

**Fusion3**

# **EDGE 3D Printer**

## **TROUBLESHOOTING: FILAMENT FEED PROBLEMS**

**Revision 8/03/2023**

# TROUBLESHOOTING FILAMENT FEED PROBLEMS

How to diagnose and fix filament feed issues on EDGE

## INTRODUCTION

### What is a Filament Feed problem?

Filament feed problems, or filament feed issues, are what we call situations where the flow of molten plastic out of the print head completely stops, or comes out at a rate lower than intended.

### What Causes a Filament Feed Problem?

A lot of things can happen to cause this:

- Jam in the print head
- The extruder has lost grip on the filament and has chewed it up
- The filament becomes wrapped/tangled on the spool and the extruder isn't able to pull it off the spool
- The filament becomes stuck in the bowden tube or in the extruder due to a bulge or thick section (rare)
- The filament has softened in the feed section from too many retractions in a row, and pressure from the feed gear has flattened it so that it no longer fits through the feed path (rare unless the extruder fan is not running)
- The bowden tube pulls out of a fitting mid-print (rare)
- False-positive (filament monitor thinks there's a problem but there isn't)

Each of these cases can have multiple root causes. For example, a print head jam can be caused by:

- Printing temperature too high resulting in pyrolysis of the material in the head
- Debris in the filament clogs the nozzle
- Cold side fan stops running and molten filament backs up into the cold side of the print head

### The Role of the Filament Monitor

In SOME but not all of these cases, the filament monitor in the extruder may detect the problem and pause the print, (and generate a *filament feed error*). This gives you the opportunity to resolve the situation if you're able, and potentially continue your print. However, **being able to continue the print is not guaranteed.**

## Scope of This Document

Due to the complexity and inherently inter-related and multi-layered nature of filament feed problems, the goal of this document is **to educate you on the general approaches and thinking to resolve these issues**. The goal is NOT to cover every possible scenario.

## BASIC FIX & TROUBLESHOOTING PROCESS

The basic steps are:

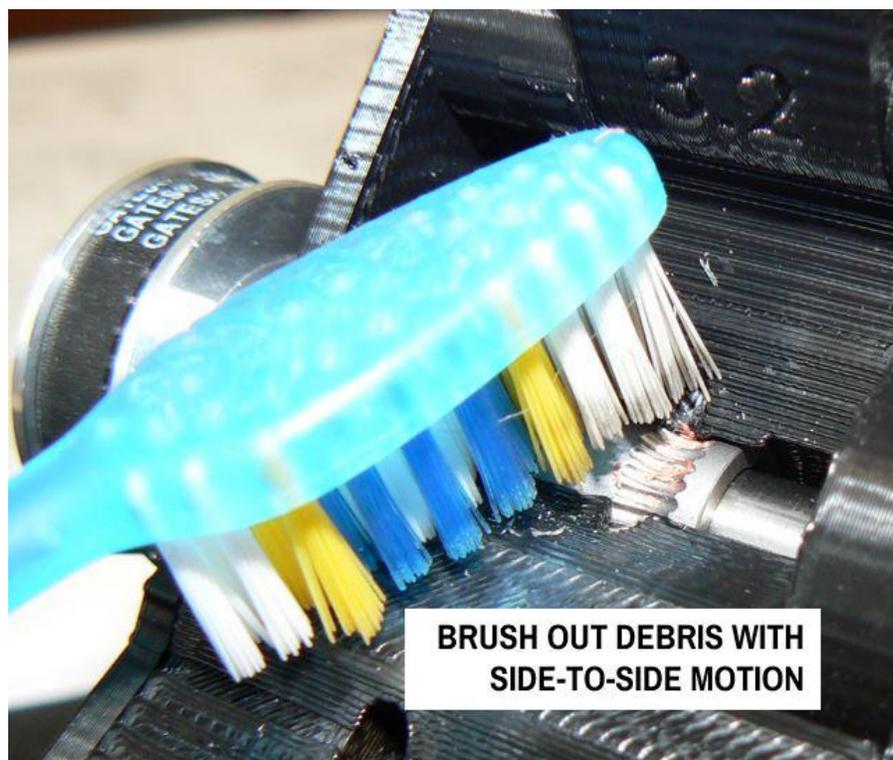
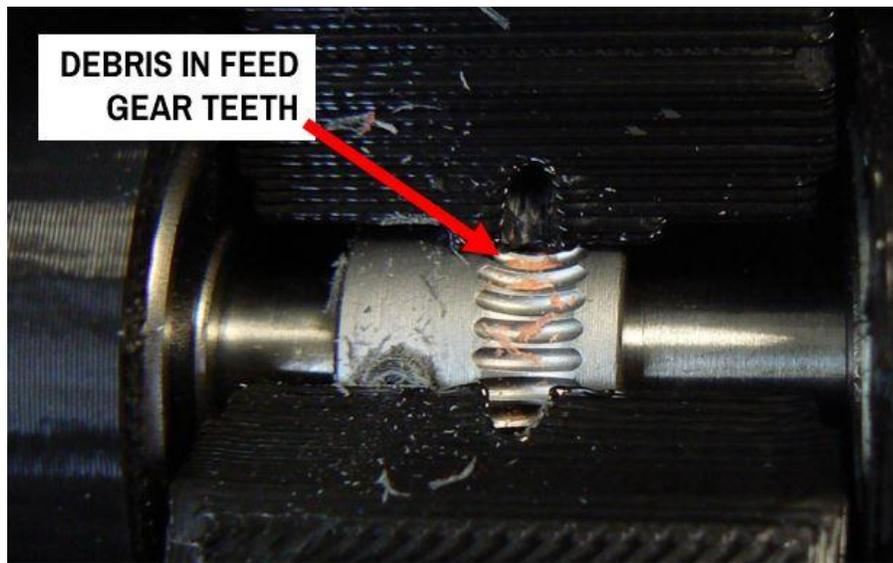
1. Unload filament
2. Cleanup & inspect
3. Re-baseline
4. Re-run print job
5. Watch for issue to happen again

