

# Chapter 7: Fundamental Printers and Scanners



## IT Essentials: PC Hardware and Software v4.1

# Chapter 7 Objectives

- 7.1 Describe the types of printers currently available
- 7.2 Describe the installation and configuration process for printers
- 7.3 Describe the types of scanners currently available
- 7.4 Describe the installation and configuration process for scanners
- 7.5 Identify and apply common preventive maintenance techniques for printers and scanners
- 7.6 Troubleshoot printers and scanners

# Introduction

- Printers produce paper copies of electronic files.
  - Hard copies of computer documents remain important today.
- Scanners allow users to convert paper documents into electronic files.



# Printers

- As a computer technician, you may be required to purchase, repair, or maintain a printer.
- Printer selection criteria:
  - Capacity and Speed
  - Color
  - Quality
  - Reliability
    - Warranty
    - Scheduled servicing
    - Meat time between failures (**MTNF**)
- Total Cost of Ownership (**TCO**)

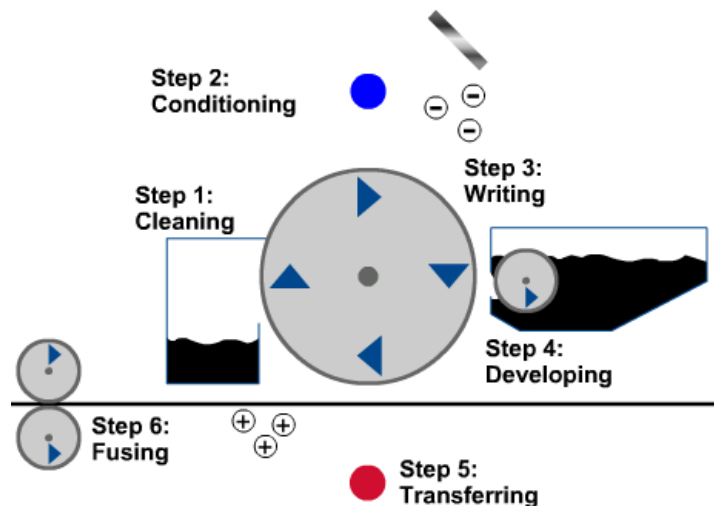
# Printer to Computer Interfaces

- To access a printer, a computer must have an **interface** with it. The following are common interface types:
  - Serial
  - Parallel
  - Small Computer System Interface (SCSI)
  - Universal Serial Bus (USB)
  - Firewire
  - Ethernet
  - Wireless
    - Infrared
    - Bluetooth.
    - Wi-Fi

# Laser Printers

- A laser printer is a high-quality, fast printer that uses a laser beam to create an image.
- **Laser printing process**

1. Cleaning
2. Conditioning
3. Writing
4. Developing
5. Transferring
6. Fusing



- **WARNING:** The primary corona wire or grid, or the conditioning roller, can be very dangerous. The voltage runs as high as -6000 volts. Only certified technicians should work on the unit. Before working inside a laser printer, you should make sure that voltage is properly discharged.

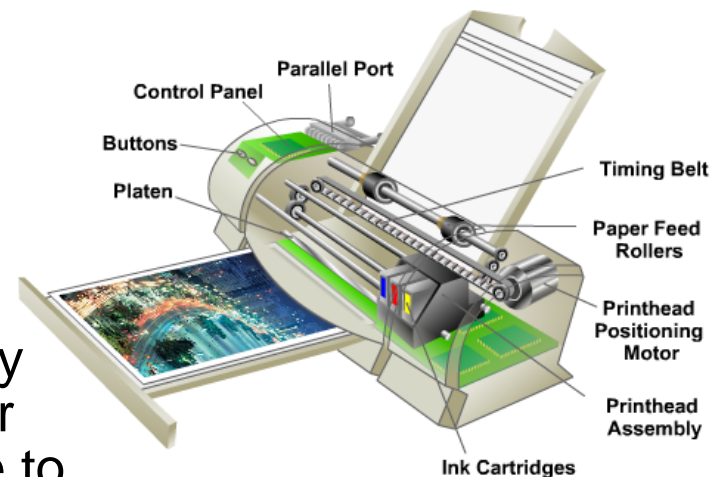
# Impact Printers

- Impact printers use a **print head** impacts a printer tape or inked ribbon to create characters.
- There are two types:
  - **Daisy-wheel**
  - **Dot-matrix**
- They use inexpensive consumables and have carbon copy printing ability. Unfortunately they are also noisy, have lower graphic resolution and limited color capabilities.



