

Laser Printers

- A laser hits the photosensitive drum to create an image
- Memorize the laser printing process
- Laser printer maintenance means replacing the toner cartridge and applying maintenance kits



Toner Cartridge -

Photosensitive Drum - Green Roller

Laser hits this Drum which holds an Electrical Static Charge

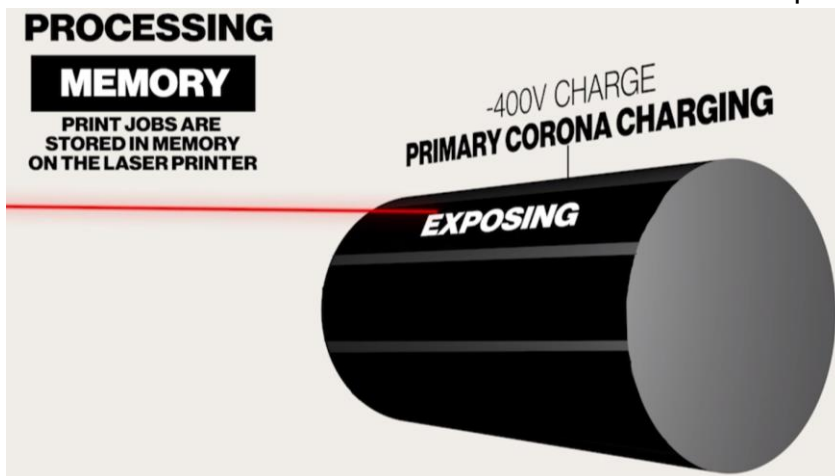
The More Light it sees, the Less of a Charge that spot can hold.

Print Jobs will come in from different computers, and they're stored in memory on the Laser Printer.

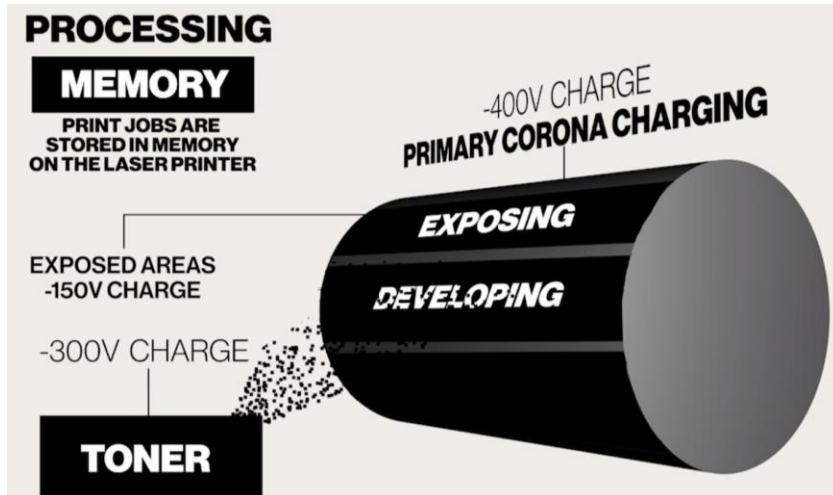
The Printing Process begins by charging 1 spot of the drum with a Primary Corona which puts a Uniform Negative Charge on this. (-400 to -600V Charge)

Sticking Your Hand in an Operating Laser Printer is a very bad idea!

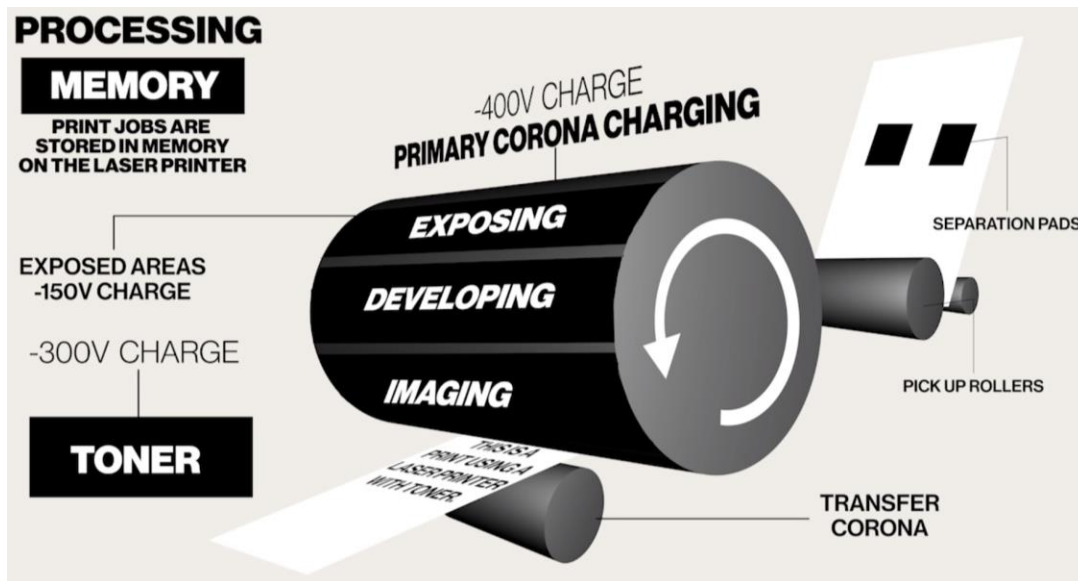
Your wall outlet is 120V. This laser printer will mess you up.