## Detailed Steps

1. Unload filament from the printer. If the extruder has really chewed up the filament, you may need to open the idler bar and pull it out manually. If the print head is cold and the filament won't come out, heat the head up to 200-250°C.
2. Inspect the removed filament for:
  - a. Chewed up sections (often described as "half-moon" cutouts). These indicate the extruder lost grip on the filament (the small v-shaped marks in the filament are normal and expected).



- b. Bulges or lumps. Usually accompanied by VERY high force needed to unload the filament. If you see these, this is probably your problem. Continue to use filament at your own risk because these usually indicate a major quality control problem with the roll.
3. Open the extruder idler bar and inspect the feed gear for chewed up plastic debris. Brush it out with the toothbrush in your toolkit, or another small plastic bristle brush. Rotate the extruder by hand to clear the entire gear.



4. Check the filament monitoring section for debris, make sure the encoder wheel is aligned with the filament path and spinning freely.
5. Sometimes you won't see an obvious indication of what went wrong. That's ok.
6. Cut ALL the filament off with tooth marks in it. Load the fresh end into the extruder as normal.
7. Close the idler bar. Check the spring preload using the fixture from your toolkit. It should slide between the grab bar and the washer with moderate force. You MUST do this with filament loaded in the extruder



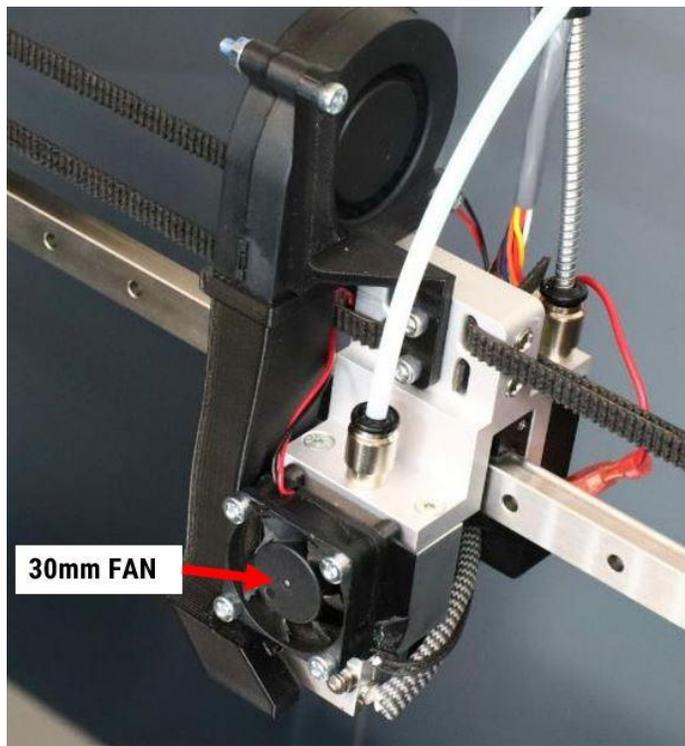
8. DON'T USE THE LOAD FILAMENT FUNCTION ON THE LCD
9. Heat the head to 250-270°C depending on your material.
10. Manually spin the extruder to advance filament up to the print head. Check for major changes in feed resistance as you do this; they indicate a problem.
11. Once the filament reaches the print head, continue to slowly advance the extruder until you see material melt and flow out of the tip. It's normal to feel some increase in resistance as you do this.
12. If you feel a sudden increase in resistance and no material flows out of the head, you likely have a jam in the tube. Replace the print head tube.
13. Resume or restart your print job

