

A laser printer is a high-quality, fast printer that uses a laser beam to create an image. The central part of the laser printer is its imaging drum. The drum is a metal cylinder that is coated with a light-sensitive insulating material. When a beam of laser light strikes the drum, it becomes a conductor at the point where the light hits it.

As the drum rotates, the laser beam draws an electrostatic image upon the drum. The undeveloped or latent image is passed by a supply of dry ink or toner that is attracted to it. While the image is being exposed on the drum, an individual sheet of paper has been pressed between a separation pad and pickup roller and is fed toward the drum.

The drum turns and brings the exposed image in contact with the paper, which attracts the ink from the drum. The paper is then passed through a fuser assembly that is made up of hot rollers, which melts the toner into the paper.

Printing Process

The laser printer process involves seven steps to print information onto a single sheet of paper.

1. Processing - The data from the source must be converted into a printable form. The printer converts data from common languages, such as Adobe PostScript (PS) or HP Printer Command Language (PCL), to a bitmap image stored in the printer's memory. Some laser printers have built in Graphical Device Interface (GDI) support. GDI is used by Windows applications to display printed images on a monitor so there is no need to convert the output to another format such as PostScript or PCL.

2. Charging - The previous latent image on the drum is removed and the drum is conditioned for the new latent image. A wire, grid, or roller receives a charge of approximately -600 volts DC uniformly across the surface of the drum. The charged wire or grid is called the primary corona. The roller is called a conditioning roller.

3. Exposing - To write the image, the photosensitive drum is exposed with the laser beam. Every portion of the drum that is scanned with the light has the surface charge reduced to about -100 volts DC. This electrical charge has a lower negative charge than the remainder of the drum. As the drum turns, an invisible latent image is created on the drum.

4. Developing - The toner is applied to the latent image on the drum. The toner is a negatively charged combination of plastic and metal particles. A control blade holds the toner at a microscopic distance from the drum. The toner then moves from the control blade to the more positively charged latent image on the drum.

5. Transferring - The toner attached to the latent image is transferred to the paper. A corona wire places a positive charge on the paper. Because the drum was charged negatively, the toner on the drum is attracted to the paper. The image is now on the paper and is held in place by the positive charge. Because color printers have three cartridges of ink, a colored image must go through multiple transfers to be complete. To ensure precise images, some color printers write multiple times onto a transfer belt that transfers the complete image to paper.

6. Fusing - The toner is permanently fused to the paper. The printing paper is rolled between a heated roller and a pressure roller. As the paper moves through the rollers, the loose toner is melted and fused with the fibers in the paper. The paper is then moved to the output tray as a printed page. Laser printers with duplex assemblies can print on both sides of a sheet of paper.

7. Cleaning - When an image has been deposited on the paper and the drum has separated from the paper, the remaining toner must be removed from the drum. A printer might have a blade that scrapes the excess toner. Some printers use an AC voltage on a wire that removes the charge from the drum surface and allows the excess toner to fall away from the drum. The excess toner is stored in a used toner container that is either emptied or discarded.

These are some advantages of a laser printer:

- Low cost per page
- High ppm
- High capacity
- Prints are dry

These are some disadvantages of a laser printer:

- High cost of start up
- Toner cartridges are expensive
- Require a high level of maintenance

Some retail cash registers or older fax machines might contain thermal printers. Thermal paper is chemically treated and has a waxy quality. Thermal paper becomes black when heated. After a roll of thermal paper is loaded, the feed assembly moves the paper through the printer. Electrical current is sent to the heating element in the print head to generate heat. The heated areas of the print head make the pattern on the paper.

A thermal printer has the following advantages:

- Longer life because there are few moving parts
- Quiet operation
- No cost for ink or toner

A thermal printer has the following disadvantages:

- Paper is expensive.
- Paper has a short shelf life.
- Images are poor quality.
- Paper must be stored at room temperature.
- Color printing is not available.

Impact printers have print heads that strike an inked ribbon, causing characters to be imprinted on the paper. Dot matrix and daisy wheel are examples of impact printers.

The following are some advantages of an impact printer:

- Uses less expensive ink than inkjet or laser printers
- Uses continuous feed paper
- Has carbon-copy printing ability

The following are some disadvantages of an impact printer:

- Noisy
- Low-resolution graphics
- Limited color capability

Types of Impact Printers

A daisy wheel printer uses a wheel that contains letters, numbers, and special characters. The wheel rotates until the required character is in place, and then an electromechanical hammer pushes the character into the ink ribbon. The character then strikes the paper, imprinting the character on the paper.

A dot matrix printer is similar to a daisy wheel printer, except that it has a print head containing pins that are surrounded by electromagnets instead of a wheel. When energized, the pins push forward onto the ink ribbon, creating a character on the paper. The number of pins on a print head, 9 or 24, indicates the quality of the print. The highest quality of print that is produced by the dot matrix printer is referred to as near letter quality (NLQ).

Most dot matrix printers use continuous-feed paper, also known as tractor feed. The paper has perforations between each sheet, and perforated strips on the side are used to feed the paper and to prevent skewing or shifting. Sheet feeders that print one page at a time are available for some higher quality printers. A large roller, called the platen, applies pressure to keep the paper from slipping. If a multiple-copy paper is used, you can adjust the platen gap to the thickness of the paper.