

**Fusion3**

# **EDGE 3D Printer**

## **TROUBLESHOOTING: NOZZLE OFFSET ERRORS**

**Revision 3/29/2023**

# TROUBLESHOOTING NOZZLE OFFSET ERRORS ON EDGE

The steps to troubleshoot and correct nozzle offset calibration errors & failures.

**NOTE: This document is written for firmware 1.4t7 and higher. If you have older firmware, or are not sure, please contact Fusion3 Support to update your firmware first. In many cases, up-to-date firmware will improve your nozzle offset performance without any other steps being needed. As of 1/10/23 the latest firmware is 1.4stable2.**

## HOW THE NOZZLE OFFSET PROCESS IS SUPPOSED TO WORK

SEE ALSO: <https://www.youtube.com/watch?v=E6vnoPltXwk>

When everything is working normally and correctly, here is what the nozzle offset calibration process is supposed to do:

1. The printer homes X, Y, and Z, if it's not already homed.
2. The printer does a single probe with the bed probe on the scrub plate, to figure out exactly where the bed is (*position changed from center of bed to scrub plate in 1.4t10*).
3. The print head is heated up so that any filament on the tip of the nozzle can be removed.
4. Once up to temperature, we perform a "ram purge" to clear all molten filament out of the print head in a way that reduces the odds of filament continuing to dribble out of the print head during the rest of this process.
5. We turn the blower on and wiggle the print head back and forth to try to dislodge the ram purge length of filament.

**NOTE: if the ram purge length doesn't drop off the print head on its own, PLEASE REMOVE IT.**

6. The print head is moved to the scrub pad and scrubbed against it to remove any filament or debris that might interfere with the probe.
7. The print head moves to the left side of the scrub pad clamp plate and attempts to achieve electrical contact between the tip of the nozzle and the plate. This step measures the Z position of the nozzle.
8. If contact is made, we do a little scrub against the plate to make extra sure the nozzle is clean.
  - a. If contact fails, we retry up to 3 times and scrub the nozzle against the plate each time. A popup message "Nozzle probe failed, retrying..." will appear if this happens.

- b. If the nozzle probe fails 3x in a row, we go back and try a ram purge again and start the process over. You'll see an error message that says "*Nozzle probe failed 3x, re-cleaning & retrying...*" if this occurs.
9. We probe the plate with the nozzle tip a second time. Same possible errors as above.
10. If this is successful, we deploy the bed probe and probe the same position with it.
  - a. If this fails, it'll retry up to 3 times but this is very rare. Error message is "*Probe failed, retrying...*" or if it fails all 3 times, "*ERROR: Probe probe failed 3X*" and it will quit the process.
11. We calculate our first nozzle offset.
12. We go back to step 7 and repeat.
13. If all of these steps complete successfully a second time, we compare the 2 nozzle offset values we calculated.
  - a. If they're within 0.05mm of each other, AND within our safe window, we exit successfully.
  - b. If they're further away than 0.05mm, we go back to step 4 and repeat once, then the values are compared again. You'll see an error message that says "*Probe offset mismatch, recalibrating...*"
  - c. If the results fail the safe range check, you'll see an error message that says "*ERROR: Offset value outside of safe range. Check system function*" and it will quit the process.
14. All of these steps will be run up to 7 times in an effort to get 2 values that are within 0.05mm. If this fails to happen, the process will quit with an error message "*ERROR: Probe system malfunction during offset calibration. Attempted 7x calibrations.*"

## ERROR MESSAGES & WHAT TO DO

This section covers the error messages that can be generated during the nozzle offset process, what they mean, and how to resolve them. Error messages that don't require corrective action aren't covered here.

### **"ERROR: Probe system malfunction during offset calibration. Attempted 7x calibrations."**

**What it means:** The printer tried 7 times to get 2 offset values within 0.05mm of each other and failed. After 7 tries it's programmed to give up and ask for help from you.

#### **What to do:**

**FIRST** - Make sure things are clean

1. Unload filament.

2. Clean the print head by following the procedure in "*Troubleshooting the offset process - Debris on the print head*" section.
3. Make sure you have the updated scrub pad system that uses the scrub plate spacer instead of the stacked washers. More info [HERE](#).
4. Make sure the scrub pad is clean, undamaged, and positioned correctly. Replace if needed.
5. Run *Utilities > Bed Leveling > Run Nozzle Offset* and see if it's able to succeed.
  - a. If the calibration **succeeds**, re-load your filament and try your print again.
  - b. If the calibration **fails**, proceed to the steps below.

**SECOND** - If you recently updated the firmware, apply the update again.

Run *Utilities > Bed Leveling > Run Nozzle Offset* and see if it's able to succeed.

If the calibration **succeeds**, re-load your filament and try your print again.

If the calibration **fails**, proceed to the steps below.

**THIRD** - Follow the steps in the "*Troubleshooting the offset process - Next Steps*" and "*- Further Steps*".

## **"ERROR: Offset value outside of safe range. Check system function."**

**What it means:** The nozzle offset process was able to complete successfully, but the resulting value is too big or too small and falls outside of the safe range (currently 1.5mm - 4mm). Values outside of this range indicate something is mechanically out of position and we want to address it before damage to the printer occurs.

