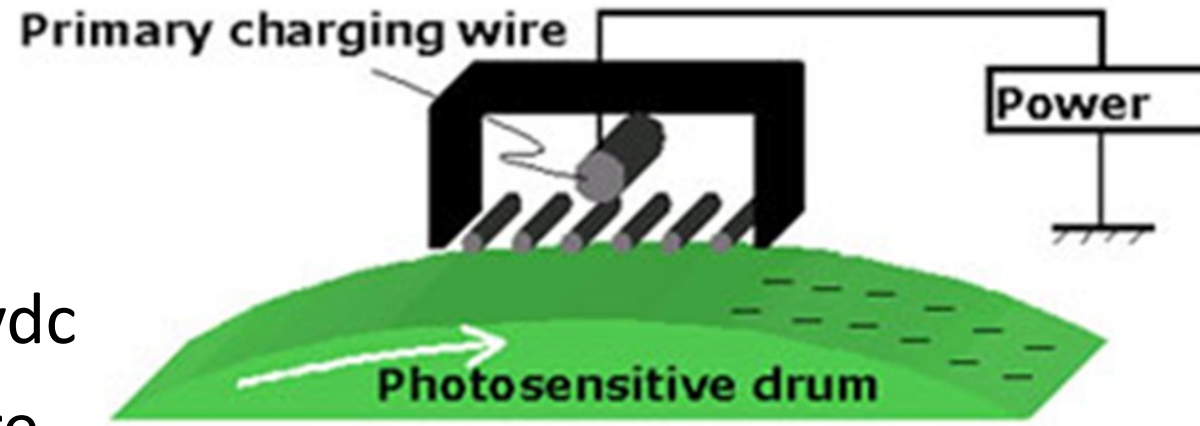
# Laser Printer

- Processing
- Charging
- Exposing (Writing)
- Developing
- Transferring
- Fusing
- Cleaning

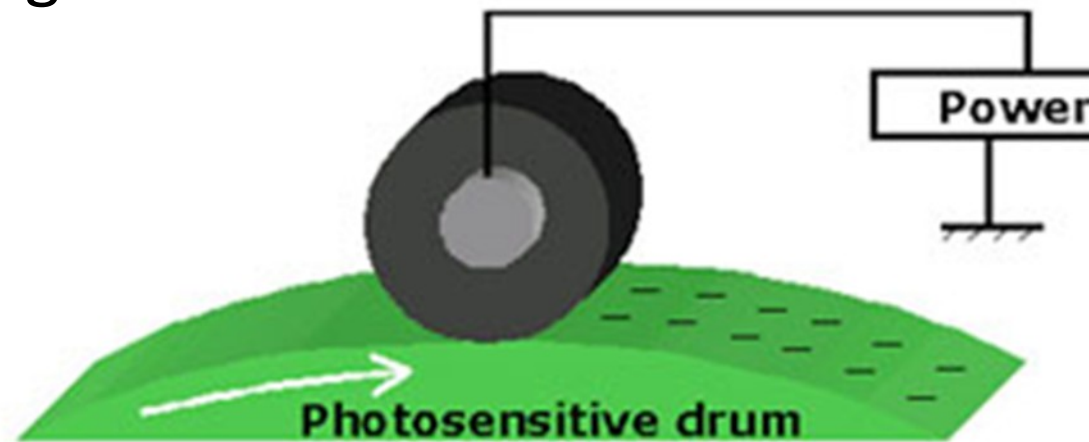


# Charging

- Corona approx. 600vdc
- Corona is a small wire
- HVPS converts ac to dc
  - High Voltage – danger!

