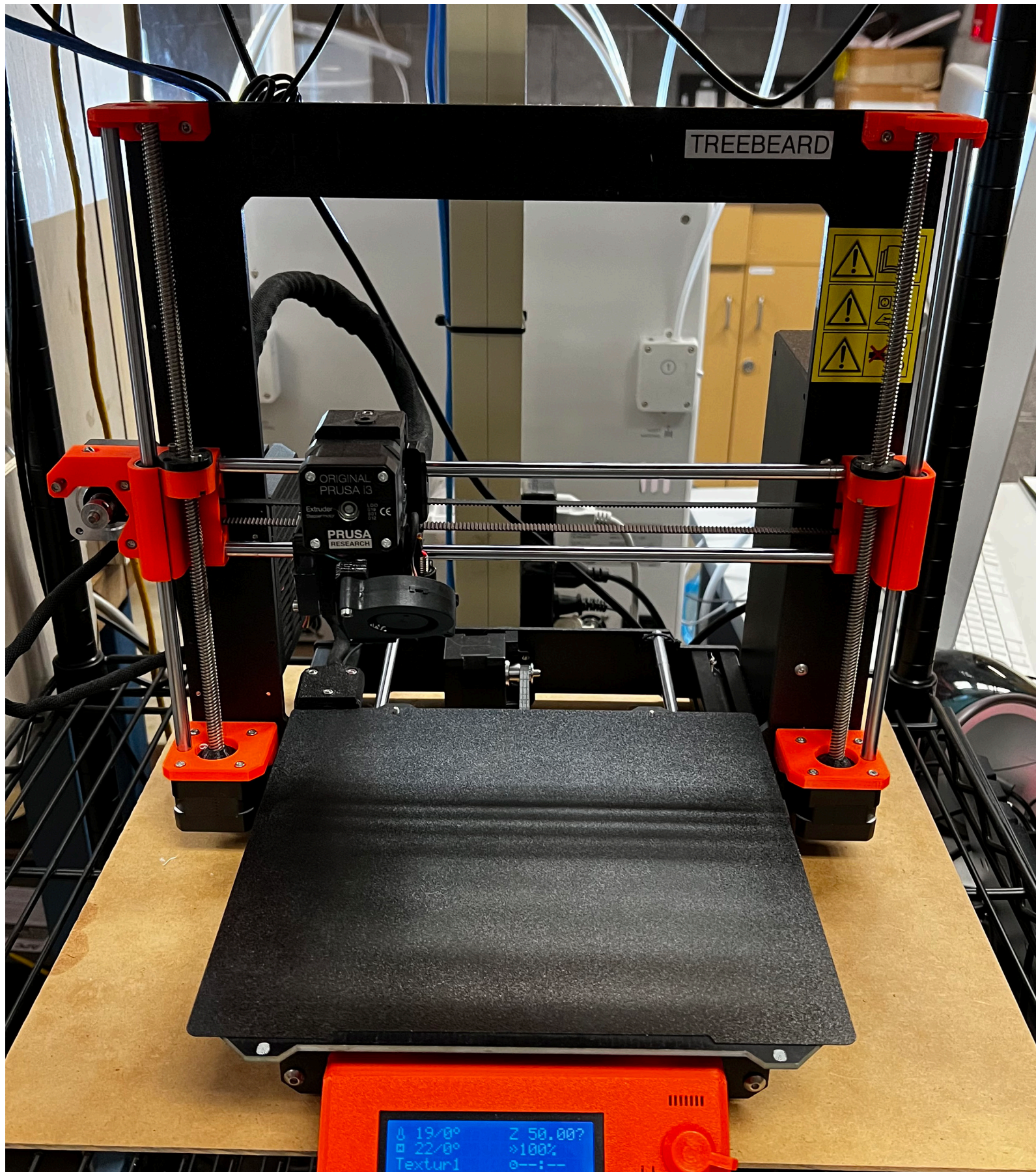


# CAP FAB LAB

## Prusa I3 MK3S+





# Definitions

<p style="text-align: center;"><b>Build-Plate or Bed</b></p> <p>Both of these are in reference to the metal sheet in which the machine lays plastic on.</p>	<p style="text-align: center;"><b>Extruder</b></p> <p>This is in reference to the part of the machine that extrudes plastic onto a build-plate. This system consists of a motor at the top which receives the filament, a hotend which melts the plastic, and a nozzle that extrudes the molten plastic.</p>
<p style="text-align: center;"><b>Gantry</b></p> <p>3D Printers typically have several Axis of movement. Such as X,Y,Z typically each will have a gantry or a system of components responsible for moving a portion of the machine in each direction. For example the extruder is attached to the X Gantry.</p>	<p style="text-align: center;"><b>Hot End</b></p> <p>This is a piece of metal within the Extruder that is responsible for melting the plastic for extrusion. It also connects to the nozzle in a straight line from where you feed the filament in to where it comes out at the nozzle.</p>
<p style="text-align: center;"><b>PLA</b></p> <p>PLA is the type of plastic in which we feed into our 3D Printers. Its full name is Polylactic Acid and consists of organic sources such as corn starch or sugar cane. It is the easiest and most versatile material used in 3D Printing.</p>	<p style="text-align: center;"><b>PETG</b></p> <p>Polyethylene terephthalate glycol, known as PETG or PET-G, is a thermoplastic polyester that delivers significant chemical resistance, durability, and formability for manufacturing. It requires hotter temperatures for it to print, but is significantly stronger than PLA. Its considered the middle ground between PLA - ABS.</p>