### **What to do:**

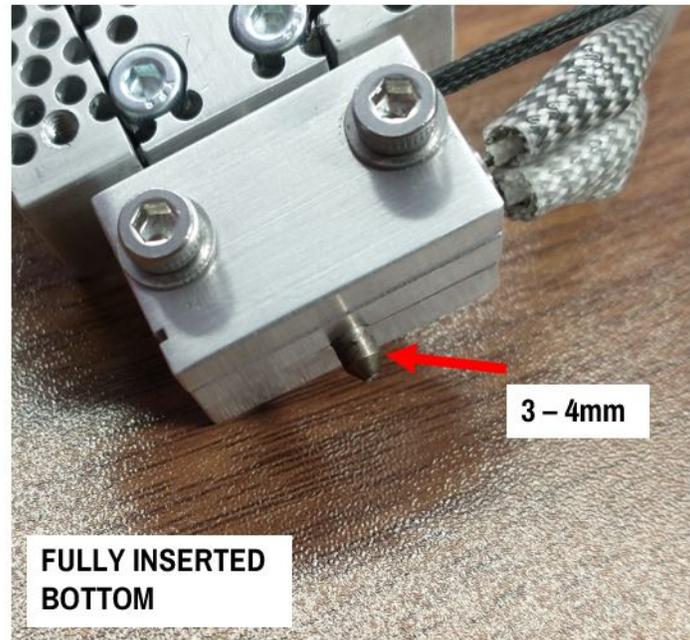
Go to *Utilities > Console* and scroll through the log until you find the bed probe result. It will say something like "*Z probe trigger height set to x.xxx mm*".

If this number is **SMALLER** than 1.5mm, that means the tip of the nozzle is too high, or the tip of the bed probe is too low.

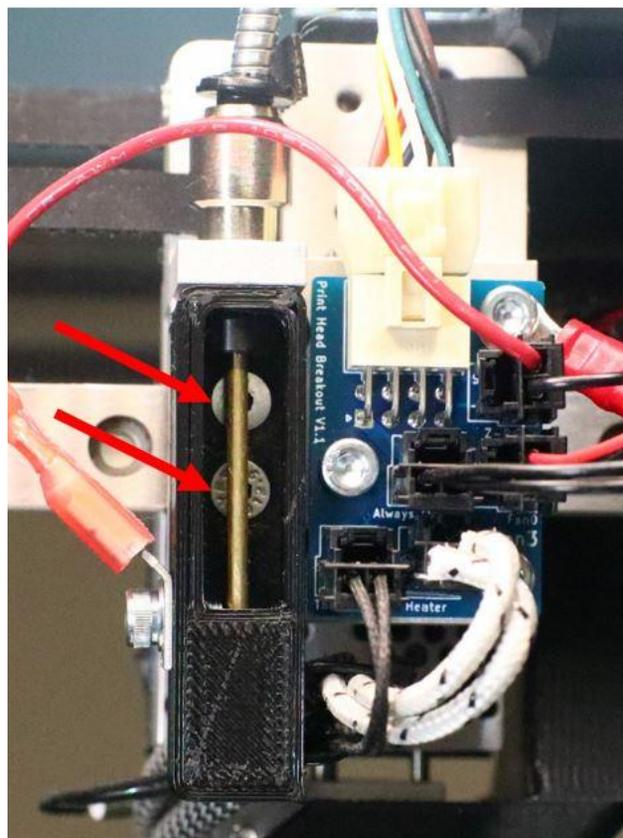
If this number is **BIGGER** than 4mm, that means the tip of the nozzle is too low, or the tip of the bed probe is too high.

Check the following:

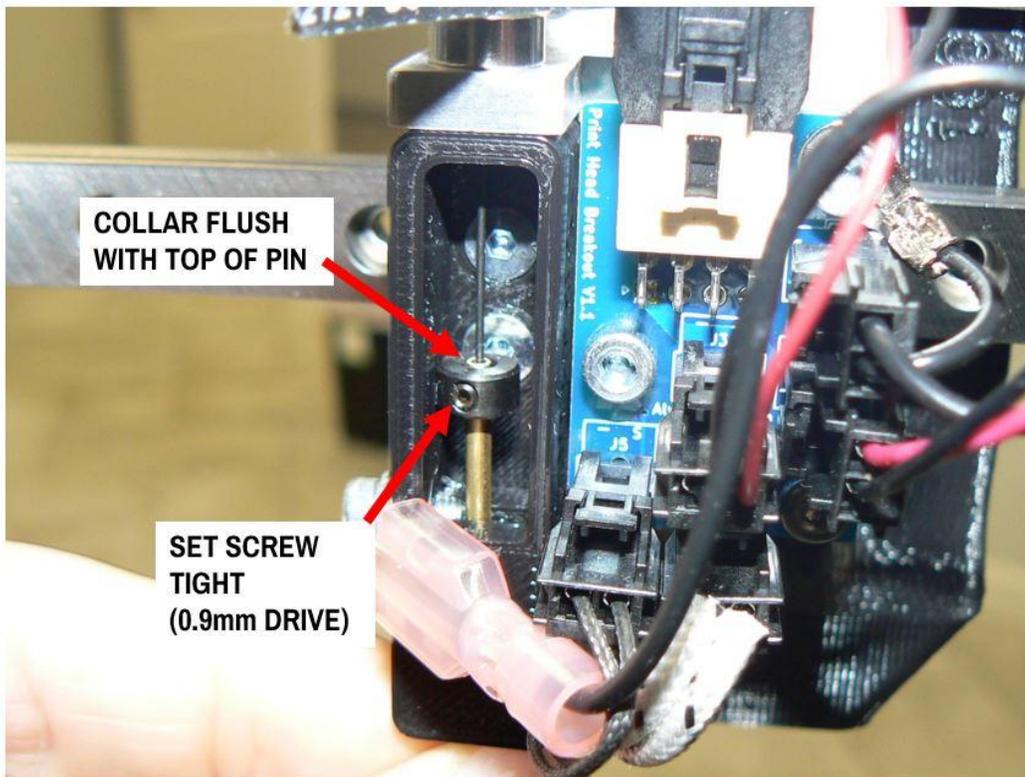
Make sure the ANVIL tube is installed correctly and the correct amount protrudes out of the bottom of the head (3-4mm). If in doubt, remove and reinstall.