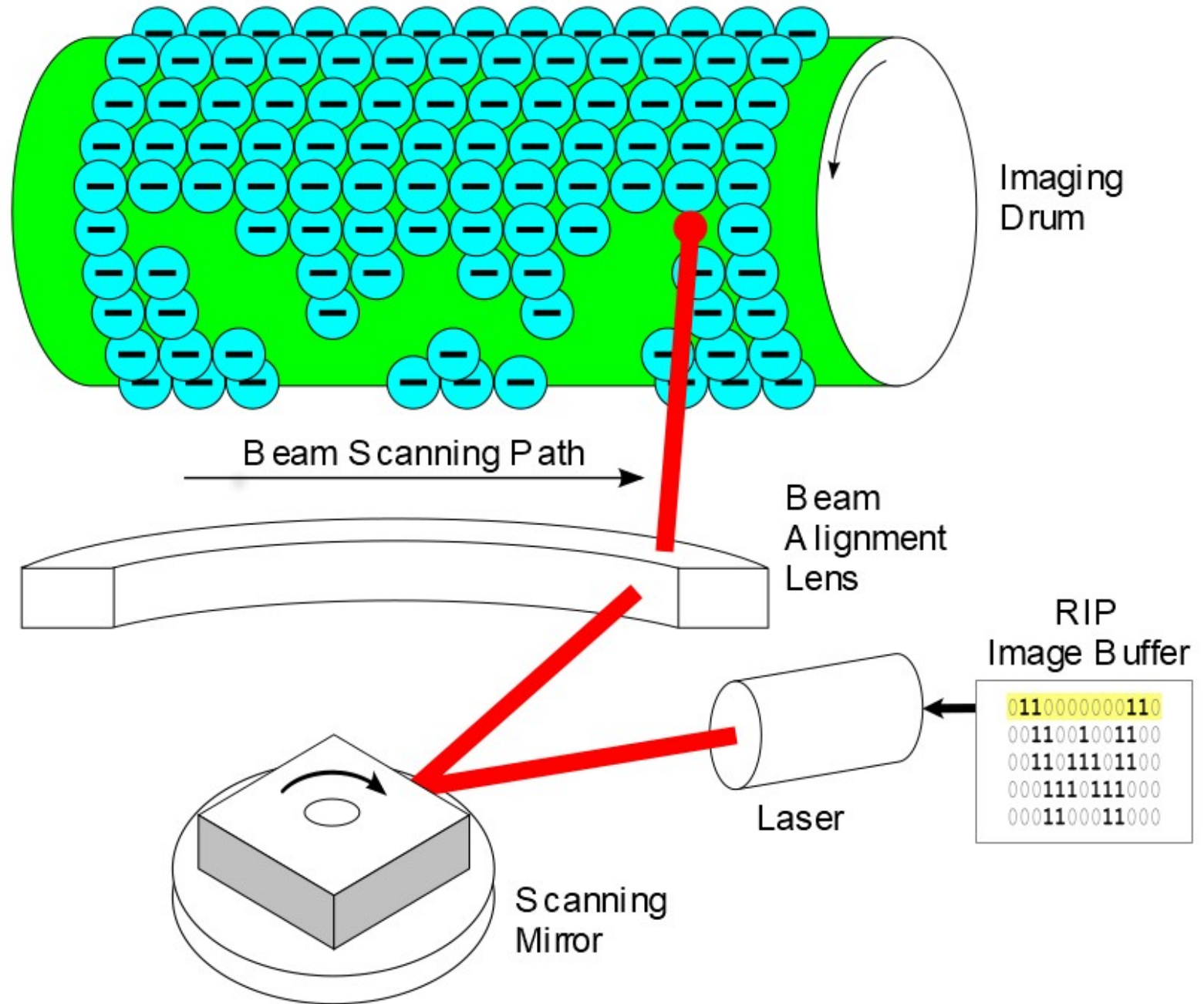


a) Corona wire

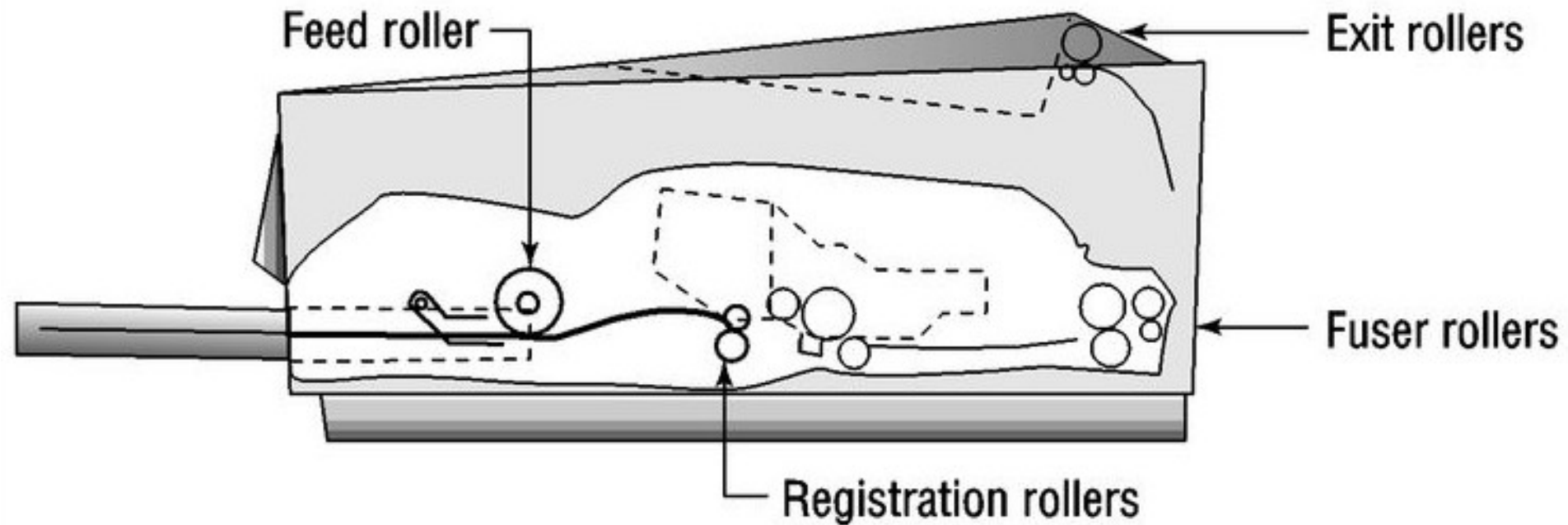


b) Electrical charging roller

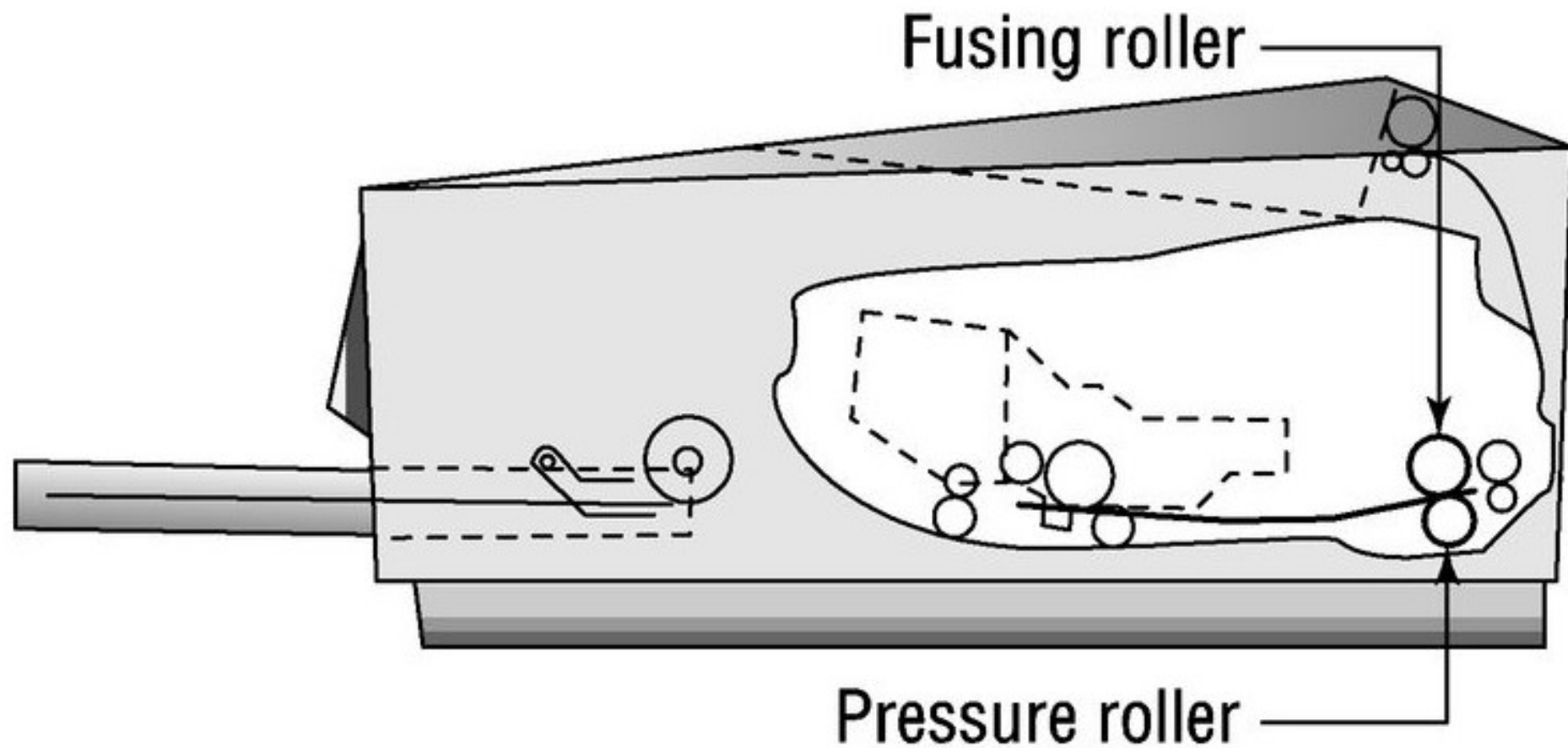
# Exposing



# Paper Transport Rollers



# The Fuser



# Fuser

- Toner will stick to anything
- Fuser cooks the toner onto the paper
- Three main parts:
  - A halogen heating lamp (165 – 200 degrees Celcius)
  - A Teflon coated aluminium fusing roller
  - A rubberized pressure roller
- The pressure roller pushes the paper to the hot fusing roller
  - Toner melts into the paper

# Processing

- Two parts:
  - Receive the image
  - Create the image
- Image is created one horizontal strip at a time
  - Called Scan Line or Raster Line
- RIP (Raster Image Processor)
  - Creates the raster images in the printer memory
  - Uses PS (Postscript) or PCL (Printer Control Language)
  - <https://blog.inkjetwholesale.com.au/printer-education/difference-pcl-postscript-drivers/>

# Charging and Exposing

- Charging
  - Voltage from HVPS (-600VDC) uniform -ve charge to the drum
- Exposing
  - Where the image is created on the drum
  - Where the laser touches the drum the -600V is reduced to about -100VDC
  - At this point the controller sends the signal for the pickup roller for paper

