

Chapter 8: Printers

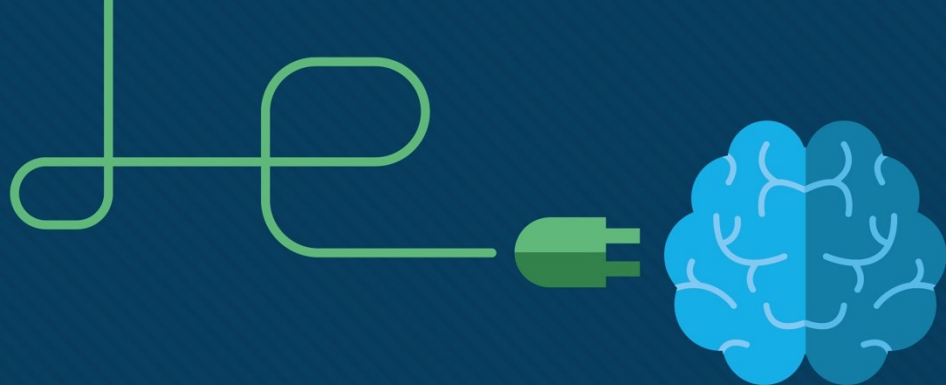
Instructor Materials

IT Essentials v7.0



Chapter 8: Printers

IT Essentials 7.0 Planning Guide



Chapter 8: Printers

IT Essentials v7.0



Chapter 8 - Sections & Objectives

- 8.1 Common Printer Features
 - Describe characteristics and capabilities of printers.
 - Identify printer connectors and ports.
- 8.2 Printer Type Comparison
 - Explain the parts and characteristics of inkjet printers.
 - Explain the parts and characteristics of laser printers.
 - Explain how laser printers operate.
 - Explain the parts and characteristics of thermal printers and impact printers.
 - Explain the characteristics of virtual printers.
 - Explain the parts and characteristics of 3D printers.

Chapter 8 - Sections & Objectives (Cont.)

- 8.3 Installing and Configuring Printers
 - Install and update the device driver, firmware, and RAM for the printer.
 - Explain how to configure settings on a printer.
 - Explain how to optimize printing performance.
- 8.4 Sharing Printers
 - Explain how to configure printer sharing.
 - Configure printer sharing using a print server.
- 8.5 Maintaining and Troubleshooting Printers
 - Explain vendor guidelines and the importance of appropriate operational environments for printers.
 - Implement preventive maintenance on an inkjet printer.

Chapter 8 - Sections & Objectives (Cont.)

- 8.5 Maintaining and Troubleshooting Printers (cont.)
 - Implement preventive maintenance on a laser printer.
 - Explain how to perform preventive maintenance on a thermal printer.
 - Explain how to perform preventive maintenance on an impact printer.
 - Explain how to perform preventive maintenance on a 3D printer.
 - Explain the six steps of the troubleshooting printers.
 - Describe common problems and solutions for printers.

8.1 Common Printer Features

Characteristics and Capabilities

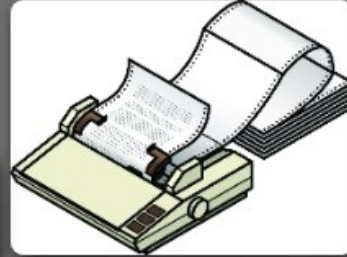
Characteristics of Printers



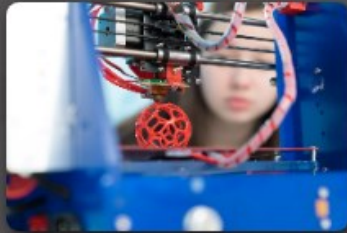
Inkjet Printer



Laser Printer



Impact Printer



3D Printer

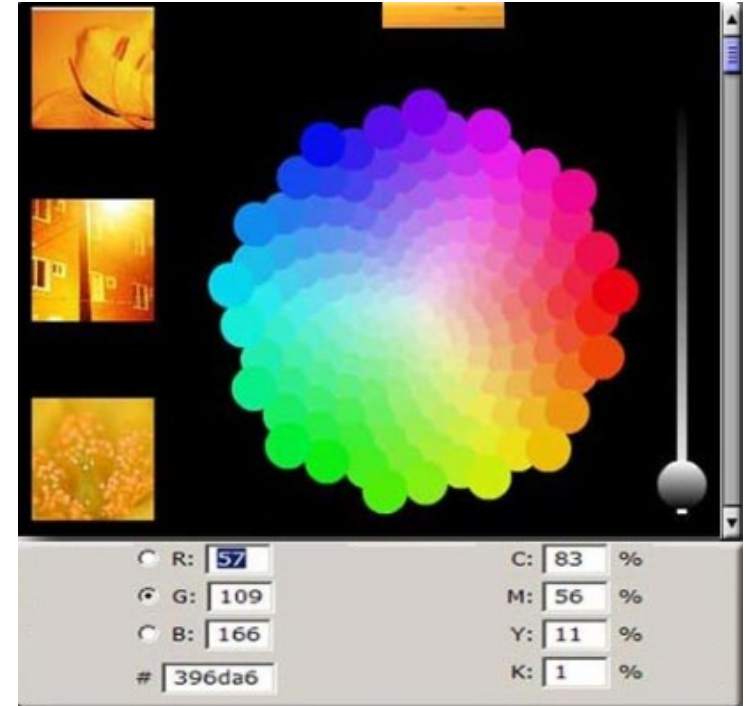


Thermal Printer

Characteristics and Capabilities

Printer Speed, Quality, and Color

- Speed and Quality
 - Speed – measured in pages per minute (ppm)
 - Quality – measured in dots per inch (dpi)
- Color
 - Cyan, magenta, and yellow (CMY)
 - Black for inkjets is the base or key color