Make sure the bed probe body is correctly bolted onto the print head assembly.



Make sure the probe pin collar is firmly attached to the pin and positioned with 0.5mm of the top of the pin.



If none of these resolve your issue, contact Fusion3 Support.

## TROUBLESHOOTING THE OFFSET PROCESS

### Check For Newer Firmware

This section of the firmware is frequently under active development. The first step should be to reach out and see if there is a firmware update available for your printer.

To check your firmware version:

1. Go to *Utilities > Info* and look at the top line. If your firmware is up to date, you will see a line that says "F3 Version 1.4Stable1". This is the most up-to-date firmware.
2. If your first line reads "F3 Web Control", your firmware is old and should be updated.

## Debris on Print Head

Most of the time, problems with the nozzle offset calibration process are caused by debris on the print head. We have a multistep semi-automated cleaning process, but it's not foolproof. Here are the steps to determine if this is the source of your problems:

1. Unload filament from the printer.
2. Manually heat the print head to 275C.
3. Once up to temperature, POWER OFF the printer.
4. Immediately scrub the bottom of the print head and nozzle with a brass bristle brush (like the one in your toolkit). Remove as much molten filament and carbonized debris from the print head as you can.

### **CAUTION: Remember the print head will still be EXTREMELY HOT**

5. Power the printer back on.
6. Go to *Utilities > Bed Leveling* and run "Run Nozzle Offset". See if it is able to complete with no error messages.
7. If it does, your original issue was caused by debris on the print head.
8. For most materials, if you load your filament back into the printer and run "Run Nozzle Offset" again, it should still work fine. Some particularly sticky materials such as PETG may require closer supervision to make sure they do not interfere with the normal function of the nozzle offset calibration process.
9. Inspect the print head scrub pad and determine if it needs to be replaced.

### **Next Steps (if still having issues):**

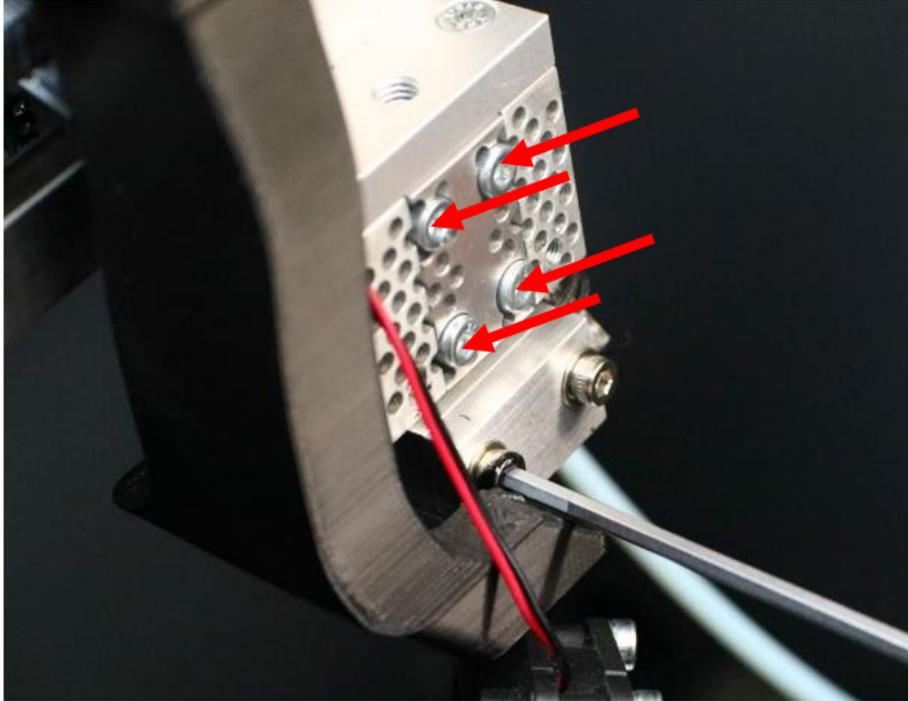
Replace the ANVIL print head tube with a new one and retry. Sometimes a tube becomes so caked with debris it becomes non-conductive.

Inspect the scrub pad clamp plate and make sure it doesn't have debris on the area where the nozzle probes. Sand with 400-800 grit sandpaper if you're not sure.

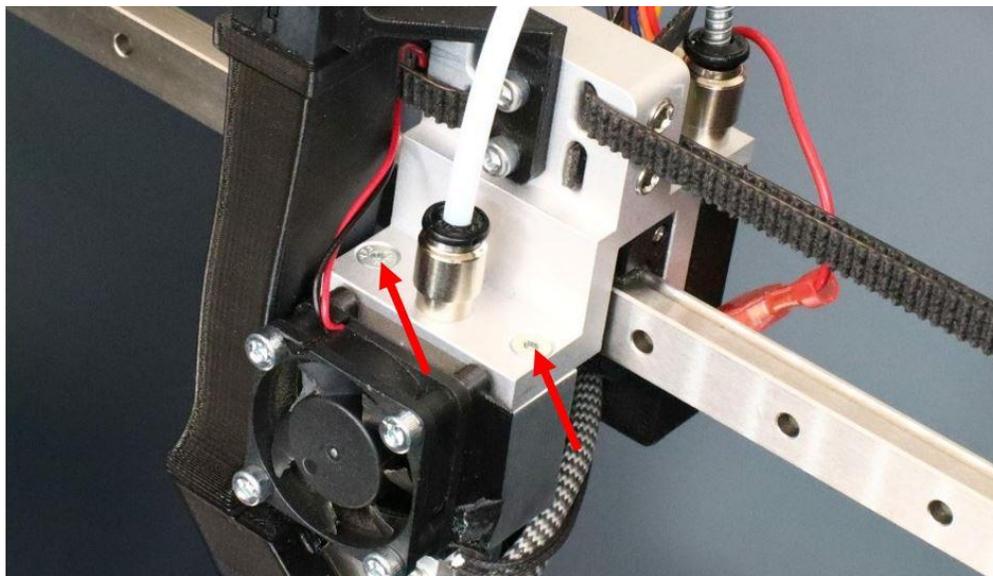
## Further Steps: Check Wiring & Mechanical:

In some cases, nozzle offset calibration problems have other causes. Here is a checklist of other things to check, if the above did not resolve your issue.