<p style="text-align: center;"><b>ABS</b></p> <p>ABS or Acrylonitrile butadiene styrene is a common thermoplastic polymer typically used for injection molding applications. It is the strongest plastic used in 3D Printing. However it is extremely difficult to print with as it is sensitive to temperature shifts and releases harmful chemicals into the air when melted.</p>	<p style="text-align: center;"><b>TPU</b></p> <p>TPU or Thermoplastic Polyurethane are a category of plastic created when a polyaddition reaction occurs between diisocyanate and one or more diols. They can be used as a soft engineering plastic or as a replacement for hard rubber. Must be printed at slow speeds to ensure adhesion.</p>

# Basic Printer Information

## Miscellaneous Cartesian

This style of printer is distinguished by its linear moving Y Axis Bed. It is capable of fast print speeds with short wide objects and is the most common type of 3D Printer.

## Bed Size

9.84" x 8.3" x 8.3"

Typical operations use 1.75 diameter filament PLA is standard but PETG or ABS is possible with considerable changes to print settings and an enclosure. Flexible filaments such as TPU are also possible due to the Direct Drive.

PLA (Hot End 215 °C)(Build Plate 60 °C)  
PETG (Hot End 230 °C)(Build Plate 70 °C)  
\*ABS (Hot End 250 °C)(Build Plate 75 °C)  
\*TPU (Hot End 205 °C)(Build Plate 50 °C)

(\* Untested Settings)

## Direct Drive

This stlye of extruder is distinguished by having the extruder mounted directly onto the print head. This allows for shorter retraction timings. Less retraction is needed to print flexibles such as TPU.

Product Page for More Information  
<https://www.prusa3d.com/product/original-prusa-i3-mk3s-kit-3/>

# Procedure

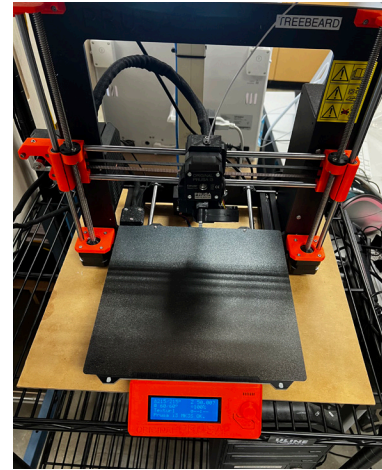
1. Printer is ON  
LCD Screen should be ON

Key point: The Power Switch is located on the Power-supply on the back right of the machine. Press switch to the ON position.