Reliability and Total Cost of Ownership



- Warranty
- Scheduled servicing
- Mean time between failures (MTBF)
- Total cost of ownership (TCO)
 - Initial purchase price
 - Cost of consumable supplies
 - Price per page
 - Pages per month
 - Maintenance costs
 - Warranty costs

Characteristics and Capabilities

Automatic Document Feeder

- Automatic Document Feeder (ADF)
 - Used with some laser and inkjet models
 - Feeds paper into the printer
 - Might provide collation (ordering of pages)



8.2 Printer Type Comparison

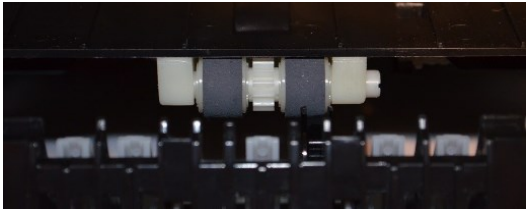
Inkjet Printer Characteristics

- Easy to use
- Cheaper than laser printers
- Advantages
 - Low cost
 - High resolution
- Disadvantages
 - Some nozzles prone to clog
 - Cartridges can be expensive
 - Ink can be wet after printing

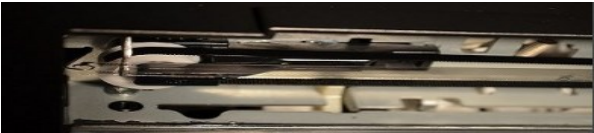


Inkjet Printers

Inkjet Printer Parts



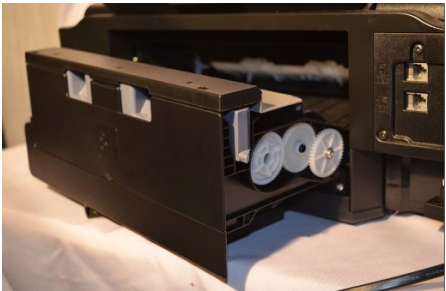
Roller



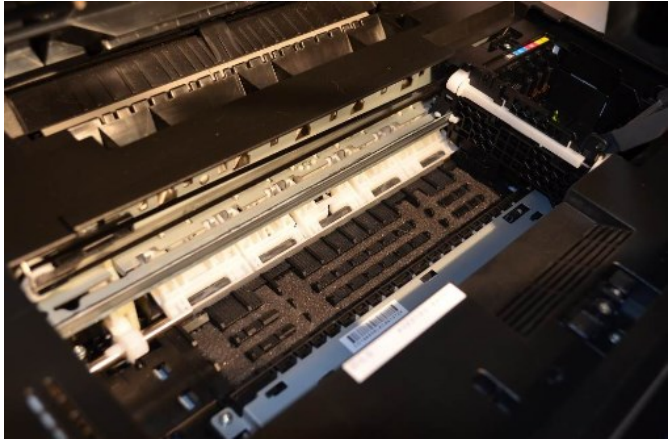
Carriage/Belt



Print Head



Duplexing
Assembly



Feeder



Ink Cartridge/
Paper



Laser Printer Characteristics

▪ Advantages

- Low cost per page
- High PPM
- High capacity
- High quality
- Fast (uses a laser beam or LEDs to create an image)
- Print comes out dry