## **OTHER ITEMS TO INSPECT**

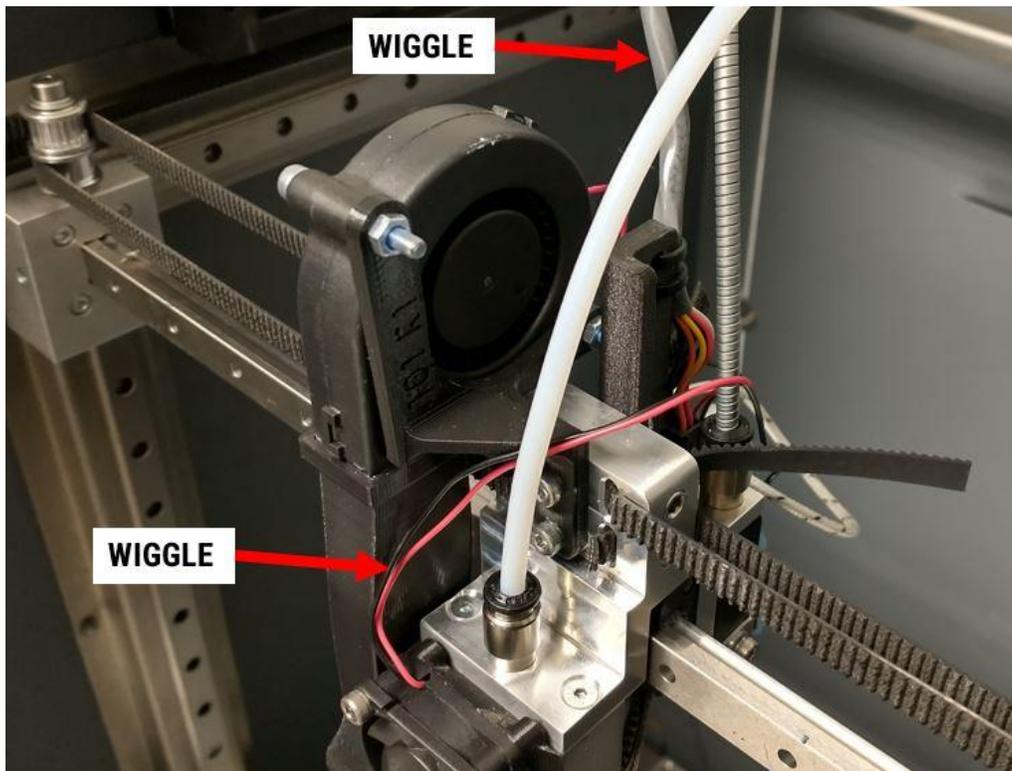
This is not a comprehensive list, but a good starting point of common causes of feed issues/jams.

### **Print Head Cold Side (30mm) Fan**

Heat the print head to > 45°C. This fan **MUST** turn any time the print head is hotter than 45°C or thermal jams will quickly develop (5-15 min of printing).