2. Build Plate is Clear  
Remove Existing Finished Prints as well as any extra filament that may be on the Build Plate.

Clean with Isopropyl Alcohol if bed appears dusty or if there are small pieces of filament that are difficult to remove by hand. (Located underneath the sink in the far corner of the Lab)



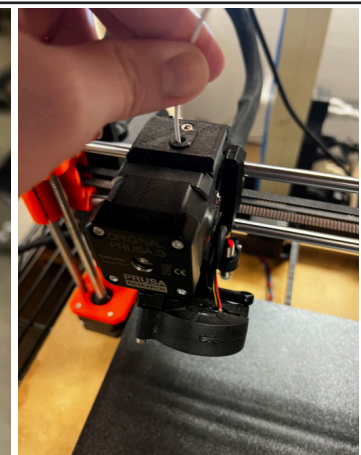
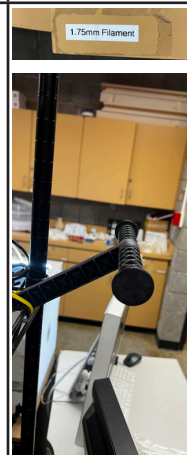
3. Prepare for Loading  
(A) Press on the Knob next to the LCD Screen.  
(B) On the New Menu scroll by turning the Knob and select Preheat  
(C) Then Select PLA or Other Specialty Material

Key point: This printer only uses 1.75 filament.



4. Loading Filament  
(D) After the printer has heated to material temperature, Place on Roll Holder then feed it into the hole on top of the Extruder. Do not force the material into the extruder.

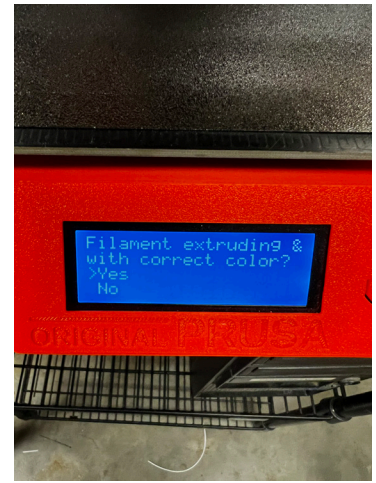
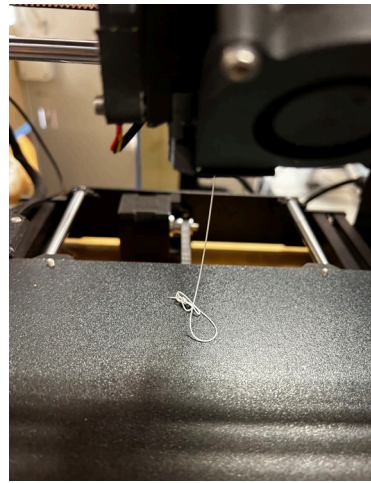
Key point: Do NOT let go of filament end at any point before loading or it will tangle.





### 5. Loading (Continued)

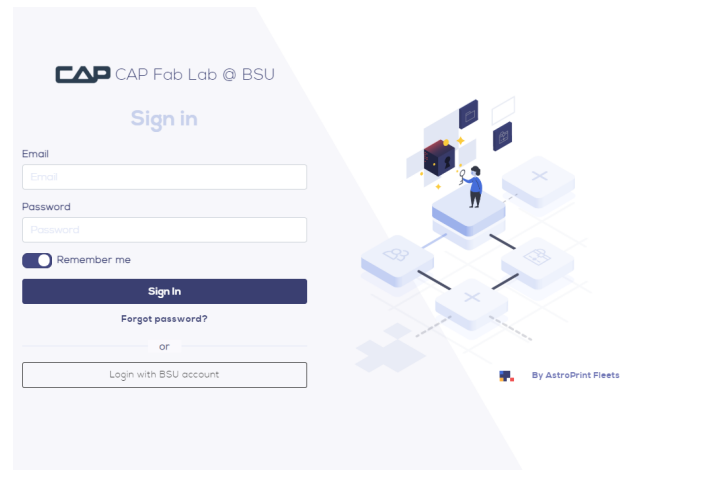
You should feel the extruder motor grab the filament if loaded correctly into the extruder.  
(F) Watch for filament extrusion from the nozzle below the extruder.  
(G) It will ask on the screen if the color filament that was extruded is correct. Ensure that it is correct then select YES.