▪ Disadvantages

- High initial cost
- Toner cartridges can be expensive



Laser Printer Characteristics



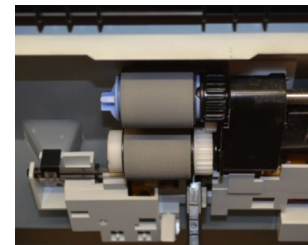
Imaging Drum



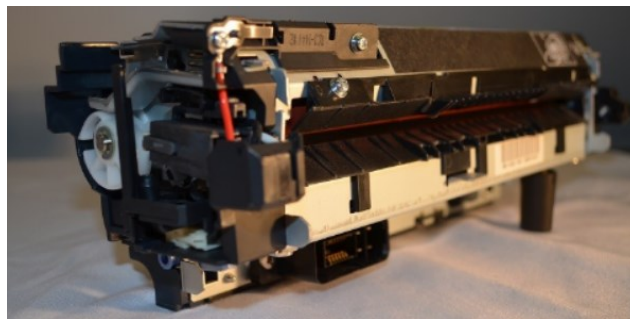
Toner
Cartridge



Transfer
Roller



Pickup
Rollers



Fuser
Assembly



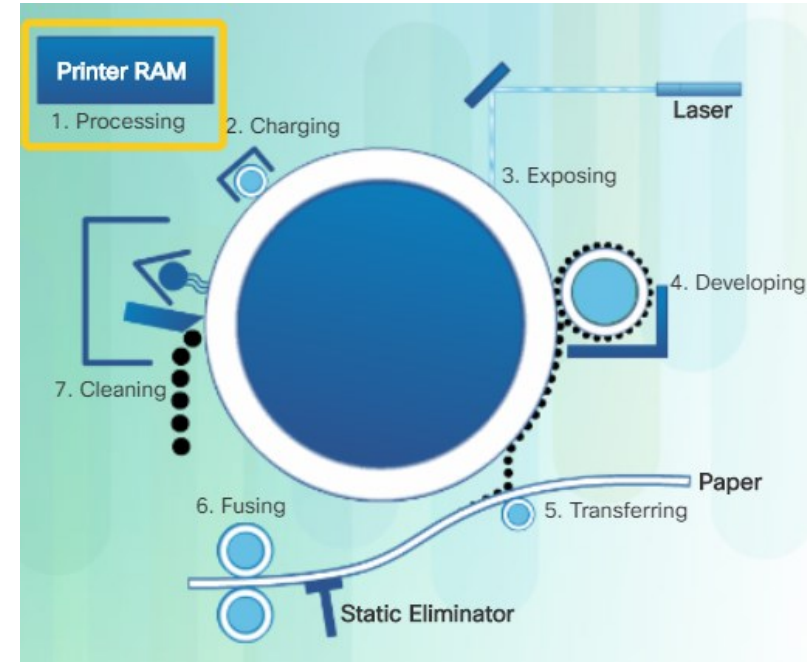
Duplexing
Assembly

Laser Printing Process

How Laser Printing Works

7 Steps of the Laser Printing Process

1. Processing – Convert data into a printable form
2. Charging – drum is conditioned for new image
3. Exposing – write the image to the drum using a laser beam
4. Developing – toner is applied to the image on the drum
5. Transferring – As the paper rolls through, the image is transferred to the paper due to a charge applied to the paper
6. Fusing – Heat and pressure are applied to the paper
7. Cleaning – Excess toner removed from the drum



Thermal Printer Characteristics

- Thermal printers are used in retail as part of a cash register system and within older fax machines.
- Heat from the print head makes the image on the paper.
- Advantages
 - Last a long time due to few moving parts
 - Quiet
 - No cost for ink or toner
- Disadvantages
 - Thermal paper is expensive and must be stored at room temperature
 - Images on thermal paper degrade over time, are poor quality, and cannot be in color



Thermal Printers and Impact Printers

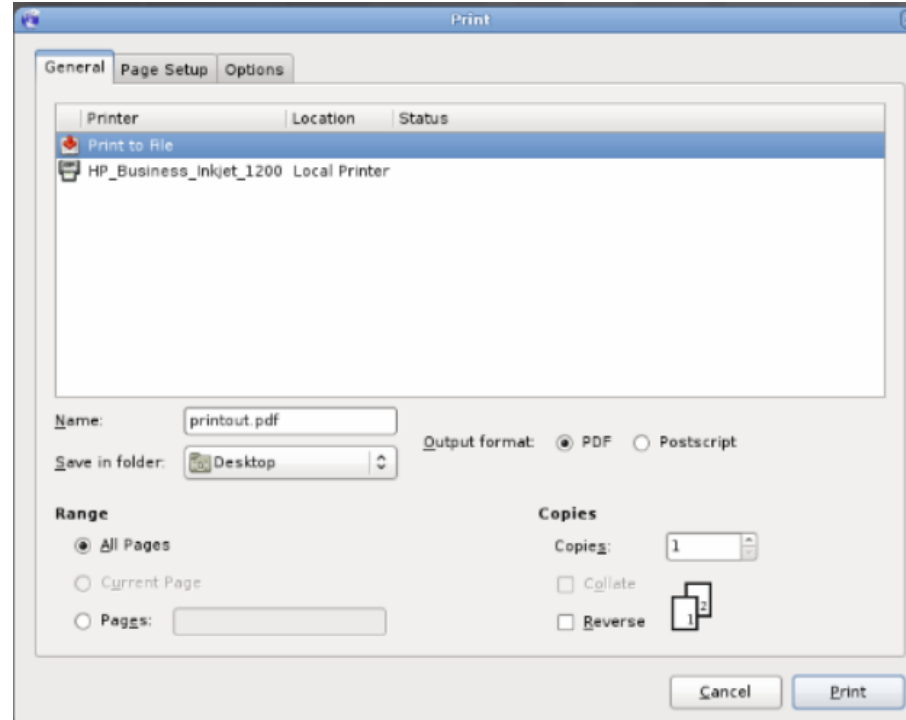
Impact Printer Characteristics



- Impact printers – dot matrix and daisy wheel
- Have print heads that strike an inked ribbon with a specific number of pins
 - Higher number of pins means better quality
- Advantages
 - Ribbons are less expensive supplies than other types
 - Can use regular paper or continuous feed paper
 - Can print carbon copies
- Disadvantages
 - Noisy
 - Graphics are low-resolution
 - Limited color capabilities

Virtual Printer Characteristics

- Print to file
- Print to PDF
- Print to XPS (XML Paper Specification)
- Print to image (such as .JPG or .TIF)



Virtual Printers

Cloud Printing

- Sends a print job to a remote printer somewhere on the network.
- Some printing companies have software that can send print jobs to their closest location.
- Google Cloud Print allows you to connect your printer to the web and you can send something to your own printer no matter where you are located.



