Fusion3

Affordable, High-Performance 3D Printers

F400 USER MANUAL

Revision 3 - 7/6/16

1 Introduction

Thank you for purchasing your F400 3D printer from Fusion3! Your F400 has been designed and manufactured to give years of excellent service with few issues and minimal maintenance.

This manual will introduce you to your F400 and help you get the most out of the equipment. We realize this is a long document and not everyone is going to read it. So if you want to get printing quickly please see the QuickStart Guide that shipped with your printer.

Remember: This is a complex piece of equipment, and there is a learning curve involved. It is a machine tool, not an appliance (like a microwave). Please be prepared to invest the time to learn how it works and how to get the most out of it. **We are here to help you get up this learning curve.** Please contact us if you are confused or have any questions!

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2 Warnings and Disclaimers

2.1 Do Not Operate Equipment Unattended

While we have designed and manufactured your F400 to minimize the risk of damage if something were to go wrong, the fact is that 3D printing is a highly complex activity that may not work correctly at any time. To minimize the risk to your equipment, facility, and personnel, we ask that you do not operate your F400 unless someone is present to monitor the equipment. If your F400 is operated unattended and something goes wrong, in extreme cases this can cause a fire.

2.2 Hot Components are Present During Operation

During normal operation your F400 contains several components that reach elevated temperatures that can cause burns if you contact them. These components include:

- The print head
- The print bed
- The motors

These components have warning labels indicating elevated temperatures may be present.

Please keep in mind these components may be hot in the minutes following a print job as the heat takes up to 20 minutes to dissipate completely.

2.3 Electrical Shock Hazard

Your F400 contains some components that operate at 110V AC. These components are all located in the enclosed electronics bay. If the service door is removed while the equipment is powered on, a shock hazard will be present. We strongly recommend you leave the service door in place if the equipment is plugged in and/or operating. If you need to service the components in the electronics bay, please unplug the power cord and wait 10 minutes before performing any work.

3 Setting Up Your F400

3.1 Please Retain All Packaging

IMPORTANT: Please retain all packaging materials (3 pieces of the box, pallet, foam endcaps). In the unlikely event you need to send your printer back to Fusion3 for repair you will need the packaging materials. The tube can be collapsed for relatively compact storage.

3.2 Lifting, Carrying, and Transporting

Your F400 is a 2-person lift only! It weighs 85 lb.

On the left and right faces are cutouts that function as hand-holds.

Remember this is a piece of precision equipment: do not subject it to shocks, drops, or bumps.

3.3 Finding a Suitable Surface

Your F400 will be at home on any reasonably sturdy and stable surface that:

- Can support 120 lb
- Is at least 31” x 30” in size
- Will resist shaking and vibration during the printer’s operation
- The rear face of your F400 must be at least 2 inches from any wall or obstruction, to allow adequate ventilation.
- The right face needs sufficient clearance for the power cord and for the operator to easily reach the power switch.
- Rubber feet on the bottom of the unit will prevent sliding on most surfaces

3.4 What is a Suitable Ambient Environment?

Typical office/indoor environment is preferred. 40^{o}F to 85^{o}F ambient temperature is recommended.

Thanks to its full enclosure, the F400 is fairly insensitive to air drafts, dust, etc. It's still better to avoid environments with these characteristics if possible.

3.5 Power

Your F400's peak power draw is approximately 5 amps at 110VAC. Operating draw will depend on the material being printed; higher temperature materials require more power.

Please use the included power cord to connect your F400 to a 3 prong outlet. Due to the high power draw, please be mindful that you do not overload any power strips/surge protectors you use.

If you are installing multiple F400s, be mindful of the capacity of your electrical circuits. Three F400s can over-draw a 15A circuit.

3.6 Network

Your F400 contains a 10/100 Ethernet port to allow you to connect the printer to your local network. It will set up a web page that allows you to remotely monitor and control the printer.

- This is an optional feature; the attached LCD also gives you full control over your printer.
- By default this web page is only accessible inside your local network. It is NOT accessible from the wider internet (it is not cloud-based)
- See section 6 for more information.

3.6.1 What if I need Wifi?

You can purchase an Ethernet to wifi bridge and use that to get your F400 onto your wireless network. We have tested the following and verified they work:

- http://www.amazon.com/IOGEAR-Universal-Ethernet-Adapter-GWU627/dp/B004UAKCS6
- http://www.amazon.com/TP-LINK-TL-WA801ND-Wireless-300Mbps-Repeater/dp/B004UBU8IE

3.7 Setting up Simplify3D

Please see our separate Simplify3D setup guide. It's available:

- As a PDF on your SD card
- On our website at https://fusion3design.com/manuals/
- Provided via email attached to your shipment notification email

4 Hardware Information

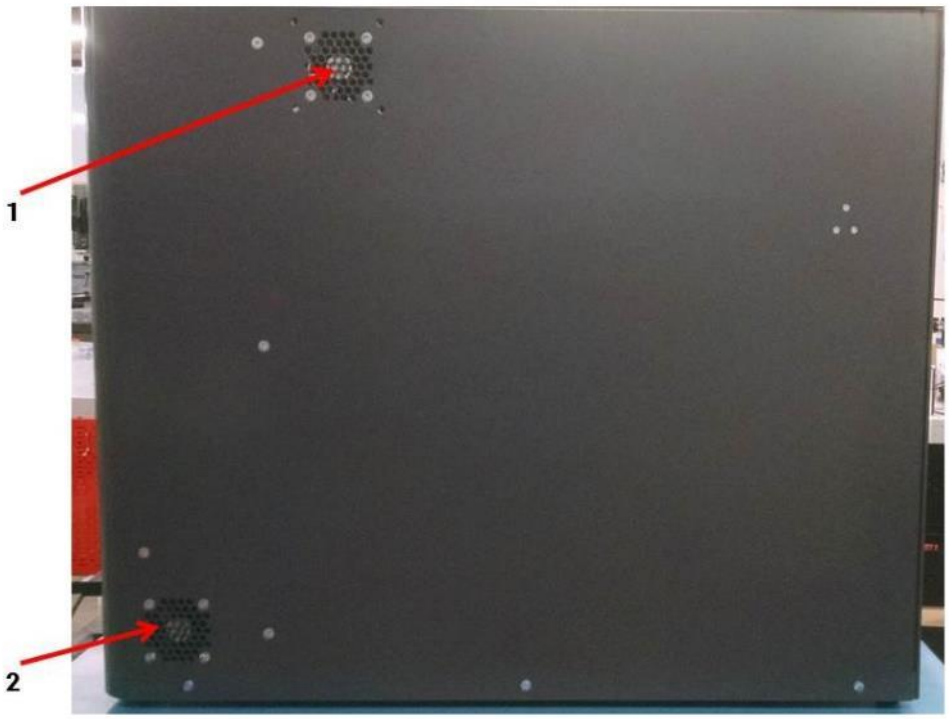
4.1 Front View

1. Print volume
2. Main door lift point
3. Filament bay
4. Filament bay door lift point
5. Control panel

4.2 Right Side

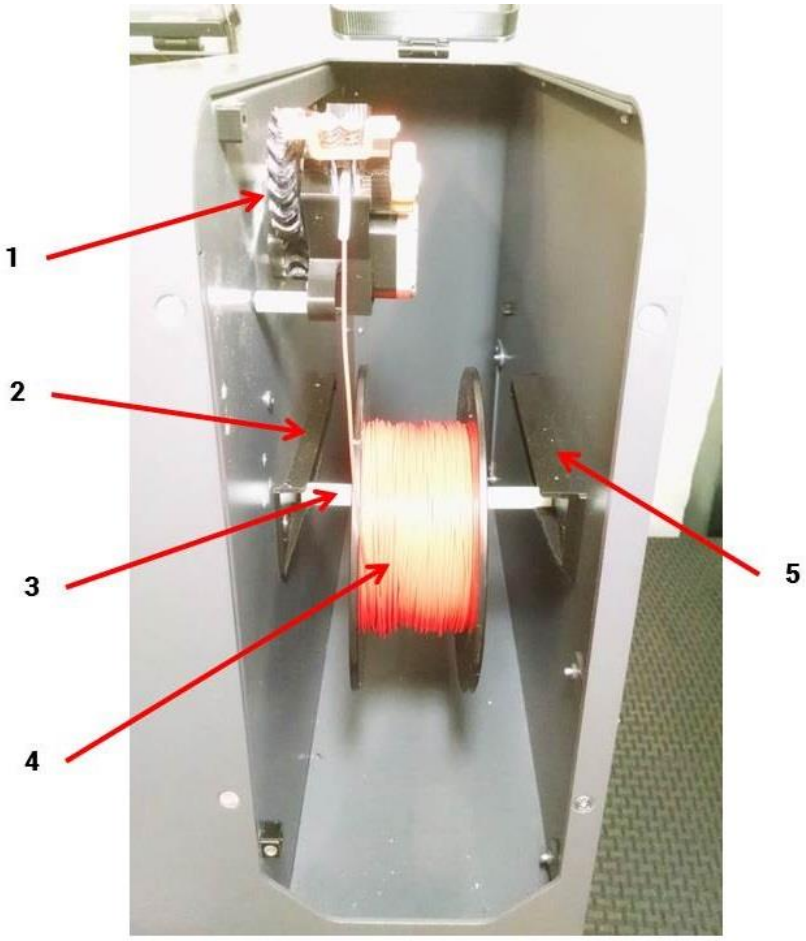
1. Electronics bay service door
2. Lift point (left side is identical)
3. Power plug and switch
4. Ethernet jack

4.3 Back



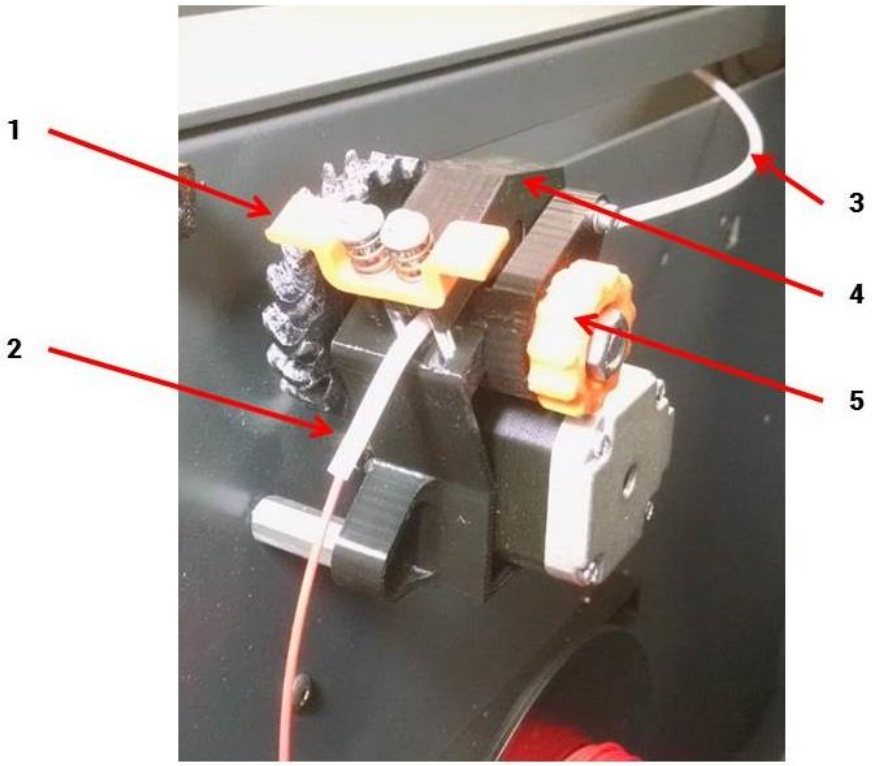
1. Print volume exhaust fan
2. Electronics bay exhaust fan

4.4 Filament Bay Detail



1. Extruder cold end (aka extruder)
2. Left filament spool track
3. Filament spool holder
4. Filament spool (1kg)
5. Right filament spool track

