



## UP 3D Printer Instructions

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# Material considerations

## ABS

- Acrylonitrile Butadiene Styrene (ABS)
- Higher Melting Point than PLA (270 degrees)
- Suitable for parts exposed to high temperatures
  
- Dissolvable in acetone
- ABS can warp as it expands and shrinks during heating and cooling.
  
- Using a heated build plate within an enclosed chamber is preferable.
  
- **ABS is the only suitable printing filament for the UP 3D printers.**



# Material considerations

## PLA

- Polyactic Acid (PL)
- Bio degradable plastic
- Dimensionally stable, so normally there is no need for a heated bed.
- PLA produces a naturally glossy, non toxic print, but it's also more brittle so may not be useful for functional parts.
- PLA is often preferred for at-home printing due to its low warping, sharper print and pleasant smell.

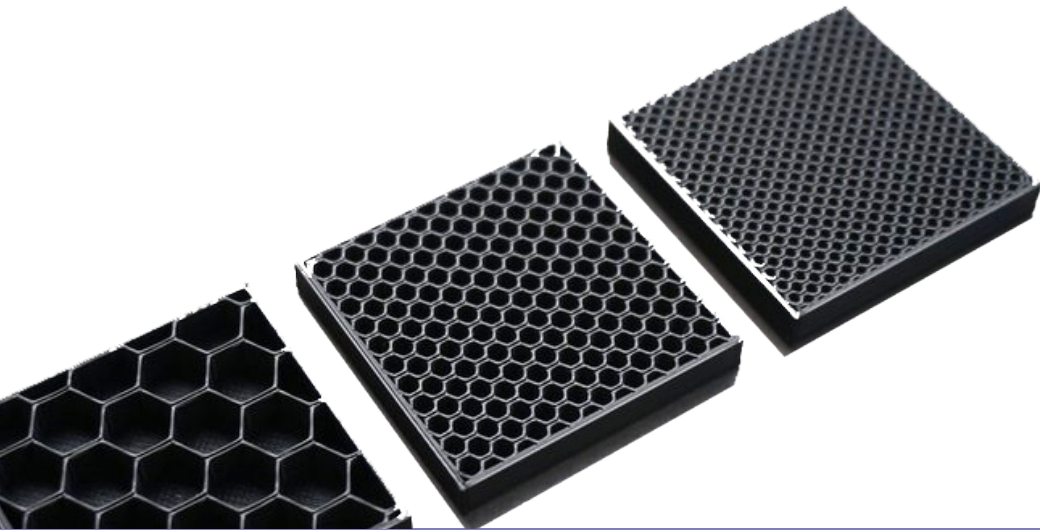


# Infill

When you are printing a 3D model you should give some consideration to the percentage of infill inside of your model.

You can choose to create a 3D print which is relatively solid or hollow depending on the infill percentage you select.

Ultimately you want to maintain structural integrity in model, preventing large surface areas on your work from sagging. The greater the infill the more support your work will have. However, at the same time you want to give some consideration to the cost of the materials required for a solid infill and the extra time that your model will take to print.



**Tip:** You can increase the surface layers and decrease the infill and have a faster printed solid print.

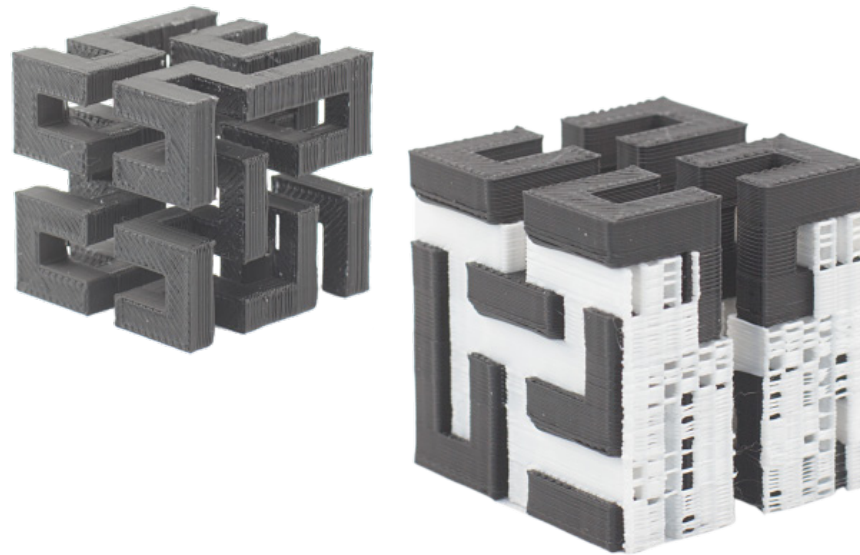
# Structural considerations



If you are planning to make a structural part on the printer you may want to consider rotating the model to give your model optimal strength

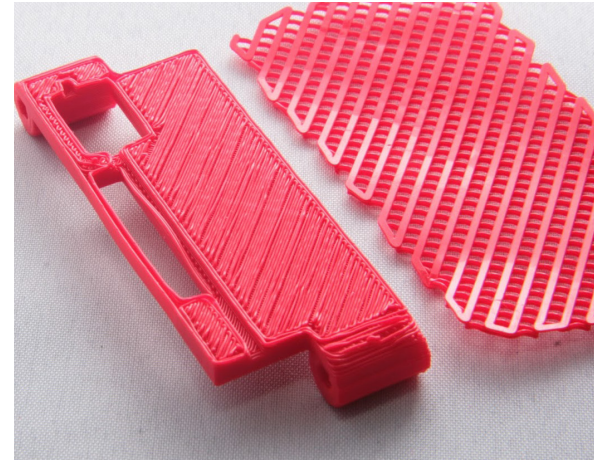
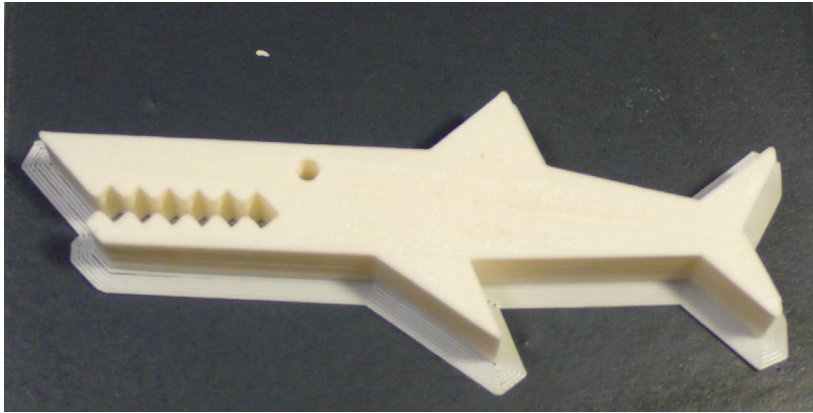
If you are just printing a non-structural design like the image above it is not really necessary to worry about strength

# Overhangs in your model - support structure



Any overhangs in your 3D model which exceed 45 degrees will require a temporary support structure to hold up the molten plastic during printing. The supports generally print as a disposable structure which will easily break away from your model. Some 3D printers will automatically insert these supports for you, others will require you to manually insert these in your 3D drawing. Support can be disabled by changing “**Area 7**” to “**Only Base**”