# Inkjet Printers

- Use ink-filled cartridges that spray ink onto a page through tiny holes, or **nozzles**. The ink is sprayed in a pattern on the page, one column of dots at a time.
- Two types of inkjet nozzles:
  - **Thermal**
  - **Piezoelectric**
- They produce high quality print, are easy to use and are less expensive than laser printers. However the nozzles are prone to clogging and the ink is wet after printing.
- A **feeding mechanism** draws paper in and the paper passes by the print head where ink is sprayed onto it.

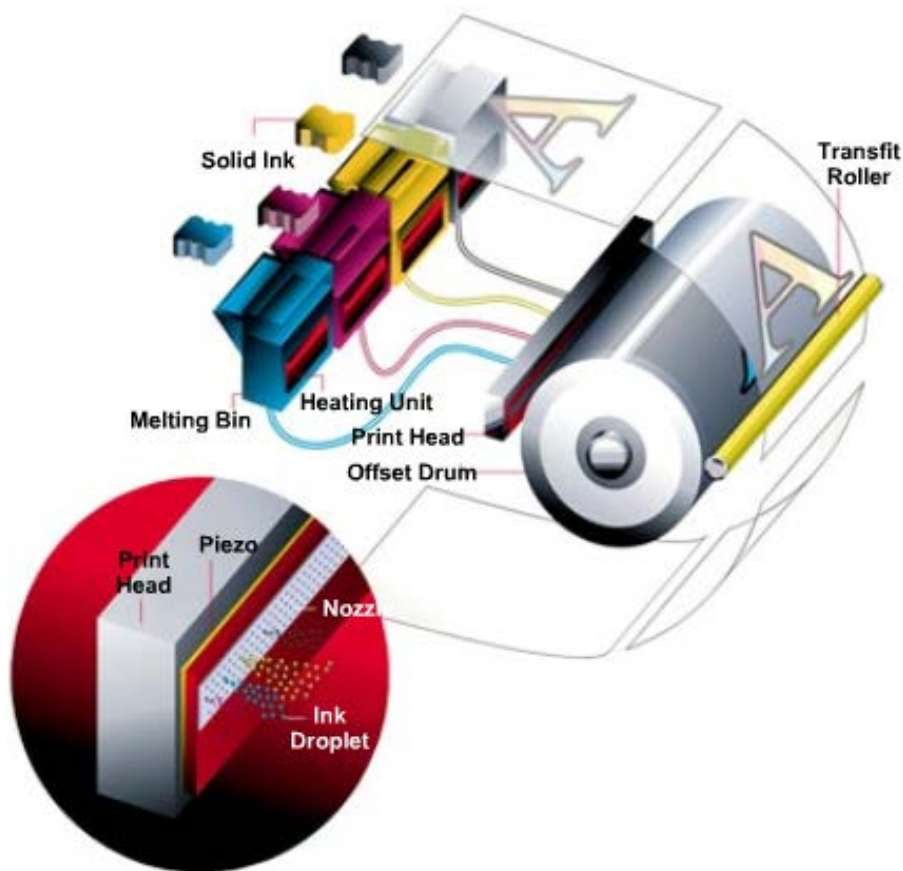




# Solid-ink Printers

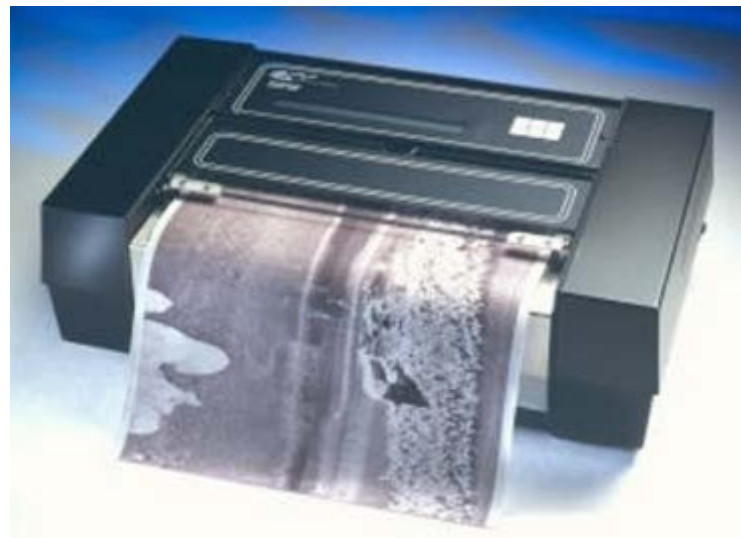
Use solid sticks of ink rather than toner or ink cartridges.