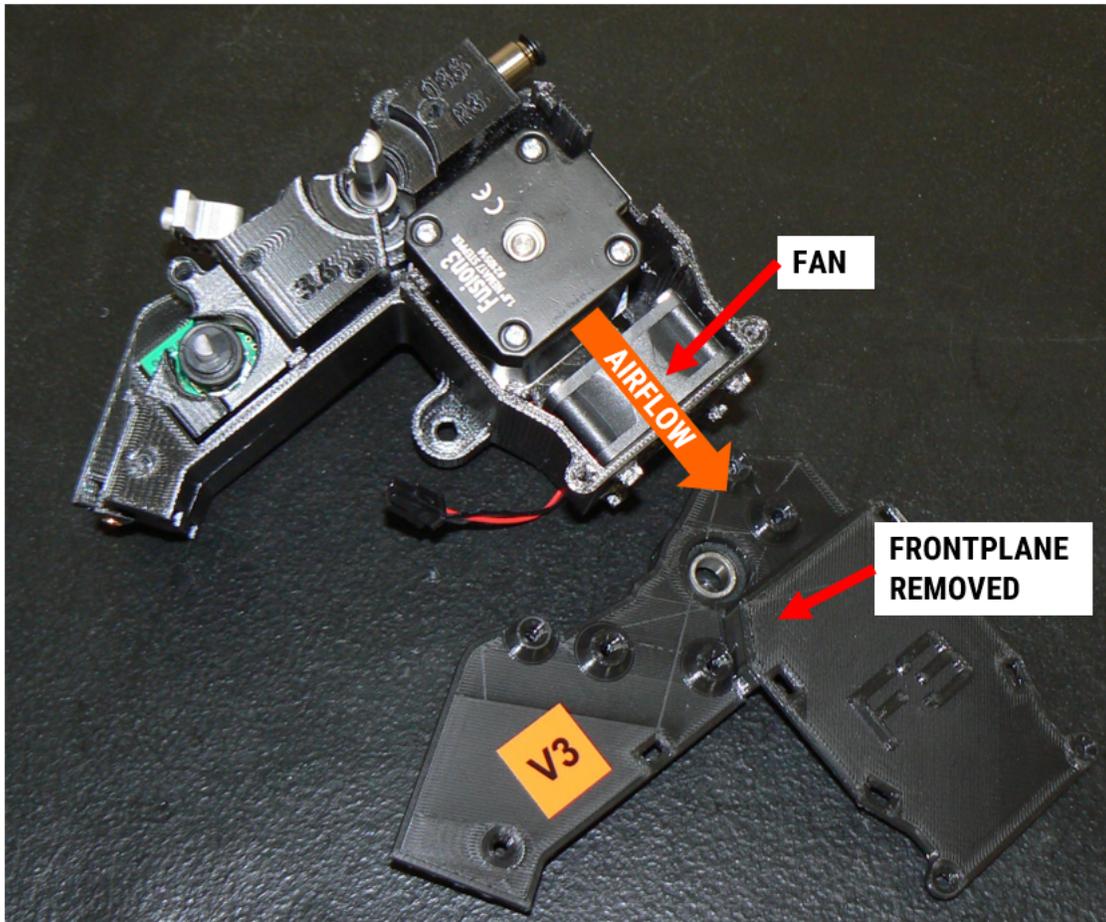


By hand, move the print head through its range of motion in the XY plane. Make sure the fan does not slow down or stop spinning at any point. Gently wiggle the wires around the fan and wiggle the 8 pin harness just above the print head assembly to check for wiring issues.



## Extruder Internal Fan

Just like the 30mm cold side fan, any time the print head is  $> 45^{\circ}\text{C}$  this fan, located inside the extruder body at the bottom, will run. This fan pushes air OUT through the bottom of the extruder.



Use your hand to make sure air is flowing out of the extruder. If this fan does not run, the filament passing through the extruder can get hot and soften, causing it to flatten and get stuck. This is particularly prevalent with low temperature materials such as PLA.