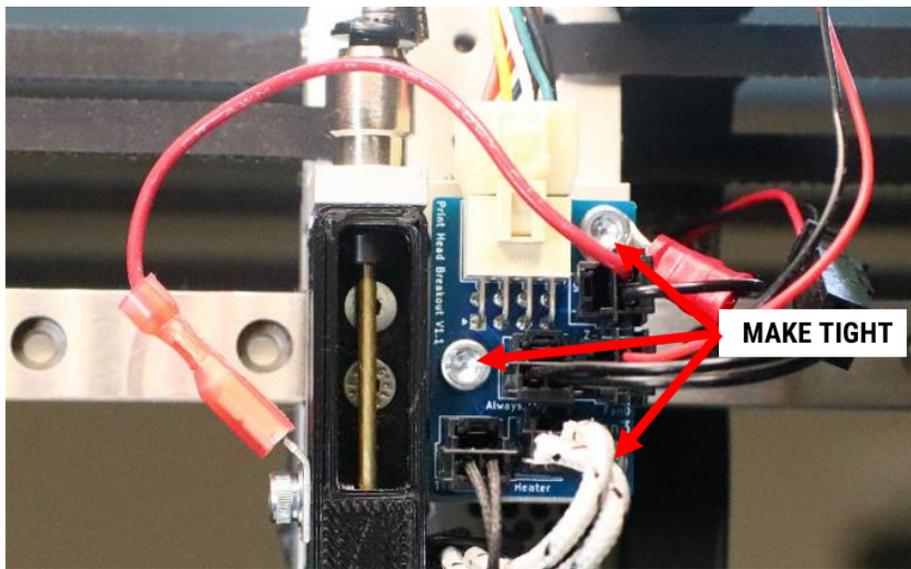
1. Check the 4x cold side screws on the print head and make sure they're very tight. They're under the 30mm fan (remove to check).



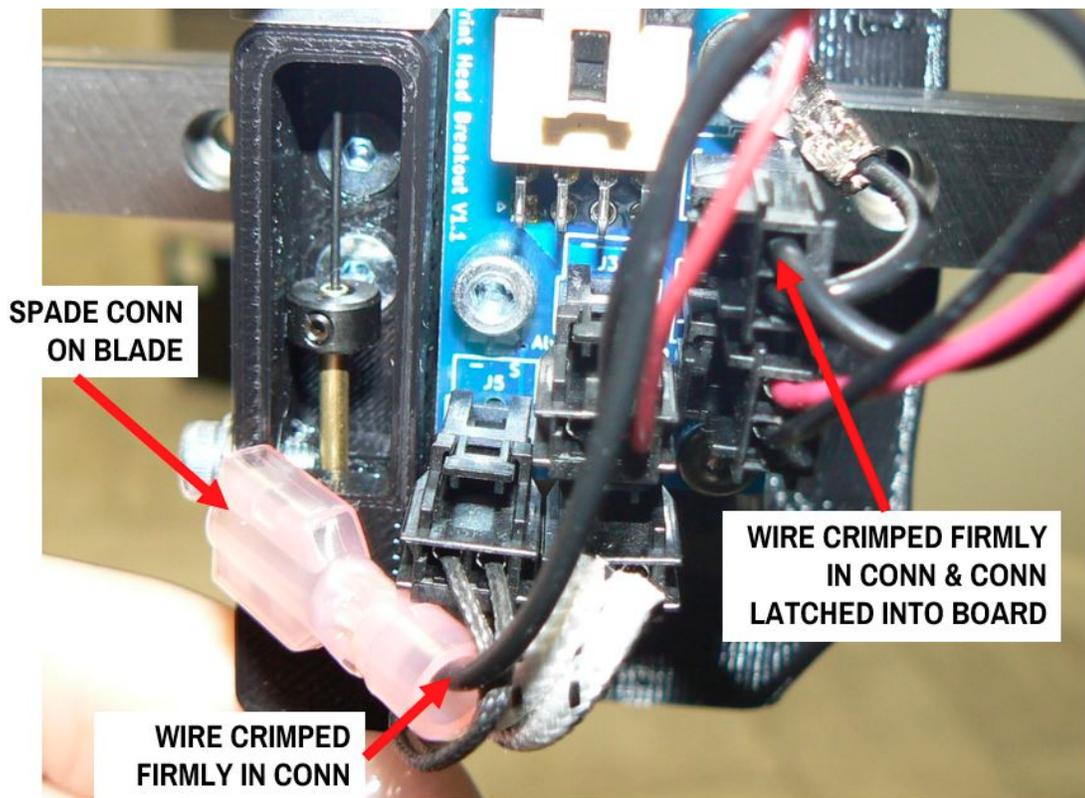
2. Check that the print head screws are tight