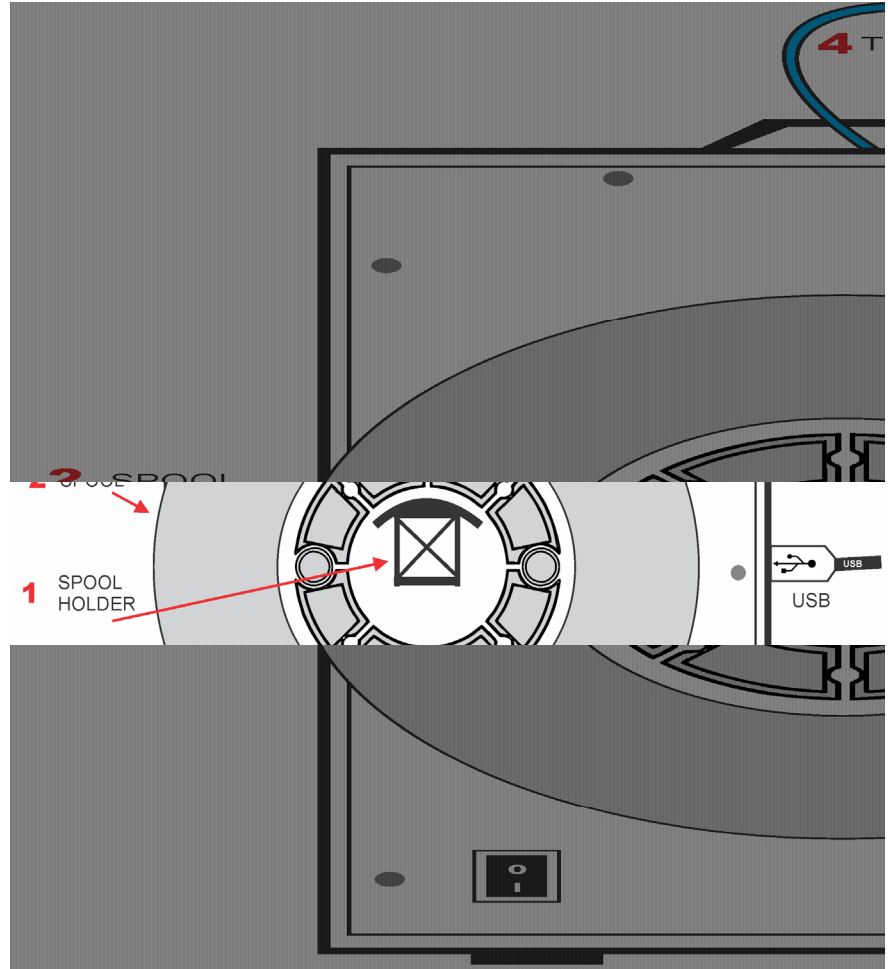
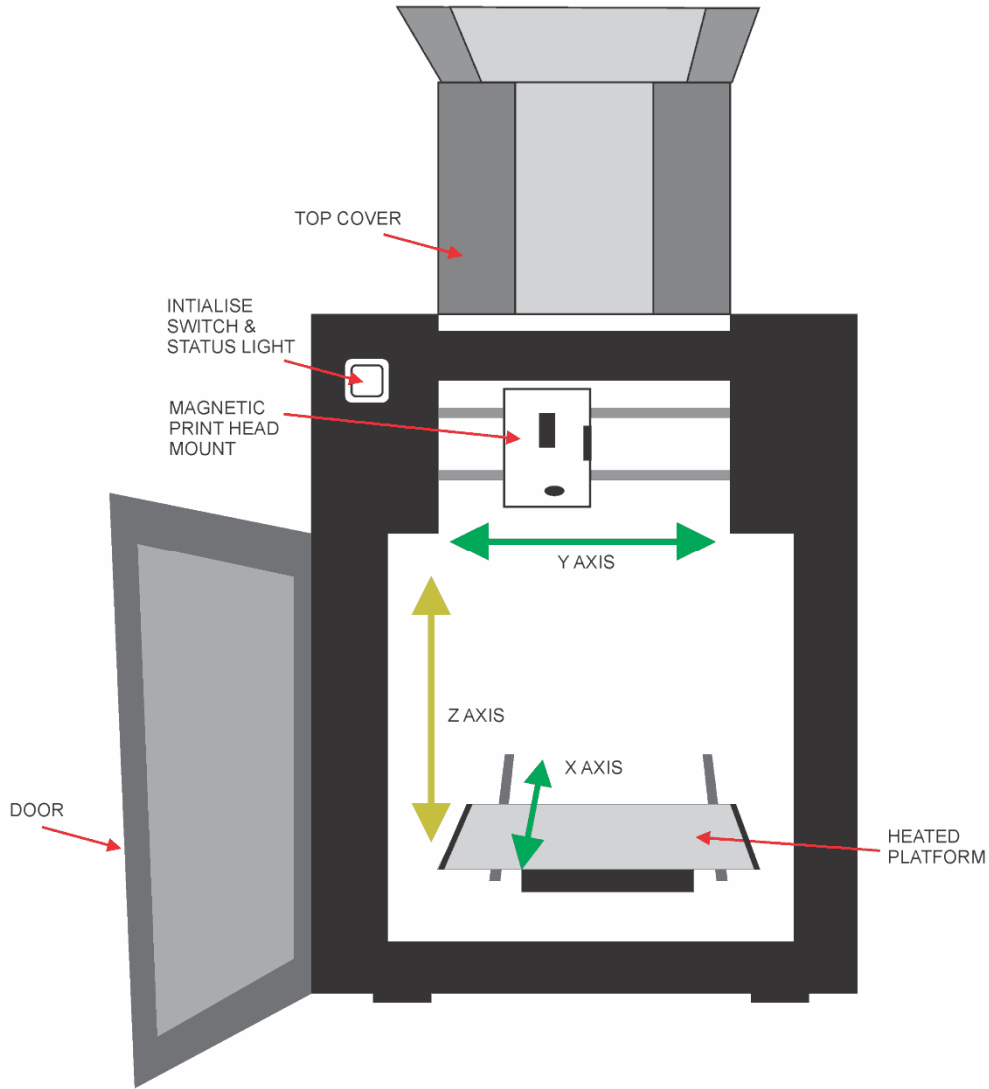
# Rafts



Rafts create a stable base for your print job to adhere to the printing bed while your 3D model prints.

The UP Software automatically generates rafts on your 3D printed objects.