### 6. File Setup + Printing

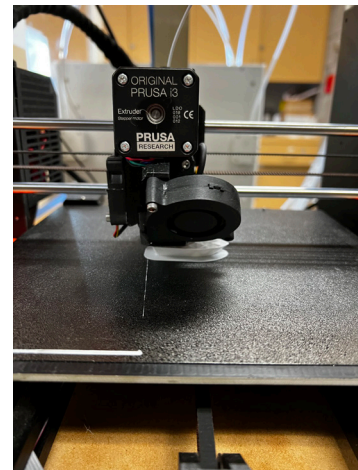
Log into AstroPrint  
Typically (Username BSU Email) +  
(Password BSU Password)

Slice for Prusa i3 Mk3s+  
(For more details reference Astroprint SOP)



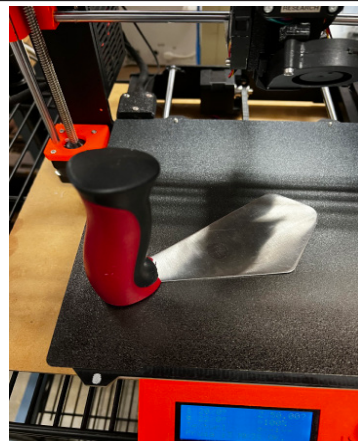
### 7. During Print

Once print has started, you **MUST** watch the first layer of that print (Most print failures start at the first level and build up into print failures or machine damages). **UNDER NO CIRCUMSTANCES ARE YOU TO START A PRINT AND WALK AWAY.** If you're on a tight time budget please wait to start a print until you have time to watch it.



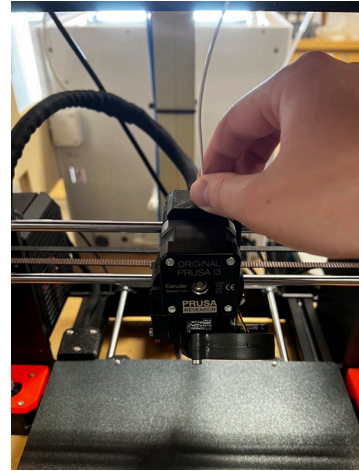
### 8. After Printing

Once print has completed, clear the bed using a scraper to remove printed model. Clean bed with Isopropyl Alcohol if it appears dirty.



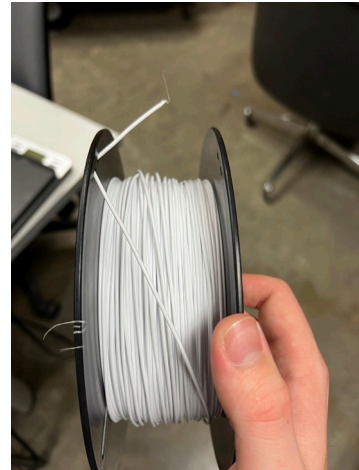
### 9. Unloading

Click on the Knob next to the LCD Screen.  
 Scroll down with the Knob until you find  
 Unload Filament.  
 Click it and wait for an audible beep.



