



# Chapter 9: Printers



## IT Essentials 5.0

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## Chapter 9 Objectives

- 9.1 Describe the common features of printers
- 9.2 Describe the various types of printers
- 9.3 Describe how to install and configure printers
- 9.4 Describe and implement printer sharing
- 9.5 Identify and apply common preventive maintenance techniques for printers
- 9.6 Apply the troubleshooting process to troubleshoot printers



# Introduction

- Printers produce paper copies of electronic files.
  - Hard copies of computer documents remain important today.
- The technician must understand the operation of various types of printers to be able to install, maintain, and troubleshoot any problems that arise.





# Printers

- As a computer technician, you may be required to purchase, repair, or maintain a printer.
- Printer selection criteria:
  - Capacity and Speed
  - Color or black and white
  - Quality
  - Reliability
  - Warranty
  - Schedule servicing
  - Mean time between failure (MTBF)
  - Total Cost of Ownership (TCO)



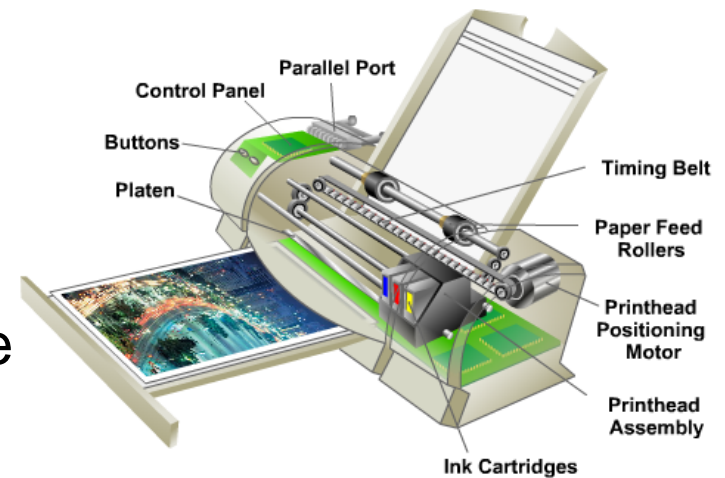
# Wired Printer Connection Types

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



# 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.
- Two types of inkjet nozzles:
  - **Thermal**
  - **Piezoelectric**
- They produce high quality prints, 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.





# Inkjet Printers (continued)

## ■ Advantages:

- Initial low cost
- High resolution
- Quick to warm up

## ■ Disadvantages:

- Nozzles are prone to clogging
- Ink cartridges are expensive
- Ink is wet after printing



# Laser Printers

- **A laser printer** is a high-quality, fast printer that uses a laser beam to create an image. It uses the following process:
  1. Processing
  2. Charging
  3. Exposing
  4. Developing
  5. Transferring
  6. Fusing
  7. Cleaning





# Laser Printers (continued)

- **Advantages:**

- Low cost per page
- High ppm
- High capacity
- Prints are dry

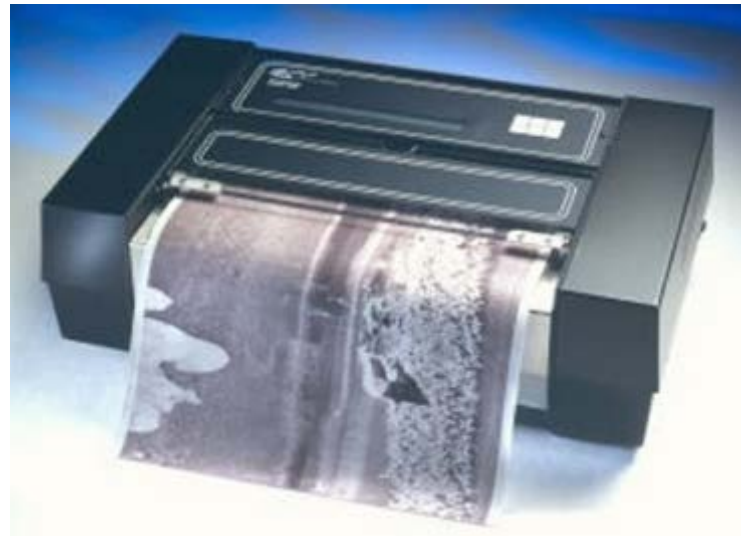
- **Disadvantages:**

- High cost startup
- Expensive toner cartridges
- Require high level of maintenance