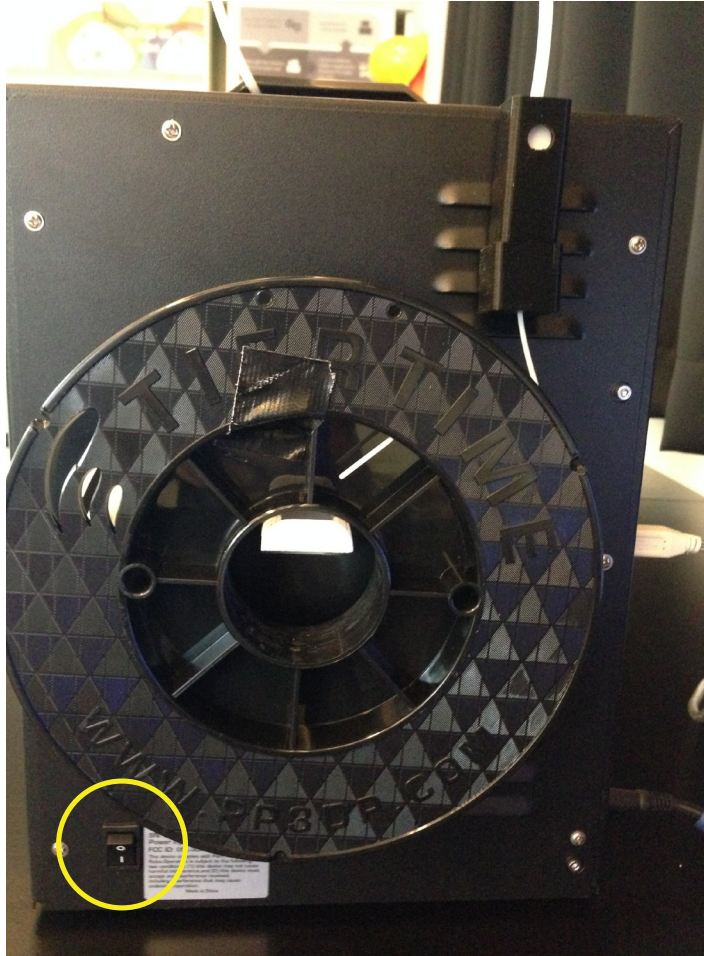
# The anatomy of the UP 3D printer





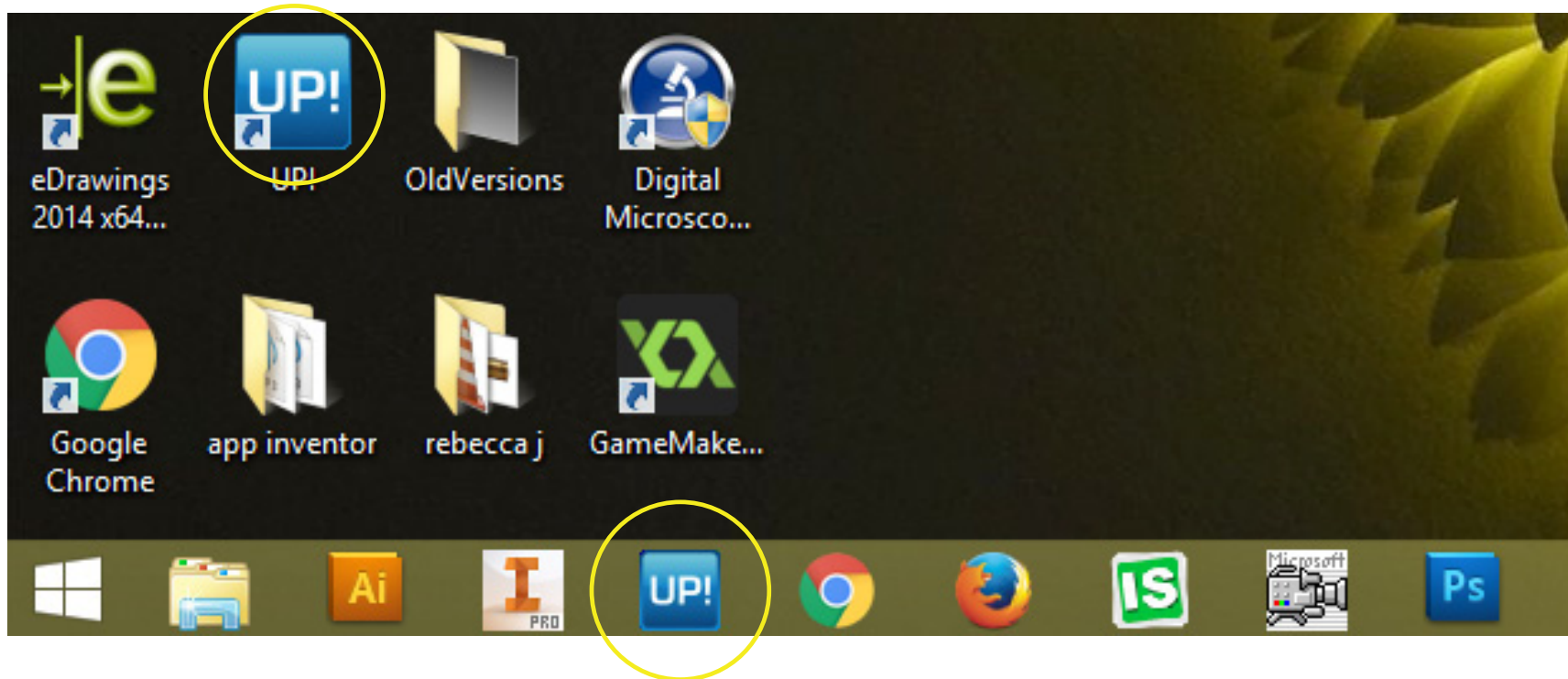
# Step-by-Step guide to using the UP

# Turn the machine ON



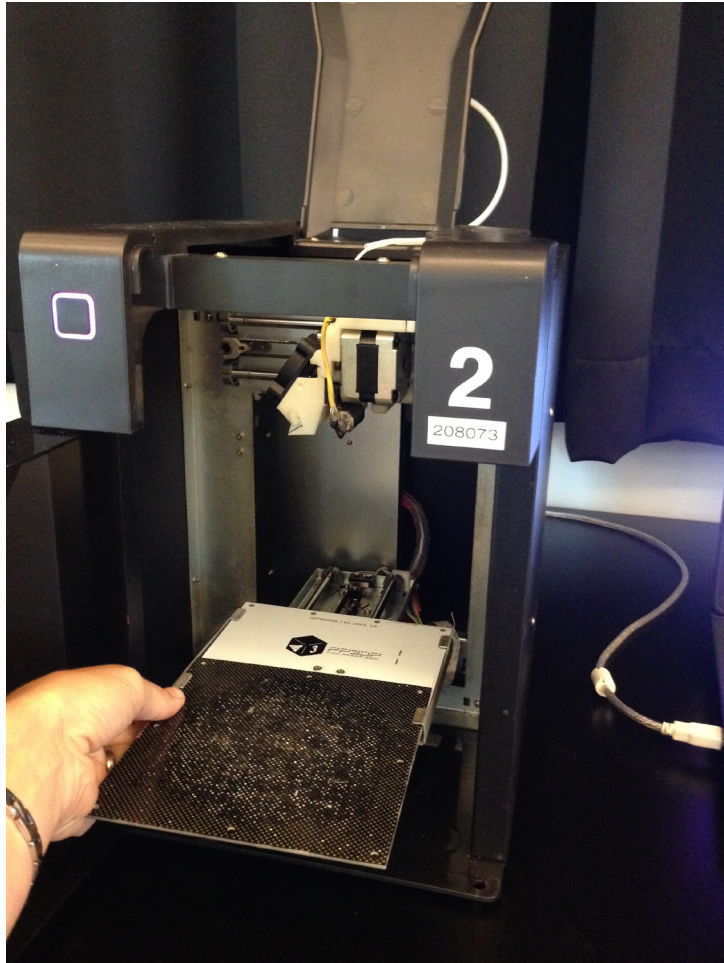
Turn the machine ON. The switch is located on the back of the machine, bottom right hand corner.

# Load up the UP software



Open the **UP** software on the attached laptop, by clicking the icon in the Task Bar or Desktop.

# Insert the perforated bed

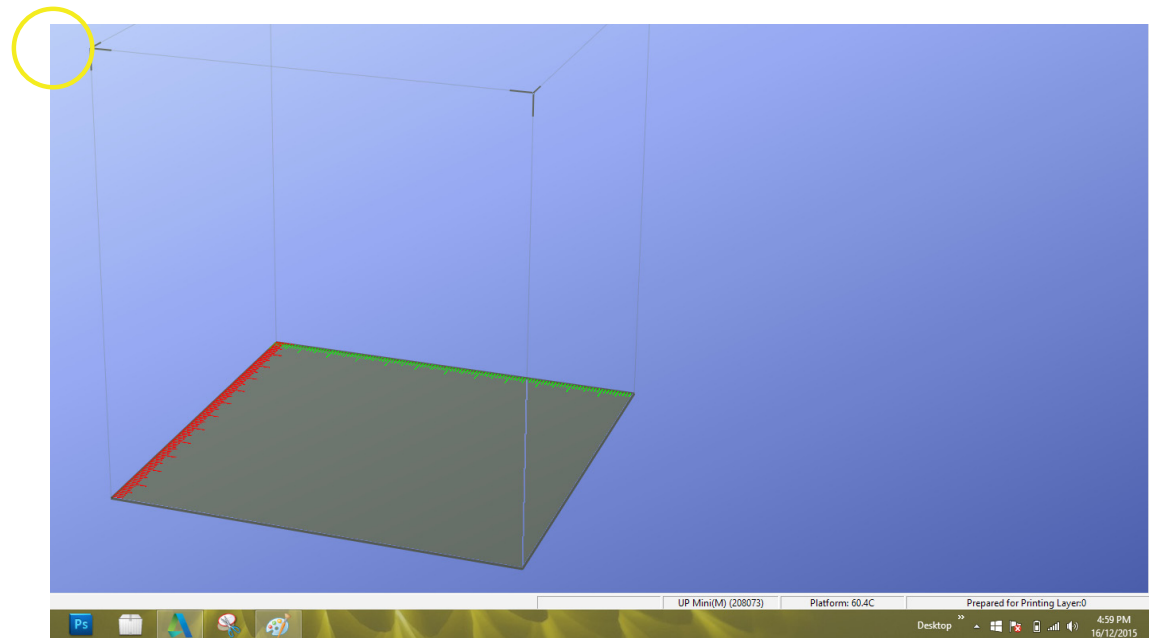


Insert a clean perforated bed into the 3D printer. Remember to use two hands and be careful not to put too much force on the printing bed platform.

# Initialize the 3D print

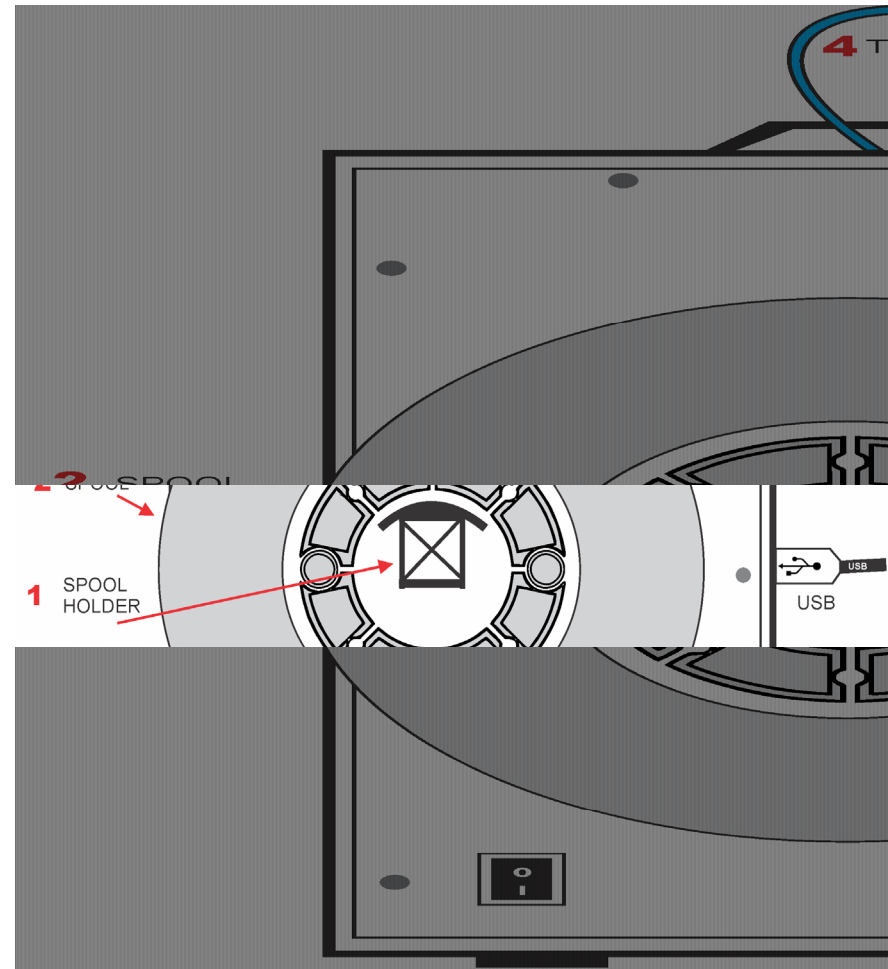
Open the software, then click “**3D Print**” and then “**Initialize**”. The printer should align each of its 3 axis

