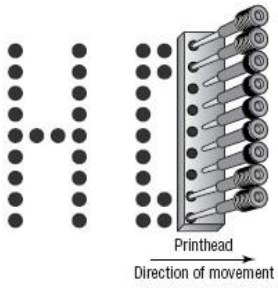
Printers and Scanners

Printer Types
Dot Matrix

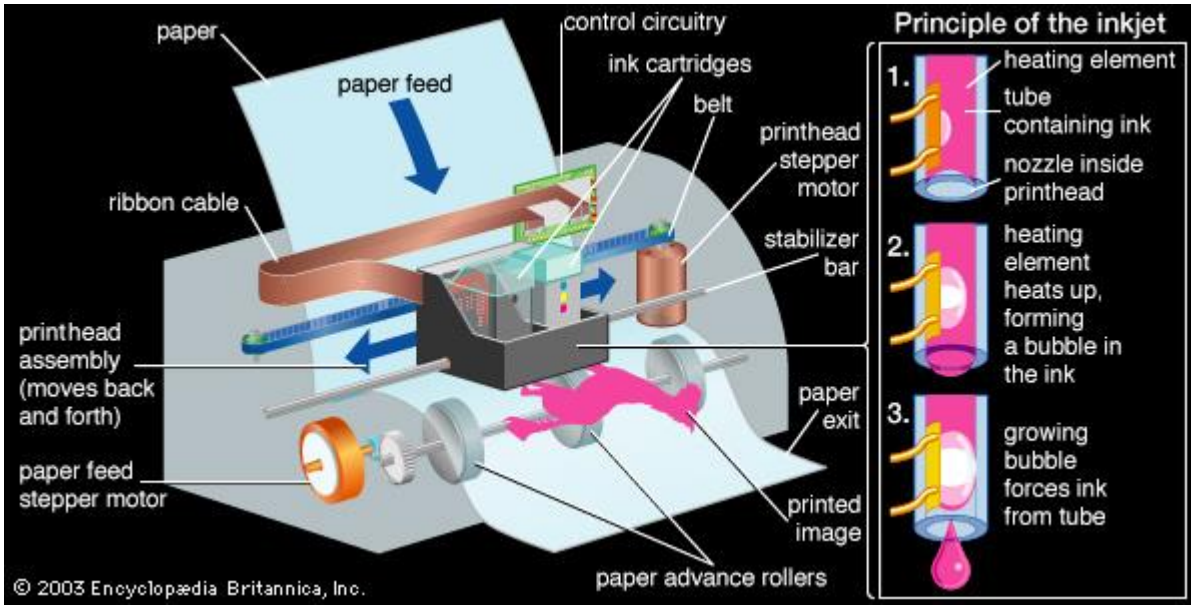
- An impact printer that transfers characters by striking a pattern (from a matrix) through an inked ribbon and onto paper.
- The most common number of pins on a dot matrix printer is 9, 18, or 24.
- The speed of dot matrix printers is measured in characters per second (CPS). Common speeds for a dot matrix printer are 32 to 72 CPS.
- Dot matrix printers can use either a friction feed or a tractor feed system to move paper through the printing assembly.
- Because dot matrix printers strike the image onto paper, it is a good printer to use when carbon-copy documents are being printed.

Formation of images in a dot-matrix printer as shown below.



Ink Jet (Ink Dispersion)

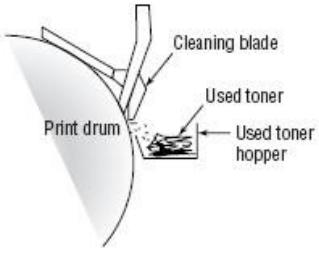
- The ink reservoir is in a disposable cartridge that includes the printing mechanism.
- Bubble jet printers print by heating the ink and squirting it through tiny nozzles in the print head and onto the paper.
- The crispness of an ink jet printer's image is usually rated in terms of Dots per Inch or DPI. Ink jets range from 150 to over 1400 dpi.
- Ink jet printers feed single cut sheets of paper, from a feed tray, by clamping them between rollers and advancing them one print line at a time, from top to bottom, and then placing the newly printed paper into a tray, other than the feed tray.



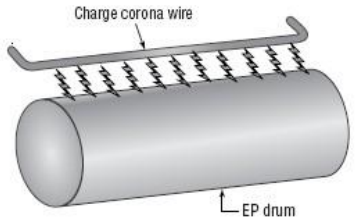
Laser

- Laser printers are classified as page printers because they print text and graphics simultaneously one complete page at a time.