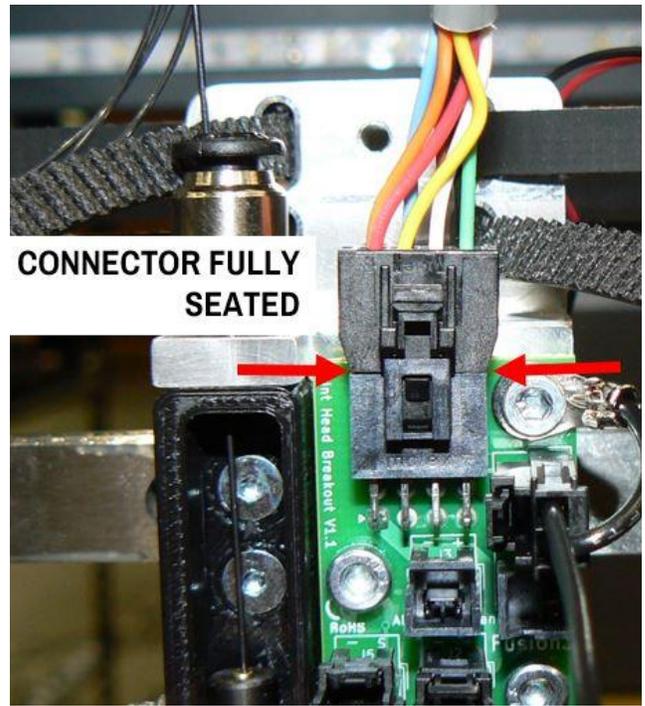
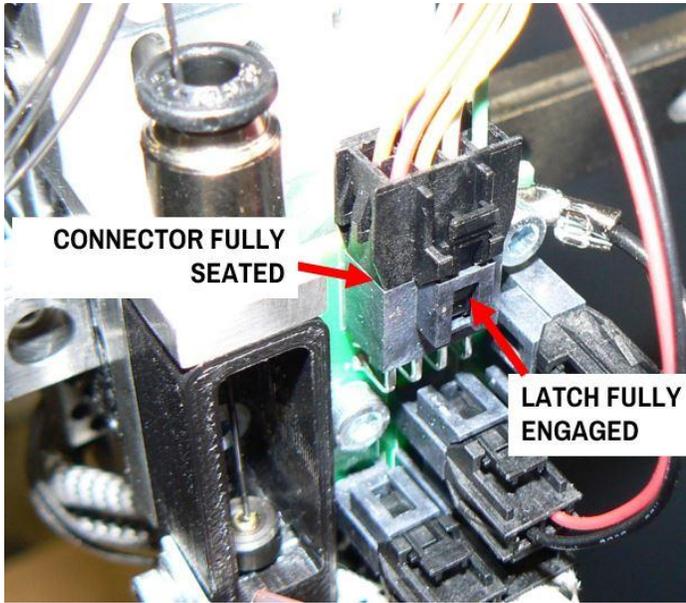
3. Make sure the 3 screws holding the breakout PCB to the print head body are tight. Particularly the top right one that has the ring terminal on it.



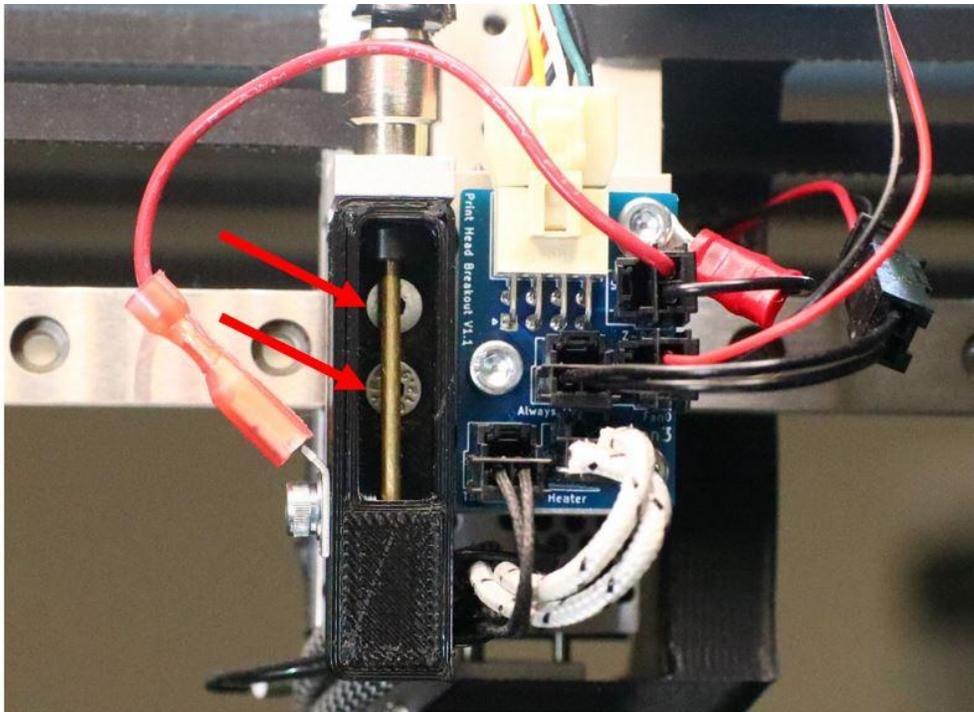
4. Make sure wire lead from ring terminal on screw is intact - ring terminal crimp, connector pin, connector fully seated