3D Printers

3D Printer Characteristics

- Used to create three dimensional objects
- Use plastic filament or other media to create the object

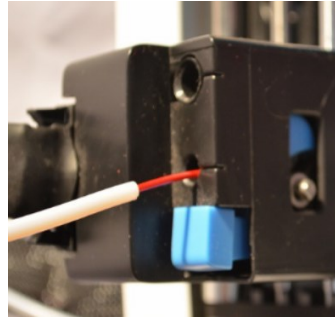


3D Printers

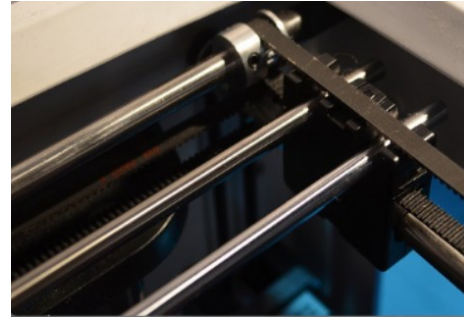
3D Printer Parts



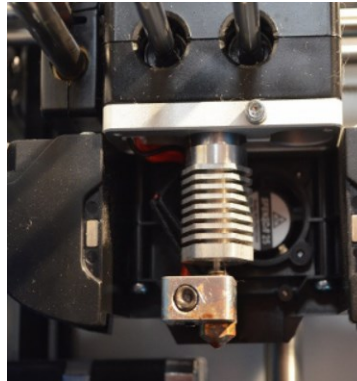
Filament



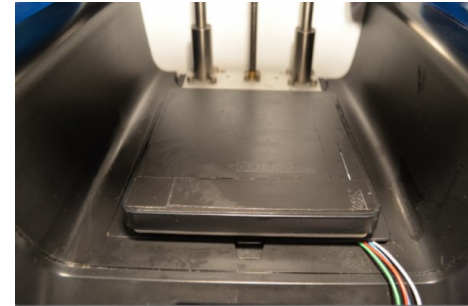
Feeder



Axis



Hotend
Nozzle



Print Bed

8.3 Installing and Configuring Printers

Installing a Printer

- Follow manufacturer's instructions.
- Remove all packing material and keep if a return is needed.
- Sometimes the printer driver is installed *before* the printer is connected to the computer.
- Connect the cable to the printer and computer or connect the network cable.
- Attach power cord.



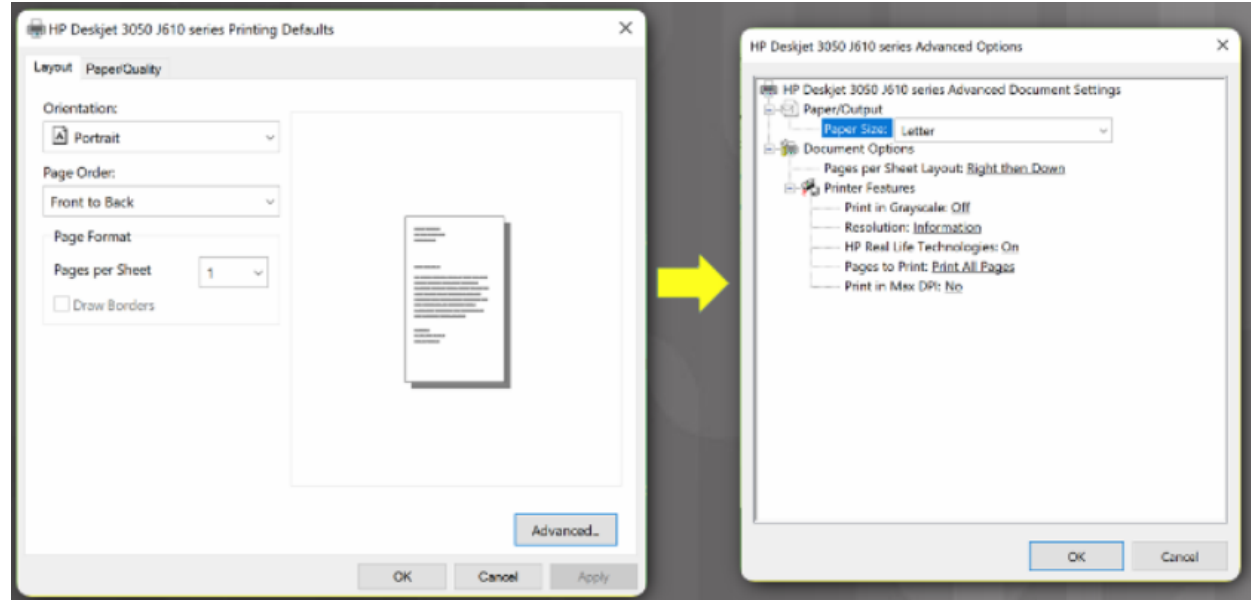
Lab - Install a Printer

In this lab, you will install a printer. You will find, download, and update the driver and the software for the printer.

Installing and Updating a Printer

Test Printer Functions

- Test all functions including
 - Double-sided documents
 - Different paper trays
 - Grayscale and color
 - Draft mode
 - Collation



Configuring Options and Default Settings

Common Configuration Settings

Configuration Option	Details
Paper type	Standard, draft, gloss, or photo
Print quality	Draft, normal, or photo
Color printing	Multiple colors of ink are used
Black-and-white printing	Only black ink is used
Grayscale printing	Images printed using only black ink in different proportions to produce shades of gray
Paper size	Standard paper sizes, envelopes, and business cards
Paper orientation	Landscape or portrait
Print layout	Normal, banner, booklet, or poster
Duplex	Two-sided printing
Collate	Print sets of a document with multiple pages arranged in order