Processing - A laser will begin to write the image onto the Photosensitive Drum



Developing - Your Toner is sitting at roughly a -300V Charge.
Exposed Areas have less Negative Charge,
which attracts the Toner toward those areas

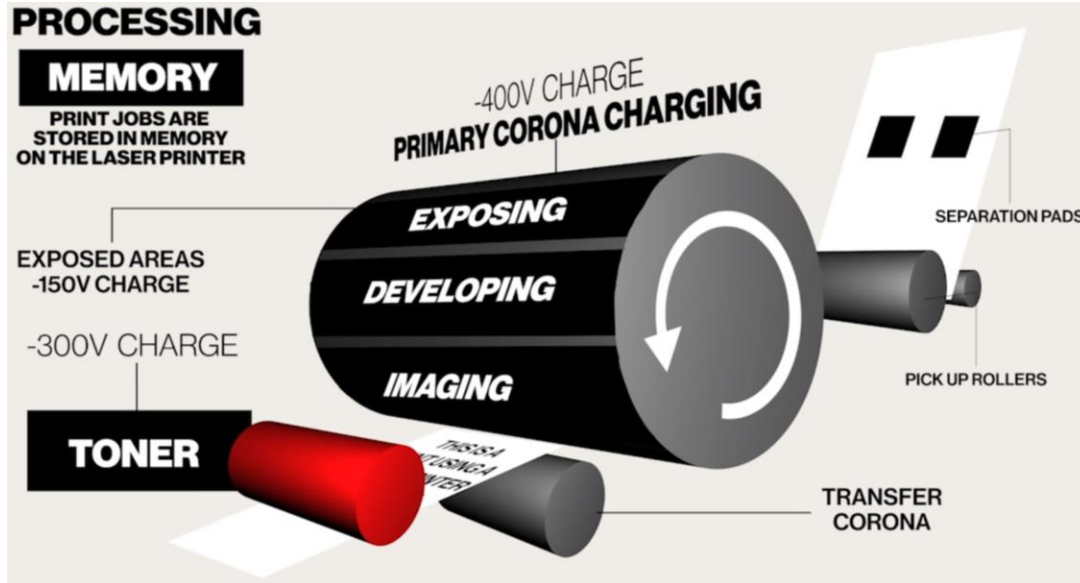


Imaging - As the Drum continues to Turn, it will pull out Paper in.

Separation Pads - Control only 1 Paper coming in at a time!

Transfer Corona - Puts a Charge of +150V onto the Paper

As the Transfer Corona rotates, the paper comes next to the Drum
and the Toner gets attracted to the Paper!



Fuser Assembly - with Heat & Pressure the Toner is Sealed to the Paper!

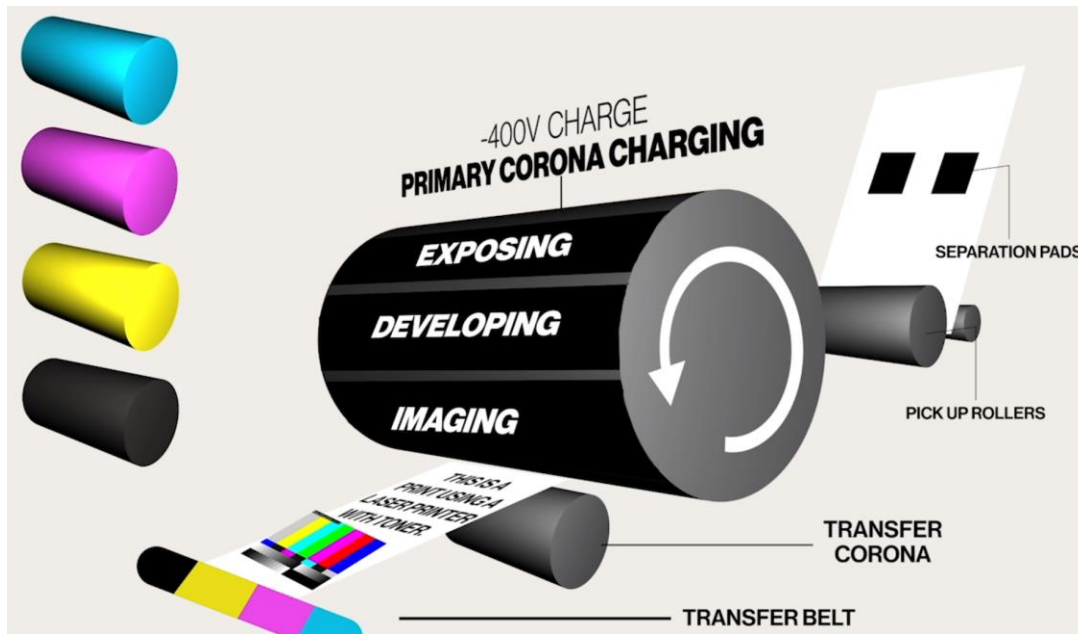
Then, there's an Anti-Static Device that wipes the Static Charge off the Paper and a Rubber Scraper that Removes Residual Toner from the Drum

