COMPLETE A+ GUIDE TO IT HARDWARE AND SOFTWARE

CompTIA® A+ Exams 220-1101 & 220-1102

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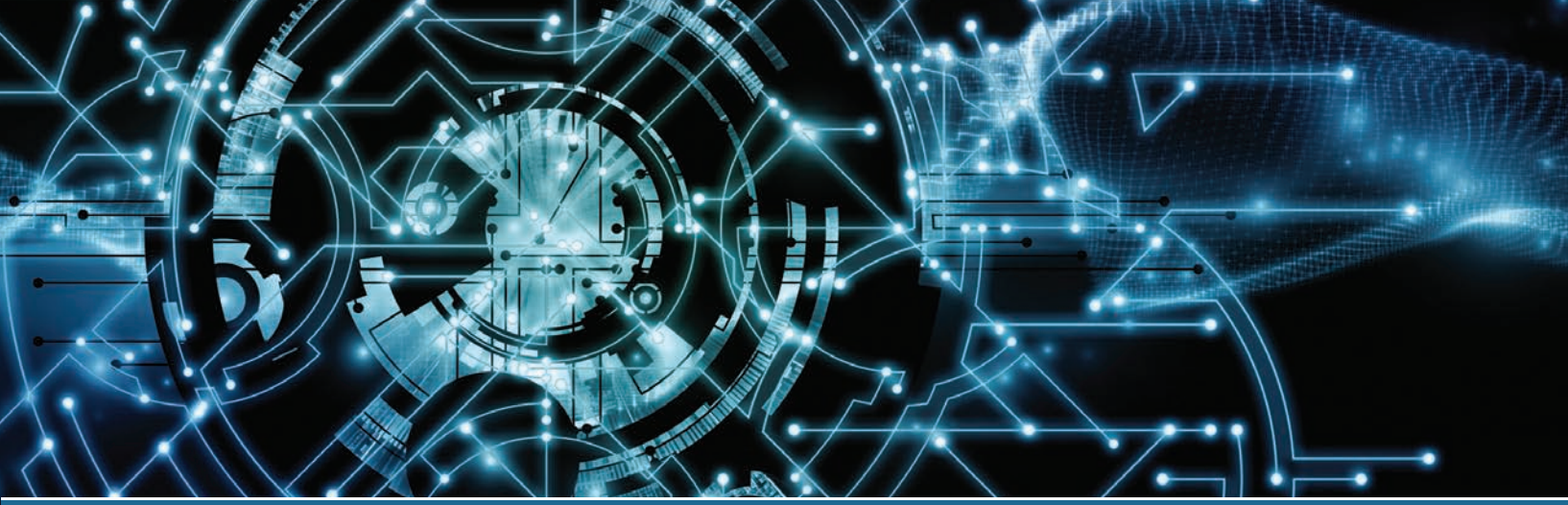

Complete A+ Guide to IT Hardware and Software

A CompTIA® A+ Core 1 (220-1101) & CompTIA A+ Core 2 (220-1102) Textbook

NINTH EDITION

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PEARSON IT
CERTIFICATION

TECH TIP

Be aware of optimized DPI

Many inkjet printers now show their DPI as *optimized* DPI. Optimized DPI describes not how many drops of liquid are in an inch but how many are in a specific grid.

Color inkjet printers usually have a black cartridge for text printing and a separate color cartridge or separate cartridges for colored ink. Buying an inkjet printer that uses a single cartridge for all colors means a lower-priced initial printer purchase but is more expensive in the long run. Models do exist that have separate cartridges for black ink and for colored ink.

There are some alternatives to inkjet technology. Table 9.3 outlines four of them.

TABLE 9.3 Other printer technologies

Type of printer	Description
Solid ink printer	Sometimes called a phase change or hot melt printer; uses colored wax sticks to create vivid color output. This type of printer can print more colors, is faster, has fewer mechanical parts, and is cheaper than color laser printers but is more expensive than normal inkjet printers.
Dye sublimation printer	Also known as a dye diffusion thermal transfer printer; uses four film ribbons that contain color dyes. The quality is high, but the printers are expensive.
Thermal wax transfer printer	Uses wax-based inks like a solid ink printer but prints at lower resolutions.
Large-format inkjet printer	A wide printer to print large-scale media such as CAD drawings, posters, and artwork.