- X axis – the table forward and backwards;
- Z axis – table up and down
- Y axis – head moves left and right and then beeps
- The printer will beep at the completion of this step

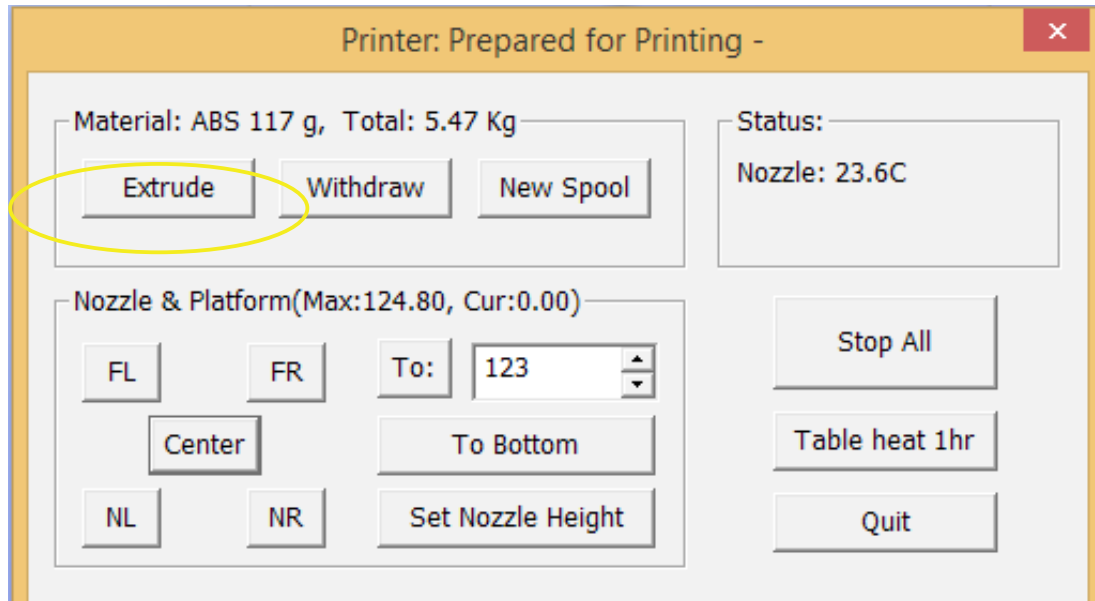


# Initialize the 3D print

- Check you have enough filament to complete the intended job
- Check the filament is not tangled or covered in dust
- If you require more filament, please see the Fabrication Lab Supervisor



# Extruding the filament

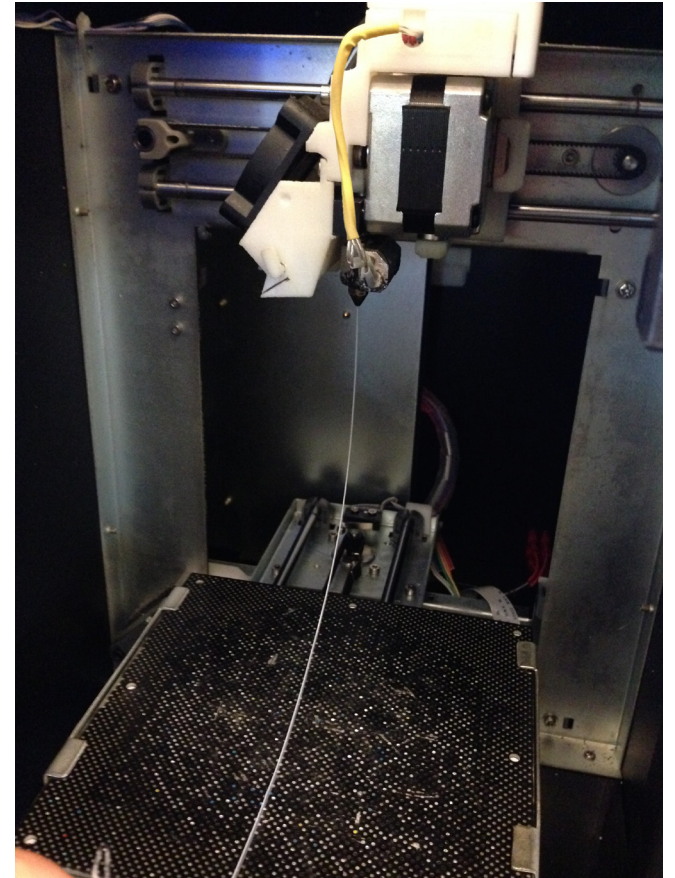


- Before you start a new print it is best to extrude old filament in the nozzle of the printer and ensure that the plastic is flowing steadily through the nozzle
- Start by clicking on **3D Print - Maintenance** and then **Extrude**
- Hit **extrude**
- Wait until the printer warms up to approximately 270 degrees
- This step is only necessary if you are the first person to use the printer on a given day

# Extruding the filament

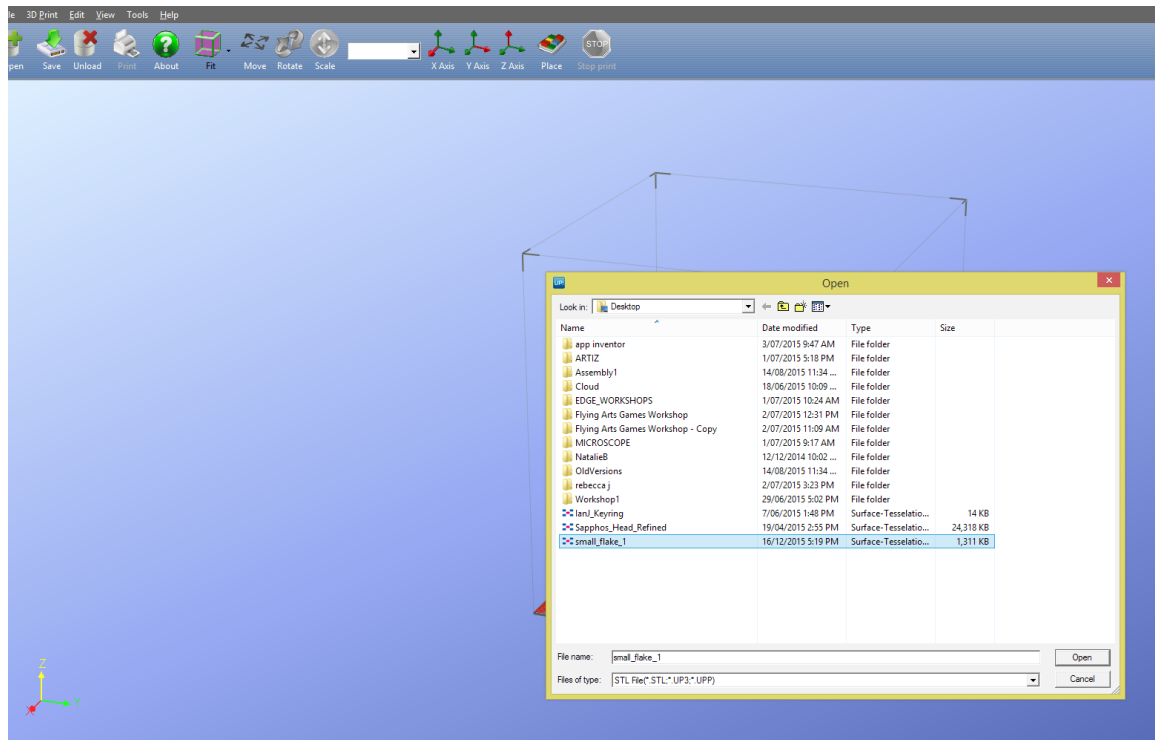
When the printer reaches the optimal temperature it will beep and molten plastic will start flowing through the nozzle of the printer. Keep pulling the flowing filament from the nozzle. If the material doesn't flow in a consistent stringy state, show the Fabrication Lab supervisor.