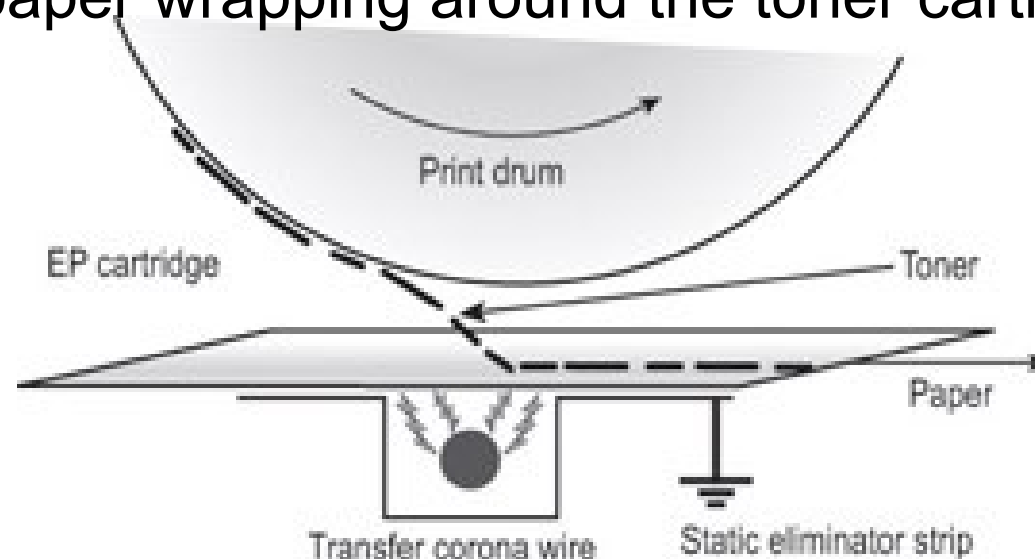
# Developing

- Developing
  - Toner gets same charge as EP drum
  - Toner sticks to the roller where exposed by the laser
  - Toner repelled by unexposed areas
  - Toner Fog created – between drum and toner roller



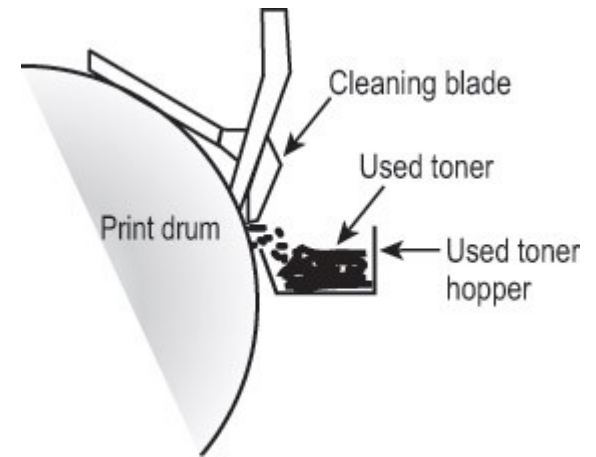
# Transferring

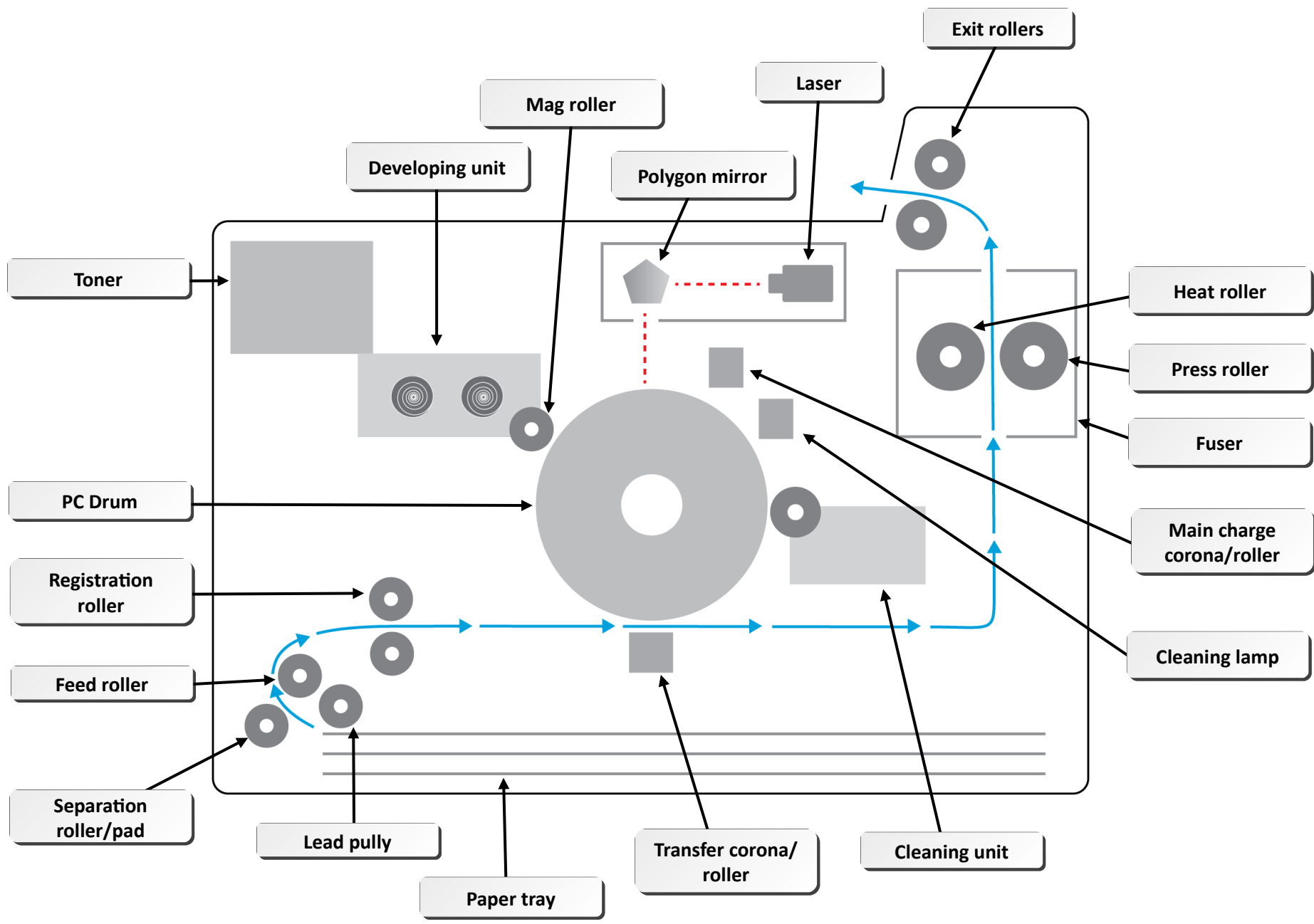
- Controller notifies registration rollers for paper
- Controller sends a +600VDC charge to apply to the paper
- Toner is pulled from the drum at point it contacts the paper
  - (Opposites attract)
- Paper is discharged by static eliminator strip
  - Critical to stop paper wrapping around the toner cartridge