The 7 Steps needed for the CompTIA Exam.....

- | | | | |
|-----------------|-------------|-------------|---------------|
| 1) Processing | 2) Charging | 3) Exposing | 4) Developing |
| 5) Transferring | 6) Fusing | 7) Cleaning | |

These Steps are all taken place at the Same Time until your Print Job is done!

This is the Process for Black & White Printing on Laser Printers



Color Laser Printers - use the exact same process,
but they use CMYK (Cyan, Magenta, Yellow, Black)

4 Hoppers of Color Toner pass by the Transfer Belt (No Transfer Roller)
leaving their Color on the Belt & then go through the Transfer Process

Replace Toner - This replaces the PhotoSensitive Drum, pick up Rollers,
and the other components

Ongoing Maintenance.....

Cleaning - Read the documentation for your Printer for the Cleaning Processes
You can use an Anti-Static Vacuum Cleaner to get to specific spots

Maintenance Kits - New Pickup Rollers, Separation Pads, Transfer Rollers, etc
Find your Brand/Model specific Maintenance Kit!! (Ebay)

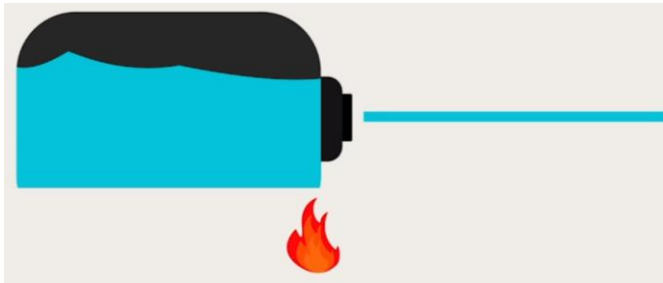
You can put a Printer into Maintenance Mode, and have it print out a Status Sheet
How many Printing Jobs has it done? How old is the Printer?
It may even tell you the Maintenance Kit Number!

Mike has a HP Printer from 1993 that runs Great
because he performs regular maintenance on it!!!

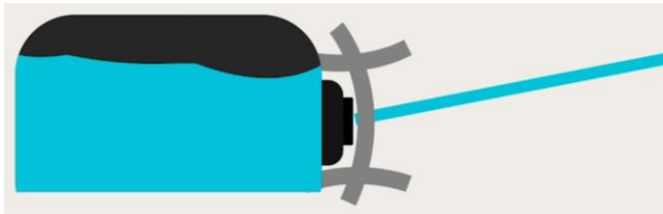
Calibration - Over time you can have issues with your Transfer Roller where the different colors of Toner aren't hitting perfectly. Run your Calibration Feature. It will fix itself!!

Inkjet Printers

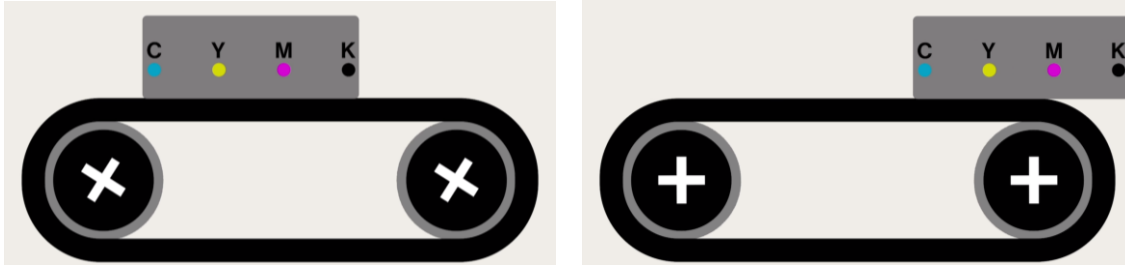
- Inkjet printers use heat or mechanical process to push ink through the print heads to the paper
- Multifunction devices (MFDs) include printers, scanners, copiers, and fax machines
- Inkjet maintenance means running cleaning routines for the nozzles, plus some form of calibration



Ink from Ink Cartridges are fed into a Jet which is Heated to the point where the Ink Boils & shoots the Ink out of the Jet!