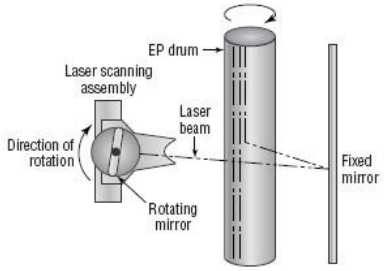
1. <u>Cleaning:</u> Cleans the photosensitive drum.



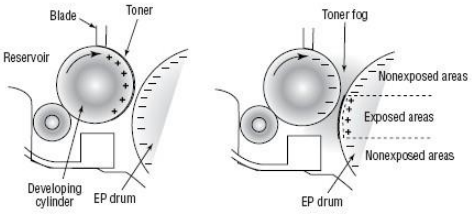
2. Charging: Puts a uniform negative charge on the drum and then wipes the previous image.



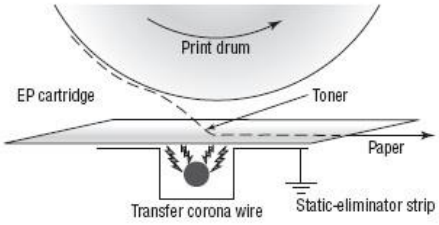
3. Writing: Writing is done with a laser beam striking the drum, then forming the image.



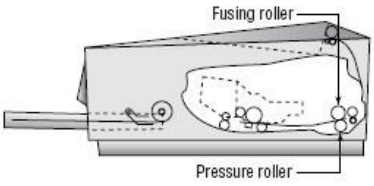
4. Developing: Image is developed by attracting positive toner onto drum.



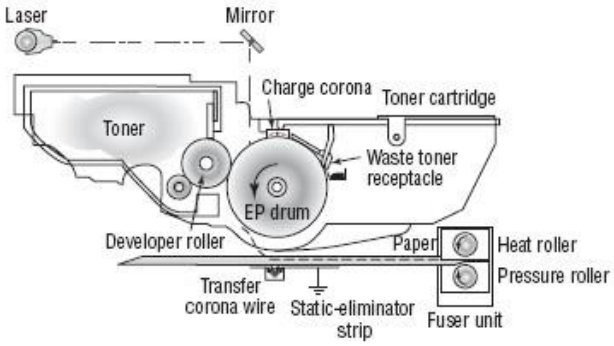
5. Transferring: Transfer corona wire charges paper. Toner from drum transfers to paper.



6. Fusing: Fuser roller heats the toner and then melts it. Pressure roller presses onto paper permanently.



The entire print process as shown below.



Dye Sublimation (Dye Diffusion Thermal Photo)

- A dye sublimation printer is a non-impact printer that uses film-embedded dye.
- The print head heats and passes over the film, causing the dye to vaporize and soak into the film paper.
- Dye sublimation printing prints in transitioning colours rather than pixels.

Solid Ink

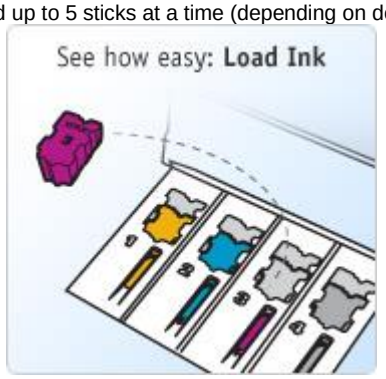
- Solid ink printers melt ink onto the print head (which is as wide as the paper). The head jets the melted ink onto the paper as the paper passes by on the print drum (similar to the laser printing process).
- The head takes as long as 15 minutes to heat prior to printing.

What is Solid Ink?

- Solid ink is a proven color printing technology only offered by Xerox. A solid ink printer or multifunction printer uses solid sticks (or blocks) of no-mess, non-toxic ink instead of toner or inkjet cartridges. Solid ink is easy to use, produces incredible color print quality, is cost-effective, and is very good for the environment.

The Ink

- Non-toxic ink is resin-based, similar to a crayon, so the sticks are safe to handle by anyone
- No-mess ink won't stain your clothes or your skin
- Capacities of ink sticks can be up to 1,000 or 2,300 pages depending on the device
- Load up to 5 sticks at a time (depending on device) of each color in a solid ink device for long, uninterrupted printing



The Mechanics

- Simple design consists of only three major assemblies: the print head (transfers ink to print drum), the print drum (transfers image to paper), and the controller (the brain that tells everything what to do)
- Ink is instantly fused onto the paper using heat and pressure, which is why solid ink produces such great image quality on any kind of media. Toner and inkjet ink soak into the paper, so the image is dependent upon the type of paper used

Solid Ink Compared to Laser and Inkjet

- More consistent print quality page after page and on any media
- Easier to use with no cartridges to load and unload, and no mess
- Less waste with no cartridges to dispose of, and far less packaging
- No paper curling or wrinkling that often plagues inkjet and color laser printers
- Fewer parts so there's less that can go wrong
- Faster than inkjet technology
- No special paper needed, unlike some inkjet printers
- A wider range of colors are printed by solid ink than most color laser devices

Thermal

- A thermal printer is a non-impact printer that uses heat to cause a reaction on specially treated paper.
- Monochrome thermal paper is chemically treated to darken where heated (photosensitive). Many cash registers use this type of printer for creating receipts.
- Color thermal paper is chemically treated to absorb color from a ribbon where heated.