You are looking for a clean flow of material



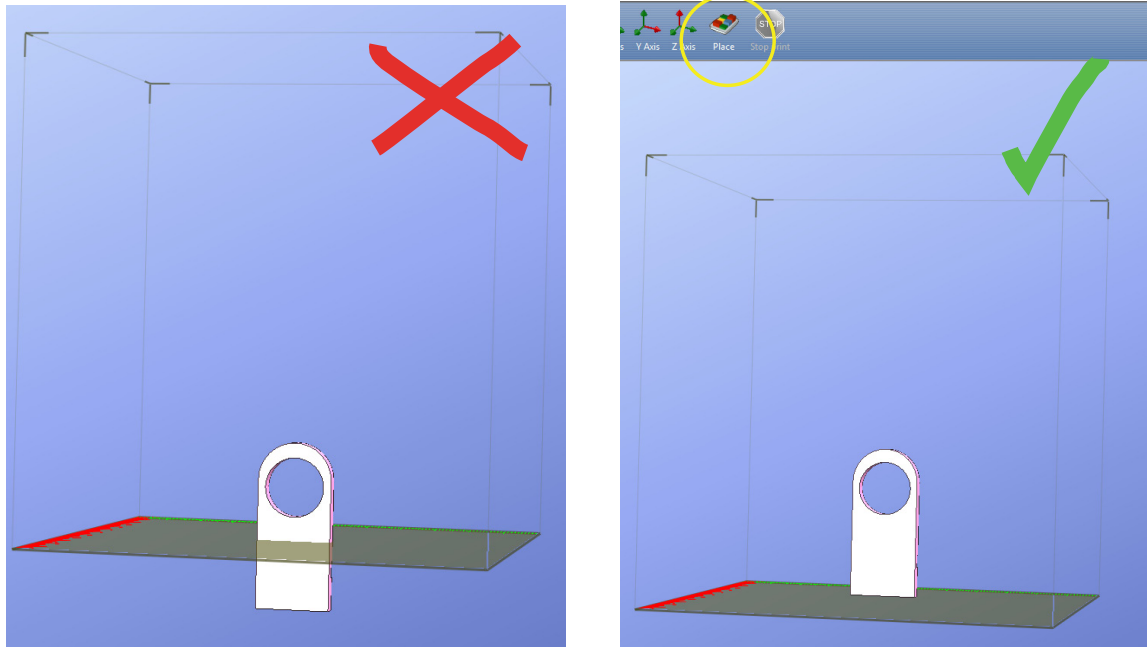


# Loading your 3D print file



- Once you have calibrated the machine and extruded the plastic you are ready to load your printing job
- Click on **File, Open** and open your print job

# Placing your 3D model on the printing bed

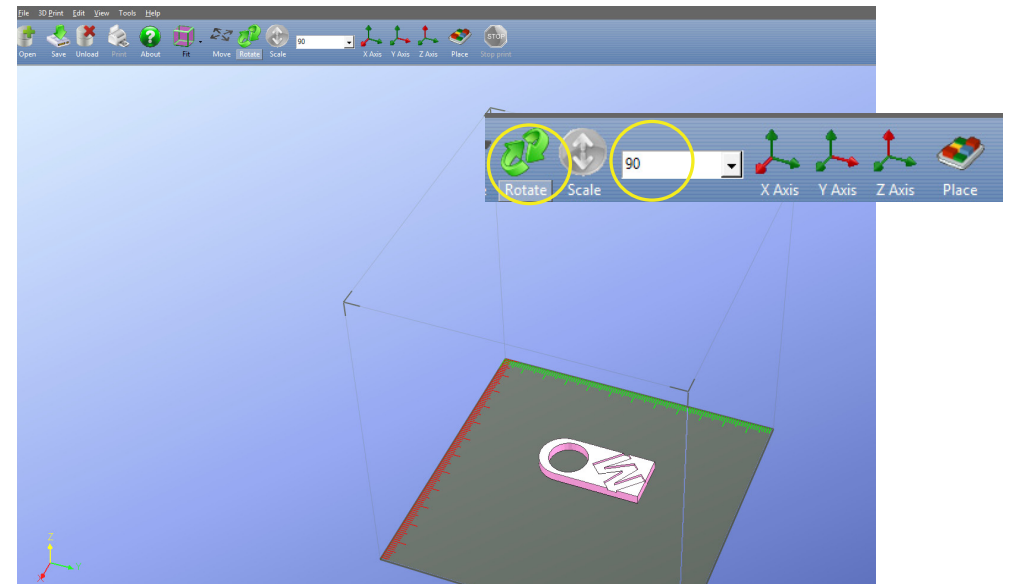


- If your work appears to be floating then click the **'Place'** button and it will shift your work on to the bed
- Ensure that your print job is sitting on the printer bed, and not part way through the print bed or floating above the bed

# Rotating your model

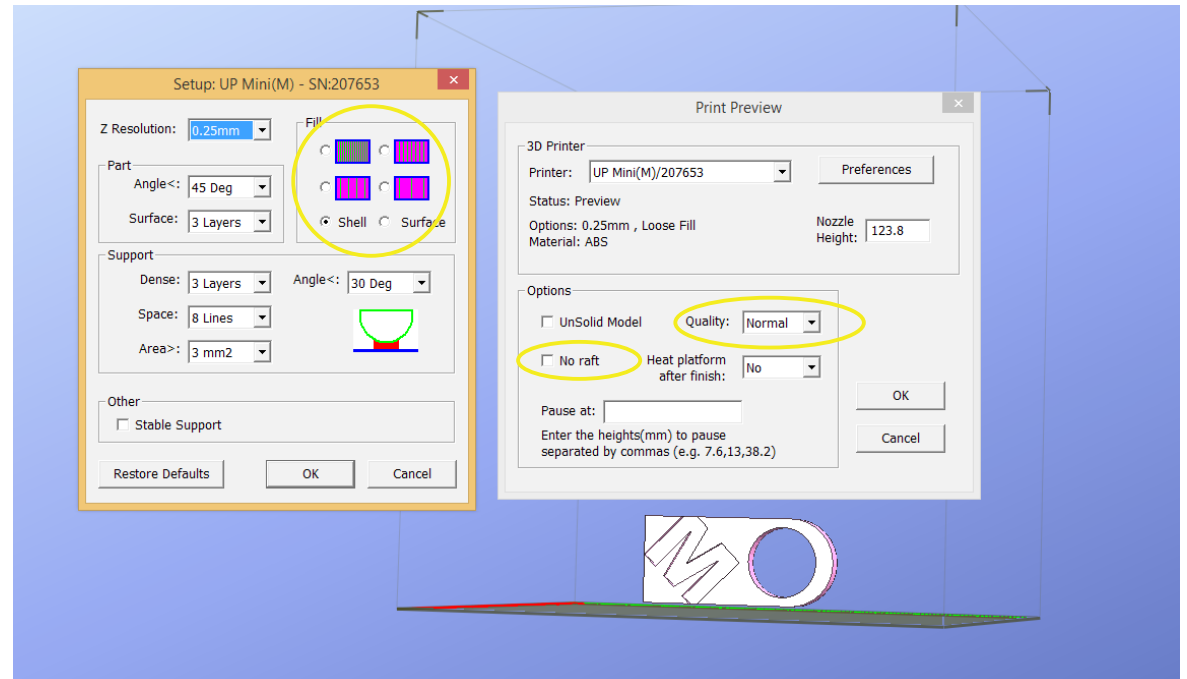
If you need to rotate your model, choose the degree you need to rotate the model and enter this value in the box

- Click on the **rotate** button on the top menu bar
- Click on the axis you want to rotate around
- Your model should start to rotate