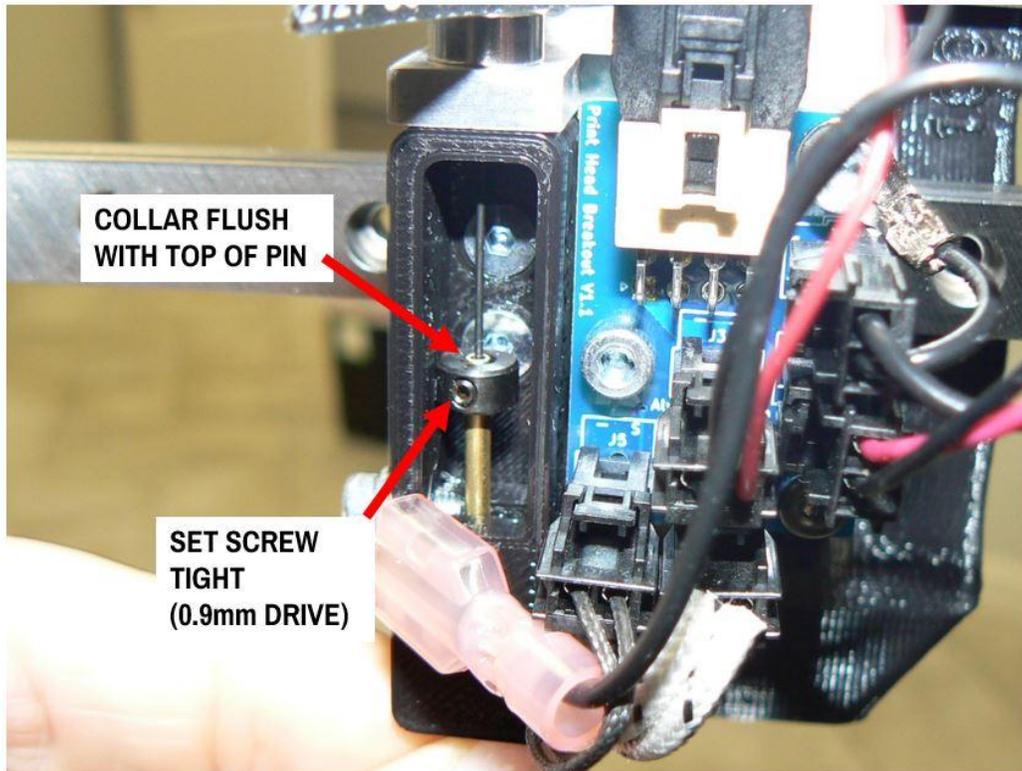
5. Make sure the print head harness (8 pin) is fully seated.



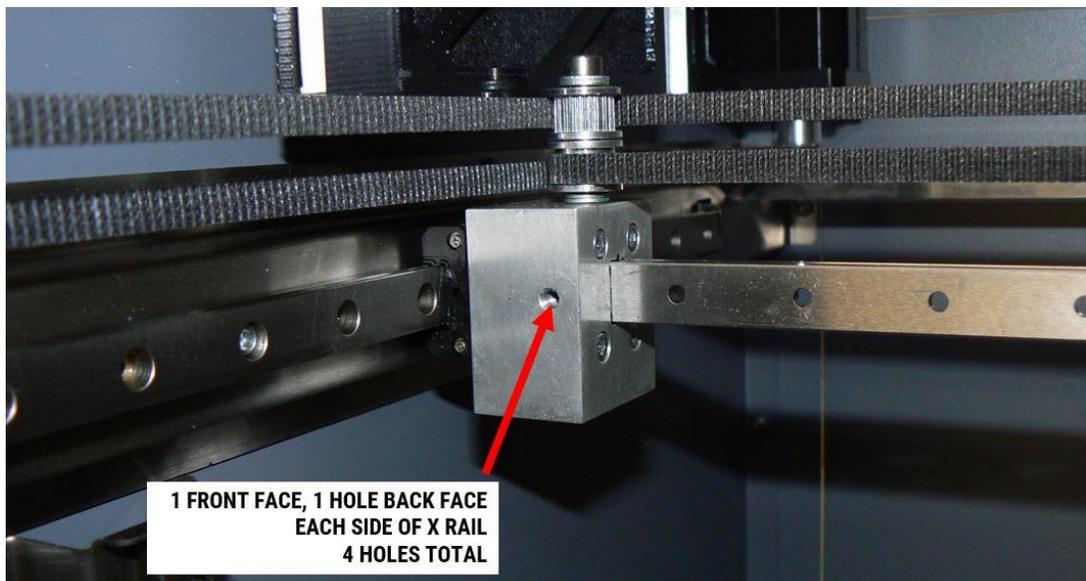
6. Check that the bed probe body screws are tight and the bed probe body is straight up and down



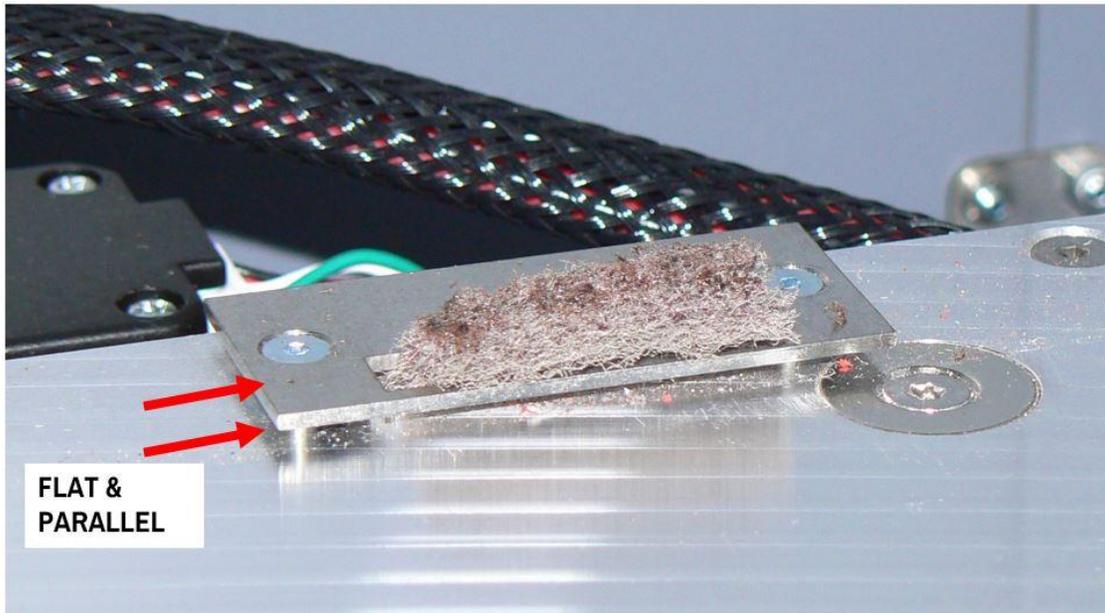
7. Check that the probe pin collar is firmly locked in place and positioned at the top of the pin. Make sure the collar is square relative to the pin (not sitting cockeyed).