Printer Output Options

Color Management

Print Speed

Media Control Options

Input paper tray selection

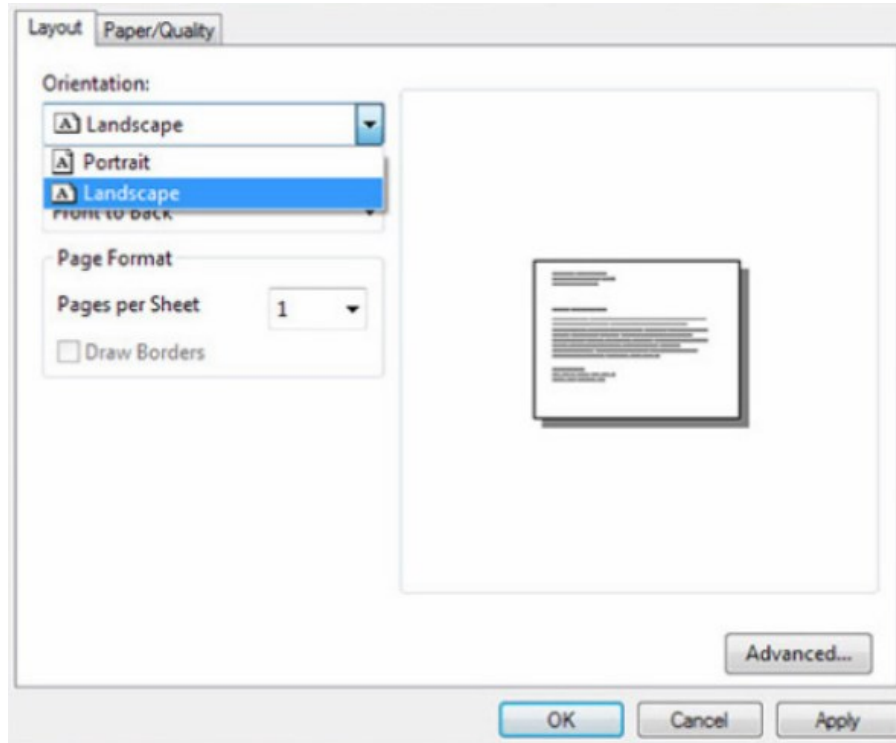
Output path selection

Media size and orientation

Paper weight selection

Optimizing Printer Performance

Software Optimization



- Use the print driver software to
 - Configure print spool settings
 - Calibrate the printer (color)
 - Set paper orientation

Optimizing Printer Performance

Hardware Optimization



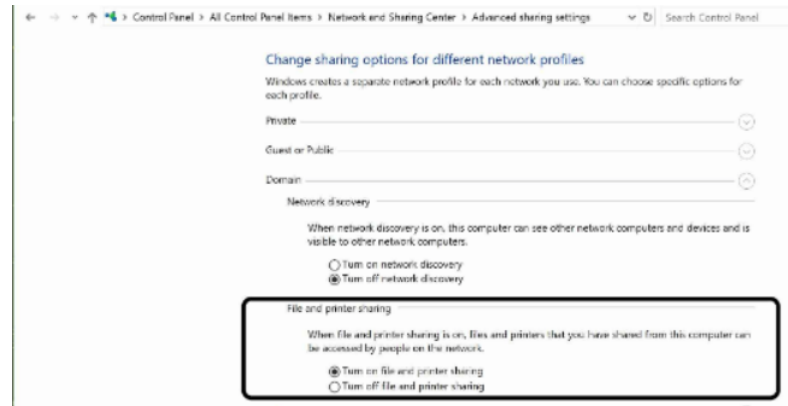
- Firmware
- Printer memory

8.4 Sharing Printers

Operating System Settings for Sharing Printers

Configuring Printer Sharing

- Those who connect to the shared printer must have the correct print driver.
- Windows can do this automatically



Operating System Settings for Sharing Printers

Wireless Printer Connections



- Bluetooth
 - Pairing between computer and printer
- Wi-Fi

Lab – Share a Printer in Windows

In this lab, you will share a printer, configure the printer on a networked computer, and print a test page from the remote computer.

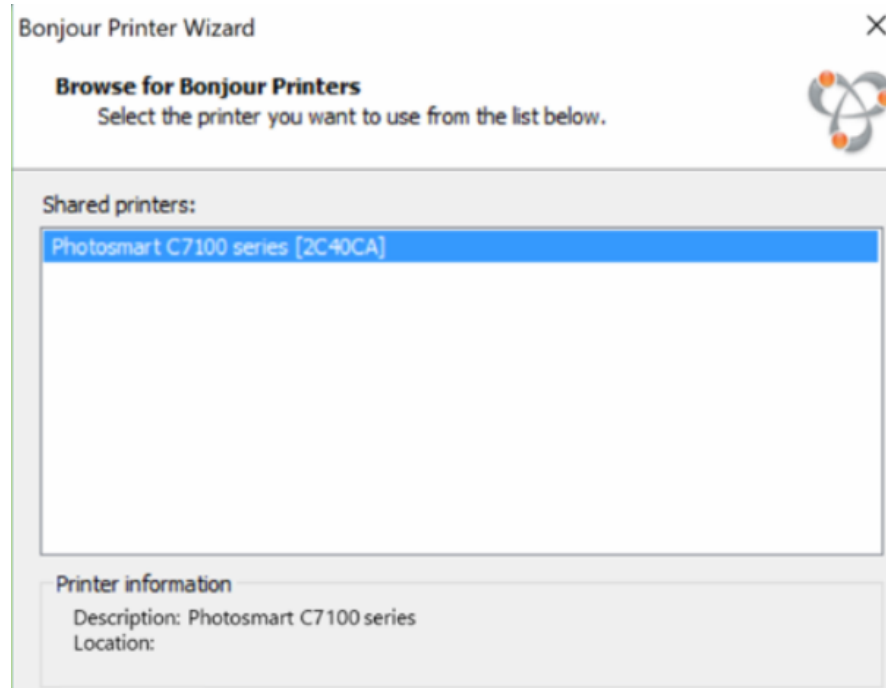
Purposes of Print Servers

- Provide client access to print resources
- Administrate print jobs by storing them in a queue
- Provide user feedback