The Ink comes out with a Charge on it.
Metal Deflectors are placed around the Opening of the Jet to guide the Ink in specific directions.



Print Head moves back & forth on a Carriage (using rollers & a belt) that allows it to shoot ink across the entire sheet of paper.

Inkjets don't have the dangerous High Voltages and High Heat that Laser Printers have

Multifunction Device - Printer, Scanner, Fax

Maintenance Mode/Tools -

- 1) Clean Heads/Nozzles - the printer will force ink out to clean the nozzle
This tends to work pretty well
- 2) Calibration - Just run the calibration and it will fix itself
- 3) Mike's not a big fan of Inkjets
They use a lot of Ink in a short period of time,
leading to lots of Cartridge Replacements (Expensive)
- 4) Clear Jams - Pick Up Rollers on Inkjets

Impact Printers

- **Impact printers strike an ink ribbon to write to paper**
- **Impact printers are very useful for printing on multipart forms**
- **Impact printer Maintenance includes replacing the ribbon and keeping it clean**

Ink Ribbon has a Print Head has a lot of tiny pins
that make impact on paper!

Impact Printers use Tractor Feed Paper
(hole punches on the sides of the 8.5" x 11")

One of the big benefits of this Dot Matrix is
because it's based on Impact, you can have 6 copies made all at once!!!

This is still common in Industrial Warehouses for shipping
using the multi-part forms. Extremely Popular

No need for Maintenance Kits. Just clean them and these tanks will run forever!

Thermal Printers

- **Thermal printers heat special paper to create a printout**
- **Thermal printers can print to multipart (thermal) forms**
- **Maintenance with thermal printers includes
frequent paper changes and keeping the heating element clean**

Thermal Printers - Print Receipts at Stores. The Paper is Thermally Sensitive.
Wherever you hit it with Heat, it changes color!!

2 Mechanisms - Feed Assembly (moves the paper up)
& Heating Element (has spots that heat up)

Benefits - Multi-part Forms. Creates a copy of the Receipt for you and the Store!

Downside - The Paper is Sensitive to Heat!
If stored in a hot room, the paper will turn Blue or Black!

Installing a Local Printer

- Installing a local printer means connecting to workstation via USB or (rarely) serial
- Device drivers enable the OS to work with the printer
- The print spooler enables multiple print jobs to queue

USB - Dominate way to connect Locally

Serial - for a Thermal Printer, looks like a RJ-11 connection, but it's Serial that connects to a Cash Register

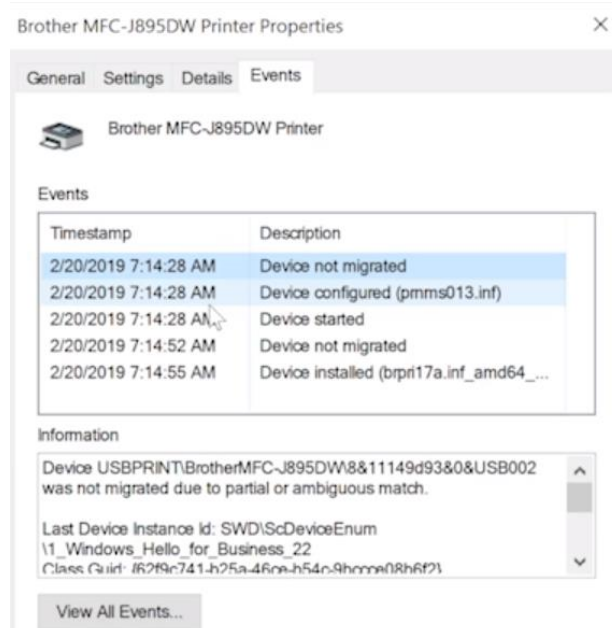
Device Manager - Connect your USB from the Printer to the computer, and your OS will usually do a great job at detecting your Printer instantly!!

If this isn't the case, just go to the company website & download the Driver

These devices have Firmware.

Firmware Updates are common with Printers.