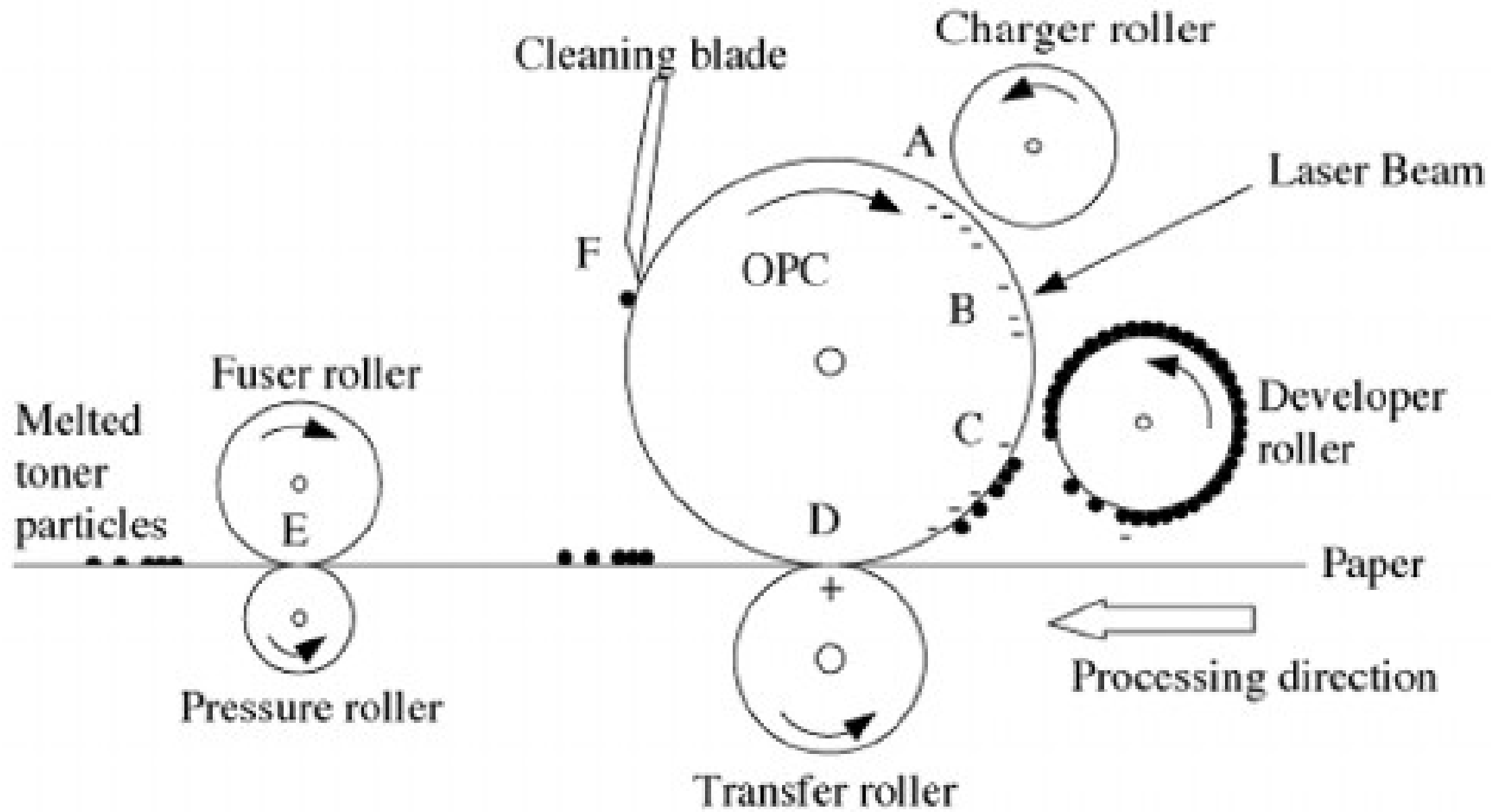


# Fusing and Cleaning

- Fusing
  - Toner only on paper by weak charge or gravity following transfer
  - Heat is applied to permanently fuse toner to paper
  - Toner melts and is pressed into the paper by rubberized roller
  - A sensor tells the controller that the paper has exited
- Cleaning
  - Rubber blade in EP Cartridge removes any residue toner left on drum
  - A fluorescent lamp discharges any remaining charge on drum
    - Remember drum loses charge on exposure
  - Prevents ghost images on page