A drawback to using an inkjet printer is that sometimes the ink smears. Ink manufacturers vary greatly in how they respond to this problem. If the paper gets wet, some inkjet output becomes messy. The ink also smears if you touch the printed page before the ink dries. The ink can also soak into and bleed down the paper. Using good-quality paper and ink in the ink cartridge helps with this particular problem. See the section "Paper," later in this chapter, for more information on choosing the correct paper for different printers.

Laser Printers

A laser printer uses a process similar to a copy machine's electrophotographic process. Before exploring how a laser printer works, identifying the major parts inside the printer helps to understand how it works. Figure 9.8 shows a side view of a laser printer.

TECH TIP

Knowing the dangers inside laser printers

Be very careful when working inside a laser printer. There are high voltages and high temperatures in various parts. Turn off the printer and let it cool down before servicing it. Remove power from the printer before working on it, when possible.

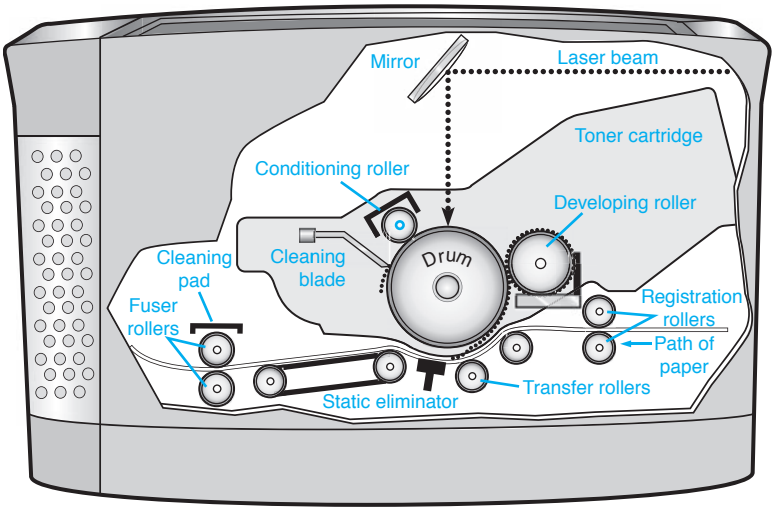

FIGURE 9.8 Inside a laser printer

The computer sends 1s and 0s to the printer. The data is converted into dots, and sent through an array of LEDs or through a laser beam. The light beam strikes the photosensitive imaging drum located inside the toner cartridge (see Figure 9.9). Laser toner particles are attracted to the drum. The paper feeds through, and the toner transfers to the paper. The toner is then fused or melted onto the paper. Table 9.4 summarizes the seven-step laser printer **imaging process.**

FIGURE 9.9 Laser imaging drum

TABLE 9.4 Laser printer imaging process

Step	Description
Processing	Gets the data ready to print. The laser printer converts the data from the printer language into a bitmap image. The laser printed page is made up of very closely spaced dots.
Charging	Also known as conditioning, as it conditions or gets the drum ready for use. Before any information goes onto the drum, the entire drum must have the same voltage level. The primary (main) corona or conditioning roller has up to –6,000VDC applied to it and anywhere from –600V to –1,000V applied to the drum surface as a uniform electrical charge.

Step	Description
Exposing	Also known as the writing phase, puts 1s and 0s on the drum surface. Light reflects to the drum surface in the form of 1s and 0s. Every place the beam touches, the drum's surface voltage is reduced. The image on the drum is nothing more than dots of electrical charges and is invisible at this point.
Developing	Gets toner on the drum (develops the image). A developing cylinder or roller is inside the toner cartridge (right next to the drum) and contains a magnet that runs the length of the cylinder. When the cylinder rotates, toner is attracted to the cylinder because the toner has iron particles in it. The toner receives a negative electrostatic charge. The magnetized toner particles are attracted to the places on the drum where the light beam strikes. The image is now black on the drum surface.
Transferring	Transfers an image to paper. A **transfer belt** (or an equivalent part, such as a **transfer roller**, corona, or pad) is located at the bottom of the printer and places a positive charge on the back of the paper. The positive charge attracts the negatively charged toner particles from the drum. The particles leave the drum and go onto the paper. At this point, the image is on the paper, but the particles are held only by their magnetic charge.
Fusing	The **fuser assembly** melts the toner onto the paper. Heat and pressure make the image on the paper permanent. The paper, with the toner particles clinging to it, immediately passes through fusing rollers or a belt that applies pressure to the toner. The top roller applies intense heat (350°F) to the toner and paper that literally squeezes and melts the toner into the paper fibers. Figure 9.10 shows an example of a fuser assembly and the motor used with it.
Cleaning	Wipes off any toner left on the drum. Some books list this as the first step, but the order does not matter because the process is a continuous cycle. During the cleaning stage, a wiper blade or brush clears the photosensitive drum of any excess toner. Then an erase lamp neutralizes any charges left on the drum so the next printed page begins with a clean drum.