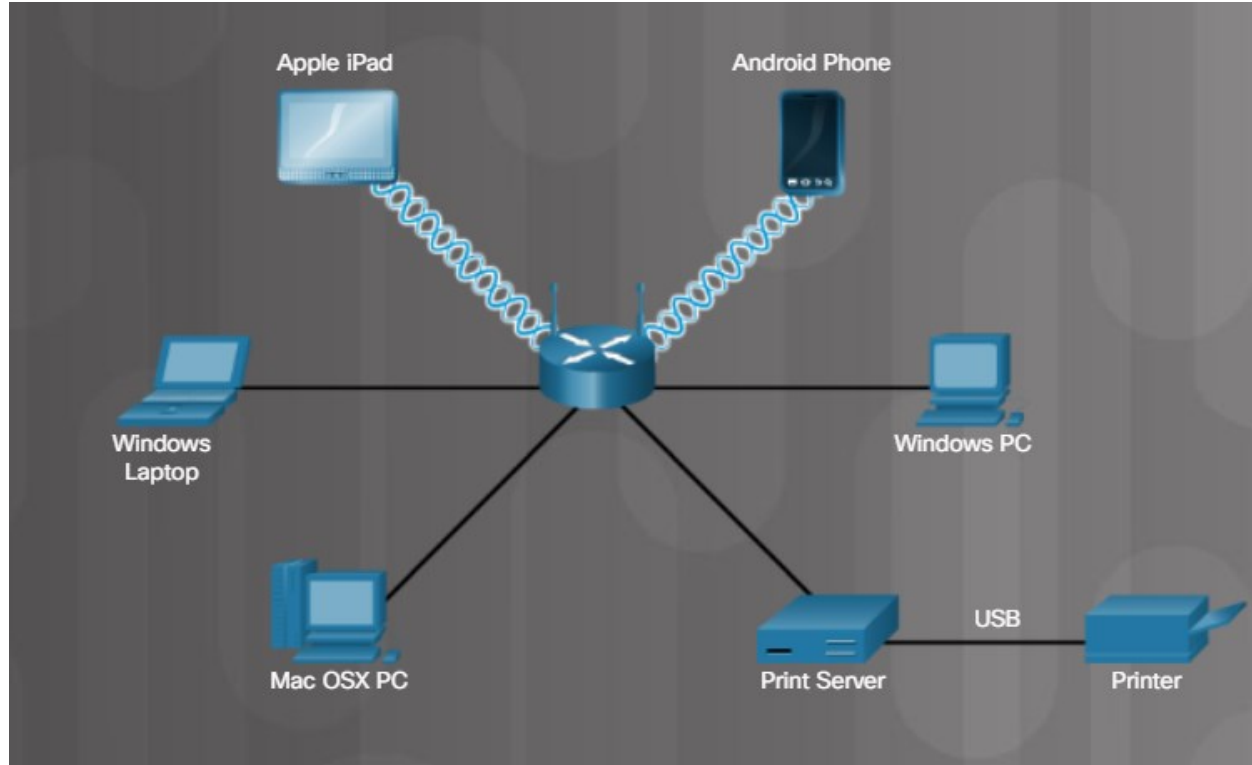


Software Print Servers

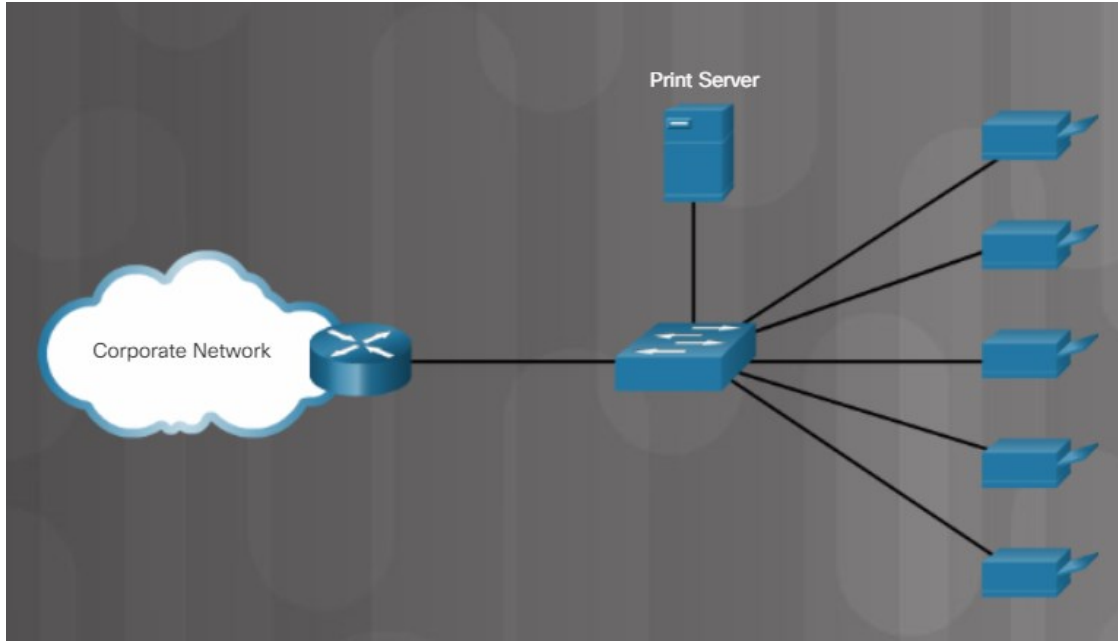
- Use print server software.
- Disadvantages
 - Sharing a printer might cause slow downs.
 - If the computer sharing the printer is down, the printer is unavailable to others.