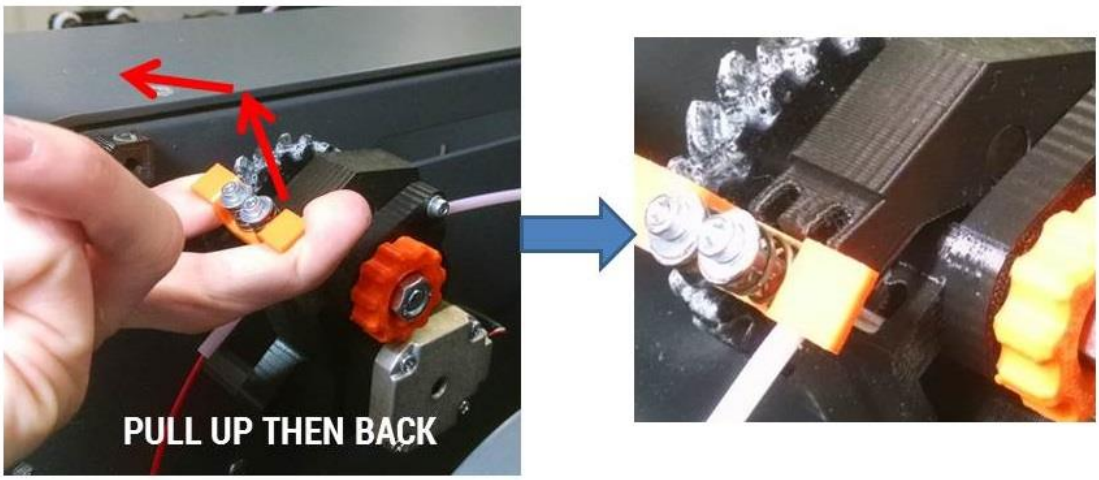
4.5 Extruder Cold End Detail



1. Spring grabber
2. Filament inlet tube
3. Filament exit tube (aka filament feed tube)
4. Idler bar (in closed position)
5. Hand feed wheel

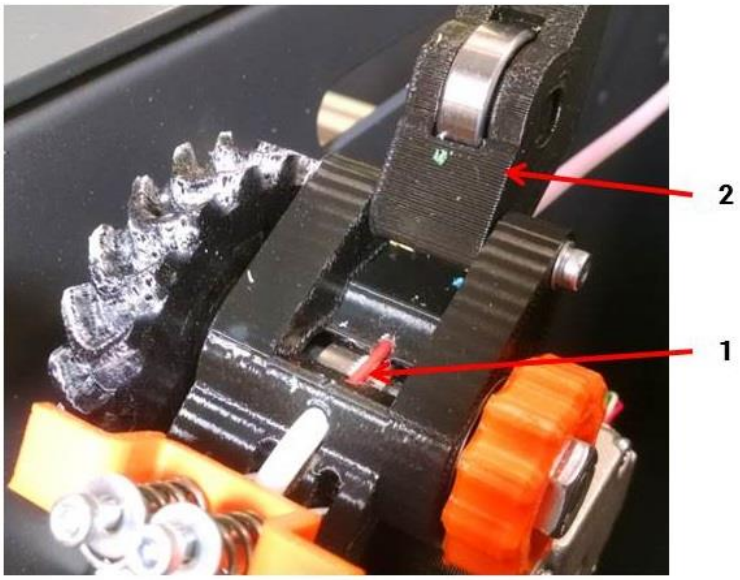
User touch points are orange on the extruder.

4.5.1 To Open the Idler Bar



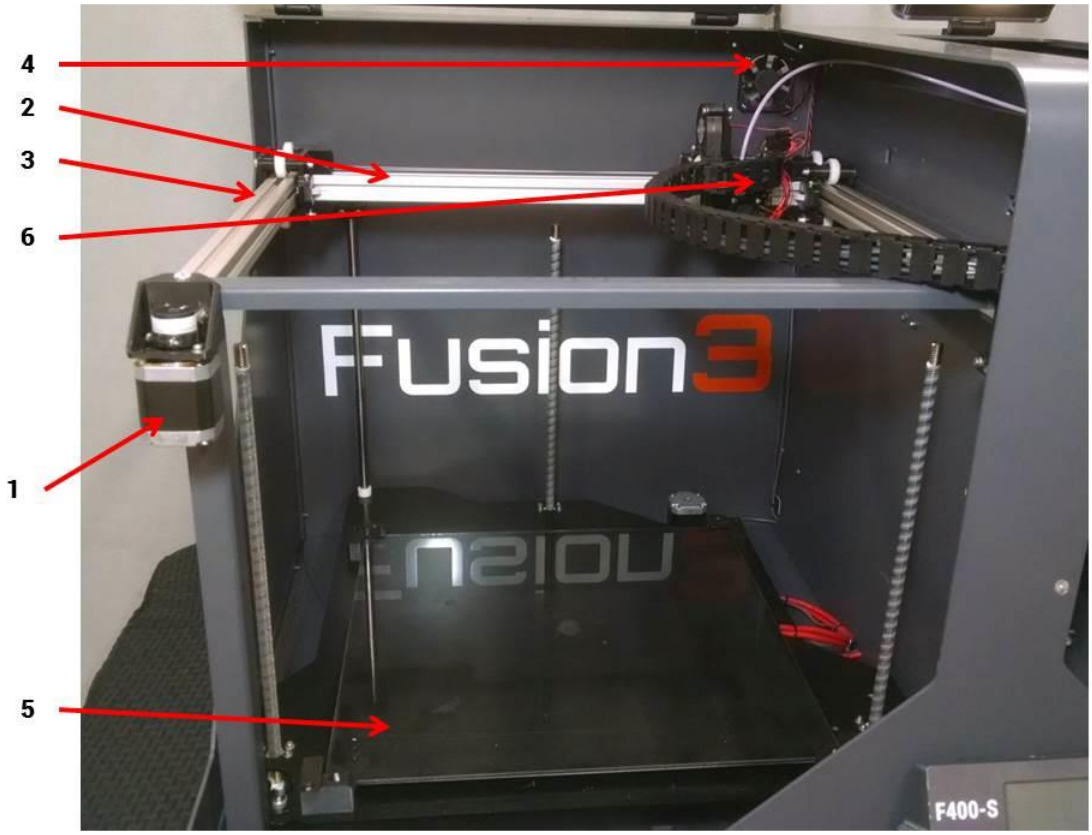
Pull up and back (towards yourself) to disengage the springs from the idler bar.

Once the springs are disengaged you can easily open the idler bar to expose the feed gear.



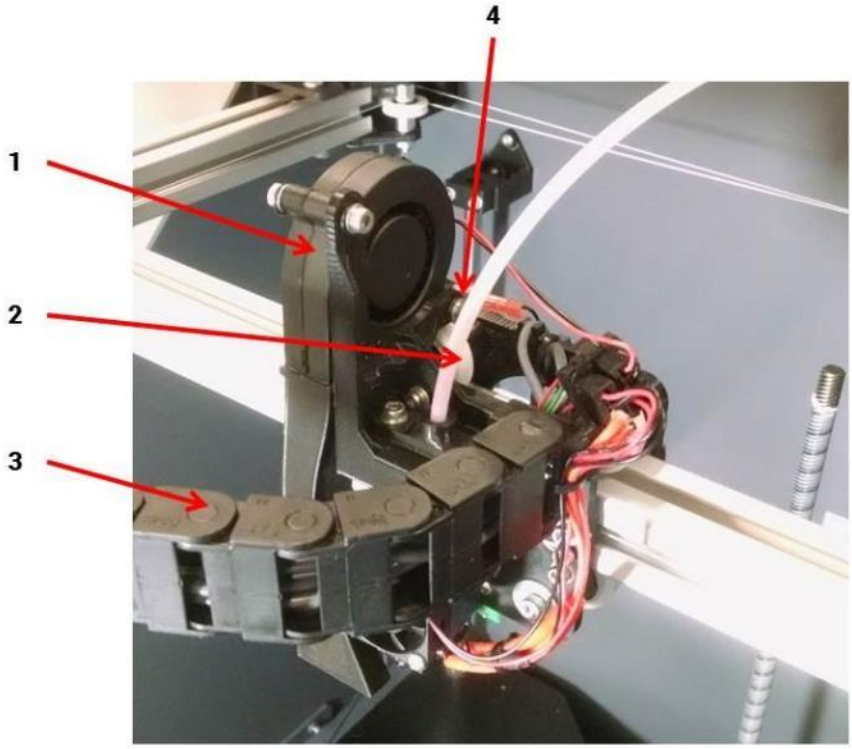
1. Feed gear
2. Idler bar (in open position)

4.6 Print Volume Overview

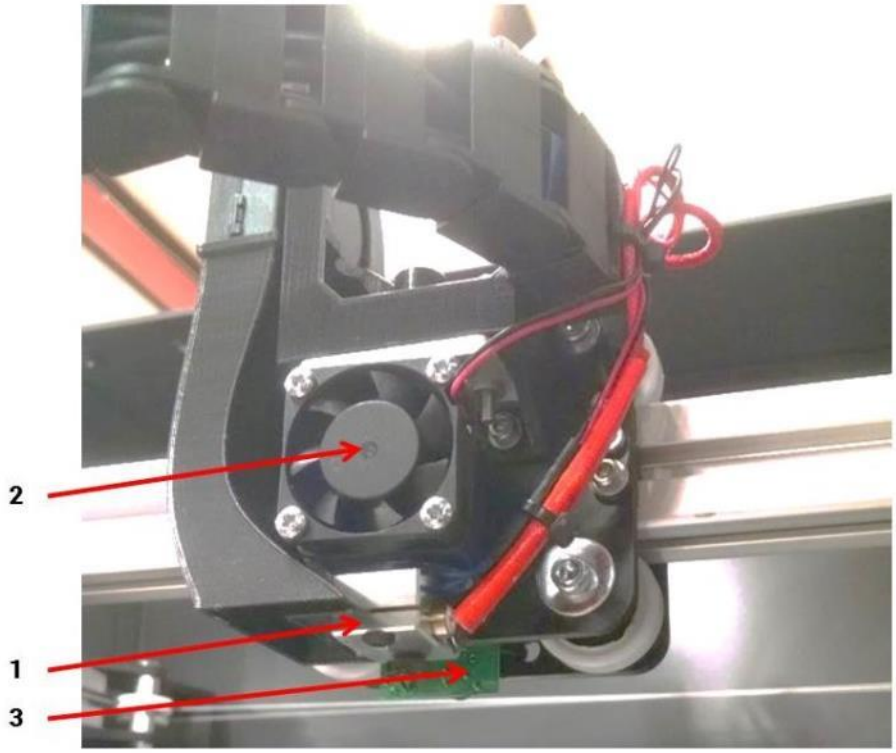


1. X/Y motor
2. X axis (left to right)
3. Y axis (front to back)
4. Exhaust fan
5. Print bed and Z axis

4.7 Print Head Assembly Detail



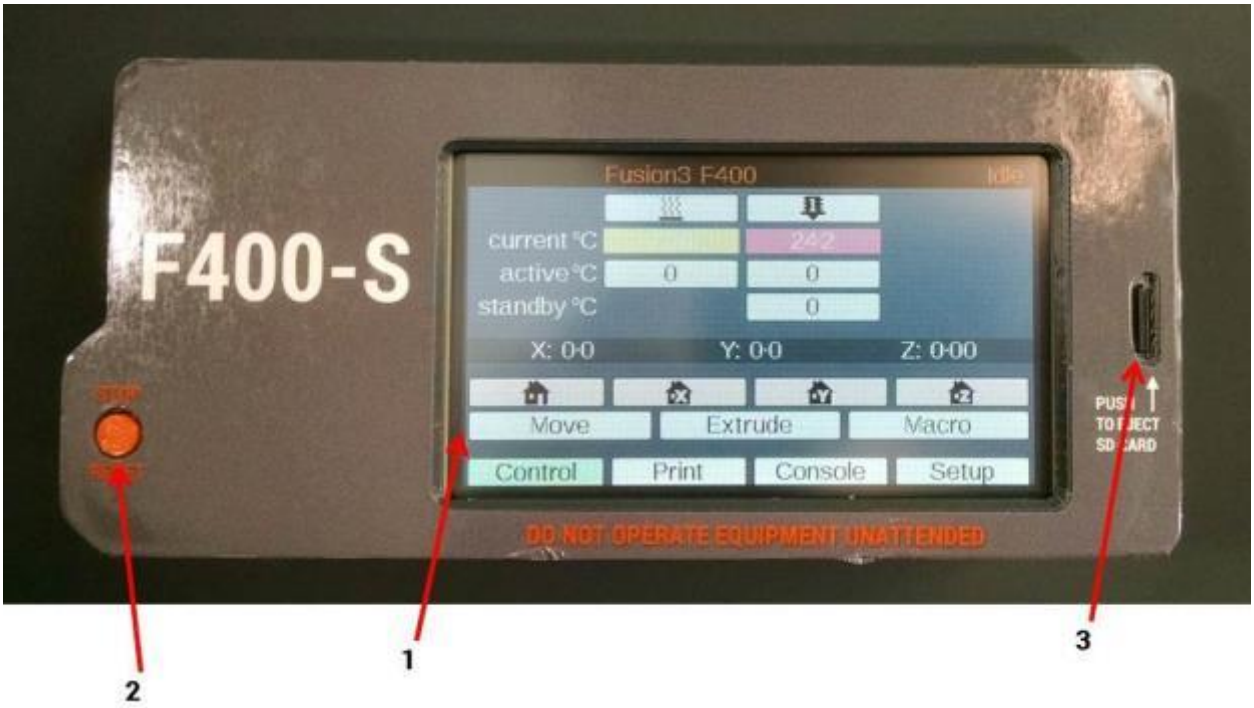
1. Cooling blower (runs intermittently)
2. Filament feed tube
3. Wiring cable chain
4. X endstop switch (on the back)