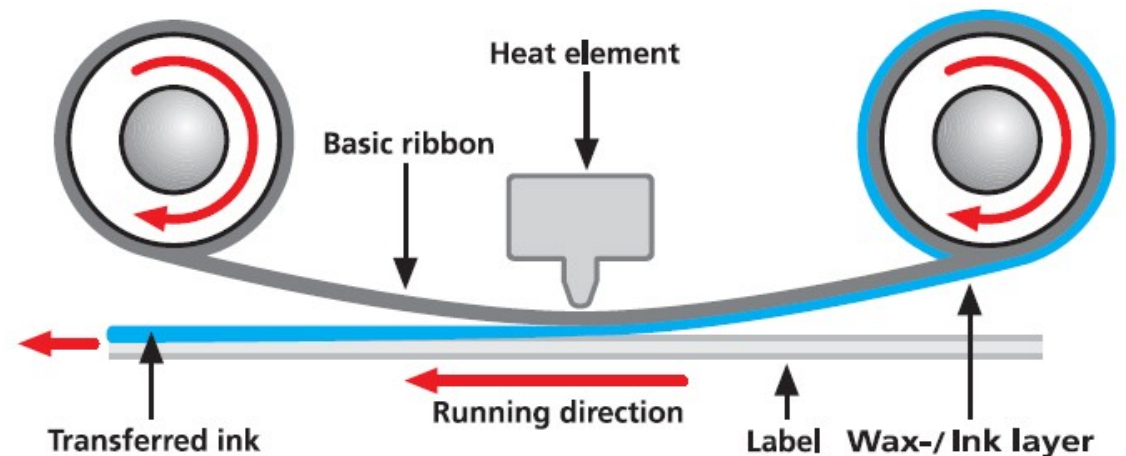
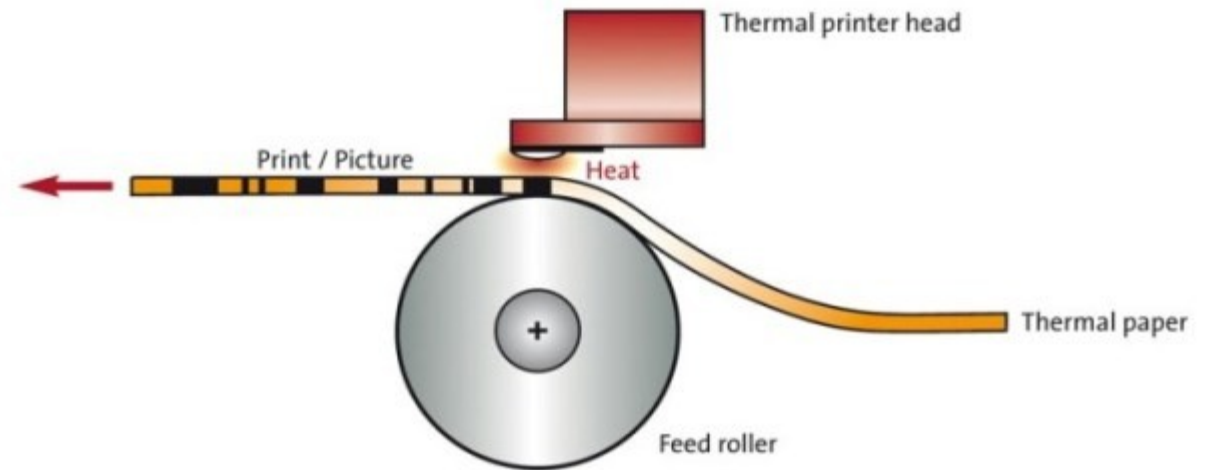






# Thermal Printers

- Receipts from shops
- Roll of paper
- Paper Thermally sensitive
- Poor image quality
- Long life of print unit
  
- Thermal transfer Printer  
or thermal wax transfer Printer



# Virtual Printers

- No physical printer present
- Print to file
- User sees no difference in process
- Normally PDF  
(Printed Document Format or Portable Document Format)
- Can be to a PS (Postscript file)
- XPS (Open XML Paper Specification)

Printers (5)



