

How Laser Printers Work

Even if you're comfortable with the terms and concepts involved with a laser printer, you may not have a clear idea of how the components fit together. Follow the steps below for a guided tour through the print mechanism. We'll take you through the five main steps of laser printing: input, the laser, the OPC (optical photoconductor drum), the fuser, and finally, the laser-crisp output.

1 Input

When you click the Print button on your computer, the printer's driver software translates the information on your screen into a print format. A driver for a four-color printer, for example, must translate your screen's RGB information (red, green, blue) into four printable colors, such as CMYK (cyan, yellow, magenta, and black).

This data is transmitted to the printer through a bidirectional (IEEE-1284) parallel cable, or a network connection such as Ethernet 10Base-T or 100Base-T.

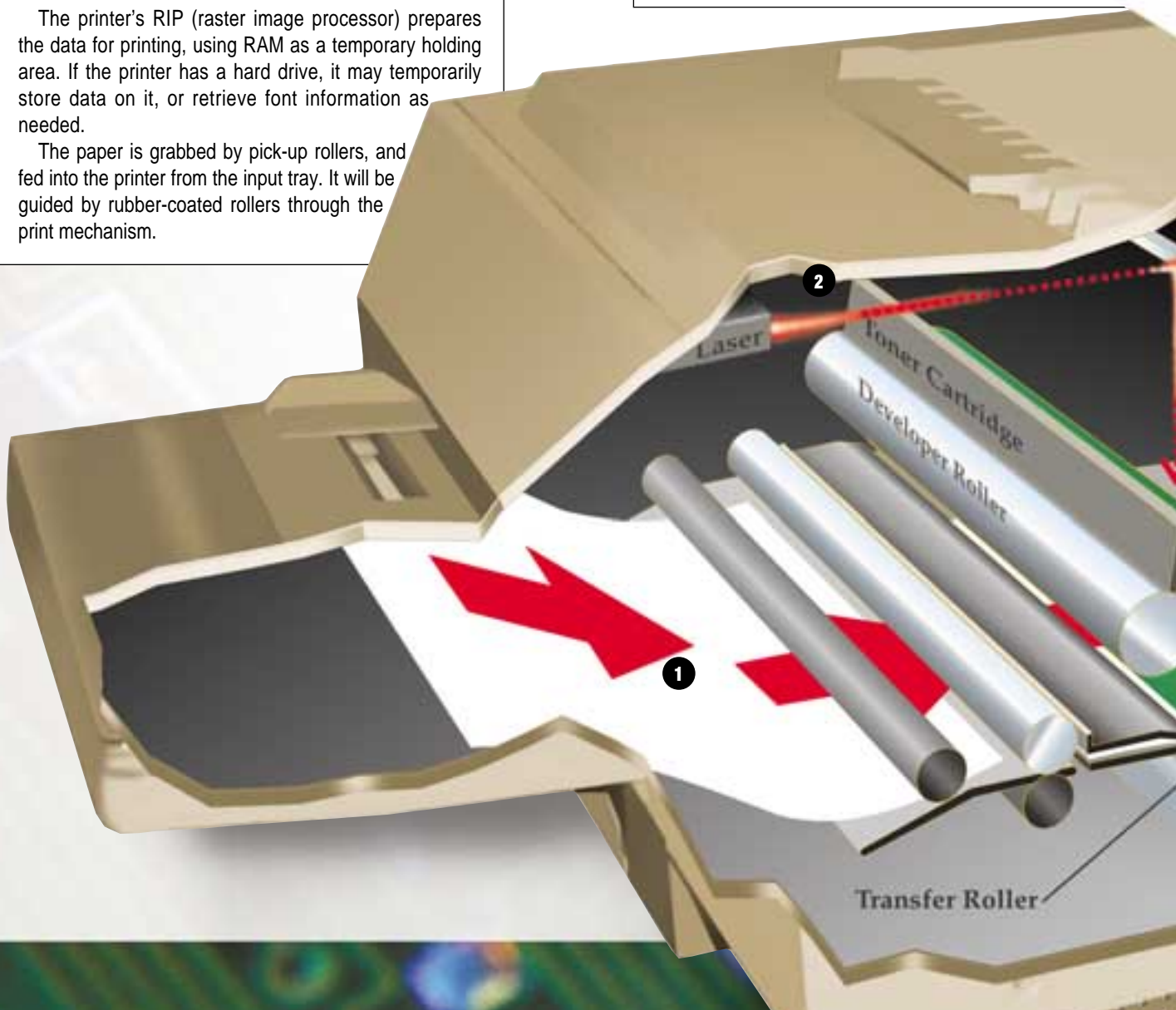
The printer's RIP (raster image processor) prepares the data for printing, using RAM as a temporary holding area. If the printer has a hard drive, it may temporarily store data on it, or retrieve font information as needed.

The paper is grabbed by pick-up rollers, and fed into the printer from the input tray. It will be guided by rubber-coated rollers through the print mechanism.

2 Laser

The RIP sends the printable data (a page at a time) to the printhead, which may contain a laser or a bank of LEDs (light-emitting diodes). Lasers are usually aimed at spinning polygonal mirrors, which direct the beam through prisms and then across the rotating OPC imaging drum (below). Typically, lasers are rapidly turned off and on to differentiate printed dots from nonprinted areas. A laser also may be constantly left on, but electronically governed by LCD (liquid-crystal display) "shutters."

The many tiny light sources of LED printheads may span the width of the OPC, and consequently don't need mirrors to reach the edges of the drum. An LED print-head stays in one place, but its legions of light-emitting diodes blink on or off as needed.



3 OPC Drum

The OPC (optical photoconductor drum, also called an imaging drum) is covered with a substance whose electrical properties change when struck by light. As the OPC rotates, it receives an electrostatic charge across its surface from the charge roller.

The laser blinks on and off as the mirror plays it across the face of the OPC drum, causing the points of the OPC hit by the light to lose their static charge. These parts will attract charged particles of toner (dry ink) from the toner cartridge via the developer roller while the rest of the OPC drum will repel the toner particles. The toner-covered parts form the image that will be printed to the paper.

A clean sheet of paper rolls between the OPC and the transfer roller, which attracts the toner particles away from the OPC and on to the page. In a color laser printer, the paper may be cycled through this process three or four times (once for each color of toner).

4 Fuser

Next, the paper is heated and compressed by the fuser roller. This hollow metal tube is heated by an internal halogen lamp. The heat (about 300 degrees Fahrenheit) melts the toner permanently into the page. Some laser printers, especially color models, automatically apply silicon-based fuser oil to the fuser roller to keep the toner from sticking to it. A felt-edged fuser wand continuously cleans the fuser.

The rotating OPC gets its excess toner scraped off, its charge depleted by light, and an even new surface charge from the charge roller. It is now ready to receive new information from the laser.

5 Output

The finished printout feeds into the output tray. The melted toner cools rapidly, leaving a printed image much more durable than that from an inkjet printer.