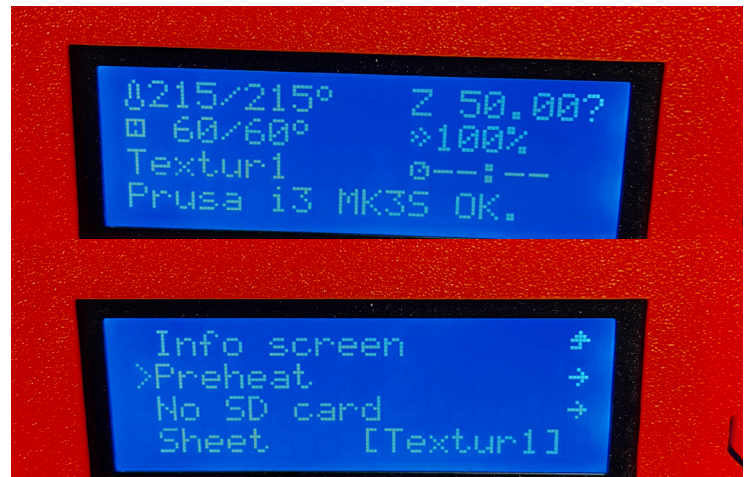
### 10. Unloading (Continued)

Then press the knob to confirm removal and  
 pull filament from the top of the extruder.  
 Remove filament from Roll Holder  
 Feed filament through holes on spool to  
 prevent tangles and place back into bag and  
 seal.



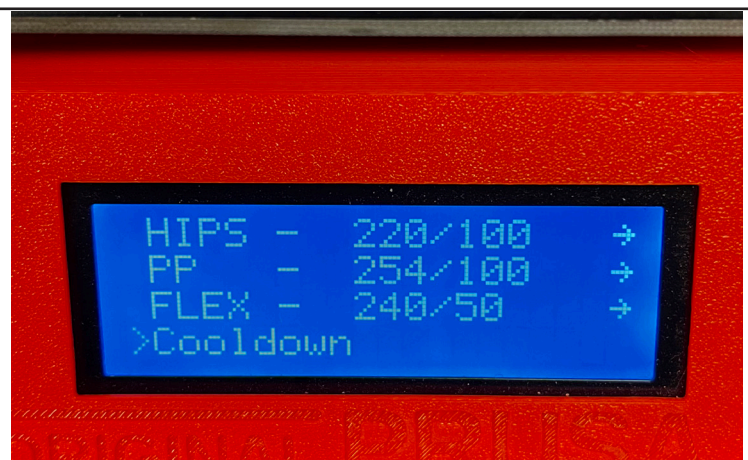
### 11. Cooling Down the Machine

The Machine at this point is still at working  
 temperature. If left in this state it will cause  
 wear and tear on the equipment. With the  
 Knob next to the LCD screen, click on it and  
 scroll down to Preheat, select.



### 11. Cooling Down the Machine (Continued)

Then scroll all the way to the bottom and  
 select Cool Down. This will spin up the fans  
 and cool off the bed and hot end bringing it  
 back down to Idle temperatures.





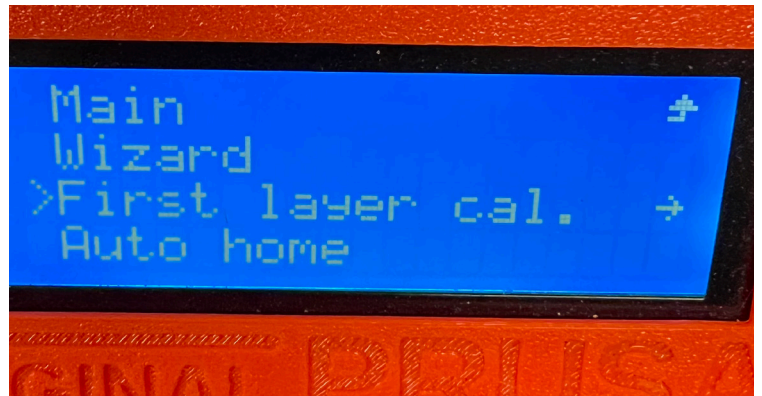
# Basic Maintenance + Repairs

## Build-Plate Adhesion Issues

If you're experiencing build-plate adhesion issues try cleaning the build-plate with Isopropyl Alcohol, It may be dusty or covered with oils from our hands.

## Build-Plate Adhesion Issues (Continued)

Next try re-leveling the printer. Start by clicking on the knob, then scrolling down to CALIBRATION click into that menu. Finally scroll down to First Layer Calibration. Then follow the steps on screen to adjust first layer adhesion. Repeat until proper first layer adhesion is achieved.