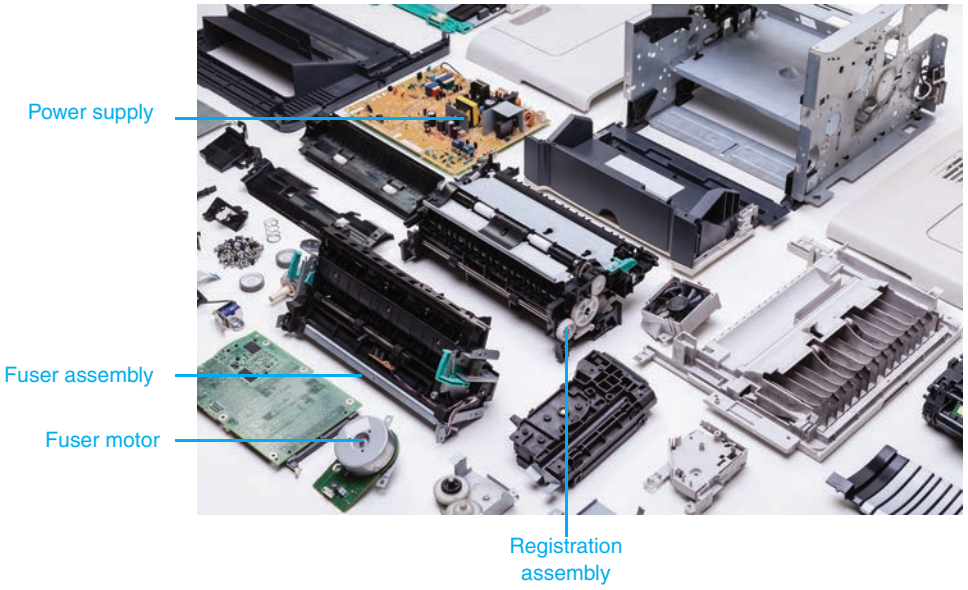

FIGURE 9.10 Laser printer parts

A mnemonic (where the first letter of a saying helps you remember another word) for the laser printer imaging process is as follows: Printers Can Expediently Do Tasks For Companies.

TECH TIP

Laser printers *do* make weird noises

A laser printer frequently makes an unusual noise that is a result of the fusing rollers turning when the printer is not in use. If the rollers didn't turn like this, they would have an indentation on one side. Users not familiar with laser printers sometimes complain about this noise, but it is a normal function of a laser printer.

Table 9.5 lists the major parts of a laser printer and briefly describes the purpose of each part.

TABLE 9.5 Laser printer parts

Part	Purpose
AC power supply	Acts as the main power supply for the printer
Cleaning blade	Wipes away excess toner from the drum before printing the next page
Cleaning pad	Applies oil to the fusing roller to prevent sticking; also removes excess toner during the fusing stage
Conditioning roller	Used instead of a primary corona wire to apply a uniform negative charge to the drum's surface
Control panel assembly	Acts as the user interface on the printer
Density control blade	Controls the amount of toner allowed on the drum (usually user adjustable)
Developing cylinder	Rotates to magnetize the toner particles before they go on the drum (also called the developing roller)
Drum (photosensitive)	Also known as **imaging drum**; accepts light beams (data) from LEDs or a laser; can be permanently damaged if exposed to light; humidity can adversely affect it
Duplexing assembly	Supports two-sided printing
ECP (electronic control package)	The main board for a printer that usually holds most of the electronic circuitry, the CPU, and RAM
Erase lamp	Neutralizes any residual charges on the drum before printing the next page
Fuser (fusing) assembly	Holds the fusing roller, conditioning pad, pressure roller, and heating unit
Fusing roller	Applies pressure and heat to fuse the toner into the paper
High-voltage power supply	Provides a charge to the primary corona or conditioning roller, which puts a charge on the drum
Main motor	Provides the power to drive several smaller motors that drive the gears, rollers, and drum
Pickup rollers (feed rollers)	Rollers used along the paper path to feed paper through the laser printer
Primary corona (main corona)	Applies a uniform negative charge to the drum's surface
Registration assembly	Holds the majority of the rollers and gears to move paper through the unit