- The printing process:
  1. Cleaning
  2. Spraying
  3. Transferring
- This type of printers produce vibrant color prints and can use many different paper types.
- The printer and the ink used are normally expensive and they are slow to warm up.



# Thermal Printers

- A **thermal printer** uses chemically-treated paper that becomes black when heated.
- A **thermal transfer printer** uses heat-sensitive ribbon, which the print head melts onto the paper.
- Thermal printers have a longer life because there are few moving parts.
- Disadvantages:
  - Paper is expensive
  - Paper has a short shelf life
  - Images are poor quality
  - Paper must be stored at room temperature



# Dye-Sublimation Printers

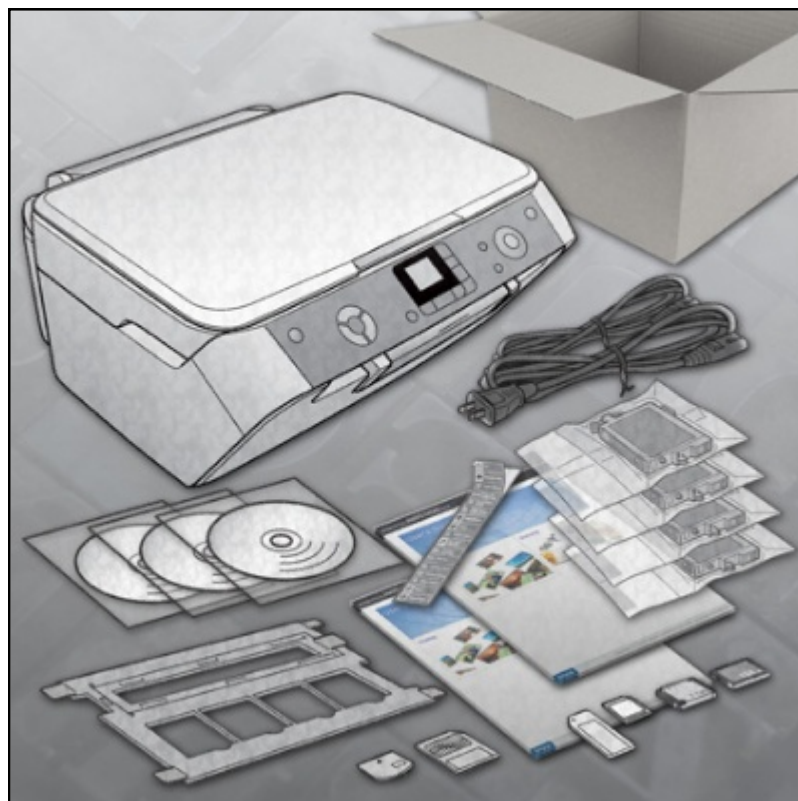
- Also called **thermal dye** printers
- Usually used in producing photo-quality images for graphic printing
- Uses solid sheets of ink that change directly from solid to gas when heated, in a process called **sublimating**
- Advantages:
  - Very high quality images
  - Overcoat layer reduces smearing, increases moisture resistance



- Disadvantages:
  - Media can be expensive
  - They are better for color than for grayscale (black and white)

# Installation and Configuration of Printers

- When purchasing a printer, the installation and configuration information is usually supplied by the manufacturer:



- An installation media that includes drivers, manuals, and diagnostic software.
- Also available as downloads from the manufacturer's website.
- Although all types of printers are somewhat different to connect and configure, there are procedures that should be applied to all printers.

# Installation and Configuration of Printers (Continued)

- Power and Connect the Printer
  - Connect the appropriate data cable to the communication port on the back of the printer.
  - **Warning:** Never plug a printer into a UPS. The power surge that occurs when the printer is turned on will damage the UPS unit.
- Printer Driver
  - **Printer driver** is the software program that enables the computer and the printer to communicate with each other.
  - It is recommendable to find out if a newer driver is available on the manufacturer's website.
- Firmware
  - Set of instructions stored on the printer to control how the printer operates.
  - If printing problems occur or you need new features, consider upgrading the printer's firmware.

# Installation and Configuration of Printers (Continued)

- **Printer Memory**
  - **Printer memory** is used to buffer print jobs, create pages, or draw images for documents.
  - Adding printer memory can improve printing speed and allow the printer to handle more complex print jobs.
- **Configuration Options and Default Settings**
  - Printers have different configurations and default options. Check the printer documentation for details.
- **Optimize Printer Performance**
  - With printers, most optimization is completed through the software supplied with the drivers (Print spool, calibration, orientation).