Albus



Canon MF3010



Fax



Microsoft XPS  
Document Writer



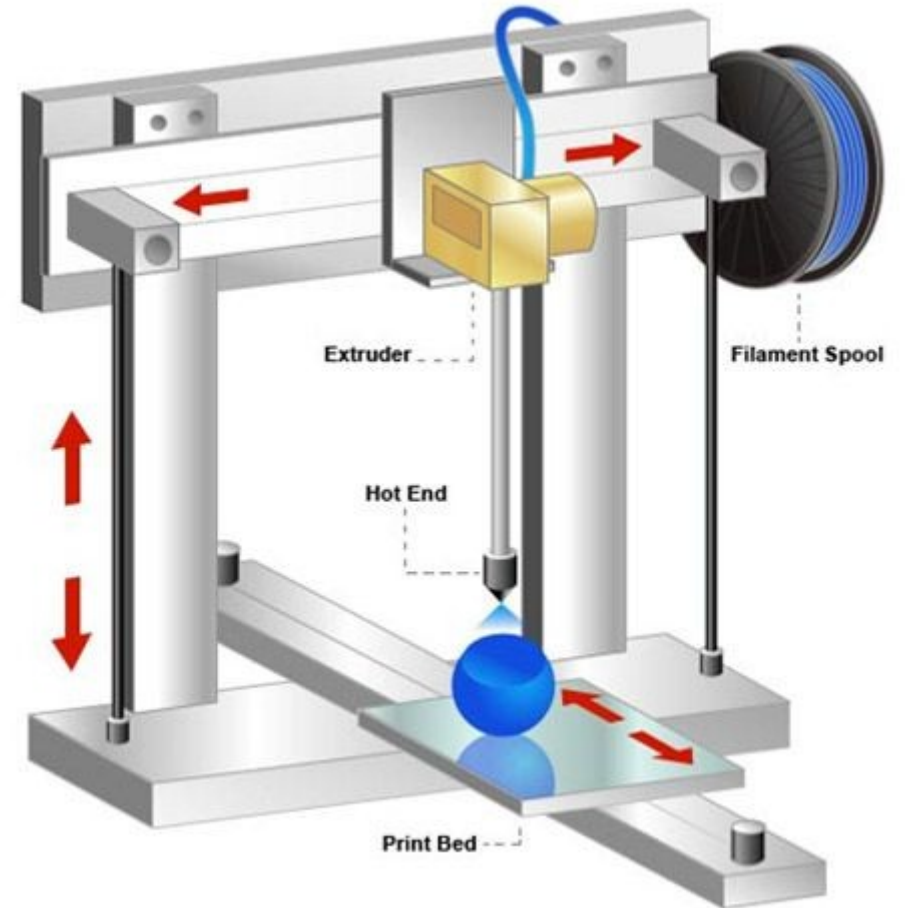
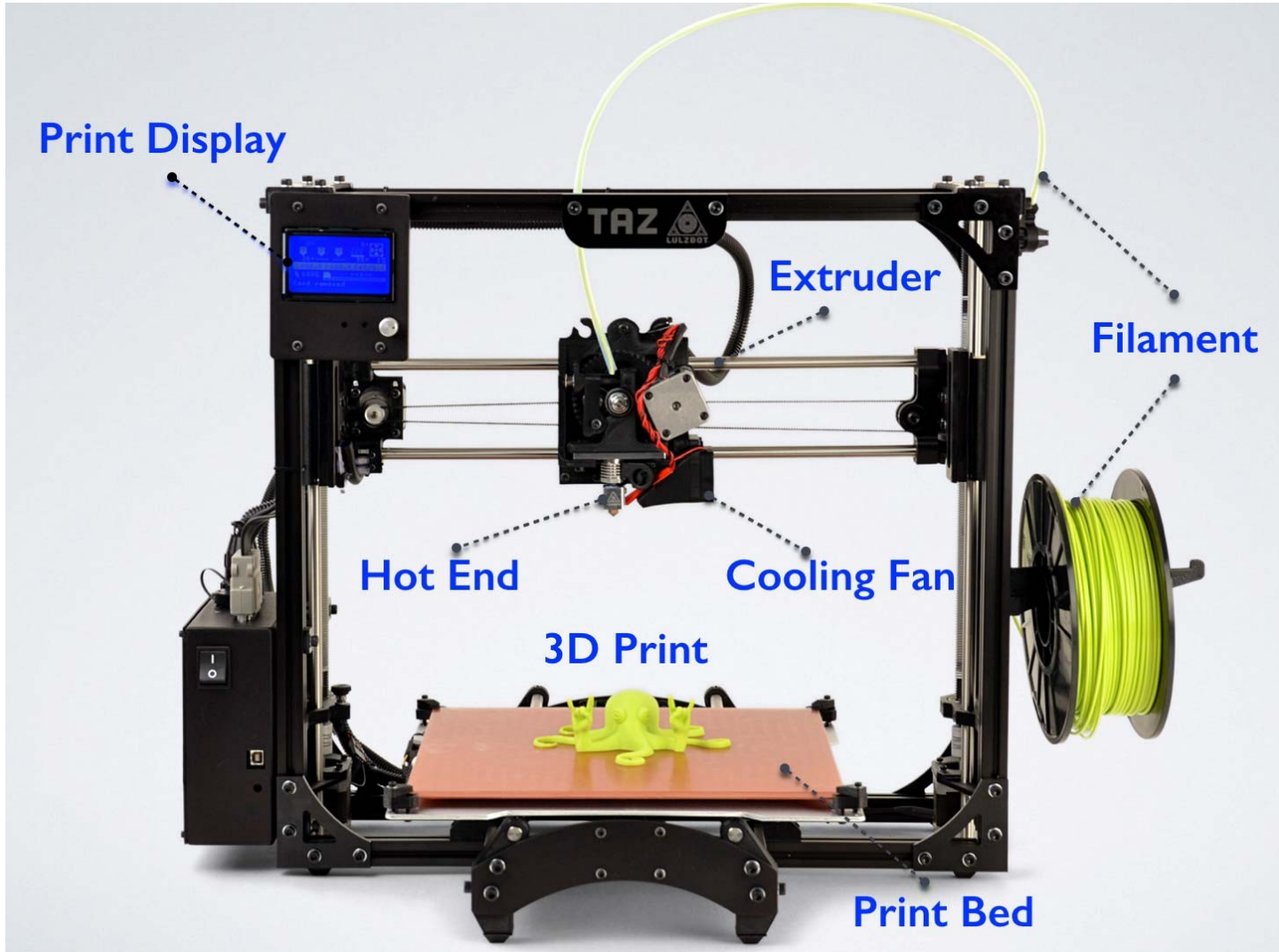
Send To  
OneNote 2013



# 3D Printing (Additive Manufacturing)

- Adds thin layers of material to create the object
- Home Printers
  - Rolls of plastic filament
- Commercial Printers
  - Aluminium
  - Copper
  - Low melting point metals