# 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.





# Thermal Printers (continued)

- **Advantages:**

- Longer life because there are few moving parts
- Quiet operation
- No cost for ink or toner

- **Disadvantages:**

- Paper is expensive.
- Paper has a short shelf life.
- Images are poor quality.
- Paper must be stored at room temperature.



# Impact Printers

- Impact printers have print heads that strike an inked ribbon, causing characters to be imprinted on the paper
  
- There are two types:
  - **Daisy-wheel**
  - **Dot-matrix**





# Impact Printers (continued)

- **Advantages:**

- Uses less expensive ink than inkjet or laser printers
- Uses continuous feed paper
- Has carbon-copy printing ability

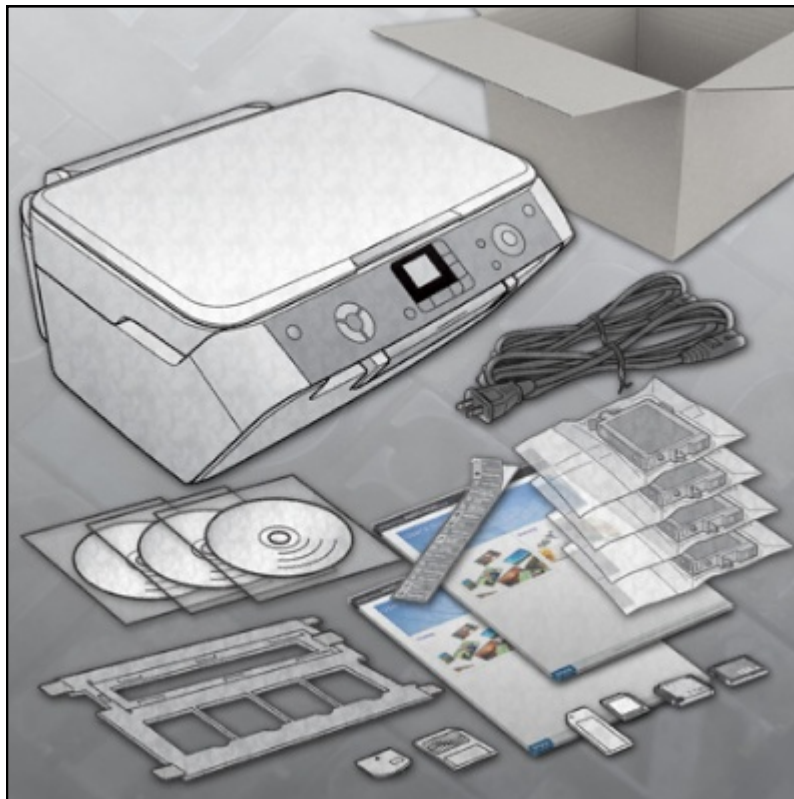
- **Disadvantages:**

- Noisy
- Low-resolution graphics
- Limited color capability



# Installing and Configuring Printers

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



- 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.