1. Print head (this gets hot)
2. 30mm fan (runs constantly)
3. IR bed probe

5 Control Panel Information

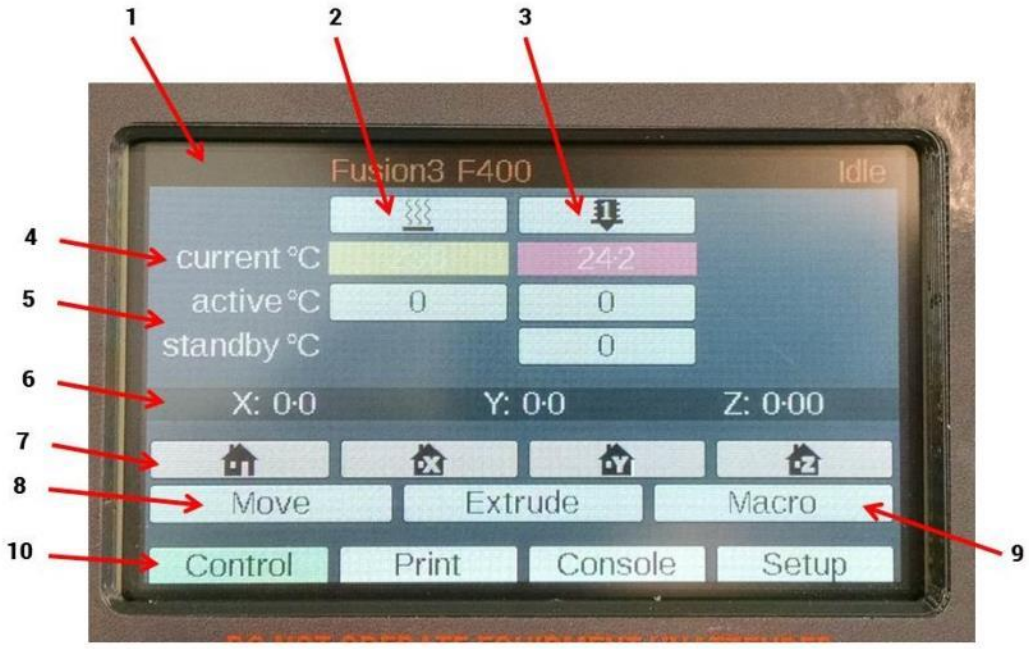
The control panel is a full color resistive-type touchscreen that gives you full control over your F400. It also contains a microSD card reader and a hard “stop/reset” button.



1. Touchscreen interface (see below for more detail)
2. Hardware “stop/reset” button. Pressing this button will immediately cause your printer to stop what it’s doing and reboot. It’s useful if something goes wrong and you want the printer to stop immediately. When you press this button the motors will be switched off and power will be cut off from the bed heater and print head.
3. microSD card reader

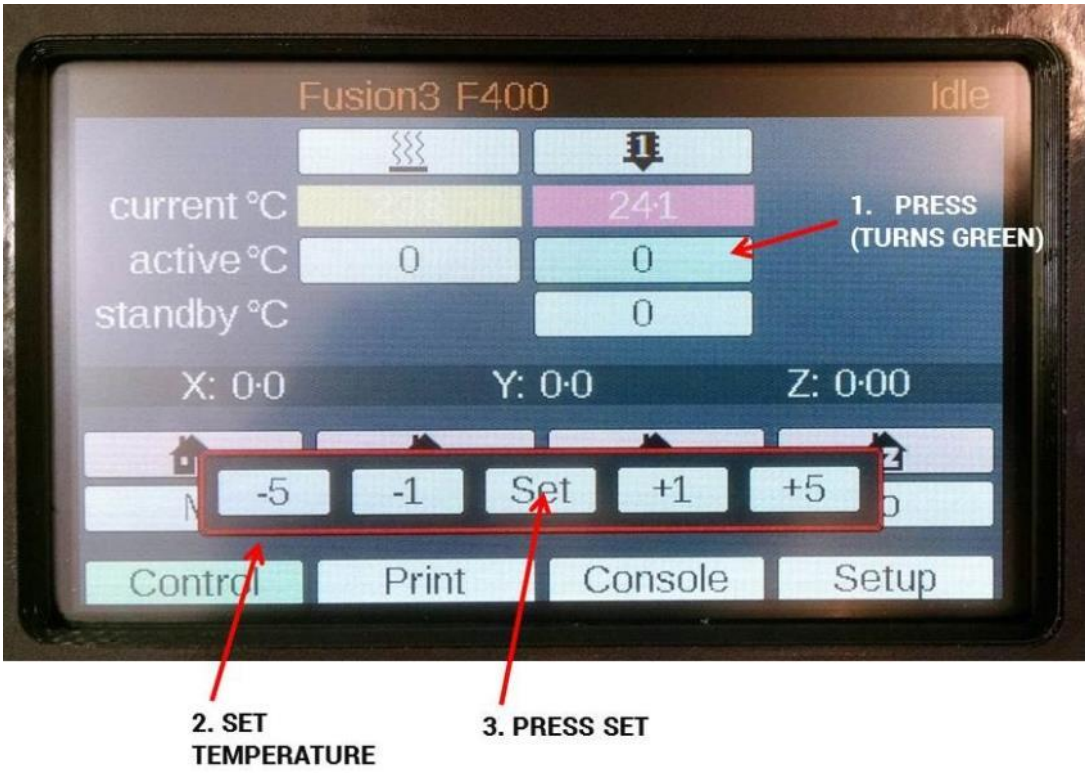
5.1 Control Tab

The control tab is the default screen you will see when you power your printer on. It gives you access to basic temperature and motion controls, and other tasks you’d commonly need to prepare to run a print (such as loading filament).



1. Message bar
2. Bed heater control column
3. Print head control column
4. Current temperature row
5. Temperature control rows
    a. “Active” = setpoint; the temperature the component is trying to reach
    b. “Standby” is not used
    c. Touch the active temperature cell to change the setpoint of the heaters (see below)
6. Current position in 3D space (may not be accurate until the machine is homed; see below)
7. Homing controls (left to right: home all, home X, home Y, home Z)
8. Move submenu
    a. NOTE: the printer will prevent you from moving an axis unless it has been “homed” first.
9. Macro submenu
10. Tabs row (active tab is green)

5.2 Setting a Temperature

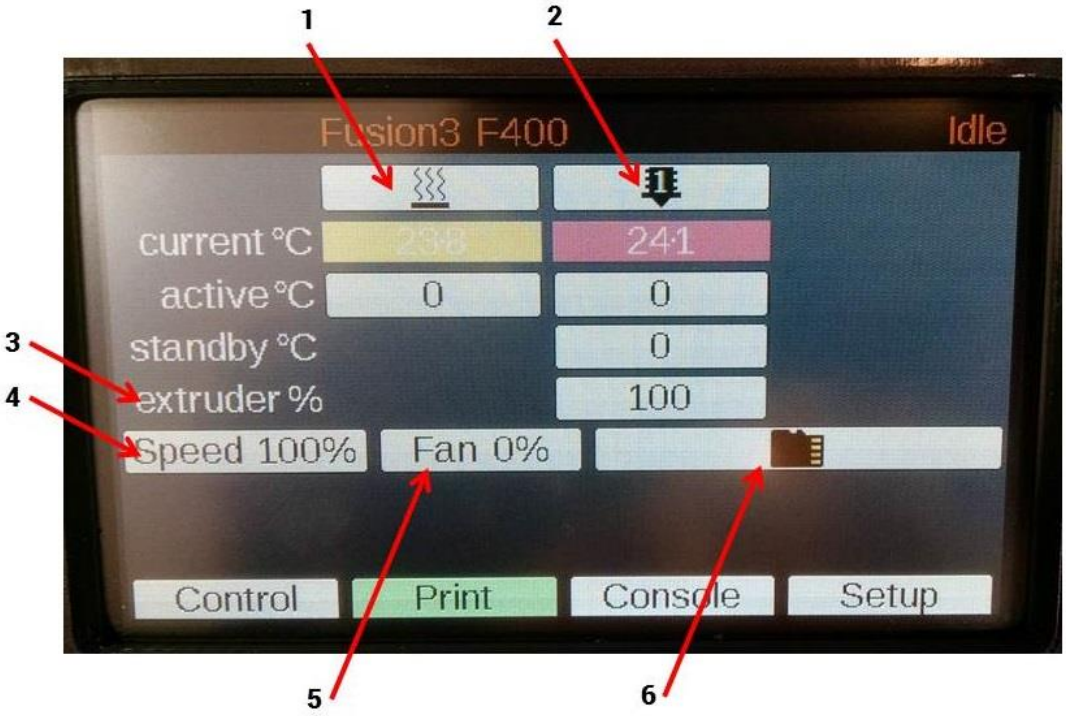


5.3 Macro Submenu

The macro submenu lists short scripts call macros that do different tasks. Press the red "X" to close the menu after selecting your macro.

1. Disable Heaters: Shuts off the print head, print bed, and blower if they are running.
2. Disable Motors: De-powers the stepper motors so that components can be moved by hand.
3. Load Filament: Script that will load filament into the print head.
4. Unload Filament: Script that will unload filament from the print head.

5.4 Print Tab



1. Bed heater controls (identical to “Control” tab)
2. Print head controls (identical to “Control” tab)
3. Extruder %: allows you to adjust the amount of plastic being extruded during a print.
4. Speed multiplier: allows you to adjust print speed in real time during a print.
5. Cooling blower control: allows manual control of the cooling blower on the print head.
6. File selection submenu: Press this to see a list of all files on the SD card.

5.5 Console Tab

This tab can be ignored for normal use of the printer.

This tab has two main functions:

- Show messages generated by the controller (routine messages and error messages)
- Allow you to send individual gcode commands directly to the controller. This is not needed in normal use but can be useful for debugging or troubleshooting.

5.6 Setup Tab

This tab can be ignored for normal use of the printer. It has various setup options for the LCD itself.

6 Web Interface Information

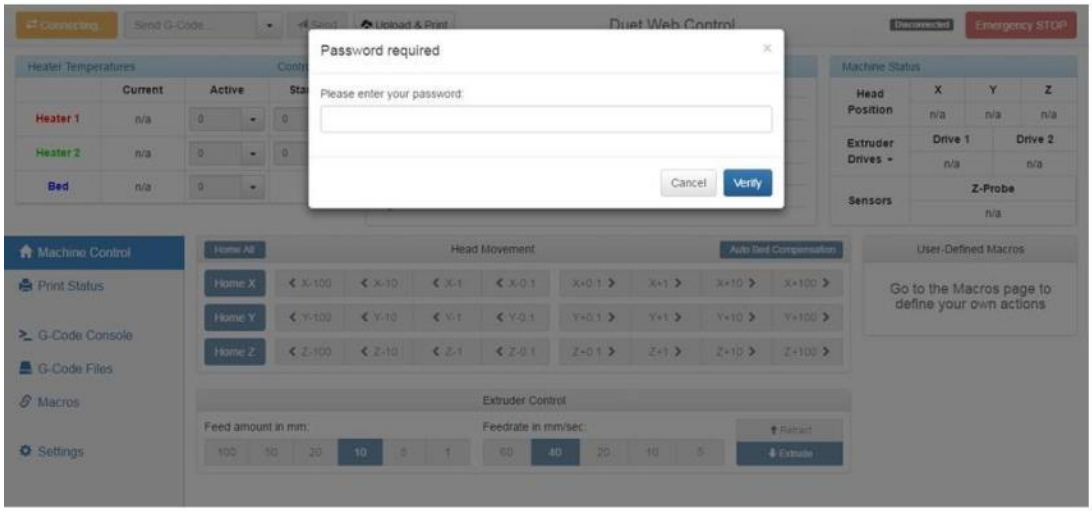
If connected to your local network, your F400 will set up a web page that allows you to remotely manage the machine. For the most part it duplicates the controls found on the touchscreen, and provides some additional information.