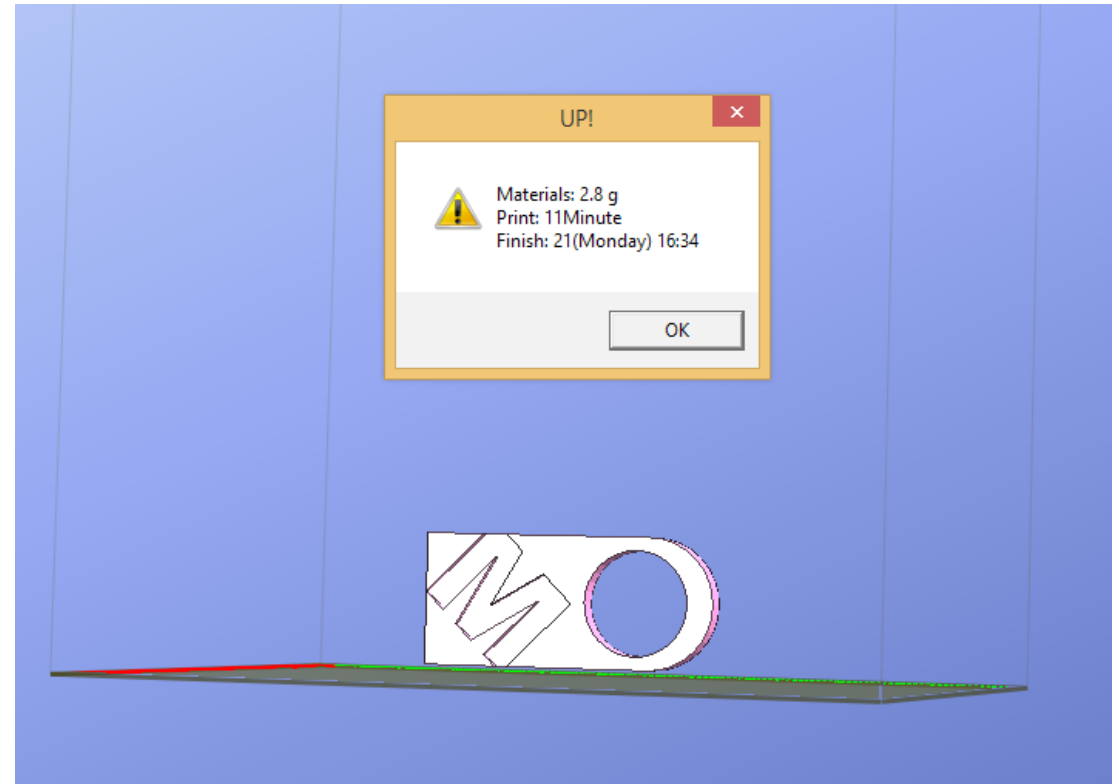
# Infill, rafts & print quality

- When you are ready to print, click on **3D print, setup**, you will need to specify the following
- **Print Quality**- The finer the print the smoother and more accurate the final model will be. However, please be aware of the increased printing time required for a high quality print
- **Infill**- Select a range of infill densities which you feel will adequately support your model while printing & will create a structurally sound part
- **Rafts**- The UP software automatically adds a raft into your 3D print, if you have already designed this it is best to click 'no raft'



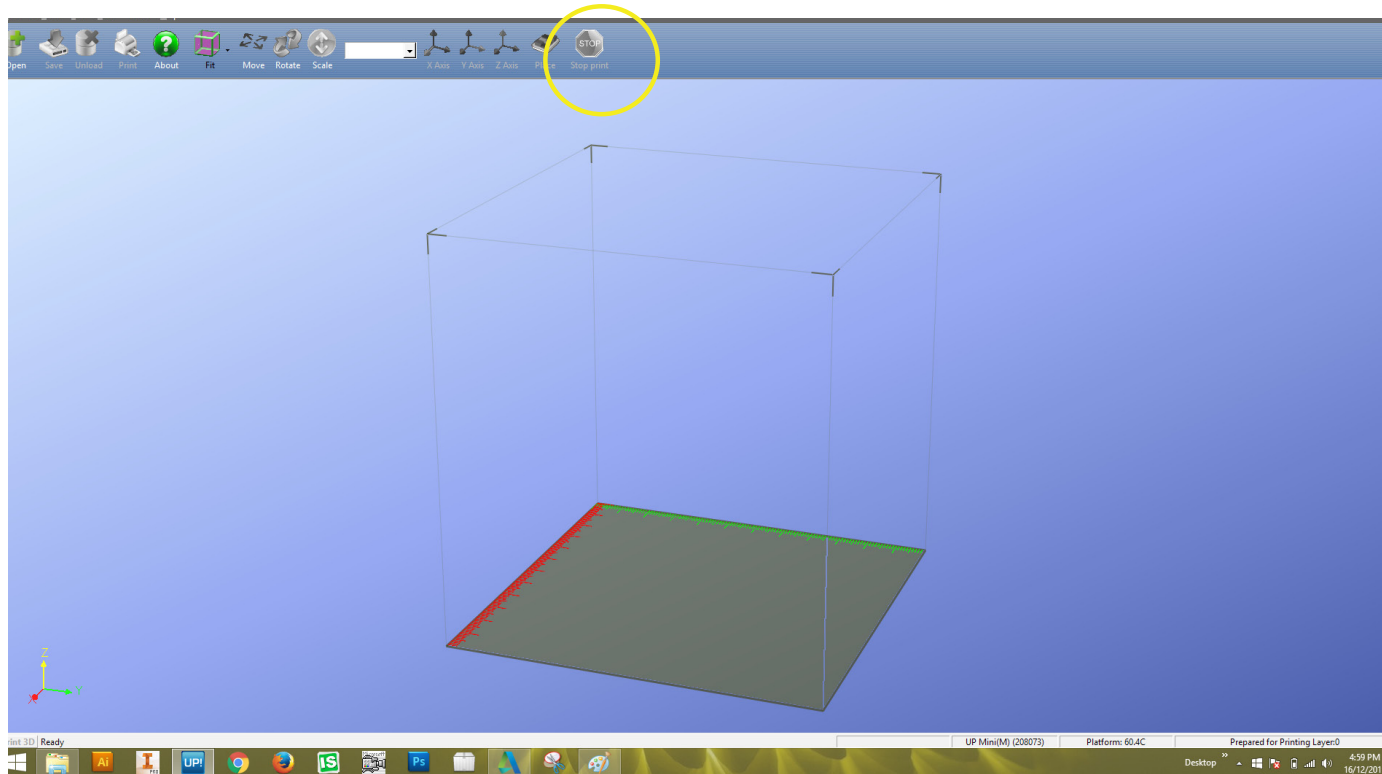
# Assess print time and weight

This is the final step prior to your model printing. You will need to assess the printing time and the weight of your print. Printing at The Edge is 0.15 cents per gram. If you are happy with this hit ok, and your print will commence.



Please take note of the time required to print the 3D model, does it clash with other bookings of the machine? Prints cannot run beyond our opening hours.

# If errors occur



Should any errors occur while you are printing you can always stop the print by hitting the **'Stop'** button in the Up Software

# When your print is ready

**Allow the fumes to vent from your 3D printer!**

**Wait for 2 minutes prior to opening the cabinet and removing your print. This will prevent plastic fumes and particles from entering the Fabrication Lab.**

# Removing your print from the bed

Once your print is complete you are ready to use a metal spatula to carefully remove your model from the printing bed.

Remember to wear gloves when you do this and always work away from yourself and your free hand when removing the work.












# Induction Paperwork Answers

## ACTIVITY 1 - KEY SAFETY TIPS FOR THE FABRICATION LAB

Draw a line to match the safety tip with its explanation

	EXPLANATION
 <b>Wear the right safety gear</b>	 It's there for your protection
 <b>Clean up as you go</b>	It's easy to ask and you could prevent an injury
 <b>Correctly use the right tool for the job</b>	They protect your feet & help prevent slipping
 <b>Always wear appropriate covered footwear</b>	Most injuries come from misusing tools
 <b>No kids under 12. Sorry!</b>	There is hazardous equipment & substances used in the Fabrication Lab
 <b>Ask questions if you have any doubts</b>	Accidents happen in untidy spaces

NAME:

DATE:

The aim of The Edge Resource Inductions are to ensure that patrons are equipped with practical skills and knowledge to safely access the range of tools available for public use in the Fabrication Lab. In each of these inductions, an Edge Facilitator will deliver training on the safe and appropriate use of equipment.

The following form serves as a record of your participation, and provides evidence to demonstrate your competent understanding and practical application of the training.