# Installation and Configuration of Printers (Continued)

- Test Page Printing
  - After installing a printer, you should print a test page to verify that the printer is operating properly.
  - You can print a test print manually, from an application such as Notepad , from the Command Line or from the printer front panel.
- Printer Sharing
  - It enables multiple network users or clients to access a printer. This reduces the expense, as fewer printers are required. Windows 2000/XP installs the print sharing capability in the basic setup.

# Types of Scanners

- Technicians may be required to purchase, repair, or maintain a scanner.
- The following are tasks that a customer may request:
  - Select a scanner
  - Install and configure a scanner
  - Troubleshoot a scanner





# Scanners

- Scanners typically create an RGB image that can be converted into image formats such as JPEG, TIFF, Bitmap, and PNG.
- Some scanners can create text documents using **optical character recognition (OCR)**.
- Resolution of a scanner is measured in **dots per inch (dpi)**. Like printers, the higher the dpi, the better the quality of the image.
- Interfaces and cables used for scanners are typically the same as those used for printers: Parallel, USB, SCSI, and Firewire.

# All-in-one Scanners

- An **all-in-one** device combines the functionality of multiple into one physical piece of hardware (scanner, printer, copier and fax).
- Normally this type of devices are not expensive and easy to configure. Unfortunately they are usually no designed for heavy use and a single problem can affect all the functionality.



# Flatbed Scanners

- Often used to scan books and photographs for archiving.
- Image is acquired by placing the document face down on the glass. The **scanner head** lies beneath the glass and moves along the item, capturing the image.
- The glass should be maintained clean and protected from scratching.



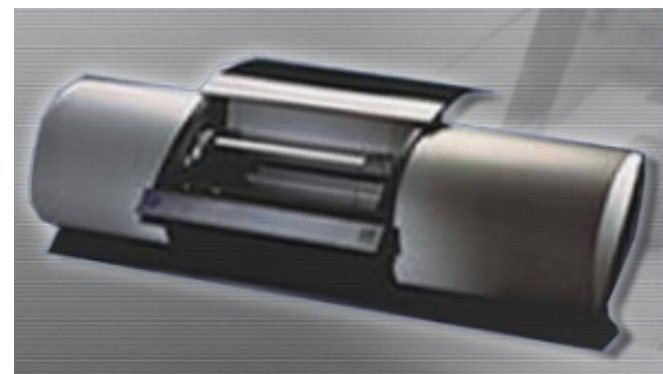
# Handheld Scanners

- A handheld scanner is small and portable.
- Pass the scanner head across the surface you want to scanner.
- When you want to scan an item larger than the head of the handheld scanner, you must make more than one pass to capture the full image.



# Drum Scanners

- Drum scanners produce a high-quality scanned image, but they are being replaced by lower priced, high-quality flatbed scanners.
- Still in use for high-end reproductions, such as archiving photographs in museums.
- To scan an image using a drum scanner you should attach the image to a revolving drum or load it into a supporting canister.



# Installation and Configuration of Scanners

- An installation media includes drivers, manuals, and diagnostic software will be included with the scanner.
- The same tools may also be available as downloads from the manufacturer's website.



# Installation and Configuration of Scanners (Continued)

- Power and Connect the Scanner
  - Scanners can connect to a computer using a USB, FireWire, network, parallel port or a SCSI interface.
  - **Warning:** All-in-one devices that include printers must connect directly to AC power because of the heavy current demands of the printer.
- Scanner Driver
  - **Printer driver** is the software program that enables the computer and the printer to communicate with each other.
  - Once the scanner is connected and started, the computer operating system may be able to discover the scanner through the **Plug and Play (PnP)** process.
- Configuration Options and Default Settings
  - A scanner may come with applications such as Graphic software for editing photographs and other images or OCR software.
  - Some configurations that may be available on a scanner are:
    - Color, grayscale, or black-and-white scanning, One-touch scanning into your choice of software, Quality and resolution choices and Sheet feeders

# Preventive Maintenance Techniques

- Printers and scanners have many moving parts that can wear out over time or through extended use.
- Also moving parts can be affected by dust and other particles.
- Clean printers and scanners regularly to avoid downtime, loss of productivity, and high repair costs.





# Preventive Maintenance Techniques (Continued)

## ■ Printer Maintenance

- Printers have many moving parts and require more maintenance than most electronic devices.
- **CAUTION:** Unplug the printer from the electrical source before beginning maintenance.

## ■ Paper and Ink

- Using the correct type of paper can help you to ensure that the printer operates longer and prints more efficiently.
- Types of printer paper available include inkjet and laser. Some papers, especially photo paper and transparencies, have a right and wrong side marked by an arrow on the package.
- Manufacturer will recommend the brand and type of ink to use. Do not refill ink cartridges because the ink may leak.