Spooler - associated software that stores the Print Jobs

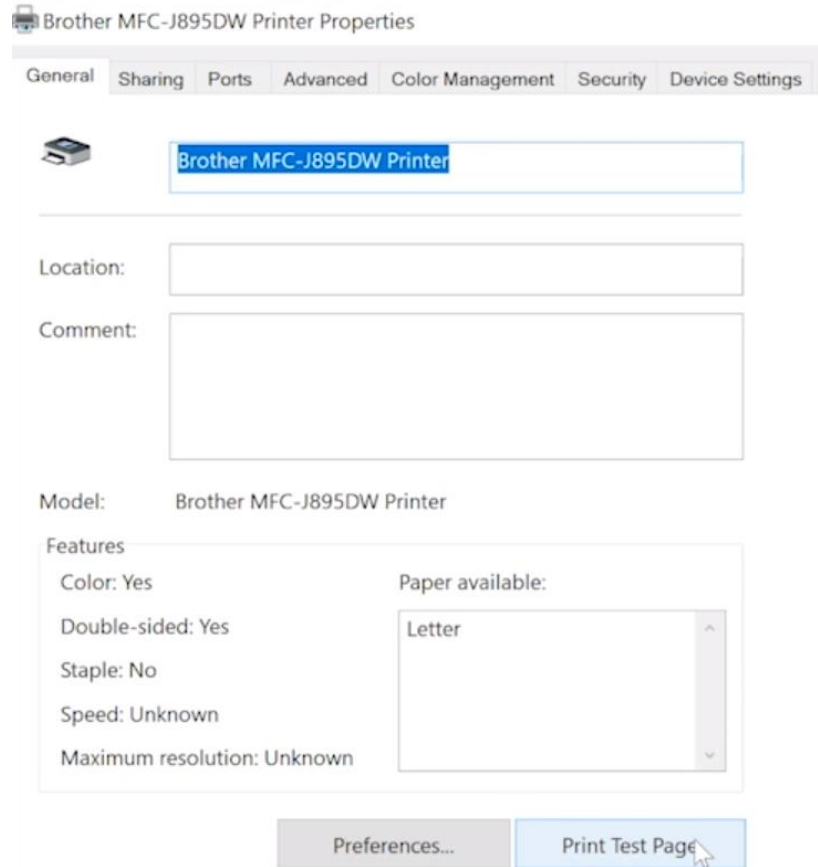


Right Click → Properties → Events - this is basically Event Viewer for this Device!

Control Panel → Devices and Printers

Right Click your Printer & Select.....

(Can set as Default Printer)



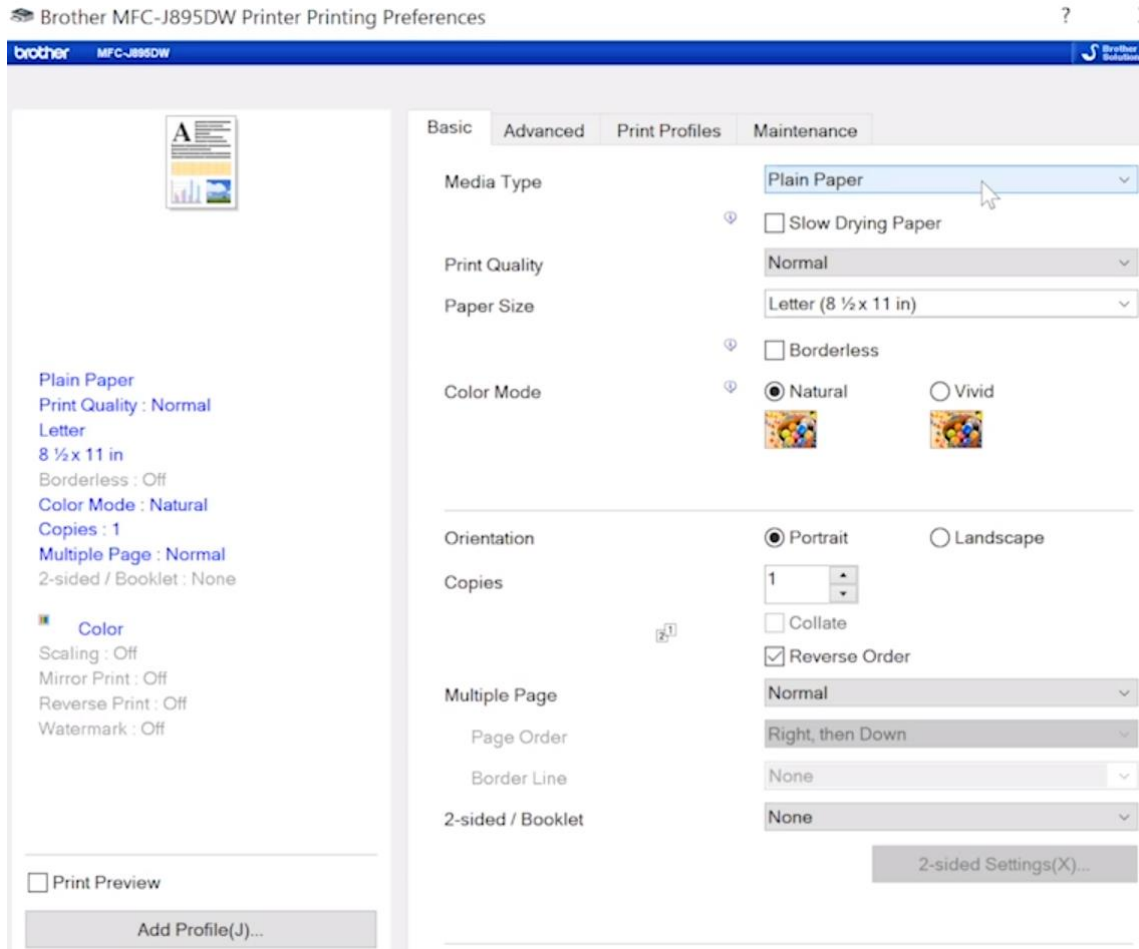
....Printer Properties (Not “Properties”, “Printer Properties”)