## Clogged Nozzle Issues

If you're experiencing thin or no filament extrusion from the nozzle then you may have a clogged nozzle.

First try heating up the nozzle to PLA temperatures, then take a nozzle cleaner from the 3D Printing Tools Drawer and sticking it into the nozzle from below. This will help clear any stuck filament inside the hot-end.



## Clogged Nozzle Issues (Continued)

Next try heating up the nozzle to ABS temperatures. This may help to heat up any hardened filament stuck within the hotend. Then take a scrap piece of 1.75 filament and push it through the extruder from the top in order to force out any clogs that remain. If the issue persists then reference (Intensive Maintenance)

# Intensive Maintenance + Repairs

## Hot End Replacement/Repair

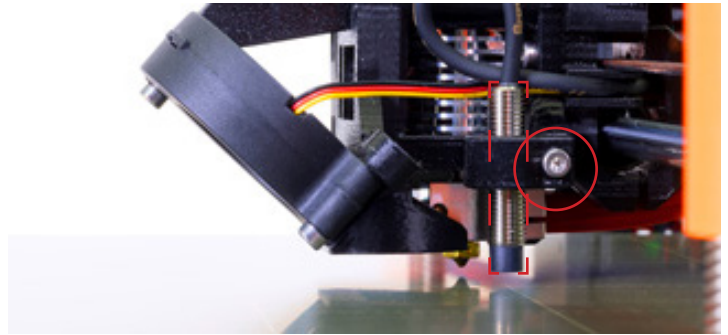
If you have performed all the steps above to unclog a nozzle or hotend, then it is time to pull apart the extruder to get a closer look.

Here is a video that will explain how to pull it apart. Further help can be found on Prusa's Website.

<https://www.youtube.com/watch?v=BE895k9kOXk>  
[https://help.prusa3d.com/guide/how-to-replace-a-hotend-mk3s-mk3s\\_161575](https://help.prusa3d.com/guide/how-to-replace-a-hotend-mk3s-mk3s_161575)

## SPINDA PROBE

If you are still having issues with first layer adhesion, try adjusting the SPINDA PROBE located next to the extruder. By undoing the bolt on the clamp it will allow you to adjust it up or down. Then simply retighten it.



## Cooling Fan Replacement

Cooling is a vital part of running a 3D Printer and the fans tend to burn out after time. Replacing these can be difficult but Prusa's Website has a very indepth guide and part list available to help sort through it.

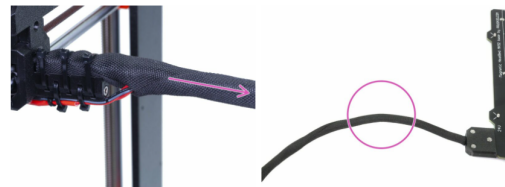
[https://help.prusa3d.com/guide/how-to-replace-a-print-fan-mk3s-mk3s\\_160876](https://help.prusa3d.com/guide/how-to-replace-a-print-fan-mk3s-mk3s_160876)

Lastly if you receive a MIN\_TEMP BED ERROR

This error happens infrequently on some of our Prusa Machines, unfortunately we are unsure of the cause. However to solve this issue simply wiggle the back cables leading from the build-plate to the power-supply. Then turn the machine off and on again.

### Wiggle it!

If you do not have a multimeter, a good way to test the cable of the thermistor is to simply wiggle it. Pre-heat to PLA (215/60) and move the extruder or bed by hand, all the way to the end of each side. See if there is any great change in temperature-reading on the LCD (tens of degrees or zeroing out).



Grab the textile sleeve and manipulate and wiggle it, again checking if there is any change in temperature. If there is, it indicates a microfracture of the cable when the connection changes depending on orientation. You then need to replace the thermistor.

[https://help.prusa3d.com/article/mintemp-error-and-mintemp-bed\\_2169](https://help.prusa3d.com/article/mintemp-error-and-mintemp-bed_2169)