# Preventive Maintenance Techniques (Continued)

## ■ Scanner Maintenance

- The scanner surface should be kept clean. If the glass becomes dirty, consult the manufacturer's user manual.
- If the inside of the glass becomes dirty, check the manual for instructions on how to open the unit or remove the glass from the scanner.
- When the scanner is not in use, keep lid closed.
- Never lay anything heavy on a scanner.

# Troubleshooting Printers and Scanners

- Step 1** Identify the problem
- Step 2** Establish a theory of probable causes
- Step 3** Determine an exact cause
- Step 4** Implement a solution
- Step 5** Verify solution and full system functionality
- Step 6** Document findings

# Step 1 - Identify the Problem

- Printer or scanner information
  - Manufacturer, model, OS, network environment, connection type
- Open-ended questions
  - What problems are you experiencing with your printer or scanner?
  - What software or hardware has been changed recently on your computer?
  - What were you doing when the problem was identified?
  - What error messages have you received?
- Closed-ended questions
  - Is the printer under warranty?
  - Can you print a test page?
  - Is this a new printer?
  - IS the printer powered on?

## Step 2 - Establish a Theory of Probable Causes

- Problem may be simpler than the customer thinks.
  
- Create a list of the most common reasons why the error would occur.
  - Loose cable connections
  - Errors on equipment display
  - Errors on computer screen
  - Equipment power
  - Out of paper
  - Printer queue
  - Paper jams
  - Low ink warning

## Step 3 - Determine the Exact Cause

- Testing your theories of probable causes one at a time, starting with the quickest and easiest.
  - Restart the printer or scanner
  - Disconnect and reconnect the cables
  - Restart the computer
  - Check printer for paper jams
  - Reseat paper in paper trays
  - Open and close printer trays
  - Ensure printer doors are closed
  - Install a new link or toner cartridge
- If the exact cause of the problem has not been determined after you have tested all your theories, establish a new theory of probable causes and test it.

## Step 4 - Implement a Solution

- Sometimes quick procedures can determine the exact cause of the problem or even correct the problem.
- If a quick procedure does not correct the problem, you might need to research the problem further to establish the exact cause.
- Divide larger problems into smaller problems that can be analyzed and solved individually.

## Step 5 - Verify Solution and System Functionality

- Verifying full system functionality and implementing any preventive measures if needed. Ensures that you have not created another problem while repairing the computer.
  - Reboot the computer
  - Reboot the printer
  - Print a test page from the printer control panel
  - Print a document from an application
  - Reprint the customer's problem document.
- Have the customer verify the solution and system functionality.



## Step 6 - Document Findings

- Discuss the solution with the customer
- Have the customer confirm that the problem has been solved
- Document the process
  - Problem description
  - Solution
  - Components used
  - Amount of time spent in solving the problem

# Common Problems and Solutions

- Printer and scanner problems can be attributed to hardware, software, networks, or some combination of the three. You will resolve some types of printer and scanner problems more often than others.

# Chapter 7 Summary

- Some printers and scanners have low output and are adequate for home use, while other printers and scanners have high output and are designed for commercial use.
- Printers may have different speeds and quality of print. There is also a difference in price between the types of printers.
- Scanners have specific applications. The drum scanner is the most expensive.

# Chapter 7 Summary

- Older printers and scanners use parallel cables and ports. Newer printers and scanners typically use USB or Firewire cables and connectors. Larger printers and scanners may also have an NIC port to connect to a network.
- Newer printers and scanners are PnP, and need only be connected to the computer. The computer will automatically install the necessary drivers.
- If the device drivers are not automatically installed by the computer, you will have to supply the drivers on a CD or download from the manufacturer website.

# Chapter 7 Summary

- Most optimization is done through software drivers and utilities. For example, print spool settings on the computer can be changed depending on the amount of available RAM on the computer.
- Once you have set up the printer or scanner, you can share the device to other users on the network. This is cost-efficient as there is no need for every user to have a printer or scanner.
- It is important to know how to properly configure local and networked printers, as well as which options are automatically installed through PnP.

# Chapter 7 Summary

- A good preventative maintenance program will extend the life of the printer or scanner and keep them performing well.
- Troubleshooting printer and scanner problems requires the technician to identify, repair, and document the problem.
- Troubleshooting steps include: identify the problem, establish a theory of probable causes, determine an exact cause, implement a solution, verify solution and full system functionality, and document findings.

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