Key information:

- This web page is only accessible from inside your local network; it is not accessible from the internet
- It is password protected to prevent unauthorized use. The default password is “fusion3”
- If local DNS is available, your F400 will attempt to use the web address “http://fusion3f400”

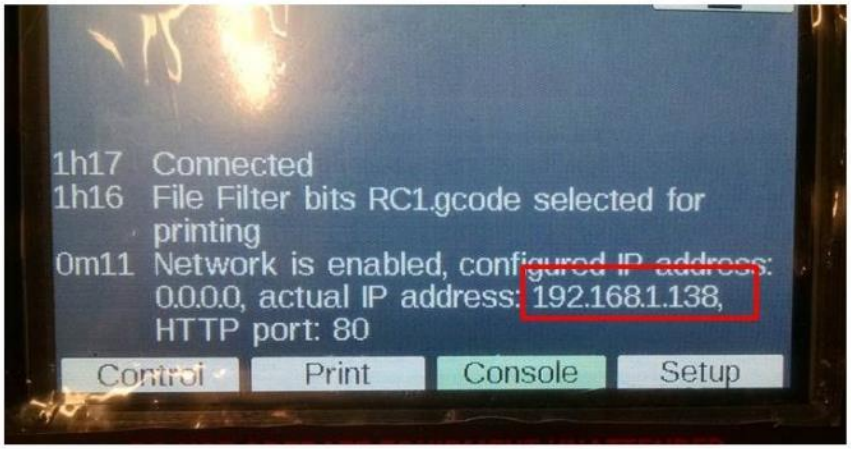
6.1 Accessing the Web Page

1. Open your web browser and type in “http://fusion3f400” and press enter.
2. The page will load and will prompt you for a password.



If the page doesn’t load, try the following:

1. Go to the printer and click on the “console” tab on the LCD.
2. Type in “M552” and press enter. Verify the printer’s IP address is not all 0s. If it is, that means it is not properly connected to the network. Try power cycling the printer (and Ethernet/wifi bridge, if one is used)



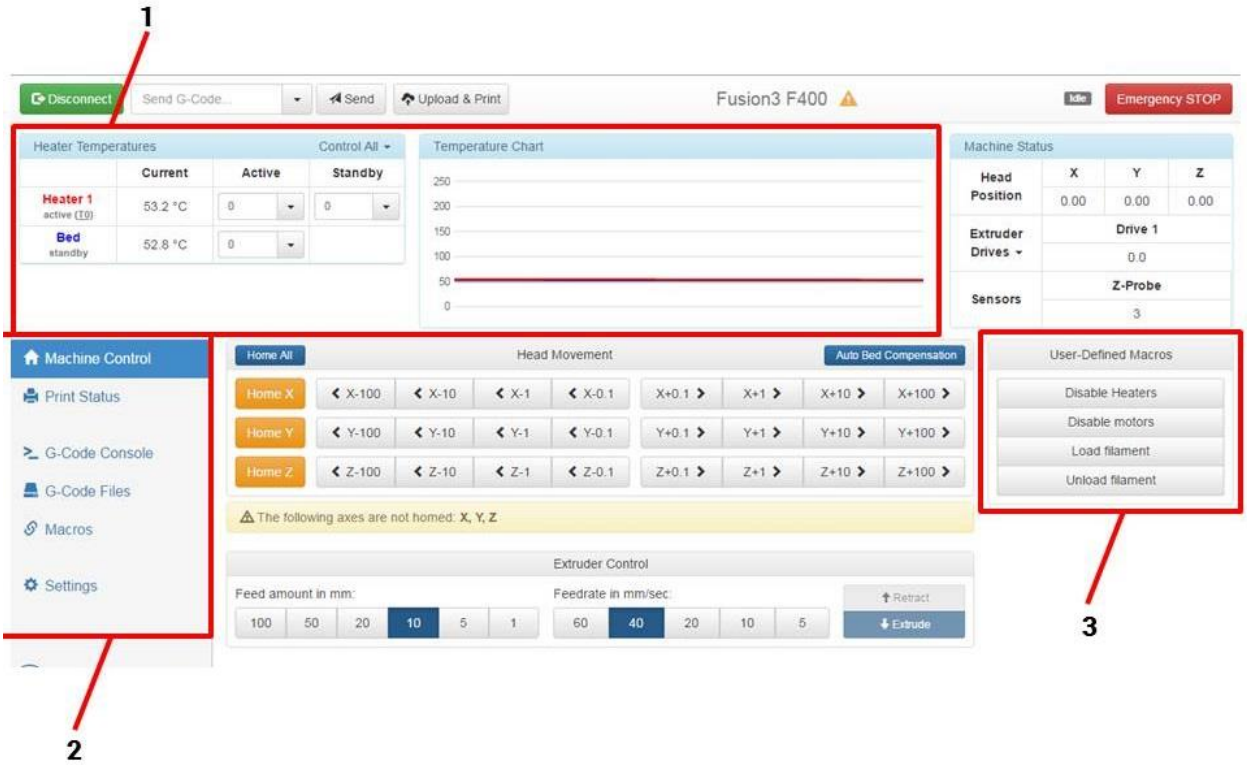
3. Once the printer reports a valid IP address, type that IP address into your computer's browser. The web page should load.

6.2 Web Interface Description

Much like the Control Panel, the web interfaces is divided into a series of tabs or screens that focus on different aspects of operating the printer.

6.2.1 Machine Control Tab

This is the default tab you will see when you log into the web interface.



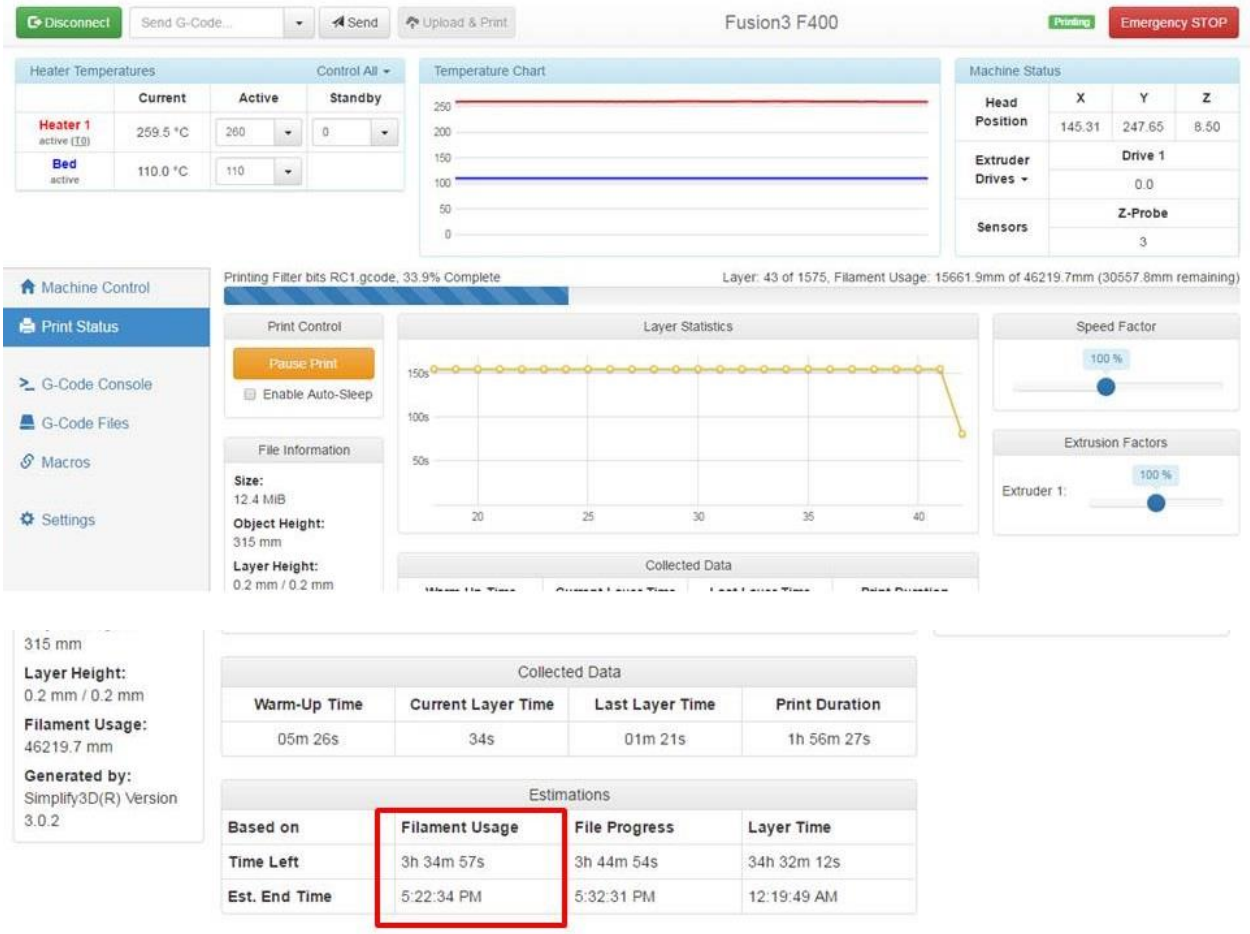
1. Temperature controls: Gives a readout of the current print head and bed temperatures, allows you to set the temperatures manually, and also shows a chart with temperature history.
2. Tab selection box: Toggle between the various tabs with this section
3. Macro box: Allows you to use the macros. Does the same thing as the “Macros” menu on the Control Panel.

Note: The temperature readouts/controls are common across all the tabs.

The other elements on the page are less useful in normal use.

6.2.2 Print Status Tab

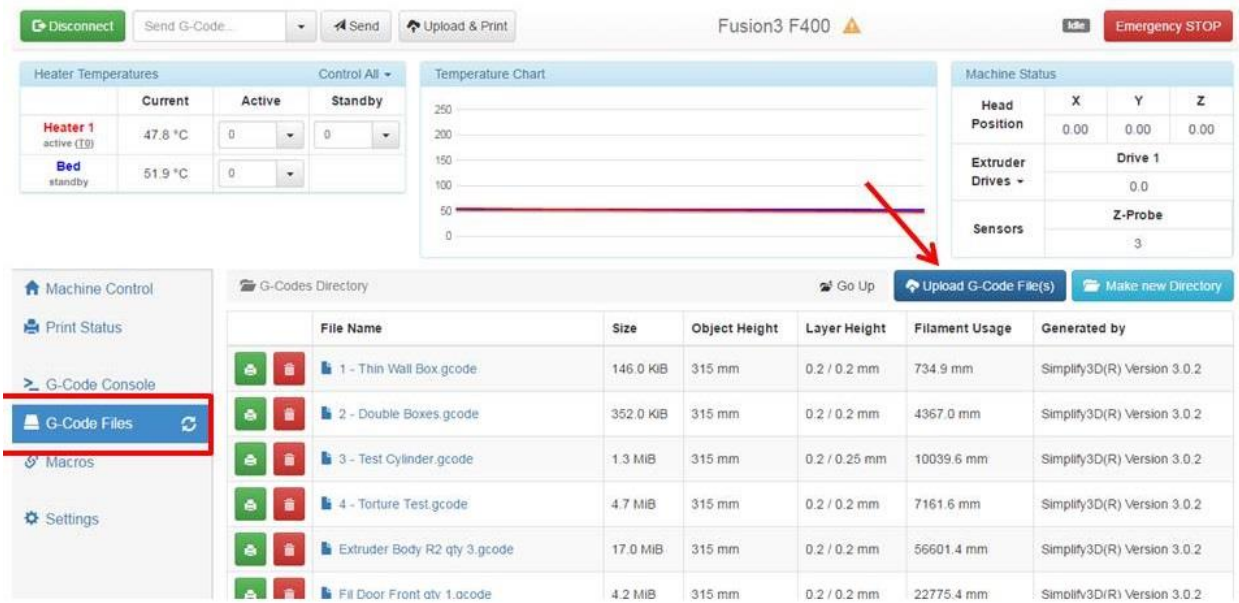
This tab gives you information on the print job in progress.



This page is pretty self-explanatory. It will give you 3 ways of estimating when the print will be done; we’ve found that the “Filament Usage” one is the most accurate (that’s the one shown on the Control Panel).