- Ink is applied via the ribbon in a similar manner to a solid ink printer.
- The colour system used by thermal printers is CMYK (Cyan, Magenta, Yellow, and black).
- The paper must make one pass for each application of a different colour.
- Colour thermal printers are very expensive, high quality, and operate quietly.

Printer Configuration Facts

Print Server: is responsible for managing the flow of documents from the queue to the printer. When the printer is ready, the print server takes the next document out of the queue and sends it to be printed.

Printer: A virtual device (logical software entity) inside the print server that can be configured to send output to a printing device. The printer is made up of the print driver, the printing device, and the spooler.

Print Device: The physical device connected to the print server where print output occurs.

Print Driver: The software that allows the printer to communicate with the print device. Printer drivers provide the following support functions:
- Translate data into a recognizable form for the given printer.
- Manage graphics via graphics drivers, converting graphics into the appropriate printer commands.
- Allow management of the print job by displaying print and printer properties in the operating system.

When a print job is sent to the printer, the printer driver:
1. Formats the print job and creates a file of commands the printer understands. The file is in a specific format called a printer language (also called page-description languages).
2. The file is then sent to the printer where it is stored in the printer's memory.
3. The printer's formatter board and control circuitry then read the commands in the file and translate them into physical actions by the printer.

Print Queue: The portion of the hard drive where print jobs are stored before going to the print device.

Print Spooling: In print spooling, documents are loaded into a buffer (usually an area on a disk), and then the printer pulls them off the buffer at its own rate. Because the documents are in a buffer where they can be accessed by the printer, the user is free to perform other operations on the computer while the printing takes place in the background. Spooling also lets users place a number of print jobs in a queue instead of waiting for each one to finish before specifying the next one.

Printer Port: The means by which a print device connects to a print server (parallel port, serial port, or to the printer's NIC). Traditional parallel ports are quickly being replaced by USB ports for printing devices. In this respect, many printers can be configured in the same way that most plug and play devices are.

All parallel connections must adhere to the IEEE standard 1284. You should look at your printer configuration to see which mode your printer requires. The five modes addressed in the IEEE standard are:
- Nibble
- Compatibility
- BYTE
- EPP
- ECP

Printer Languages

Language	Description
Escape Codes	Used to control dot matrix printers.
Printer Control Language (PCL)	Hewlett-Packard has created several versions of a printer control language called PCL. Many modern printers understand PCL.
PostScript	Adobe created a printer language called PostScript that easily handles scaling of certain fonts and images.

Troubleshooting Printers

If the printer prints, but the printout quality is poor, check the following:
- Check ribbon, ink, and toner levels.
  - For dot matrix printers, printer images become faint when the ribbon needs to be replaced. Also, ensure that there isn't too much of a gap between the printer head and the paper.
  - For inkjet printers, if letters have missing lines, use the printer's automatic cleaning feature. If this doesn't work, replace the printer cartridge. For missing or incorrect colours, verify ink levels.
  - For laser printers with missing lines, try shaking the toner cartridge to distribute the toner evenly. If lines are still missing, or if extra characters appear, you might need to have the printer cleaned or some internal components replaced.
- For laser printers:
  - A dirty primary corona wire can cause a vertical stripe down the print job because that part of the OPC drum is not being charged by the charge corona.
  - A dirty secondary corona wire could cause the same problem because the charge is not being applied to part of the paper.
  - If toner is not sticking to the paper, check the transfer rollers.
  - A faulty static eliminator strip might cause paper jams because the paper will stick to the components inside the printer.
- For newer laser and inkjet printers, calibrate the printer (perform a self test). Calibration fixes blurry text or incorrect colours.
- If the text appears garbled, make sure the proper printer driver is used.
- If the page only prints part way through (and the rest of the page is blank), you might need to upgrade the memory on the printer or check the print server settings.
- Check the pickup rollers; if paper is not being fed through the printer properly.

Scanners

- Scanners use a light source and a Charge-Coupled Device (CCD) that captures light and converts it to digital data.
- Twain is a scanner language that bridges the different scanners to a common form that can be interpreted by typical graphics software applications.

Below is a typical scanner and its components