Hardware Print Servers



Dedicated Print Servers



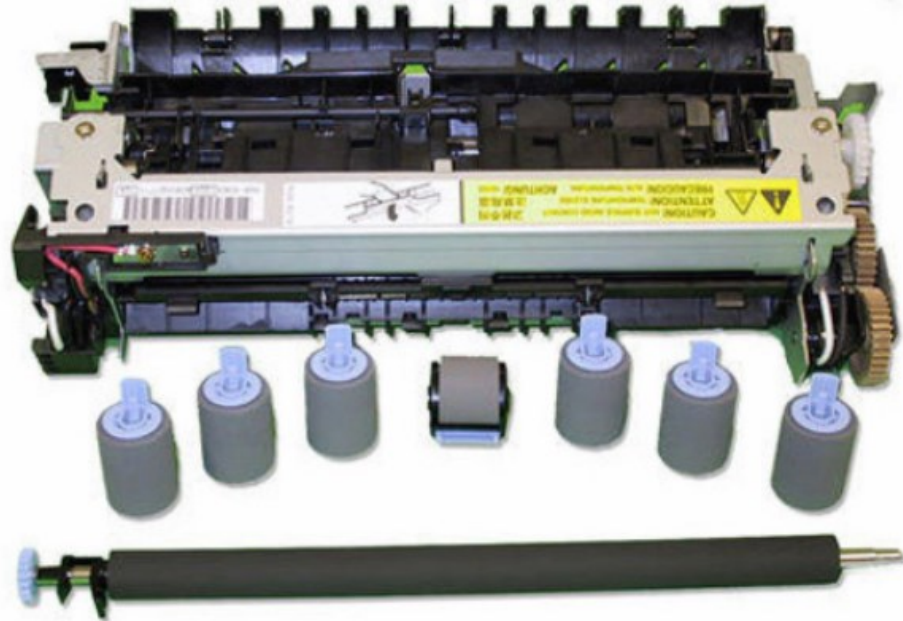
- Powerful processor
- Adequate storage space for queued documents
- Adequate memory

8.5 Maintaining and Troubleshooting Printers

Printer Preventive Maintenance

Vendor Guidelines

- Refer to the printer's documentation.
- Follow recommended maintenance processes and instructions.
- Some manufacturers sell maintenance kits.

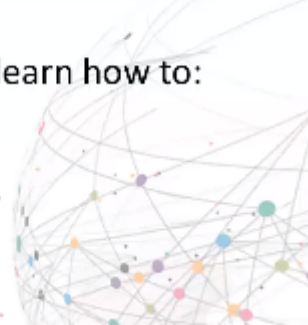


Video Demonstration – Inkjet Printer Preventive Maintenance

Video Demonstration: Inkjet Printer Preventive Maintenance

In this video demonstration, you will learn how to:

- Replace the ink cartridges
- Clean print heads
- Remove a paper jam



Lab – Perform Preventive Maintenance on an Inkjet Printer

In this lab, you will perform preventive maintenance on an inkjet printer. Note: The lab instructions are for general reference only. Refer to the manufacturer's printer manual for instructions to perform preventive maintenance on your inkjet printer model.

Video Demonstration – Laser Printer Preventive Maintenance

Interactive Video Demonstration: Laser Printer Preventive Maintenance

In this video demonstration, you will learn how to:

- Replace the toner cartridge
- Replace the rollers
- Replace the fuser assembly
- Calibrate the printer



Lab – Perform Preventive Maintenance on a Laser Printer

In this lab, you will perform preventive maintenance on a laser printer.

Note: The lab instructions are for general reference only. Refer to the manufacturer's printer manual for instructions to perform preventive maintenance on your laser printer model.

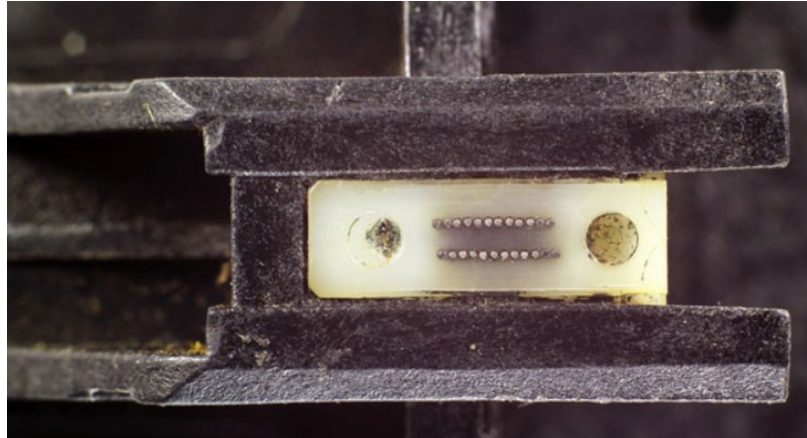
Perform Preventive Maintenance on a Thermal Printer

- Refer to the printer's documentation.
- Replace the paper.
- Clean the heating element with a cotton swab dampened with isopropyl alcohol.
- Use compressed air or a lint-free cloth to remove debris.