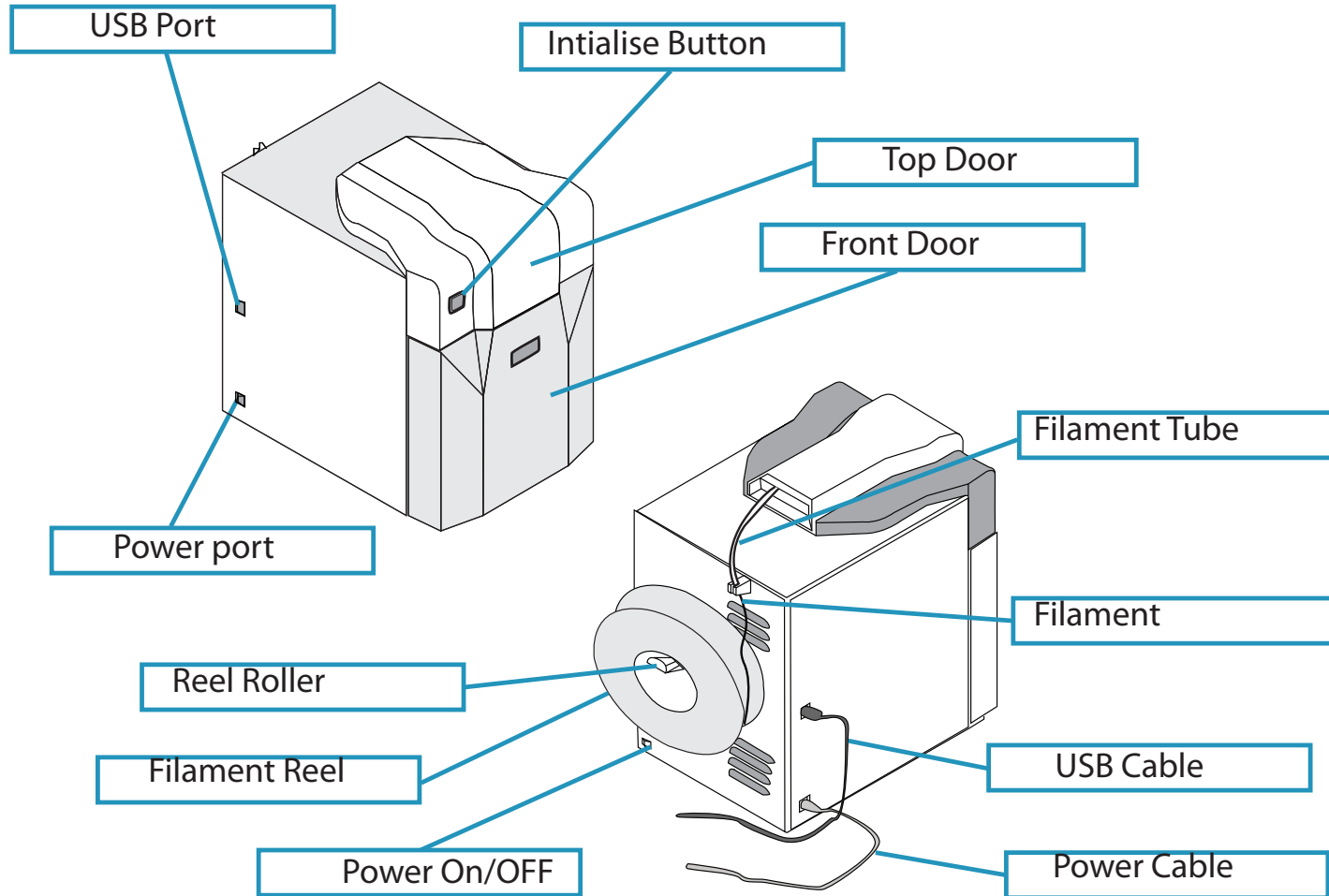
The assessment evidence collected in this Induction will be in three forms: Written Assessment, Peer Assessment (Verbal), and Workshop Facilitator Observations.

If you require any extra assistance to complete this induction please inform your facilitator at the beginning of the session.



**ACTIVITY 2 - IDENTIFY 3D PRINTER COMPONENTS**

Using the list of components on the right, identify each part by writing it in the relevant box.



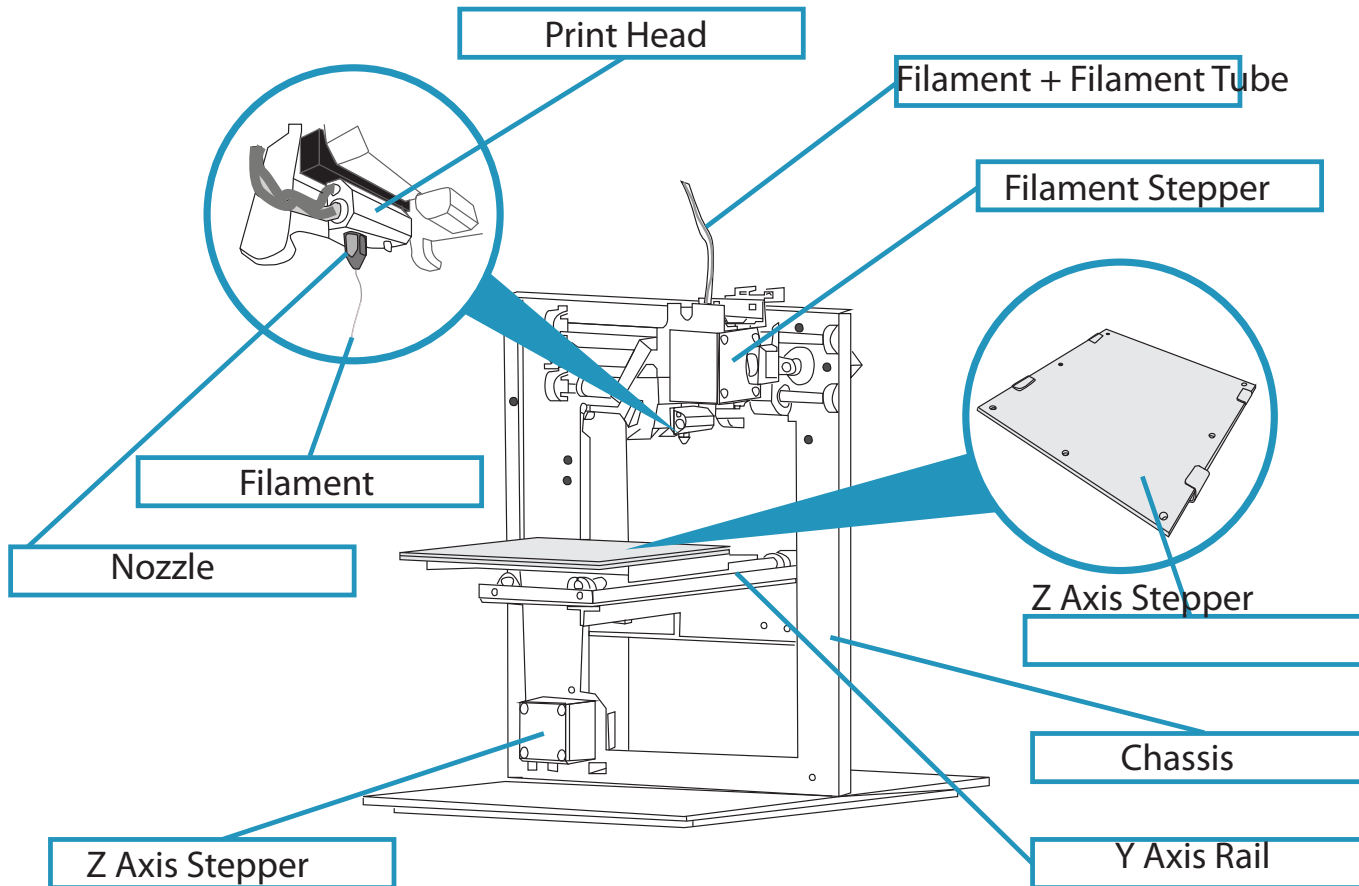
**COMPONENTS**

- Power Port
- USB Port
- Filament Tube
- Filament
- Filament Reel
- Front Door
- Top Door
- Initialise Button/Status Light
- Power ON/OFF
- Power Cable
- USB Cable
- Reel Roller



## ACTIVITY 3 - IDENTIFY THE INTERNAL COMPONENTS

Using the list of components on the right, identify each part by writing it in the relevant box.