# Installing and Configuring Printers (Continued)

## ■ Connect the Printer

- Connect the appropriate data cable to the communication port on the back of the printer.
- Attach the power cable to 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

PostScript	PCL
Page is rendered by the printer	Page is rendered on local workstation
Better quality output	Faster prints jobs
Handles more complex print jobs	Requires less printer memory
Output is identical on different printers	Output varies slightly on different printers

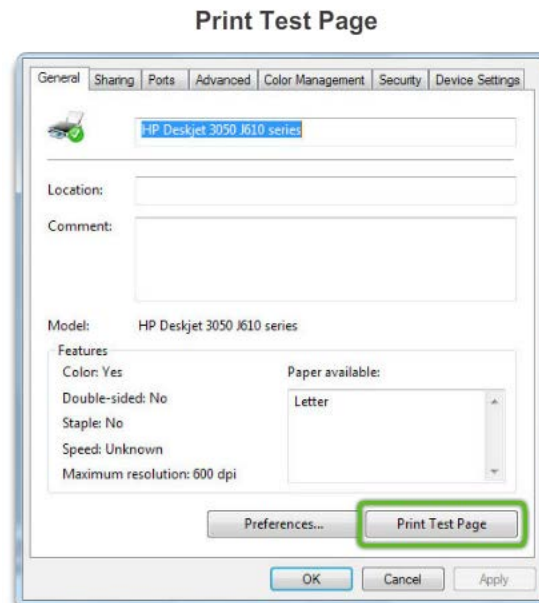
- A **printer driver** is the software program that enables the computer and the printer to communicate with each other.
- It is recommendable to find out if a newer driver is available on the manufacturer's website.



# Installing and Configuring 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 page manually, from an application such as Notepad, or from the Command Line.







# Common Configuration Settings

- Configuration Options and Default Settings include:
  - **Paper type** - Standard, draft, gloss, or photo
  - **Print quality** - Draft, normal, or photo
  - **Color printing** - Multiple colors is used
  - **Black-and-white printing** - Only black ink is used
  - **Grayscale printing** – printing using only black ink in different shades
  - **Paper size** - Standard paper sizes or envelopes and business cards
  - **Paper orientation** - Landscape or portrait
  - **Print layout** - Normal, banner, booklet, or poster
  - **Duplex** - Two-sided printing



# Global and Individual Document Options

## Global and Individual Document options

- **Global method** – settings that affect all documents.

- In Windows 7, use this path to change global settings:

**Start > Devices and Printers> right-click the printer**

- In Windows Vista, use the following path:

**Start > Control Panel > Printers > right-click the printer**

- In Windows XP, use the following path:

**Start > Printers and Faxes> right-click the printer**

- **Per Document Method** – change the document print settings for specific documents.



# Software Optimization

- Most optimization is completed through the software supplied with the drivers
- Tools to optimize performance:
  - **Print spool settings** - Cancel or pause current print jobs in the printer queue.
  - **Color calibration** - Adjust settings to match the colors on the screen to the colors on the printed sheet.
  - **Paper orientation** - Select landscape or portrait image layout.



# Hardware Optimization

- **Firmware** - controls how the printer operates. Check the manufacturer's homepage for the availability of new firmware.
- **Printer Memory** – upgrading memory increases the printing speed and enhances complex print job performance.
- Additional upgrades:
  - Duplex printing to enable dual-sided printing
  - Extra trays and/ or specialized trays
  - Network cards to access a wired or wireless network
  - Firmware upgrades to add functionality or to fix bugs



# Configuring Printer Sharing

- In Windows 7, to connect to the printer from another computer follow these steps:
- **Step 1.** Choose **Start > Devices and Printers > Add a Printer.**
- **Step 2.** The Add Printer wizard appears.
- **Step 3.** Select **Add a network, wireless or Bluetooth printer.**
- **Step 4.** A list of shared printers will appear. If the printer is not listed, select **The printer that I wanted is not listed.**
- **Step 5.** After selecting the printer, click **Next.**
- **Step 6.** A virtual printer port is created and displayed in the **Add a Printer** window. The required print drivers are downloaded from the print server and installed on the computer. The wizard then finishes the installation.



# Configuring Printer Sharing

- In Windows 7, to configure the computer with the printer attached to accept print jobs from other network users, follow these steps:
- **Step 1.** Select **Start > Control Panel > Network and Sharing Center > Change advanced sharing settings**.
- **Step 2.** Expand the network listing to view the network profile.
- **Step 3.** If printer sharing is off, under **File and printer sharing**, select **Turn on file and printer sharing**, and then click **Save changes**.