6.2.3 Gcode Files Tab

This tab allows you to view and manage the .GCODE files that are on the SD card. You can also upload new .GCODE files to the printer.



Note: If a print is running, the upload option will be locked out until the print is done. This is for performance reasons.

6.2.4 Other Tabs

The other tabs such as the Gcode console, Macros, and Settings tabs are not used in normal use.

6.3 Changing the Web Interface Configuration

The following parameters can be adjusted by the end user if needed. To adjust these you will need to open and edit the /sys/config.g file on your SD card. See section 8 for more information on the SD card file system.

- Website name
- Login password
- Printer MAC address
- Assign printer a static IP address

6.3.1 Website Name

If you have multiple F400s on your network, you will need to assign each one a unique name to prevent conflicts.

To change the website name, locate the line in config.g that begins with “M550 PFusion3 F400”.

The characters after the “P” are the name of your printer and will also be used as the web address for the web interface.

6.3.2 Login Password

To change the login password, locate the line that begins with “M551 Pfusion3”.

The characters after the “P” are the login password.

6.3.3 Printer MAC Address

If you have multiple F400s on your network you will need to compare their MAC addresses to ensure they are not the same. If you need to change it, you can do so on the line that reads “M540 …”.

6.3.4 Assigning a Static IP Address

If you need to assign the printer a static IP and/or adjust other networking settings, you can do so on the M552, M554, and M553 lines.

7 Software Information (AKA Working with Simplify3D)

A large part of getting great results from your printer is good setup on the software (Simplify3D) side. A comprehensive manual on Simplify3D would be a book by itself, so our goal here is to:

- Provide a general overview of the software and workflows
- Cover some of the more common issues with prints and how to fix them in Simplify.
- This is not intended to be comprehensive. If you have additional questions please contact us!

Simplify3D is written, maintained, and sold by www.simplify3d.com; it is not a product of Fusion3. We bundle Simplify3D with our printers and provide tier 1 technical support for this software.

7.1 Additional Resources

Simplify3D has some additional resources that may be helpful. Please remember that not all of Simplify's documentation apply to your printer, since we do some things a little differently. When in doubt please follow our instructions vs. Simplify's.

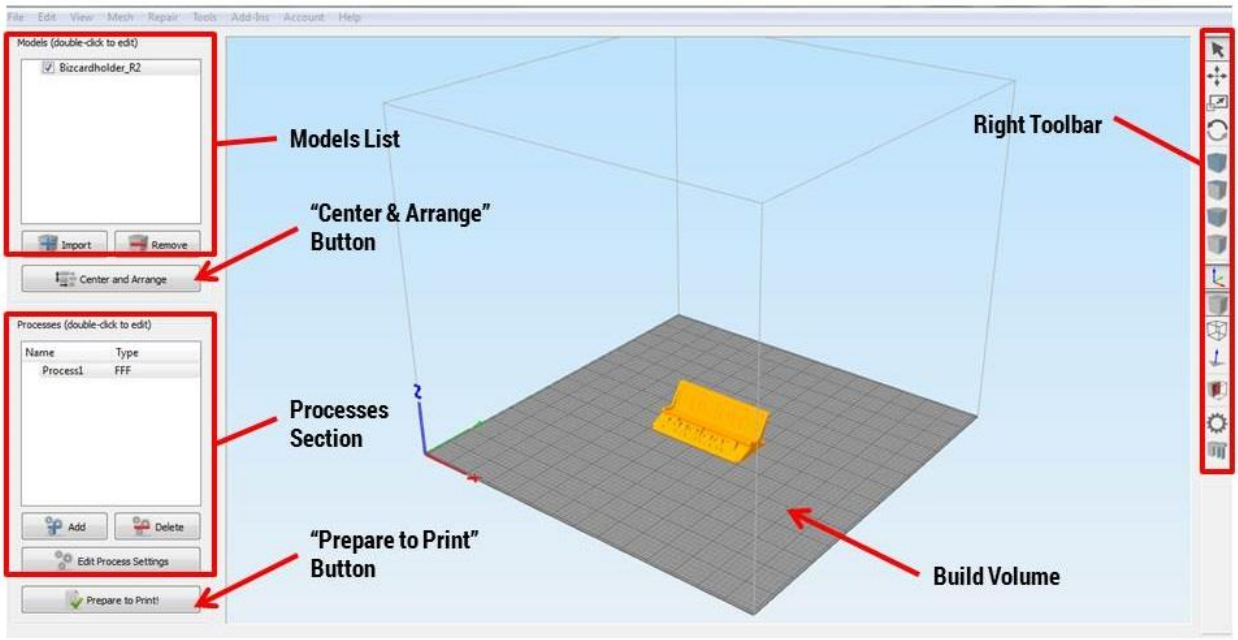
- https://www.simplify3d.com/support/video-library/
- https://www.simplify3d.com/support/tutorials/
- https://www.simplify3d.com/wp-content/uploads/2015/06/S3D-Quick-Start-Guide-v3.pdf

7.2 Basic Interface & Operations

Recommended links:

- https://www.youtube.com/watch?v=HIhpUfCorSM
- https://www.youtube.com/watch?v=i5rLVYpeoXU
- https://www.simplify3d.com/support/tutorials/importing-and-manipulating-your-models/

The Simplify3D Main Interface:



Models List: Shows a list of all models currently on the build plate. You can import more than 1 model at once to print them all simultaneously.

"Center & Arrange" button: Click this to automatically arrange the parts on the build plate so that they don't overlap. Note that this does **not** rotate any models to the best printing orientation – that's up to you.

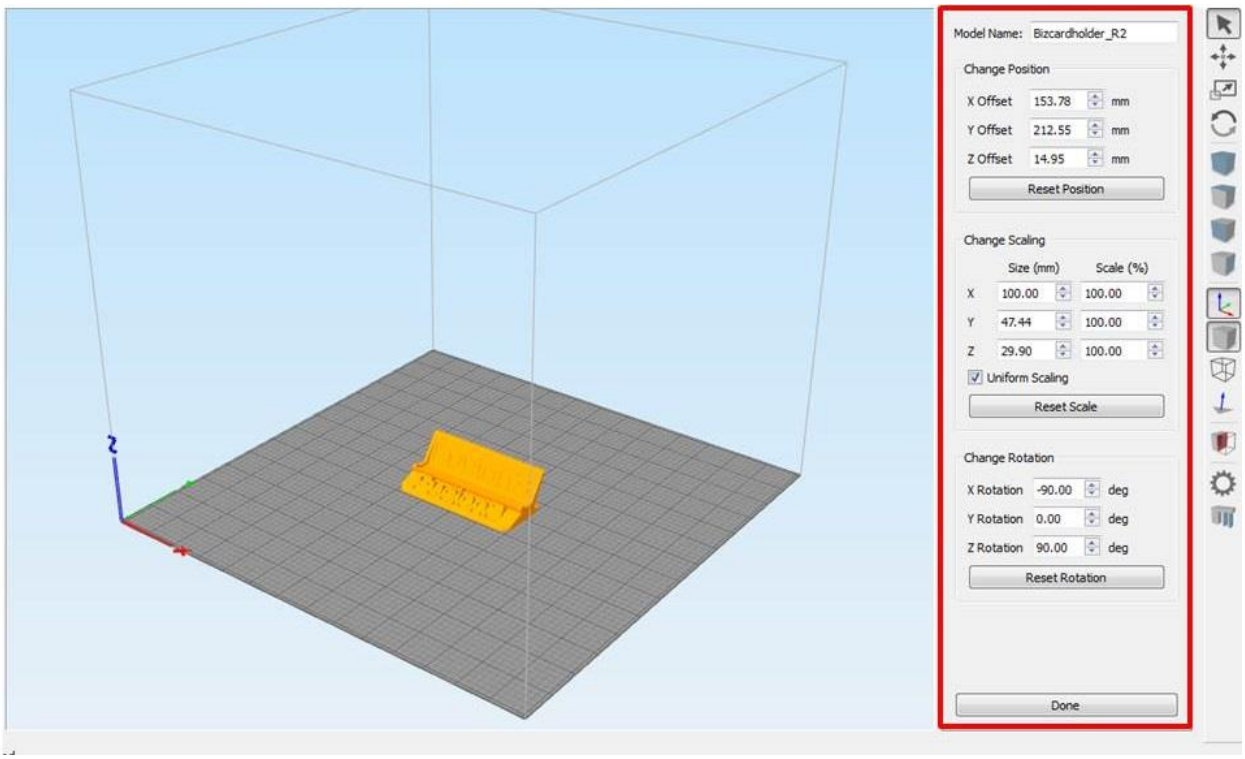
Processes Section: This is where you define how you want the part to be printed (material and other settings). For most applications you should only have 1 process in this list at a time.

"Prepare to Print" button: Clicking this will "slice" your model with the settings defined in your process and provide you with a 3D preview of the toolpath.

Build Volume: A 3D view of your printer's build volume and the models you've imported.

Right Toolbar: This toolbar has many powerful tools including different visualization options, manually defining support, etc.

Double clicking on a model will open another menu on the right with options to reposition, scale, and rotate your model.



The rotation options are especially useful to position your part in the best orientation for printing.

7.3 Processes & Profiles

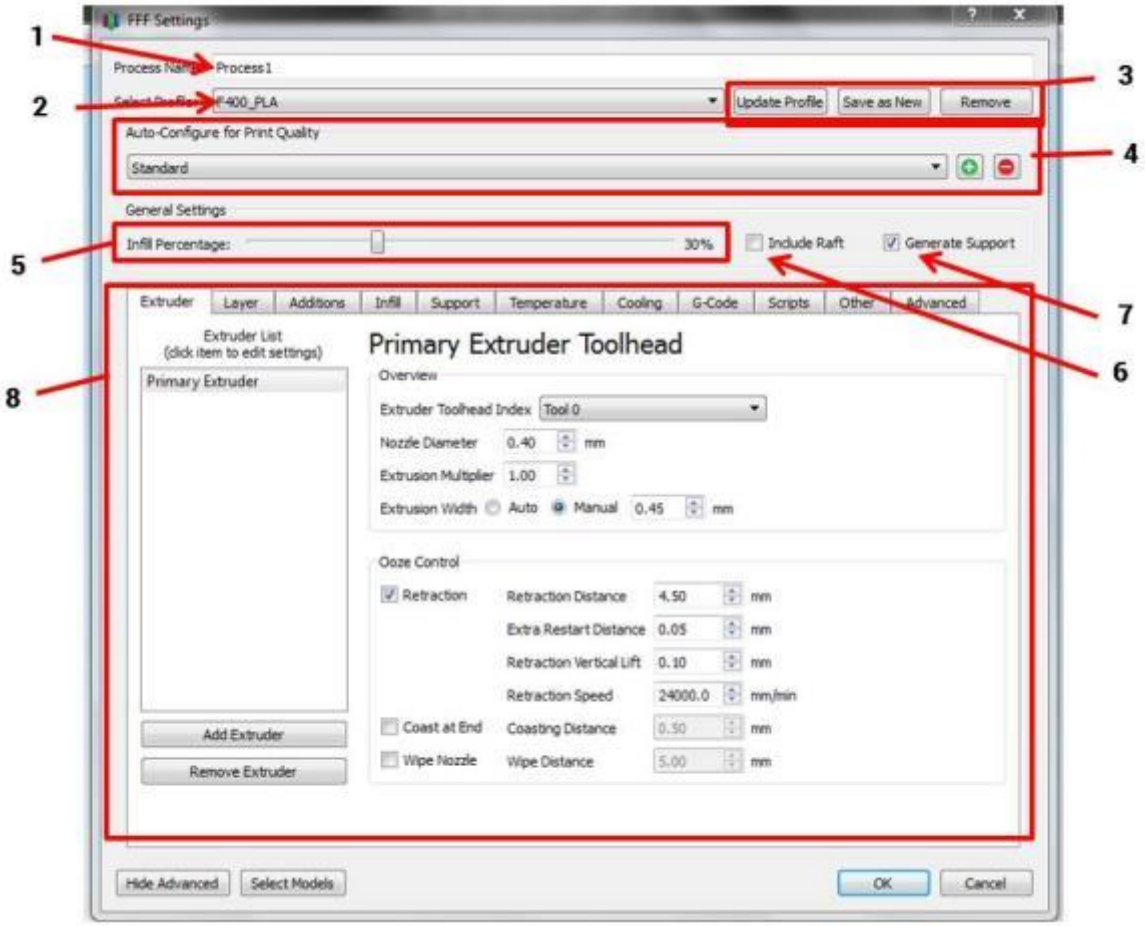
Processes are how you tell Simplify how you want the part built. Things like material, layer height, infill amount, speed, etc are all defined in the process.