8. Check that the bed probe pin is straight and deploys smoothly (rotate bed probe motor by hand)
9. Check that the x rail locking screws are tight

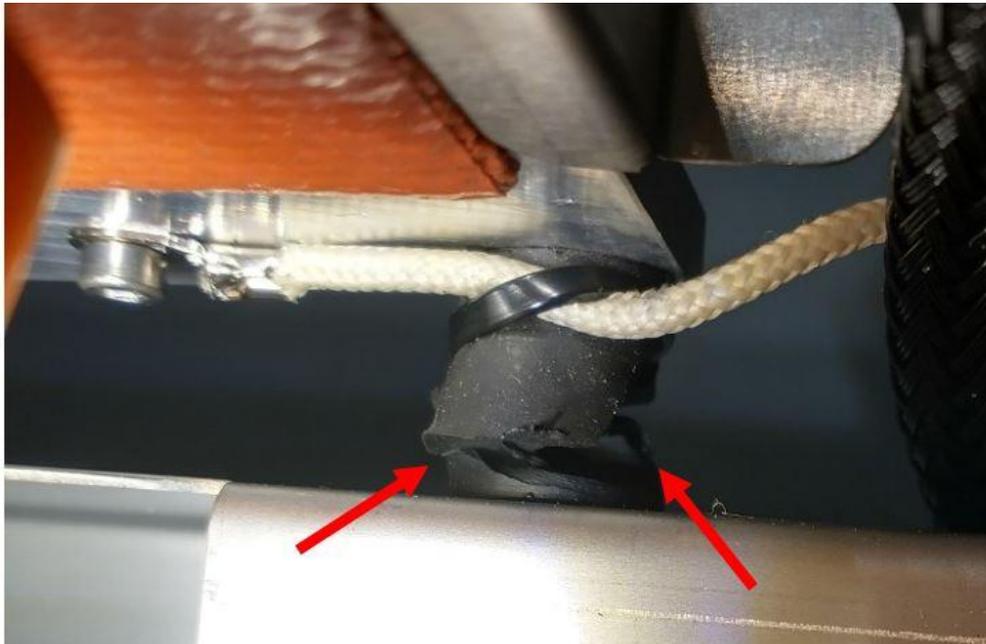


10. Check that the nozzle scrub plate is flat and parallel with the bed tool plate (this step is superfluous if you have installed a scrub plate spacer - not shown in pic).



11. Check that the nozzle scrub plate screws are tight

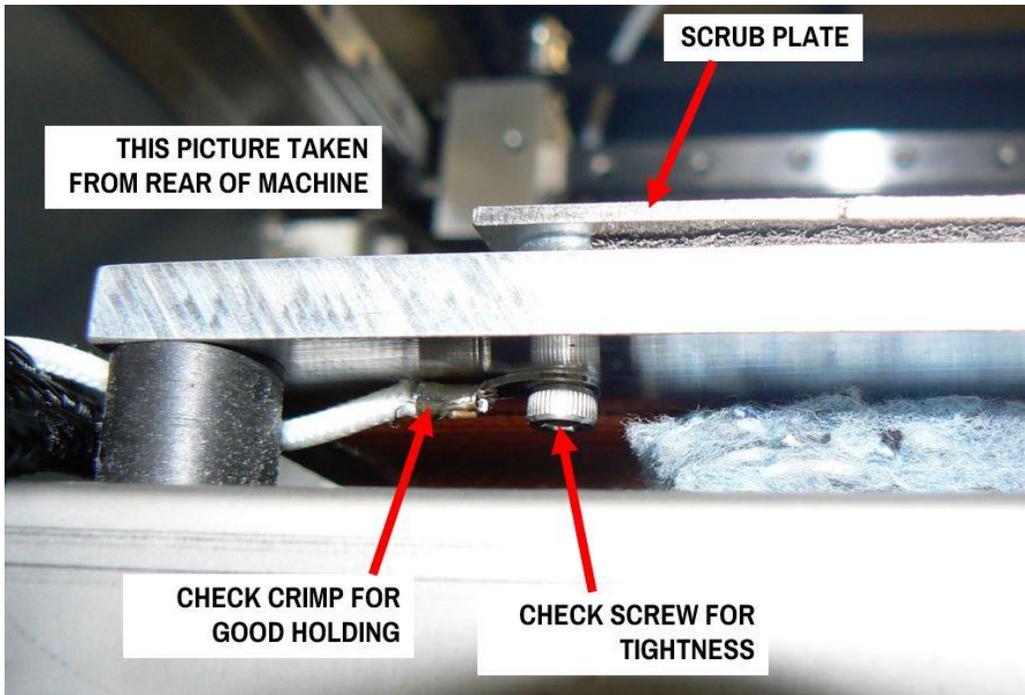
12. Check that the rubber bed standoffs are not damaged, torn, or misshapen (one at each corner).  
Example of a damaged bushing is below.