# 3D Printer Anatomy



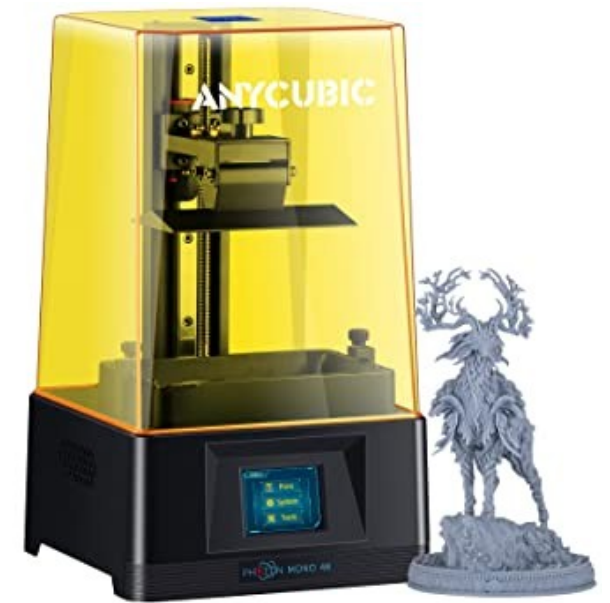


# 3D Printer

- Filament comes on a spool
  - PLA – polylactic acid
  - ABS – acrylonitrile butadiene system (shrinks as its printed)
- Size
  - Common 1.75mm
  - Original 3mm
- Colour
  - Various
- Small jobs about an hour
- Some jobs can take days

# 3D Resin Printer

- Also called stereolithography/digital light processing printers (SLA/DLP)
- Reservoir of liquid resin
- Hardens under UV
- Watch this video in your own time (<https://www.youtube.com/watch?v=6TZ2R88rPoo>)



# Interfaces

- Serial (Rare)
  - Sends data one bit at a time
- Parallel
  - Sends data eight bits at a time
  - Increasingly Uncommon
- USB
  - Most popular peripheral interface
- Ethernet
- Wifi
- Bluetooth

# Interface Software

- PDL – Page Description Language
  - Describes the page being printed
    - Text
    - Margins
    - Headers / Footers
    - Converts pages into language for the printer

# PDL Types

- PostScript (PS)
  - Adobe invented
  - Used by Apple
  - Commands are English (POSITION, DRAW etc)
- Printer Control Language (PCL)
  - Developed by HP
- Graphics Device Interface (GDI)
  - Microsoft
  - Defines how to draw bitmaps to be sent to screen or printer
  - Cheaper printers

# Driver Software

- Specific options for each type of printer
  - Paper Tray
  - Duplex
  - Paper Size

# Installing and Sharing Local Printers

- Attach the device using a local port (USB)
- Install and update the device driver
- Configure Options and Settings
- Print a test page
- Verify compatibility with the OS and applications
- Inform users on how to use

# Installing and Sharing Networked Printers

- All users will need a local account if not on a domain
- The PC will be the print server
- The PC will need to be left switched on
- So print server becomes part of the printer



# TCP Printing

- Connect the printer to a network
- Configure the printers IP address
- From PC – Add a printer
- Choose add a network printer
- Search for the printer
  - Can stop by clicking “The Printer That I Want Isn’t Listed”
- Add a printer using TCP/IP Address or Hostname
- Enter the IP address (or hostname).
- Add a port name (for identification)
- Select make and model from the list
- Install the device driver

# RAW or LPR

- RAW – standard TCP/IP Port Monitor
  - Port 9100 by default
  - Uses SNMP for bidirectional communication (PC to printer)
- LPR – Older and used for legacy
  - Ports
    - source 721-723
    - Destination 515

# Basic Install and Config procedure

- Find a suitable location for the printer and properly unbox the device
- Attach the device using a local or network port and connect the power
- Install and update the device driver and calibrate the device
- Configure options and default settings
- Print a test page
- Verify compatibility with the operating system and applications
- Educate users about basic functionality

# Bonjour (now Rendezvous)

- Apple (2002)
- Zero Configuration printing
- Automatic discovery of devices and services
- Works on other OS
- Major manufacturers now support Bonjour
- Service on windows
  - <https://support.apple.com/kb/dl999>
- Airprint in 2010 to support printing from iPads and iPhones
  - Device must be on same local network

# Cloud Printing

- Printing to a remote device
- Need a cloud printing service
  - Google Cloud Print
  - HP ePrint

# Printer Maintenance

- Replacing consumables
- Printer Paper!
  - Composition
  - Weight (Actual weight of a Ream, 500 sheets, in lbs)
  - Caliper – thickness of an individual sheet
- Ink and Toner
- Cleaning Solutions

# Printer Safety

- Heat – Laser Printers produce a lot of heat
- Humidity – Paper likes to be dry!
- Light – Avoid exposing drum to light
- Ozone – By product of printing. Hazardous in quantity
- Ammonia – Contained in Printing products.

# Need to Know

- Know the differences between types of printer technologies
- Understand the basics of how 3D printers create objects
- Know the names, purposes, and characteristics of printer interfaces
- Know how to install and configure printers
  - Attach the device using local or network port (and connect power)
  - Install and update the device driver and calibrate the device
  - Configure options and default settings
  - Print a test page
  - Verify compatibility with OS and applications
  - Educate the end user



# Need to Know continued

- Know the seven steps of the EP process
- Know the 4 types of virtual printing
  - To file
  - To PDF
  - To XPS
  - To image
- Understand the need to use genuine inks/toners
- Understand how to upgrade memory and firmware
- Know the environmental hazards for printers