General - Feel free to change the Printer Name

Print a Test Page to see how your Printer is doing

Ports - show how your Printers are connected (USB)

Advanced - handle how the Spooler works



....Printing Preferences

Collation - Prints pages 123 123 123,
As opposed to 111 222 333

Duplex - Prints on Both Sides

Collation & Duplex can also be selected
in the Software you're using (MS Word) at the Print Screen

Spooler - Pause Printing, Cancel All Documents, Resume Printing, Restart Printing

You need Permissions to Pause/Cancel other Users Print Jobs,
but you are able to Cancel/Pause your own

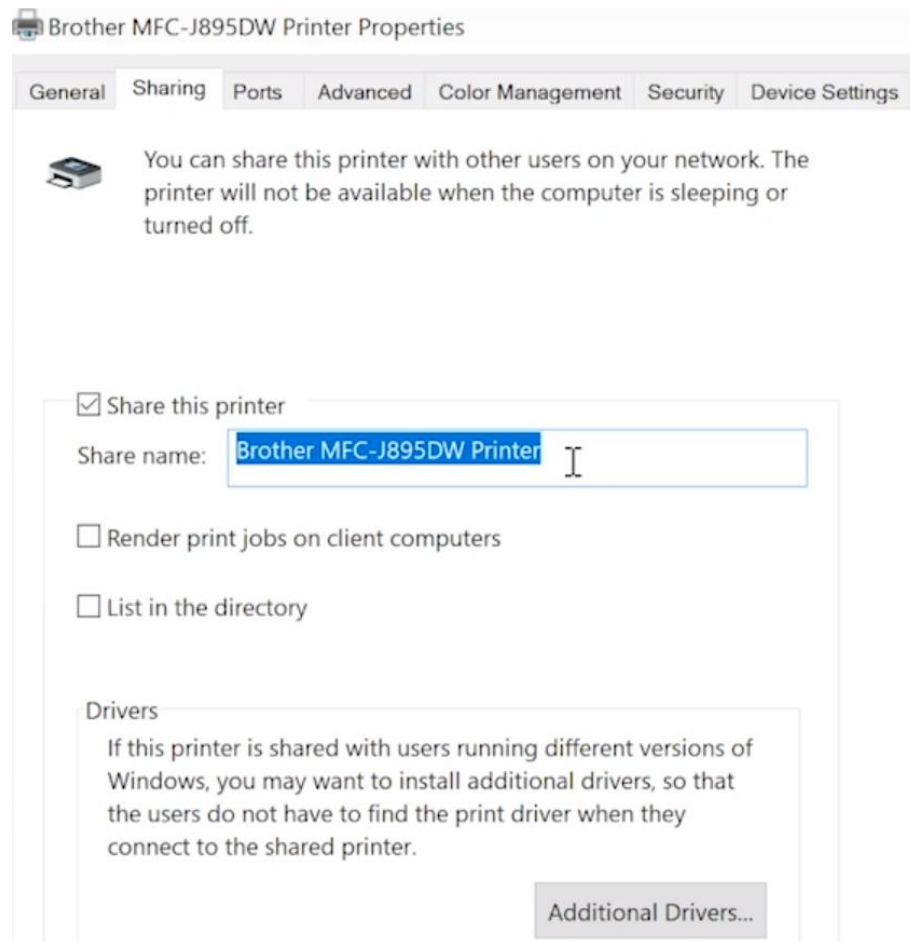
Print to PDF - Printing to this will just create a ".pdf" file

Print to XPS - This will just make an XPS Style Document

Print to Image -

Sharing Printers

- Sharing a local printer over a network requires sharing enabled & a share name
- Security options enable local control over the print spooler
- To connect to a shared printer, add a printer
but select the shared printer rather than a local printer



Control Panel → Devices and Printers

Right Click your Printer & Select Printer Properties → Sharing

Select the Checkbox to “Share this Printer” & “List in the Directory”
Can Change the Share Name

Printer Properties → Security

This now shows that “Everyone” is allowed to access this Printer!

Installing Wireless and Cloud Printers

- A wired network printer has an Ethernet NIC and plugs in directly to the network
- A wireless network printer requires configuration to get on an 802.11 network
- Wireless print utilities can help troubleshoot any connectivity problems
- Cloud printing enables mobile devices to print to a printer associated with an online account, such as a Google account

To avoid having to share your Printer,
you can set up your Printer as a Network Device.