For your F400, we've built a separate process for each material. The base settings in each process are set up to work for most prints. So when you're getting started, you should just need to select the right material profile and click "Prepare to Print".

Fusion3's naming convention for all Simplify profiles is *PrinterModel_Material*. So for example, **F400_PLA**.

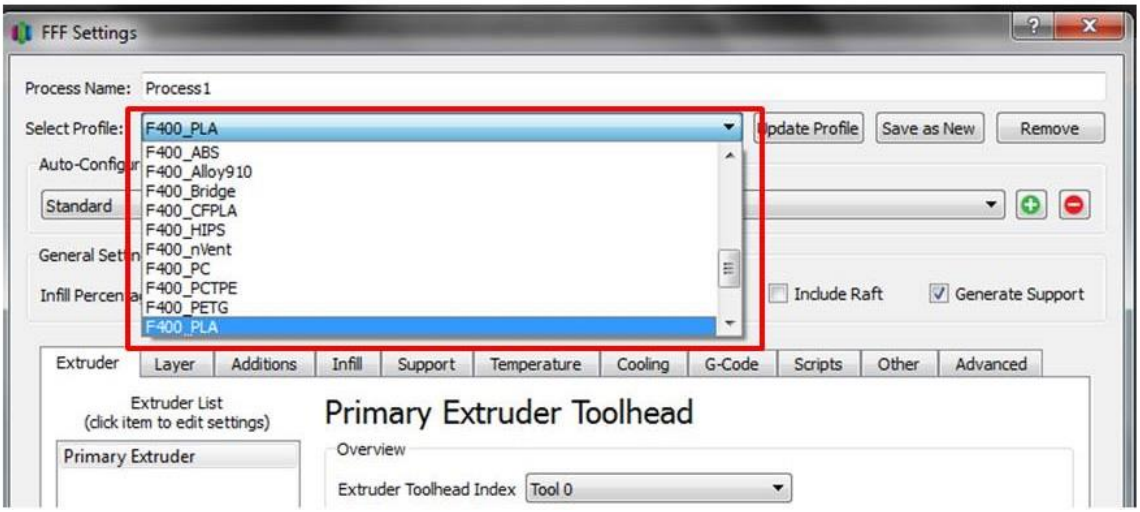
7.3.1 Editing a Process

Double click on a process in the Process List to open the Process Settings Dialog box:



1. Process name (meaningless; you can ignore it)
2. Profile selection drop-down menu (select other profiles here)
3. Buttons to manipulate profiles; see below for more info
4. Quality presets (only applies to some profiles)
5. Sparse infill % slider
6. Raft toggle (leave this off 99% of the time; the F400 rarely needs rafts)
7. Support generation toggle (leave this on unless you know your part does not need support)
8. Advanced settings

7.3.2 Selecting a Profile

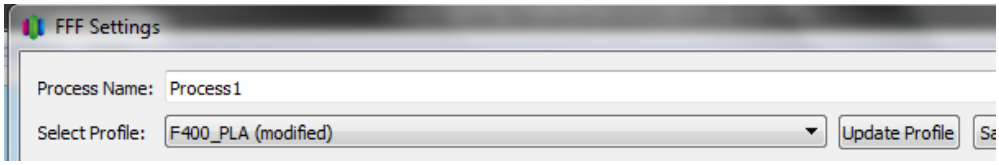


Ensure the material preset you select matches the material you have loaded into your F400!

7.3.3 Making Changes to Profiles

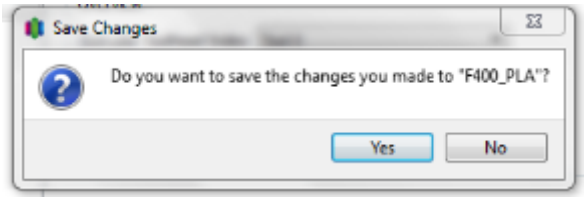
You can make non-permanent and permanent changes to Profiles.

If you make a non-permanent change to a Profile (for example, turning support off), you will see the word "modified" appear in the name in the "Select Profile" drop-down.



If you close and re-open Simplify, it will remember your changes.

To reset the profile to its original state, simply select another profile from the list. You will see the following dialog box. Select "No".



Now toggle back to the original profile. Any temporary changes you made will be gone.

To make a permanent change to a profile, simply make your change and then click the "Update Profile" button.

If you wish to save your changes as a new profile (recommended), you can click “Save as New” instead. This will prompt you to name the new profile and will add a new entry to the drop-down list.

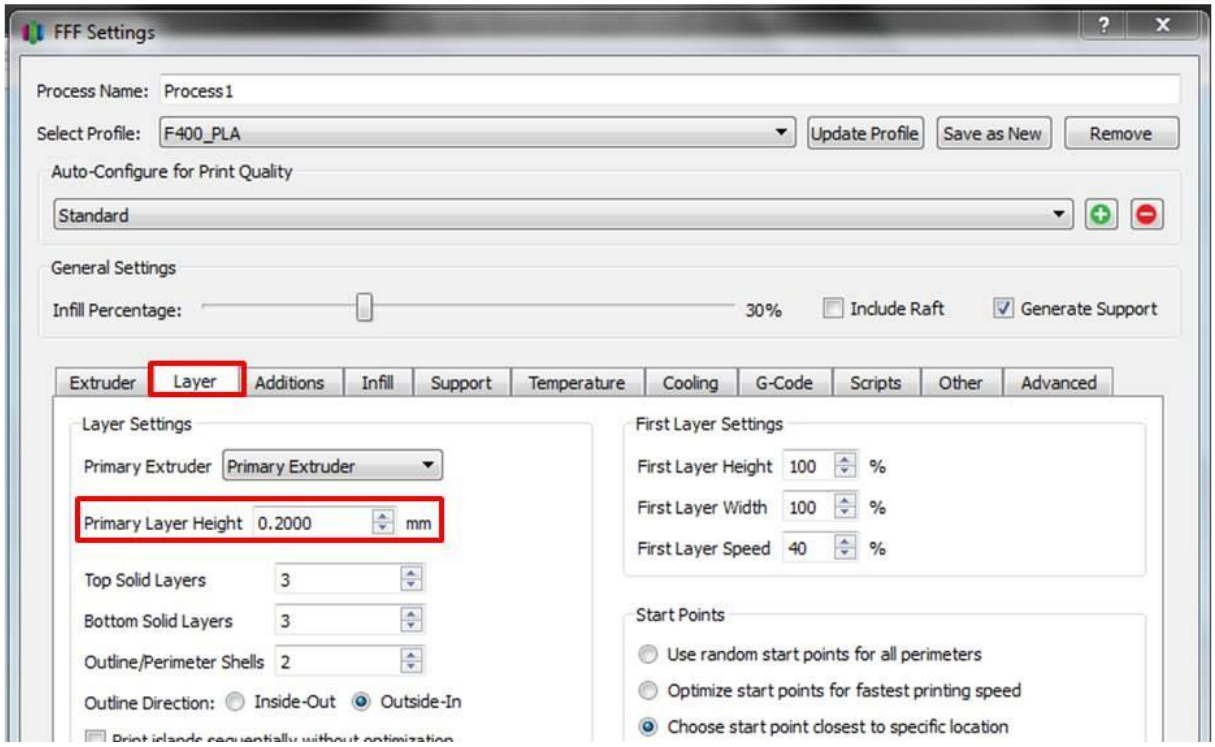
7.3.4 Commonly Adjusted Parameters

Most of our profiles do not have different quality levels specified. So in order to print at different layer heights, speeds, etc you will need to make those changes yourself. Some of the commonly adjusted parameters are:

- Layer height; how tall each layer of plastic will be. Smaller layers look better (smaller stair-steps) but will take longer
- Infill; how dense the internal lattice inside the part is. Denser is stronger but will take longer.
- Speed; how fast the print head moves. Faster will take less time, but at the loss of some surface finish. This does not have as big an impact on print time as you might think – start with using taller layers if you want to save time.
- Support material settings (see section 7.5)

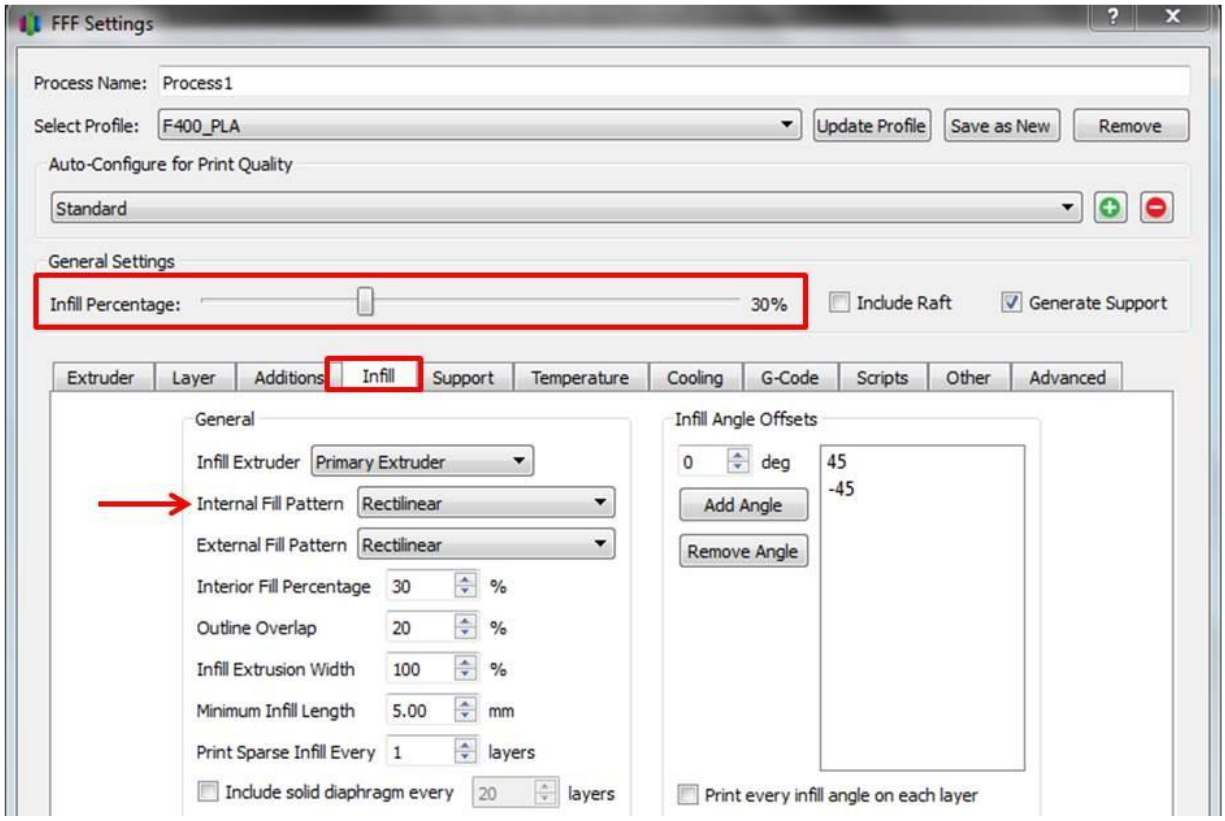
Layer Height

This is adjusted on the “Layer” tab. Values between 0.1 and 0.3 should work for most materials. If you use small values such as 0.05 please be prepared to adjust other parameters such as speed in order to achieve good results.