Perform Preventive Maintenance on an Impact Printer

- Refer to the printer's documentation.
- Replace the ribbon.
- Check character quality – might need to replace the print head.



Video Demonstration – 3D Printer Preventive Maintenance

Interactive Video Demonstration: 3D Printer Preventive Maintenance

In this video demonstration, you will learn how to:

- Replace filament
- Clean print bed
- Replace hotend nozzle

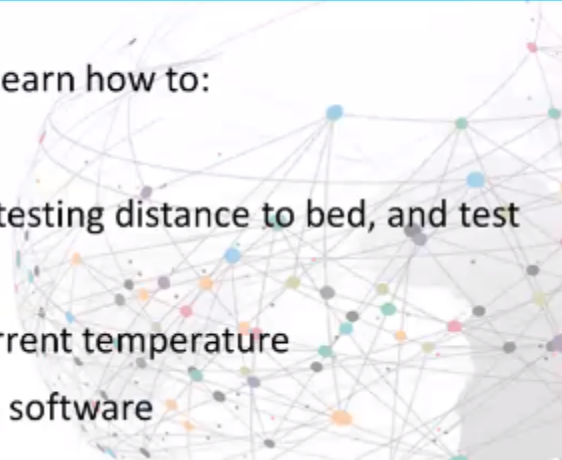


Video Demonstration – 3D Printer Printing a Component

Video Demonstration: 3D Printer Printing a Component

In this video demonstration, you will learn how to:

- Load and print the 3D print job
- View the printer test: Leveling bed, testing distance to bed, and test line
- Set target temperature and view current temperature
- View printing from printer and from software



The Six Steps of the Troubleshooting Process

Step 1. Identify the problem.

Step 2. Establish a theory of probable cause.

Step 3. Test the theory to determine the cause.

Step 4. Establish a plan of action to resolve the problem and implement the solution.

Step 5. Verify full system functionality and if applicable, implement preventive measures.

Step 6. Document findings, actions, and outcomes.

Troubleshooting Printing Issues

Identify the Problem

Step 1. Identify the Problem	
Open-ended Questions	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• Is the printer under warranty?• Can you print a test page?• Is this a new printer?• Is the printer powered on?

Establish a Theory of Probable Cause

Step 2. Establish a Theory of Probable Cause	
Common causes of printer problems	<ul style="list-style-type: none">• Loose cable connections• Paper jams• Equipment power• Low ink warning• Out of paper• Errors on equipment display• Errors on computer screen

Test the Theory to Determine Cause

Step 3. Test the Theory to Determine Cause

Common steps to determine cause

- 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 ink or toner cartridge.

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

Step 4. Establish a Plan of Action to Resolve the Problem and Implement the Solution	
If no solution is achieved in the previous step, further research is needed to implement the solution.	<ul style="list-style-type: none">• Helpdesk Repair Logs• Other Technicians• Manufacturer FAQs• Technical Websites• Newsgroups• Computer Manuals• Device Manuals• Online Forums• Internet Search

Verify Full System Functionality and, If Applicable, Implement Preventive Measures

Step 5. Verify Full System Functionality and, If Applicable, Implement Preventive Measures	
Verify full functionality	<ul style="list-style-type: none">• 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.

Document Findings, Actions, and Outcomes

Step 6. Document Findings, Actions, and Outcomes

Document your findings, actions, and outcomes

- Discuss the solution implemented with the customer.
- Have the customer verify the problem has been solved.
- Provide the customer with all paperwork.
- Document the steps taken to solve the problem in the work order and the technician's journal.
- Document any components used in the repair.
- Document the time spent to resolve the problem.

Identify Printer Problems and Solutions



Common Problems and Solutions for Printers

Common Problems and Solutions for Printers

Identify the Problem

An application document does not print.

Printer cannot be added or there is a print spooler error.

Printer jobs are sent to the print queue but are not printed.

Print queue is functioning properly, but the printer does not print.

Printer is printing unknown characters or does not print a test page.

Printer prints unknown characters or does not print anything.

Paper jams when printing.

The print jobs are faded.

The toner is not fusing to the paper.

The paper is creased after printing.

The paper is not being fed into the printer.

User receives a "Document failed to print" message.

User receives an "Access Denied" message when trying to install a printer.

Printer is printing incorrect colors.

The printer is printing blank pages.

The printer display has no image.

An application document does not print.

Probable Causes	Possible Solutions
There is a document error in the print queue.	Manage the print jobs by canceling the document from the print queue and print again.

Show PDF

Common Problems and Solutions for Printers (cont.)

Advanced Problems and Solutions for Printers

Identify the Problem

Printer prints unknown characters.

Printer will not print large or complex images.

Laser printer prints vertical lines or streaks on every page.

Printed pages show ghost images.

The toner is not fusing to the paper.

Paper is creased after printing.

Paper is not being fed into the printer.

Each time a network printer is restarted, users receive a "Document failed to print" message.

There are multiple failed jobs in the printer logs.

Printer prints unknown characters.

Probable Causes	Possible Solutions
An incorrect print driver is installed.	Uninstall the incorrect print driver and install the correct driver.
The printer cables are loose.	Secure the printer cables.

Show PDF

8.6 Chapter Summary