# Wireless Printer Connections

- Wireless printers allow hosts to connect and print wirelessly using **Bluetooth, 802.11x, or infrared (IR)**.
- **Bluetooth** - both the printer and the host device must have Bluetooth capabilities and be paired.
- **802.11x** - printers are equipped with installed wireless NICs and connect directly to a wireless router or access point.
- **IR (infrared)** - requires transmitters and receivers on both devices and a clear line of sight between the transmitter and receiver.



# Print Servers

- A print server has three functions:
  1. Provide client access
  2. Administrate print jobs
  3. Provide feedback to the users
- There are three kinds of print servers:
  1. Network print server devices
  2. Dedicated PC print servers
  3. Computer-shared printers
- Windows allows computer users to share their printers with other users on the network. There are two steps:
  1. Configure the computer attached to the printer to share the printer with other network users.
  2. Configure a user's computers to recognize the shared printer and print to it.







# Preventive Maintenance Techniques

- Preventive maintenance decreases downtime, increases service, guarantees good quality prints, and ensures uninterrupted operation.
- Most manufacturers sell maintenance kits for their printers. For laser printers, the kit might contain replacement parts that often break or wear out:
  - Fuser assembly
  - Transfer rollers
  - Separation pads
  - Pickup rollers

Maintenance Kit





# Preventive Maintenance Techniques (Continued)

- Paper and Ink:
  - Using the correct type of paper can help 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)

- Always follow the manufacturer's guidelines when cleaning printers.
- **CAUTION:** Unplug printers before cleaning to prevent danger from high voltage.
- Use the utility supplied by the manufacturer to clean the ink jet print heads.
- When cleaning a laser printer, use a specially designed vacuum cleaner to pick up toner particles.
- To extend the life of the thermal printer, clean the heating element regularly with isopropyl alcohol.



# Troubleshooting Printers

**Step 1** Identify the problem

**Step 2** Establish a theory of probable causes

**Step 3** Test the Theory to Determine cause

**Step 4** Establish a Plan of Action to Resolve the Problem and Implement the Solution

**Step 5** Verify Full System Functionality and Implement Preventative Measures

**Step 6** Document Findings, Actions, and Outcomes



# Step 1 - Identify the Problem

## ■ **Printer information**

- Manufacturer, model, OS, network environment, connection type

## ■ **Open-ended questions**

- What problems are you experiencing with your printer?
- 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

- **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 - Test the Theory to Determine cause

- **Test your theories of probable causes one at a time, starting with the quickest and easiest.**
  - Restart the printer
  - 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 - Establish a Plan of Action to Resolve the Problem and Implement the 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 Full System Functionality and Implement Preventative Measures

- Verify full system functionality and implement 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, Actions, and Outcomes

- 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 problems can be attributed to hardware, software, networks, or some combination of the three.
- See chart of common printer problems and solutions in the curriculum 9.6.2.1.



## Chapter 9 Summary

- Some printers have low output and are adequate for home use, while other printers 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.
- Newer printers typically use USB or Firewire cables and connectors.
- Most printers also have an NIC port to connect to a network or they can connect wirelessly.



# Chapter 9 Summary

- Newer printers usually need only be connected to the computer and the computer will automatically install the necessary drivers.
- If the device drivers are not automatically installed by the computer, you will have to use the drivers from CD or download from the manufacturer website.
- Most optimization is done through software drivers and utilities.
- Once you have set up the printer, the device can be shared to other users on the network. This is cost-efficient as there is no need for every user to have a printer.



# Chapter 9 Summary

- It is important to know how to properly configure local and networked printers, as well as which options are automatically installed through PnP.
- A good preventative maintenance program will extend the life of the printer and keep it performing well.
- Troubleshooting printer 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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