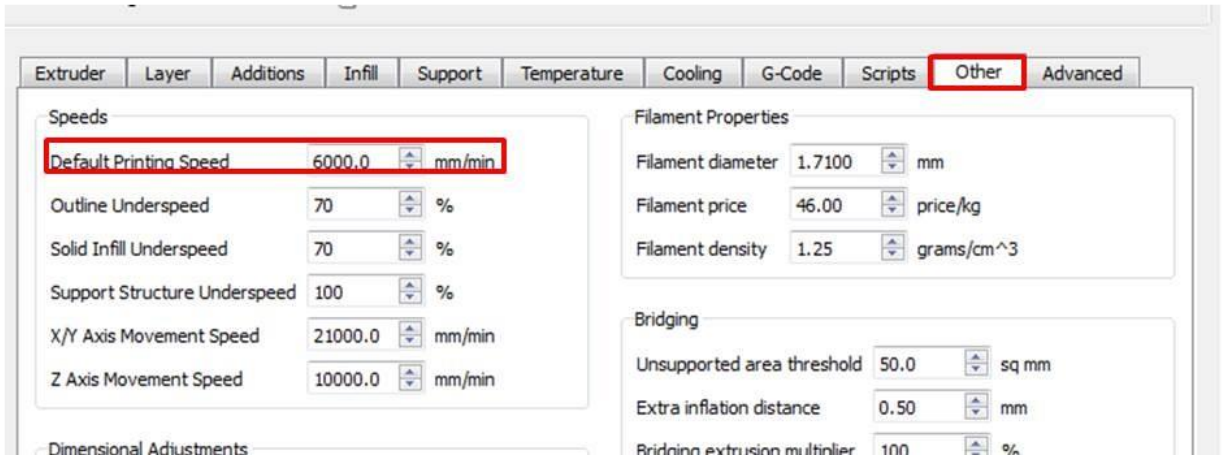
Infill

Infill amount can be adjusted via the slider at the top. More detailed settings are found on the “Infill” tab. On this tab you can also change the infill type. Certain types of infill, such as full hexagonal and grid, can be stronger than rectilinear but also have downsides. Hex is slow, and grid will overfill small cross sections.



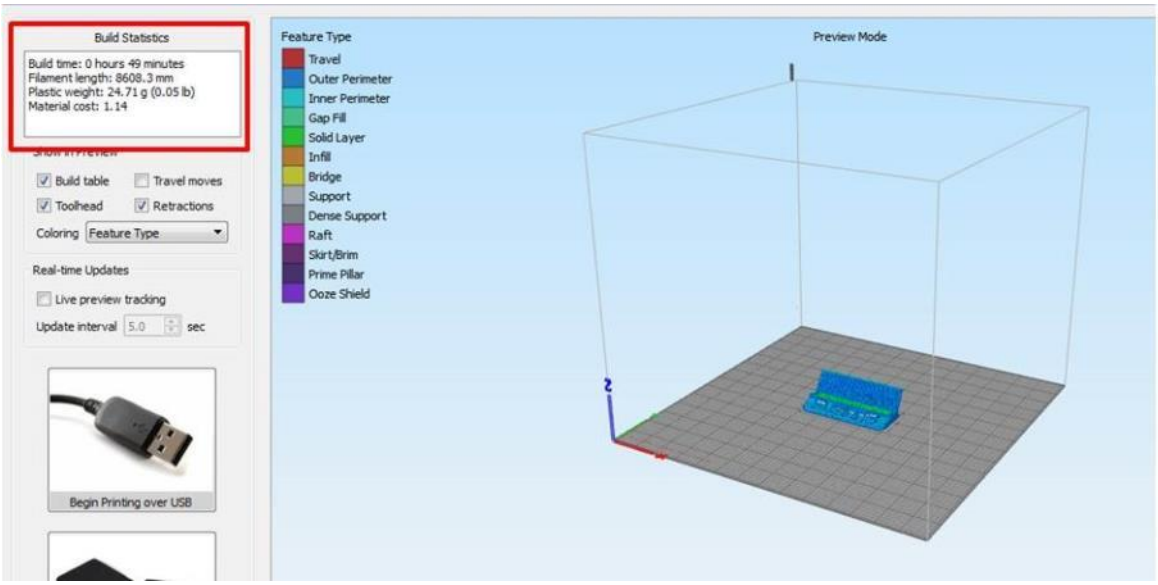
Speed

Print speed is adjusted on the "Other" tab. You should only adjust the "Default printing speed"; please leave other values as-is. Remember that printing faster will result in somewhat lower output quality, and depending on your part may not result in much time savings. 6000 mm/min is 100mm/s.



7.4 Simplify3D Build Estimates

When you slice your part, as part of the preview Simplify will give you an estimate of print time, material length consumed, and material weight consumed.



(This is the screen you will see after clicking "Prepare to Print")

The material length and weight are fairly accurate, but the time estimates are low by about 40%. **To get a more accurate time estimate, multiply Simplify's estimate by 1.4.**

7.5 Support Structures

Your F400 prints breakaway support structures out of the same material that the part is made out of. Using this technique, you can make complex shapes without the need for soluble support or a second print head (which adds complexity and cost).

Simplify has two ways to generate this support structure: it can be done automatically based on the overhang angles on the part, or it can be placed manually. Simplify also allows you to preview where support will be placed prior to slicing the part; something no other slicer does.

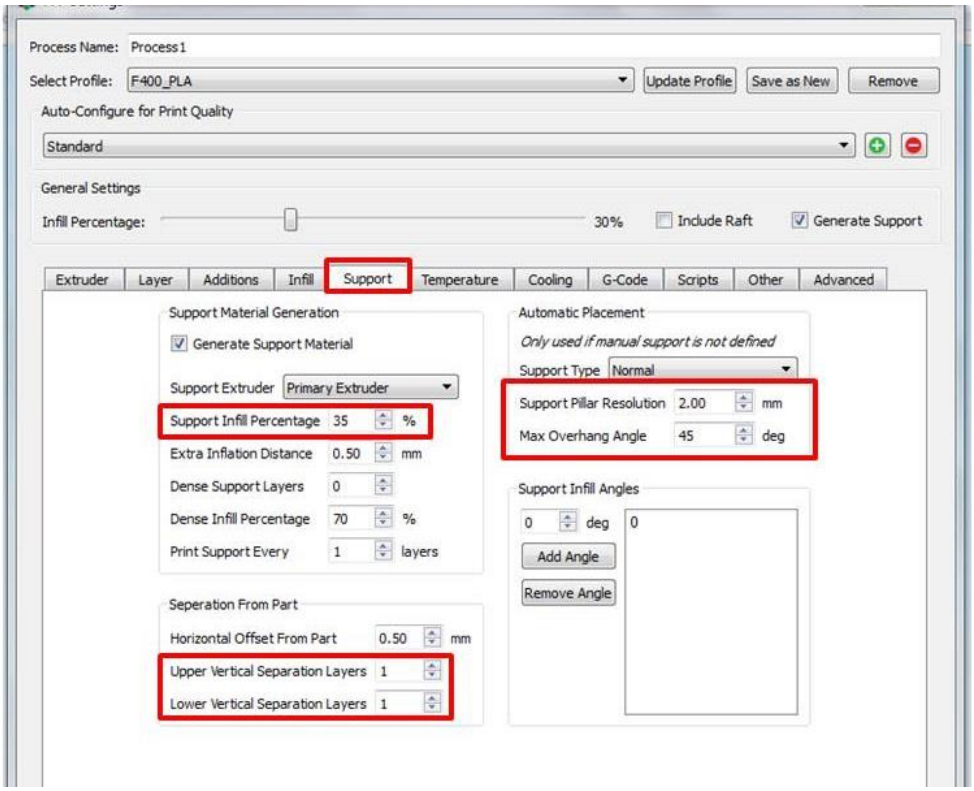
Some additional resources:

- https://www.youtube.com/watch?v=6tlrCpwAV4M
- https://www.simplify3d.com/support/tutorials/adding-and-modifying-support-structures/

7.5.1 Default Settings

The default settings for most materials are the same and can be found on the "Support" tab. These settings will work well for most parts that need support. Explanations for commonly changed settings:

- Support density is set to 35% (this is how dense the zigzags are). Too dense will make it very hard to remove the support. Too sparse will result in poor finish on the part.
- Upper and lower separation layers are 1. This means Simplify will leave an empty layer between the top of the support and the bottom of the part. So there is a weak bond which enables us to easily remove the support after the part is done. For some cases (see below) you will want to change this value.
- Support detection parameters; overhang must be shallower than this angle and the area of the face must be larger than this value.



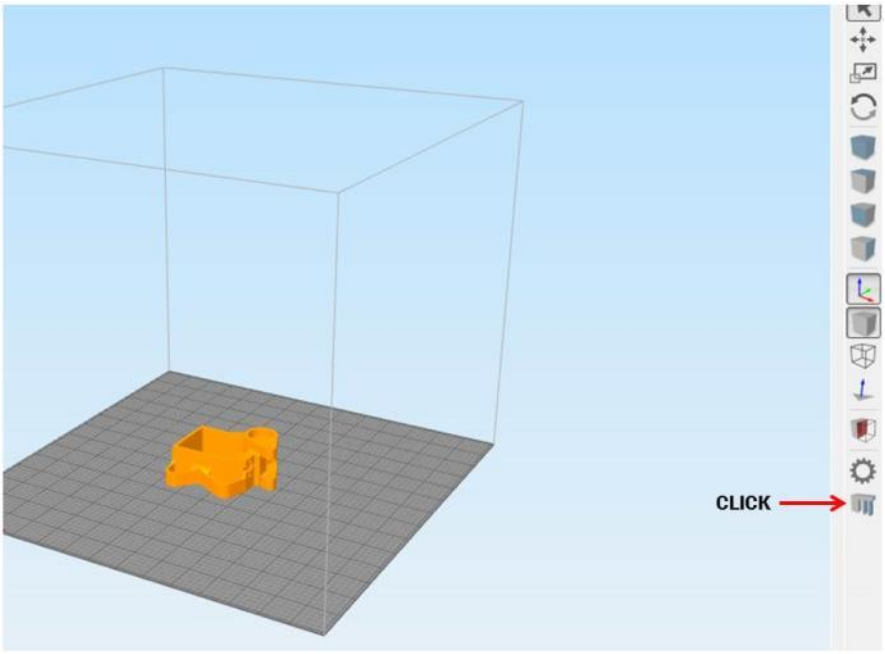
7.5.2 When Should I Change These Values?

- If you are using tall layer heights (0.3mm or larger) you may want to set the Upper/lower separation to 0 layers. This will result in a strong bond but better surface finish.
- If you have a part with a lot of angled overhangs that need to be supported and no flat overhangs, consider setting the separation layers to 0.
- If you want to reduce the amount of support in small holes or pockets, increase the support pillar resolution (larger number).
- If you are 100% sure your part does not need support, you can turn support off completely. It is safer to always leave it on and let Simplify figure out if support is needed or not.

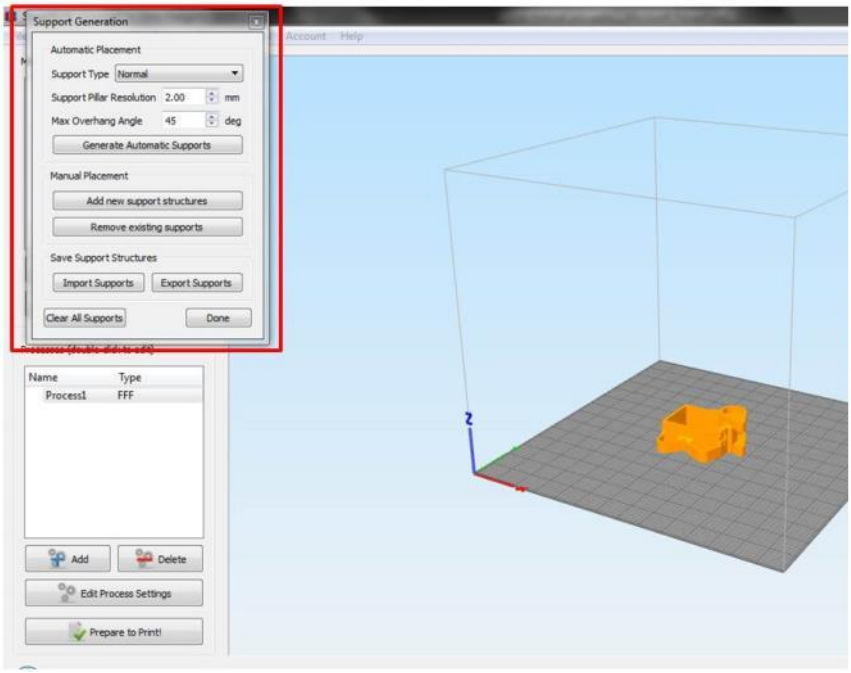
7.5.3 Manually Defining Support

This is one of the best features of Simplify. Most slicers do not give you the ability to manually adjust or define where support is placed, and this can be critical on complex parts.