2 Kinds of Network Devices -

Wired Devices - Printer with a Network Card in it

Wireless Devices - Printer with a Wireless NIC in it

There's not a whole lot of difference in this type of configuration

Wired Connection -

Most Printers today are incredibly aware of their Network

Connected to a RJ-45 as DHCP Clients, they will broadcast their presence

Windows - LLDP Protocol

Mac - SLP Protocol

Go into the OS, Install the Printer, and you're set!

Wireless Connection -

Make sure your 802.11 Standard your using matches up with
the 802.11 Standard your Printer is uses.

You can set these up for Ad hoc (Wireless Direct Network)

Get an Individual Client (Laptop) to set up the Ad hoc Network,
and the Printer can tie into that SSID

just as though it was tying into an Infrastructure SSID

Bluetooth - There aren't a lot of Bluetooth capable Printers out there,
but they do exist. Just need to Pair the 2 Devices

WPS - If there's WPS on the Printer, press the WPS button on your Router, and on your Printer, and they will auto configure with an IP Address and it's on to your SSID

Broadcasts your Printer on a....

....Wired Network through

Bonjour for Mac -

you don't even need to Install Locally, it just magically appears

Zeroconf (Zero Configuration) for Windows - Not as simple as the Mac :(

.....Wireless Network through

AirPrint For Mac - very nice & convenient

To take advantage of these Multifunctions, like the Fax, a lot of the time when we want to Fax something, we'd Print it out, then Fax it. Instead we could Print to a Fax!

Cloud Printing - biggest thing out there is Google Cloud Printing

Print to a Printer installed to your Google Account!

Needs to be a Wireless Printer (same Network as Device you're Printing from), and needs Google Print Services Support built into it.

Go to Google Cloud Print website,
and it will show all the Printers that can do it.

No matter where you are, you can Print to this Cloud Printer!!!

Troubleshooting Printers

- Inability to install a printer can reflect an unshared or missing printer
- Lack of connectivity can refer to physical cables, print server disabled, device drivers lacking, wireless configuration problems and more
- Physical print problems can manifest as no display, paper jams, insufficient memory corrupted drivers, and more

Unable to Install a Printer -

You don't have Rights to Install that Printer!

Someone at the Administrative Level set it up so you cannot Install

There is No Printer to Install

Someone hasn't Shared the Printer.

The Printer isn't on your Network (check IP Address & UNC)

Make sure it's Turned On!

No Connectivity - Printer we've used plenty of times before, and now it's not there
Are you Physically Connected to it?

If it's a Network Printer, is it getting good DHCP?

Are other people able to connect to it?

This is a sign of a generic Network Problem & has nothing to do with the Printer

If you have an issue with a Printer, go through the Process of a Mental Reinstall
Printer & Printer Queue is showing up in Device Manager
Send a Test Page to it
If these 2 are working, then Reinstall the Printer

Rollback your Device Driver if there's a recent Update that is causing the issue

Access Denied -

You need to have Permission to Print to Shared Printers
Trying to Delete another Users Print Jobs from the Spooler,
and you don't have those Permissions.

No Image on Printer Display -

Is it Turned On?

Is the Printer in some form of Sleep Mode?

Are you Locked Out and need to do some sort of Key Stroke?

You might just have a bad display. Get spare parts for this.

Paper Not Feeding/Paper Jam - These are the EXACT same Problem

There's an issue with your Pickup Rollers, or Separate Pads.

Get new ones! There's always going to be a Maintenance Kit with these.

Humidity is a great killer of paper!

Low Memory Errors - most likely for Laser Printers

They all use memory/RAM Today's Printers use older types of RAM (DDR2)

Reduce the Resolutions. Instead of printing 1200 x 1200, try 300 x 300

Buy more RAM! (Ebay!)

Error Codes -

Often will use very strange language,
so you might have to research what the code means.

PC Load Letter - Paper Cartridge Load Letter (Out of Paper!)

If you understand how Printers work, when you get a bad Print Out, it should make sense what went wrong.

Garbled Characters on Paper -

- Bad, or Corrupted Drivers

- Reset the Printer, get it back Online.

- Might want to Rollback the Driver, but usually not necessary here.

Vertical Lines on Page -

- This will happen with Laser Printers

- There's foreign matter on your Optically Sensitive Roller.

- Pieces of Paper, or String wrapped around it

- Throw out the Toner Cartridge

- It's impossible to try to remove this. It's too sensitive.

- Touch this & it will never print properly again.

Color Prints in the Wrong Print Color -

- Driver issue.

- One color of CMYK has ran out.

Printing Blank Pages -

- Thermal Printer - Heating Element is no longer working

- Laser Printer - Primary Corona is dead

- Think about the Technology & how it works to diagnose this issue

Streaks -

- Inkjet issue.