### COMPONENTS

Print Head

Nozzle

Filament

Filament Stepper

Filament & Filament Tube

Y Axis Rails

Chassis

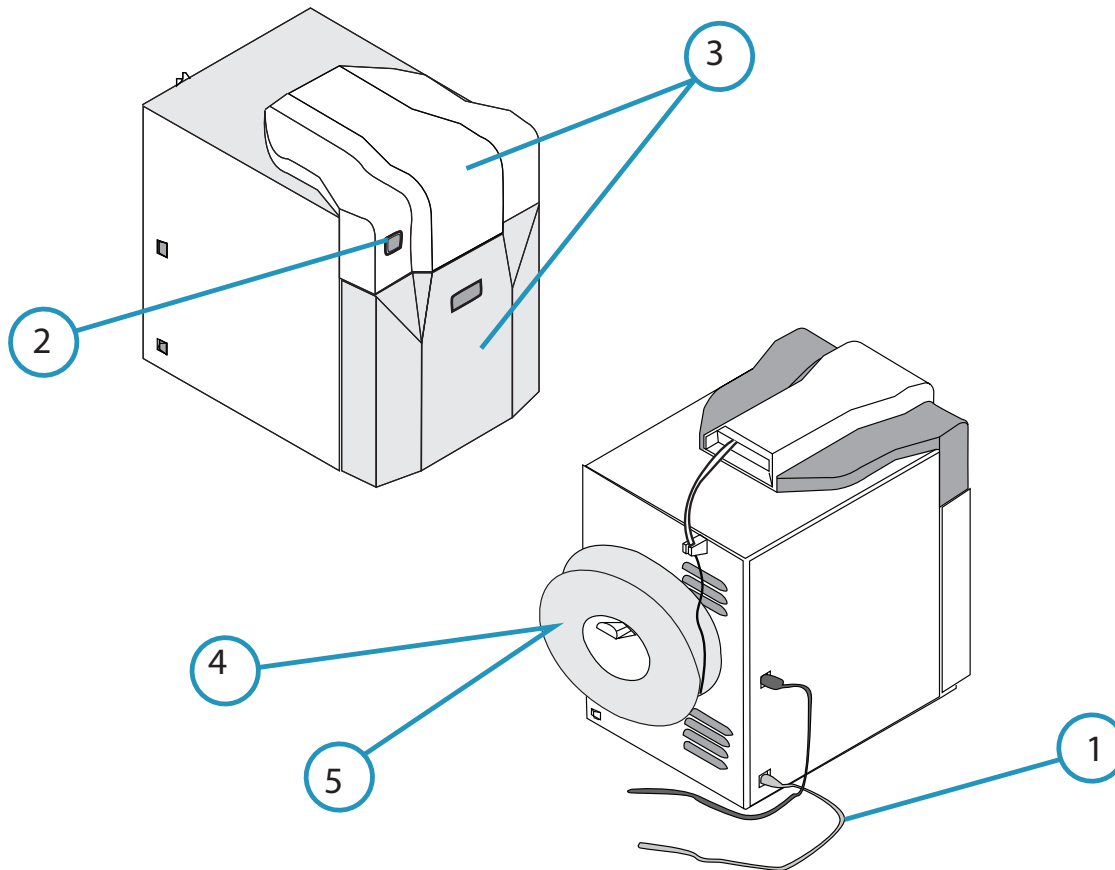
Print Bed & Perfboard

Z Axis Stepper



## ACTIVITY 4 - IDENTIFY 3D PRINTER SAFETY/OPERATIONAL TIPS

Using the safety tips on the right, identify what component it relates to by writing the safety tip number in the relevant circle.



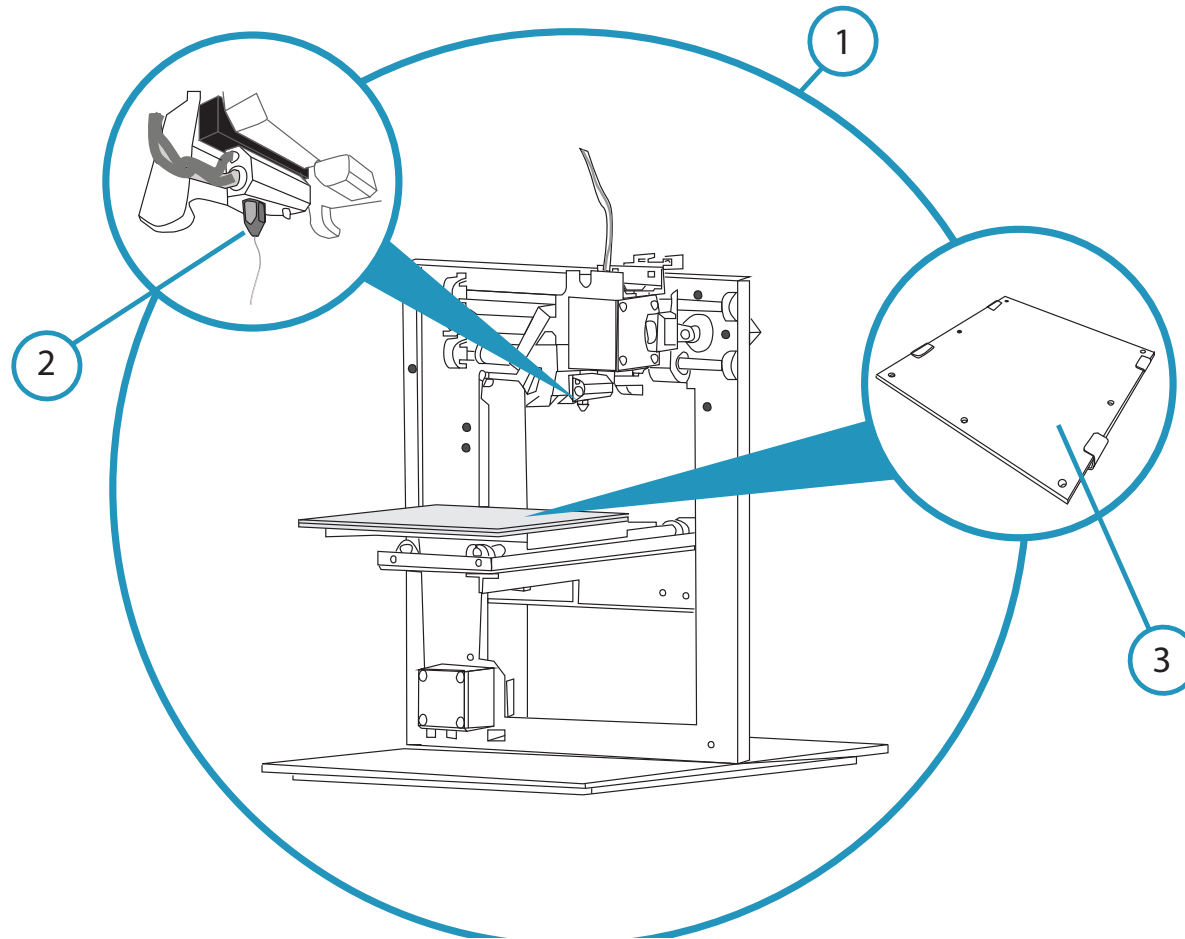
### SAFETY/OPERATIONAL TIPS

- ① Remember your electrical safety
- ② Double click me to turn on the light inside. HOLD me to abort
- ③ Keep me closed when printing  
Keeps the print warm & stops it from deforming
- ④ Make sure there are no kinks & that the filament can roll off the reel cleanly
- ⑤ Make sure there is enough filament on the roll to print your model



## ACTIVITY 6 - IDENTIFY 3D PRINTER SAFETY/OPERATIONAL TIPS

Using the safety tips on the right, identify what component it relates to by writing the safety tip number in the relevant circle.



### SAFETY/OPERATIONAL TIPS

- 1 Crush Hazard! Moving parts don't stop for fingers
- 2 250°C+ This will burn. Turn off & allow to cool before handling
- 3 Replace perfboard carefully. If steppers slip the print will need to be reinitialised



## ACTIVITY 7 - 3D PRINTER WORKFLOW

We've identified four key stages in the 3D printing process. Each stage is listed below, with a number of consecutive steps. Put each step in the correct order, by placing a number in the corresponding circle.

### 1. GET THE 3D PRINTER READY

- 4 Check the 3D printer is extruding correctly
- 2 Switch on and initialise the 3D Printer
- 3 Check there is enough filament to complete the print
- 1 Insert the perfboard into the print bed

### 2. PREPARE YOUR DESIGN FOR PRINTING

- 3 Orient, scale and place model for efficient printing
- 2 Import the CAD model into the UP! software
- 2 Design a model in CAD and export for printing



## ACTIVITY 5 - 3D PRINTER WORKFLOW CONTINUED

### 3. PRINT YOUR MODEL

2

Monitor the print job

1

Select print options and execute print

3

If the print is failing, abort the job

### 4. REMOVE YOUR JOB

3

Weigh, pay and takeaway

2

Clean up perfboard, ready for next use

1

Remove completed print from perfboard





### PEER ASSESSMENT

I confirm that the observations of my peer showed active participation in this induction workshop and demonstrated a satisfactory understanding, including competent and safe use of the above tools.

Date	Peer Assessor	Peer Assessor Signature
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### FACILITATOR WORKSHOP OBSERVATION

I confirm that the observations made of the participant and active participation in this induction workshop demonstrated a satisfactory understanding, including competent and safe use of the 3D printer.

Date	Edge Facilitator	Facilitator Signature
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### PARTICIPANT DECLARATION

I declare the assessment above was my own individual work.

Date	Participant Signature
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