Lab Understanding Laser Printers

Objective

The objective of this lab exercise is for you to inspect and understand the function of each component within a laser printer. After completing this lab exercise, you will be able to:

- Describe the function of each internal laser printer component.
- Describe the laser printing process.

Materials Required

- Operating system: N/A
- Lab workgroup size: 2–4 students
- Configuration type: N/A

Additional Devices

- One functional laser printer for each lab workstation
- One disassembled printer cartridge
- Labels for each lab laser printer

Lab Setup & Safety Tips

- The instructor should be familiar with the lab laser printers.
- Always unplug the power cord before touching any component in the printer.

Activity

Inspecting and labeling a laser printer cartridge

1. Using Figure 18-1 as a guide, identify each component in the disassembled laser printer cartridge, and describe its function on the lines provided.

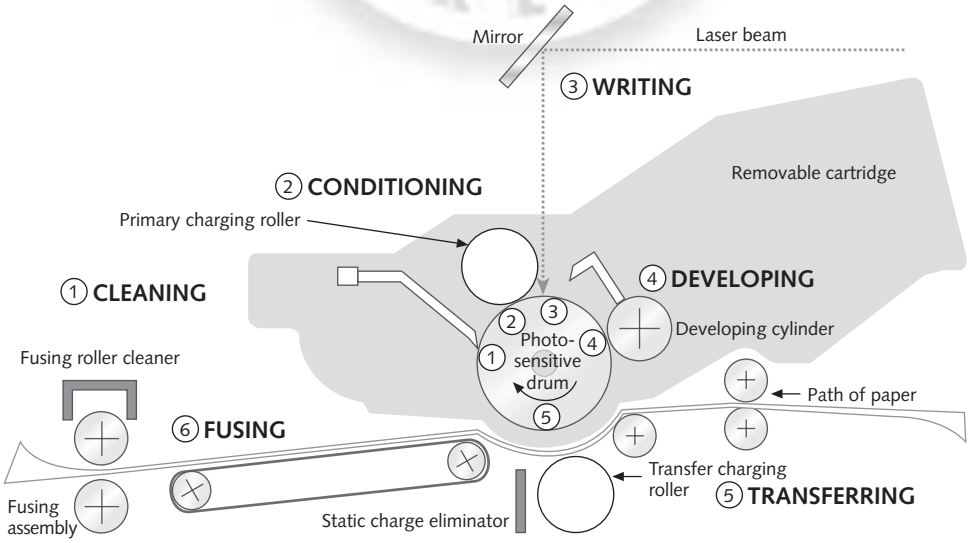

Figure 18-1 The six progressive steps of laser printing

Primary charging roller _____

_____

_____

_____

Photosensitive drum _____

_____

_____

_____

Developing cylinder _____

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_____

_____

Inspecting and labeling a laser printer

Although all laser printers follow the same printing process, each has a different design. Your instructor will show you how to disassemble your lab workstation's laser printer so you can complete the following exercise.

1. Power off and unplug your laser printer.

   (If your laser printer has been used recently, allow it to cool before proceeding.)

2. Open your laser printer.
3. Identify each of the following laser printer components and describe its functionality:

   Fusing components _____

   _____

   _____

   _____

   Paper path _____

   _____

   _____

   _____

   Primary charging roller _____

   _____

   _____

   _____

   Transfer charging roller _____

   _____

   _____

   _____

Power supply _____

Lab Notes

The Six Steps of Laser Printing:

Step 1: Cleaning

The printer uses the cleaning blade to scrape leftover toner from the previous image off the drum. It removes the previous electrostatic image from the drum with an erase lamp.

Step 2: Conditioning

The primary charging roller applies a uniform negative charge (-600 volts) to prepare the drum for the new image. *Warning*: Do not expose the drum to light.

Step 3: Writing

- The PC sends the image to the formatter.
- The PC formatter sends the image to the DC controller.
- A laser beam is initiated and directed toward the scanning mirror.
- The laser beam reflects off the scanning mirror and is focused by the focusing lens.
- The laser deflects off the mirror and is projected through a slit into the removable cartridge.

Note that the speed of both the drum motor and the scanning mirror motor are synchronized so that the laser beam completes one scan line and returns to the beginning of the drum.

Step 4: Developing

The electrostatic image develops into a visible image when toner from a developer cylinder is transferred to the discharged (-100 volt) areas of the drum. The developer cylinder has a magnetic core that attracts the iron in the toner. As the cylinder rotates, the doctor blade keeps the toner at a uniform height. The toner acquires a negative charge by rubbing against the developer cylinder. This negative charge causes the toner to be attracted to the relatively positive (-100 volt) areas of the drum that have been exposed to the laser light.

Lab Notes (continued)

Step 5: Transferring

The transfer charging roller produces a positive charge (+600 volts) on the back of the paper that pulls the toner off the drum and onto the paper. Once the toner is on the paper, a static charge eliminator reduces the paper's charge.

Step 6: Fusing

The toner is held on the paper by gravity and a weak electrostatic charge until it reaches the fuser assembly. Heat (180° C/356° F) and pressure applied by the fuser rollers melt the toner into the paper and produce a permanent image. Because the photosensitive drum is 3.75 inches in circumference, the print cycle must be repeated several times to print one sheet of paper. If the temperature rises above 410° F, the printer automatically shuts down to cool off the fuser.

What about ink jet printers?

As the print head moves across the paper, an electrical pulse flows through thin resistors at the bottom of all the chambers that the printer uses to form a character or image. The resistor in each chamber heats a thin layer of ink to more than 900° F to form a vapor bubble. As the vapor bubble expands, it pushes ink through the nozzle to transfer a drop of ink to the paper. A typical character is formed by an array of ink drops arranged in a pattern that is 20 across by 20 high.

Review Questions

Circle True or False.

1. The photosensitive drum is always housed within the printer cartridge. True / False
2. The primary charging roller is always housed within the fuser. True / False
3. During the printing process, mirrors are used to control the movement of a tiny laser beam. True / False
4. What are the six steps of the laser printing process?

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5. Describe how to replace the fuser in your lab workstation.

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