- When little Jets begin to clog, bits of Ink will form around the outside of the opening, and that ink will get stuck and push across the paper.

- Go into Maintenance Mode, and clean it up!

Faded Prints -

- Laser Printer - Low on Toner (give it a shake & see if it'll run a little longer)

- Impact Printer - Your Ribbon is running out.

- InkJet - either running low on Ink, or jets are evenly clogged

Ghost Images -

Laser Printers more than anything else
Last part of the Printing Process is Cleaning,
where a Rubber component rubs against the Optically Sensitive Drum,
pushing off any residual Toner.

Ghost Images are a result of the Rubber Piece being broken.
Just replace the Toner.

Toner Not Fused to Paper -

There's something wrong with your Fuser Assembly!
Very easily replaceable!

Creased Paper -

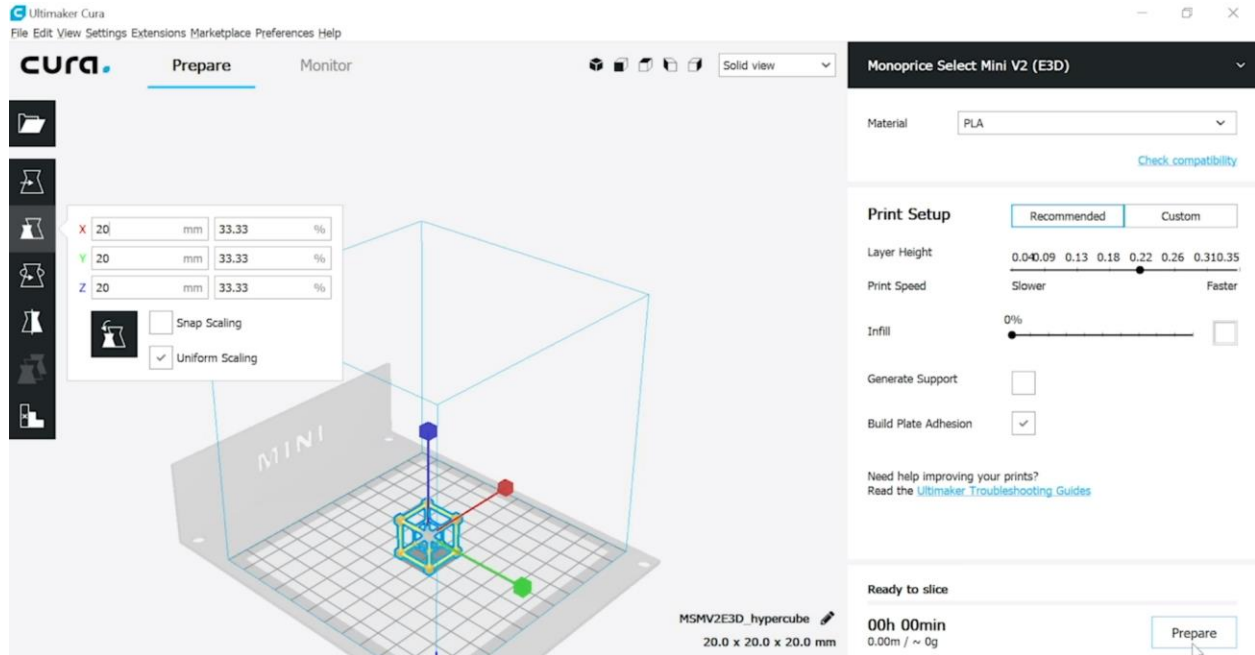
Pick Up Rollers - 1 is in Good Shape, but the other isn't
resulting in pulling at angles, causing creases
Maintenance Kit to fix this!

3D Printing

- **3D printers melt some material (such as forms of plastic) in a pattern to create a 3D shape**
- **Use specialized software to create a 3D image**
- **The printing process requires preheating the various print elements, such as the filament, extruder, and bed**

3D Printer - Heating Element that can move back & forth,

Filament - Unmelted Raw Material. They melt and harden really quickly!



Layer Height - height of each Cross Section

Infill - if the object is solid, it's how much of the inside you want filled in for structural strength

Generate Support - uses physics (Center of Mass) to make sure it stands and doesn't topple over. Not sure if I understood this correctly, but it might create a support, or possibly creates this with more infill.

Build Plate Adhesion - remember those green plastic army soldiers. They had Adhesion Plates they stood on.

Click Prepare, and the program will go through the Slicing Process, and make a Slice File. This is what we feed into the 3D Printer Device

3D Printing uses some form of Thermal Plastic Filament that uses an Extrusion Process by looking at 3d Programs which are then sent through a Slicing Process, and the Slice Files that make the Objects/Images!

I hope you're enjoying this Notes Course.

I'd really appreciate it if you were to rate & review this course.

Thank you and keep up the good work!

Robert Mathisen