Part	Purpose
Separation pad	A bar or pad in a laser printer that can have a rubber or cork surface that rubs against the paper as it is picked up
Scanner unit	Includes a laser or an LED array that is used to write the 1s and 0s onto the drum surface
Toner	Powder made of plastic resin particles and organic compounds bonded to iron oxide
Toner cartridge (EP cartridge)	Holds the conditioning roller, cleaning blade, drum, developing cylinder, and toner; always remove the toner cartridge before shipping a laser printer
Transfer corona wire (transfer belt or roller)	Applies a positive charge on the back of the paper to pull the toner from the drum onto the paper

Figure 9.11 shows the inside of a toner cartridge.

FIGURE 9.11 Inside a laser printer cartridge

TECH TIP

A word about spilled toner

Toner melts when warmed; small toner spills outside a printer can be wiped using a cold, damp cloth. Toner spills inside a printer require a special type of vacuum with special bags. Toner on clothing can normally be removed by washing in cold water. Do not put the clothing in a dryer if the toner has not yet been removed, or the toner will melt into the clothing and become impossible to remove.

Thermal Printers

Thermal printers are used in a lot of retail establishments and at kiosks, gas pumps, trade shows, and basically anywhere someone needs a little printer to print a document, such as a receipt. IT staff commonly service thermal printers. Thermal printers are also known as point of sale (POS) or cash register printers.

A thermal printer uses **special thermal paper** that is sensitive to heat. A print head has closely spaced **heating elements** that appear as closely spaced dots on the heat-sensitive paper. A **feed assembly** is used to move the thermal paper through the printer. Figure 9.12 shows examples of thermal printers. Figure 9.13 shows how a thermal printer works.

FIGURE 9.12 Thermal printers

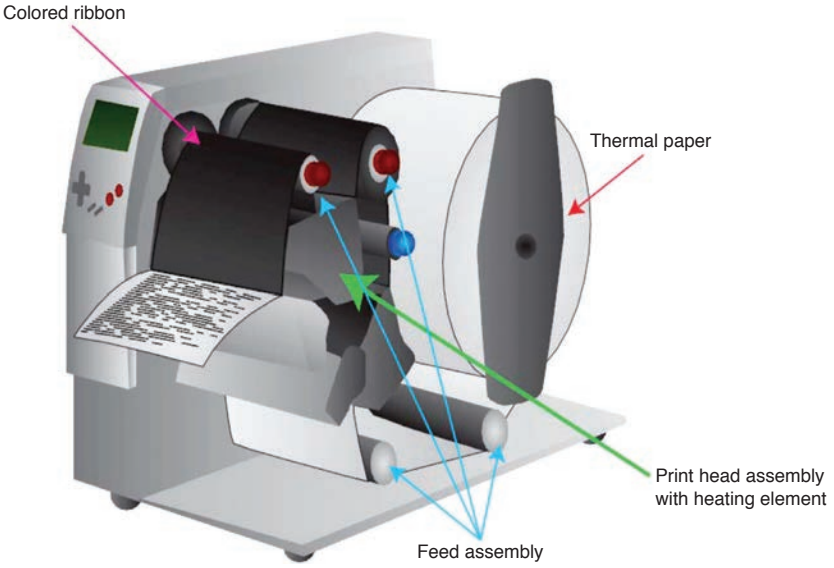

FIGURE 9.13 Inside a thermal printer

A technician must be sure to warn the user about the **high sensitivity of thermal paper** and to store the paper in a cool location. Most thermal printing situations—such as parking receipts and bar codes—require high-sensitivity thermal paper that does not last long. Other situations—such as certain sales receipts, warehouse labeling, and supermarket weigh scale labels—require low-sensitivity thermal paper that is not as affected as much by high temperatures or exposure to the sun.

The thermal print head is one of the most important parts of a thermal printer. The print head can be damaged in several ways:

- Residue or material buildup can cause uneven printing or missing dots.
- Opening the print mechanism while printing can damage the print head.
- Poor-quality thermal paper can damage the print head.
- A dirty environment can damage the print head.
- Other objects (stuck labels, staples, paper clips, and debris) can damage the print head.