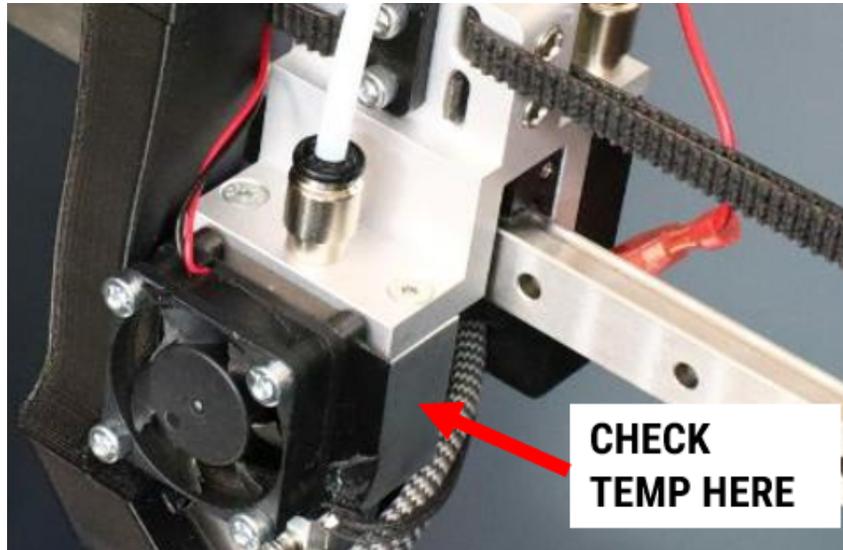
(You don't have to take the extruder apart to check this - the picture is for illustrative purposes so you know where the fan is located)

## Print Head Cold Side Temperature

Perform this check if you are not sure if the cold side fan is working properly or if you suspect there may be thermal issues in the print head with other causes.

1. Heat the print head to  $255^{\circ}\text{C}$ .
2. Let the print head sit at temperature for 15 minutes.

3. Place your finger on the side of the cold section. It should be warm to the touch BUT COMFORTABLE to touch. If it is too hot to touch comfortably, there is an issue.



You can also use a thermocouple for a more scientific measurement. Tape the probe in the same spot. The heat sink temperature should be less than 45°C, and >50°C indicates a problem. **DO NOT use an IR or no-contact thermometer as these are not accurate on metal surfaces.**

### **ANVIL Print Tube Position**

Make sure the ANVIL print head tube is not over-inserted into the head. This can cause poor heat transfer between the top section of the tube and the heat sink, which effectively lengthens the melt zone and causes very poor performance (stringing, zits, blobs, flow starvation) or jams.



## DETERMINING IF A FEED ERROR IS REAL OR A FALSE POSITIVE

Sometimes, with specialty filaments or with unusual prints, the filament monitor may report a filament feed error even when everything is fine. Here's how to tell if a feed error is real or a false positive.

1. Press CLOSE to close the feed error notification on the LCD.
2. Tap the print head temperature icon to heat the print head back to printing temperature.
3. Once up to temperature, if the extruder is not able to be turned by hand press "disable extruder".
4. Turn the extruder by hand and see if any filament squirts out of the print head.

If YES - this is a false alarm and it's ok to resume the print.

1. Clear the extruded filament off of the print head.
2. Press "resume" and wait for the print to resume.
3. Watch it carefully to make sure material is flowing out of the head.

If NO - we have an actual filament feed error.

1. Attempt to unload the filament from the print head/extruder by hand (don't use the onscreen buttons).
2. Trim the end and reload it by hand.
3. When the tip of your filament gets to the print head, slowly feed it forward and try to get some material to extrude.
4. If you're able to get material to extrude, press "resume" and follow the instructions above.
5. If you encounter a lot of resistance and no material comes out of the print head, the head may be jammed. You will probably need to cancel the print and clear/replace the print head tube.

If your error was a false positive and it keeps happening, consider bypassing the filament monitor by unplugging the 4 wire connector. For some materials such as flexibles this is best practice. Just remember to plug it back in when you change materials!

For more information, see our *TROUBLESHOOTING - FILAMENT MONITOR* document.

## MISC INFORMATION & CASES

### Multiple Feed Failures in a Row

If your print fails multiple times without any sign as to what's causing the problem:

1. Replace the print head tube
2. Replace the bowden tube
3. Consider replacing the PTC fittings (optional)
4. Check the extruder idler bar spring preload. If it looks good, tighten slightly and try again

### Miscellaneous Cases

**If the bowden tube pops out of a PTC fitting:** Replace the bowden tube and the PTC fitting. Once the fitting lets go once, it's permanently compromised.

**False positives:** Make sure the encoder wheel is aligned with the filament path and spins freely. Make sure there is not debris in the monitor section that might impact the encoder's grip on the filament or its ability to rotate. Make sure the filament monitor door is fully closed and latched and the idler bearing is making contact with the filament.

