

THE PRINTER

Principles of Operation of Laser Printer

The term 'LASER' stands for Light Amplification by Stimulated Emission of Radiation. A laser printer operates on the principle of electro-photography used in photocopy machine. The laser printer uses a beam of laser for the purpose of printing. The basic functioning of the laser printer is the principle of static electricity. Electric charge that accumulates on an insulated object is called static electricity. Since oppositely charged atoms (positive and negative) are attracted to each other, objects with opposite static electricity fields get attached to each other. The laser printer uses this property to combine ink powder and paper.

The laser printer consists of a revolving cylinder that is made up of photoconductive material. Initially, the drum is given a positive charge with the help of a wire and the drum starts revolving. This wire is known as Corona Wire. The wire has electric current passing through it.

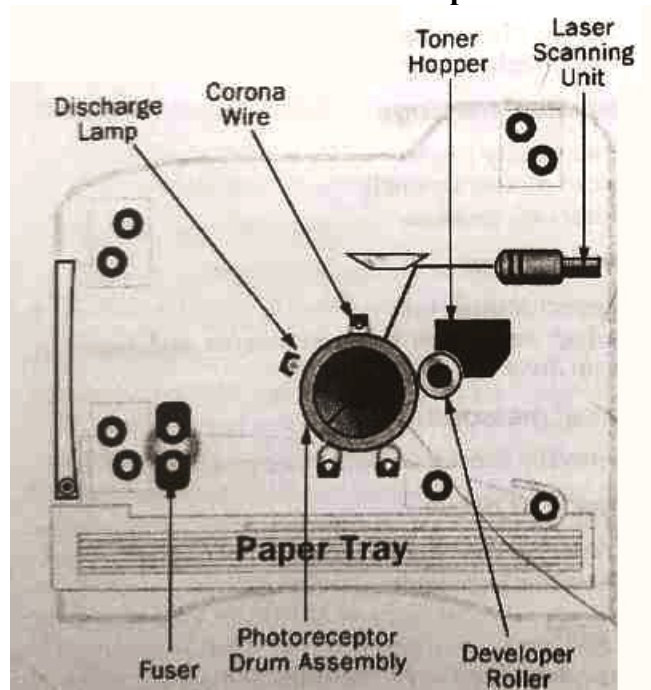
The laser printer works in the following manner:

1. In a laser printer, the photosensitive drum or the Organic Photo Conductive (OPC) drum is the main component for the image formation system. It is the center of the complete image formation process. The photo conductive drum is given a positive or negative charge by the charge corona wire.
2. As the drum starts revolving, the printer shines a laser beam on the surface of the drum to create some discharge points. In this way, the laser draws letters and images to be printed as pattern of electrical charge. In order to draw the pattern on drum, the laser receives the page data (tiny dots that make up text and images) one horizontal line at a time. Also, the laser does not move the beam itself; instead, it emits the beam on a movable mirror. The mirror moves and shines the beam through a series of lenses on the surface of the drum.
3. After the pattern is set, the printer coats the negatively charged surface of the drum with toner—a type of fine black powder. Since the toner is positively charged, it sticks only on the negatively discharged points on the drum.
4. With powder pattern attached, the drum rolls over the sheet of paper coming from the paper tray. This paper sheet is positively charged. The positive charge is strong enough to attract the negatively charged toner particles from the drum. The toner particles leave the drum and go onto the paper. At this point, the image is on the paper. However, the particles are held only by their opposite charge.
5. The printer passes the pages through the fuser, a pair of heated rollers. As the paper passes, the loose toner powder melts, fusing with the fibers in the paper. This makes the image permanent. The fuser rolls the paper to the output tray and you get the finished page. Printouts from laser printers are warm because they pass through the fuser before being released. However, the paper moves at a very high speed and, therefore, it does not get burned. The fuser rollers must be coated with Teflon, which is a non-sticky material. Thus, this material prints the collection of toner on the fuser.
6. Lastly, the drum is cleaned to remain any toner particles left on it. Then the drum surface passes the discharge lamp. The bright light of the lamp exposes the entire surface of the drum, thus erasing the pattern of electric charge. Then the corona wire reapplies the positive charge to the drum, preparing the drum for the next printing job.

Various Components of Laser Printer

The basic parts that a laser printer consists of are toner hopper, corona wire, discharge lamp, laser scanning unit, fuser, developer roller and a photoreceptor drum assembly. Each of these parts plays an important role in the printing process.

Basic Laser Printer Components



1. Toner hopper

The toner of the laser printer is stored in a little compartment that is known as the toner hopper. This toner hopper section is basically a small container that is built into a removable casing, so that it can be removed, filled and put back into the laser printer without any trouble.

2. Corona Wire

An initial storage of the printing, a light-sensitive drum, is given a positive charge with the help of a wire and the drum starts revolving. This wire is known as corona wire.

3. Discharge Lamp

The bright light of the lamp exposes the entire surface of the drum, erasing the pattern of electric charges.

4. Laser Scanning Unit

The laser, scanning unit is capable of radiating heat generated by a light source.

5. Fuser

A fuser comprises two rollers, which are heated. The heat element in the fuser is an important aspect of finishing the printing job. When the paper goes in between these two rollers that are heated, the toner powder that has remained loose will melt and combine with the fiber present in the paper. Next, the fuser simply passes the paper into the output tray.

6. Photoreceptor

The most important part of the laser printer is the photoreceptor. The photoreceptor basically consists of a cylinder or k drum that revolves, using highly photoconductive material that is dispersed by light photons.

Stages Involved in Printing Process of the Laser Printer

Let us now see the steps performed by the laser printer during the print process.

1. Charging

This step cleans the surface of the cylindrical photosensitive drum. The drum is prepared for use and corona wire passes electric charge to the drum.

2. Writing

The laser beam along with the movable lens together writes an image of document on the drum surface,

3. Developing

During this step, the toner (fine black powder) gets attached to the positive points of the drum.

4. Transferring

Image made with dry toner powder on the drum surface gets transferred to the paper.

5. Detaching

This step removes the paper, along with the dry toner image on the paper surface, from the drum.

6. Fusing

It is the job of the fusing section to melt the toner and fuse it on the printing media by applying heat and pressure. This makes the image permanent.

7. Cleaning

In this process, the toner is cleaned from the drum. The cleaning blade removes any toner that remains on the drum after the transfer process. The toner that removed is collected in a separate waste toner compartment within the toner cartridge. Waste toner cannot be reused for printing because it can be contaminated with dust and paper fibers. A quality printed image requires clean toner.

Exercise:

1: Write a short note on Laser Printer.

2: List Various Components of the Laser Printer.

3: Write the various stages in printing process of laser printer.