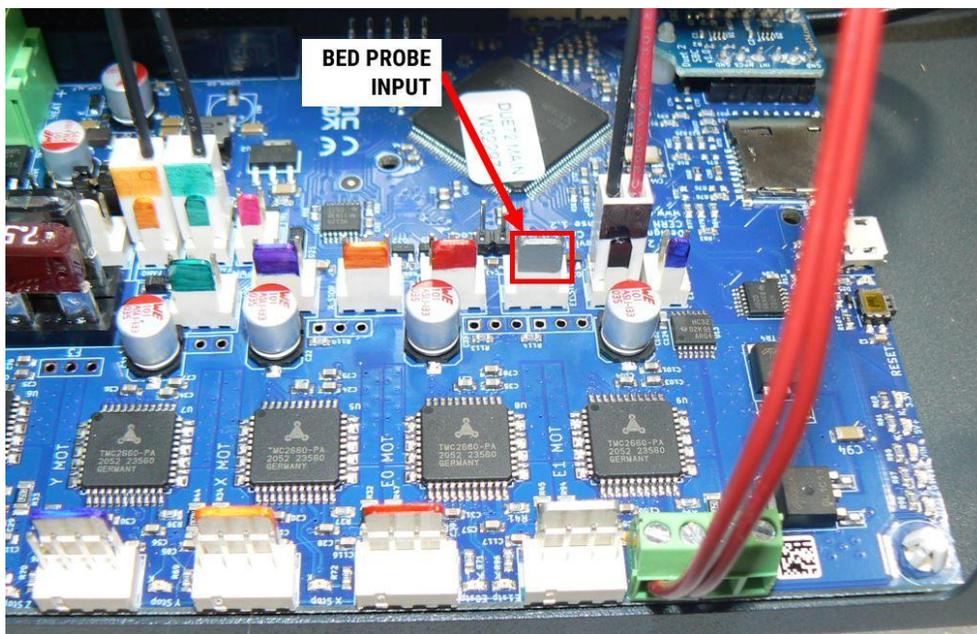
13. If you see the white wire retained to the bed bushing as shown in the picture, please cut the zip tie (be careful not to cut the wire)

14. Check for play at each bed corner by gently lifting up. The bushing should stretch with the bed and no looseness should be felt between the bed and rubber bushing.

15. Locate the end of the white wire on the underside of the bed (this should be right under the probe plate). Make sure the screw holding the ring terminal is tight. You may need to remove the rear service door to access this screw.



16. In the electronics bay, make sure the white wire plug is fully seated.



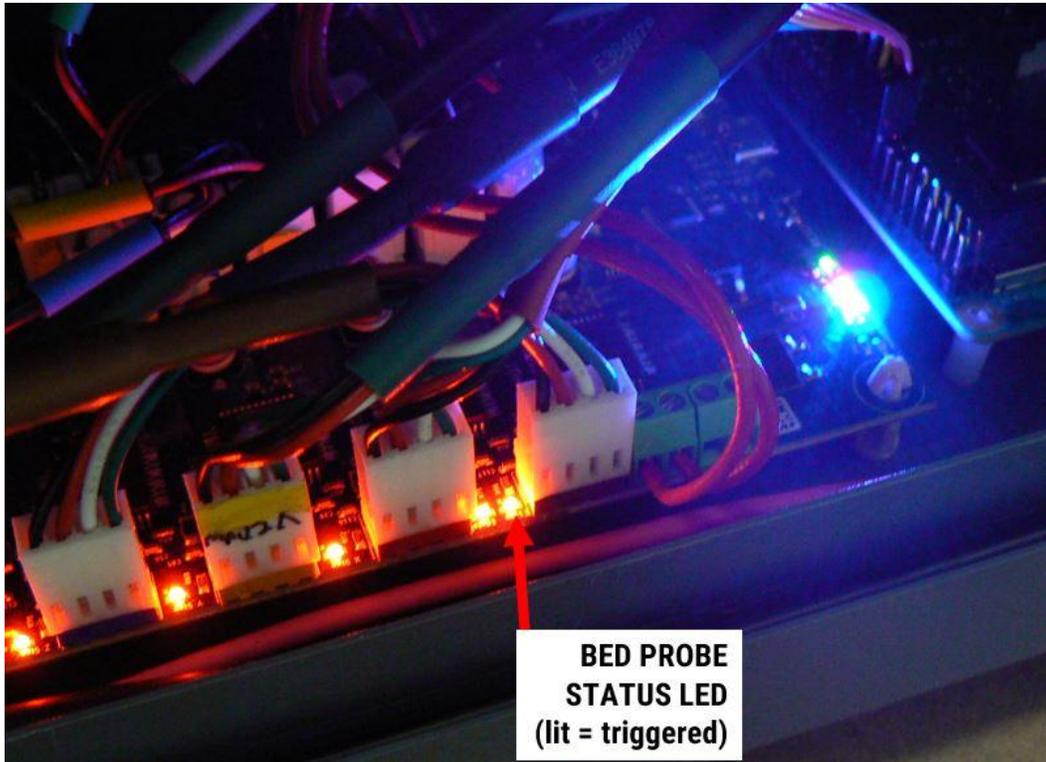
### Next Steps:

If you did not see anything obviously wrong when working through the checklist above, you can function check the bed probe circuit by doing the following:

Keep the electronics bay open.

Using a length of wire, bridge the tip of the print head to the scrub plate. You should see a red LED next to the white wire input light up when you make this connection, and go out when you break the connection.

**Please note this is the RIGHT-most red LED in the gap highlighted below.**



Run the *Utilities > Bed Leveling > Run Nozzle Offset* function with the electronics bay open, and monitor the status of this LED when the print head touches the scrub plate. There are 4 possible results:

- The LED does not light up and the nozzle drives into the scrub plate without stopping
- The LED lights up faintly and the nozzle drives into the scrub plate without stopping
- The LED lights up strongly and the nozzle drives into the scrub plate without stopping
- The LED lights up faintly or strongly and the nozzle stops appropriately

If at this point your printer is still not behaving appropriately, please contact us for help.