**Wrap/tangle on spool:** In 99% of cases, this happens because the free end escaped and got itself wrapped under another coil on the spool. Sometimes this will happen and not cause a problem until hundreds of grams later. This is why it's so critical to NEVER let the free end get away from you while handling or storing your filament. You have a few options:

- Cut the spool, unwind a significant portion of it to chase the tangle out and ensure it hasn't simply migrated away from you, then rewind it.
- Throw the spool away and start with a fresh one
- Accept that you're going to have to babysit the rest of the print and periodically adjust the spool to stress relieve it and prevent the tangle from getting pulled taut. If you're attentive you can continue this pretty much indefinitely.

**Can't unload filament at all:** If the filament is stuck in the extruder even with the print head hot, try the following:

- Close the idler bar and apply firm pressure with your hand to get maximum grip on the filament. Use the feed wheel to turn the extruder in reverse. Stop if this strips the filament.
- If the filament is stuck in the ANVIL print head tube, remove it and replace it.
- If the filament is stuck in the bowden tube, remove it and replace it.
- If the filament is stuck in the extruder, cut it flush with the exit and attempt to push it back out with a 2mm hex key.
- If the filament is stuck in the extruder PTC fitting, use slip-jaw pliers to carefully unthread the fitting from the extruder and replace it.

## OTHER THINGS TO CHECK

This is a list of other possible causes of feed issues we've collected over the years.

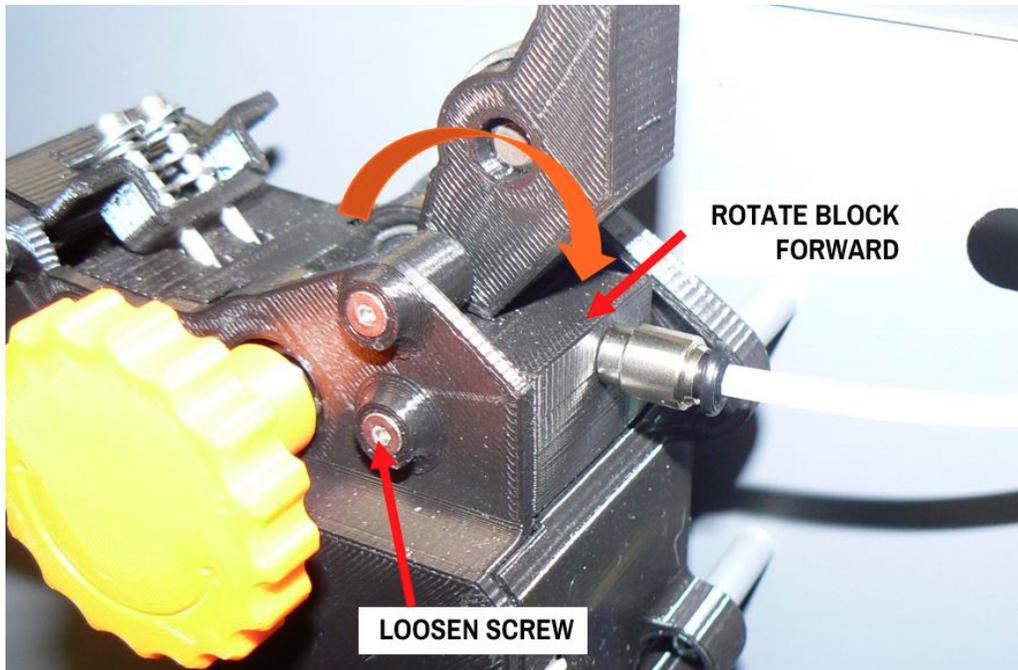
### Idler Bar Tightness

Make sure the extruder idler bar screw is tight enough that the idler bar cannot wobble side to side. The screw should not be so tight that it's difficult to open or close the idler bar.



## Extruder Midplane Fwd Rotation

Make sure the extruder midplane fwd is positioned correctly as shown in the picture.



## NEXT STEPS & GETTING HELP

If you have multiple feed issues in a row, and if you've gone through everything in this guide and can't diagnose the problem, please reach out to our customer support team.

Please be prepared to share the following information to help us help you quickly:

- Nature of the problem (jam, false feed error, where it's jammed, etc)

- Material (type, brand, fill if any) you're using
- Your gcode file
- Information such as if the printer always/typically jams in the same spot in the file
- Steps you have tried so far, and results.

This is not a comprehensive list but it's a good starting point for us to assist you.