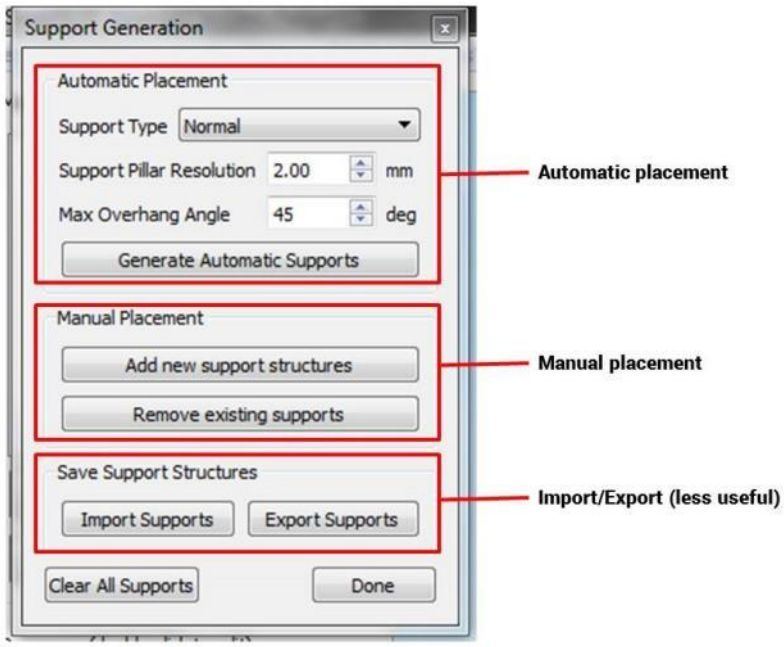
First, click the last button on the Right Toolbar.



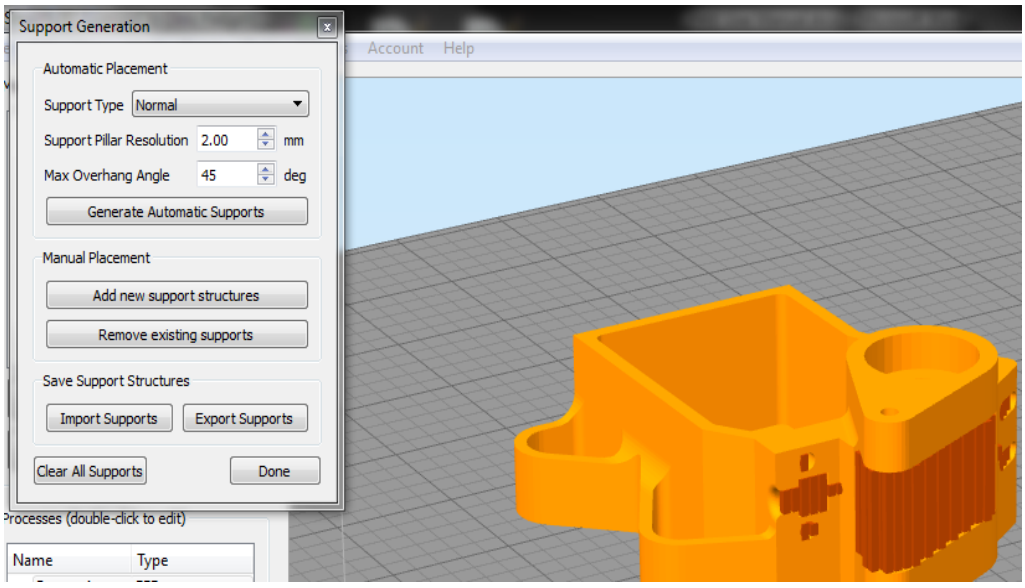
The Support Generation box will pop up.



This box has 3 main sections:



- Automatic placement; these controls are duplicates of what's on the Support tab. Click "generate automatic supports" to see a preview of where Simplify thinks support is needed.
- Manual placement; Allows you to manually add or remove support by using your mouse.
- Import/Export; allows you to save a support structure as its own model. This is not as useful as many times it's easier to just save everything as a .factory file.



In many cases, using the automatic placement is a good starting point, which can then be fine-tuned by hand to add or remove supports as needed.

The support structure preview is made up of box columns. This is turned into the zigzag pattern when you slice the part.

7.6 Working with .factory Files

.factory files are another great innovation Simplify has developed. A .factory file combines your model(s), any custom support structure, and your processes into a single file. This allows you to easily save past print jobs and reopen them to make changes to settings, or just use it as a reference for other prints. If you're having trouble with printing a part and contact Support, we may ask you to send over a .factory file so we can see exactly what your setup looks like.

7.6.1 Creating a .factory File

Make sure you have your model AND process set up. (You can save a .factory file without a process in it, but that's less useful)

Go to File > Save Factory File As and save it like a normal file (word document etc).

You can verify that is saved properly by resetting Simplify (ctrl+N) and opening the file you just made.

7.6.2 Opening a .factory File

Go to File > Open Factory File. Note that this will clear any current work (models or processes) you have open.

7.6.3 Additional Resources:

- https://www.simplify3d.com/support/tutorials/working-with-file-types/

7.7 Common Questions, Tips, & Tricks

This section will introduce common issues and questions related to Simplify. Please consider this merely a starting point to your experimentation; this is by no means comprehensive.

7.7.1 Printing Small Parts

Small parts present some unique challenges because the plastic does not have time to cool sufficiently before the next layer is deposited. When this happens, feature definition and resolution can be lost.

A part that is less than 1 square inch in horizontal cross-section should be considered a small part.

The simplest fix is to run 2 of them at the same time. This gives each layer time to cool while the print head is printing the other part.

Lower temperature materials such as PLA will be more prone to issues with small parts.

7.7.2 Printing Large Parts

Large parts have their own set of challenges. All thermoplastics contract as they cool down and solidify. Larger parts have more plastic, and therefore more contraction forces. This can cause the bottom of the part to lift off the print bed (sometimes called "curling") and loss of dimensional accuracy. You may also see horizontal cracks in the part caused by thermal stress.

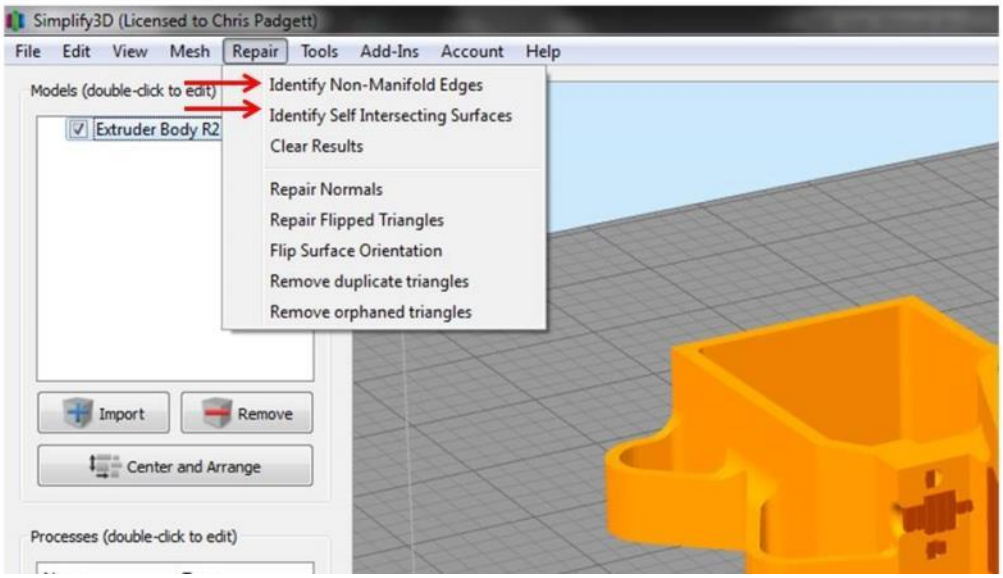
Thanks to its enclosure and high temperature heated bed, the F400 is relatively immune from this problem. However it can still occur with large parts out of high temperature materials such as ABS, Acrylic, PC, etc.

If you see curling, ensure your first layer height is correct (see section 12.1) and you are using the recommended bed coating for that material.

If you see cracking in the part, bump the head temperature up 5 to 10°C. Do not exceed 305°C on the head. You can also try printing slower and make sure the cooling blower is not running.

7.7.3 Model Issues

There are many issues that can be present in the STL files themselves that can cause problems with your prints. Simplify has some built-in ability to diagnose these problems. Under the "Repair" menu are two options to detect issues.



In some cases, Simplify will be able to correctly slice the model anyway (it tries to make some assumptions about what the part should look like) but it's better to repair the file before attempting to slice it.

Other models may technically be "correct" STL files, but will still print poorly for some of the following reasons:

- Internal geometry that is not needed
- Not oriented properly (at a very slight angle)
- Excessive number of faces
- Zero thickness faces

When in doubt, preview the gcode and make sure it makes sense!

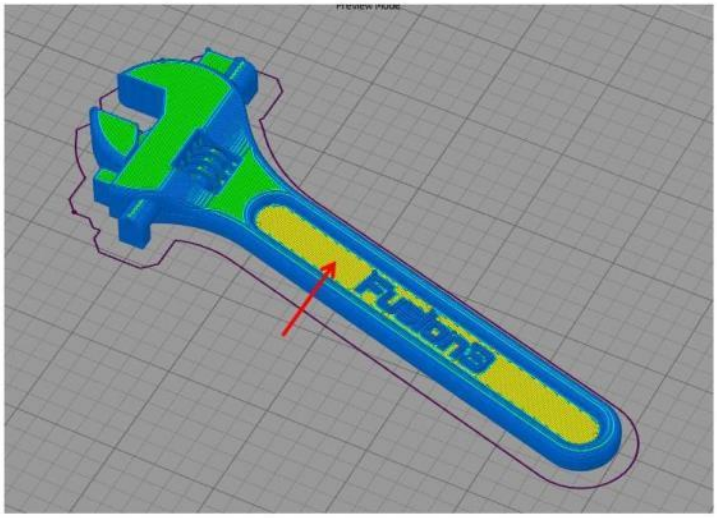
7.7.4 Repairing Models

While Simplify has some built-in options for repairing broken models, we've had the best luck with an online tool called Netfabb cloud. This is a free service that will automatically repair any STL you upload and give you a fixed version to download. You will need a Microsoft online account to use it.

https://netfabb.azurewebsites.net/

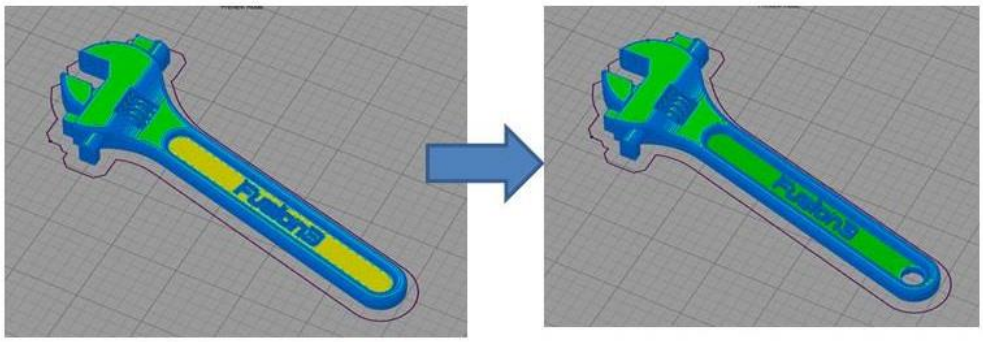
7.7.5 "Mystery Bridge" Layers

On some models you may see toolpaths generated that don't match your model at all. Maybe there is a layer where a hole is filled in ("bridged"), or maybe there are missing layers of gcode.



Here you can see what should be a normal top layer is being treated as a bridge.

Fortunately this is a simple fix: by offsetting the part in Z by a very small amount, Simplify3D will generate the correct toolpath.



7.7.6 Other

- Setting up multiple processes to fine-tune how parts are printed: https://www.simplify3d.com/support/tutorials/working-with-file-types/
- Using the “Place Surface on Bed” function: https://www.youtube.com/watch?v=XJi4_ScDLtE

- Mirroring mesh: https://www.youtube.com/watch?v=q5kPGHaBy3c
- Using the cross-section tool: https://www.youtube.com/watch?v=Rog5coZPOYU

8 SD Card Information

WARNING: DO NOT ERASE OR ALTER any of the files on your SD card outside of the “gcodes” folder. Doing so will cause your printer to malfunction.

Your SD card is the “hard drive” of your F400. While it is removable, the card must be installed in the printer in order for it to operate.

If the printer is powered on and the SD card is removed, you MUST press the “stop / reset” button to reboot the printer after the SD card is reinserted. This is to re-initialize the SD card.

As long as the printer is idle, (not running a print, loading/unloading filament, etc), it is perfectly safe to remove the SD card while the printer is powered on. Just press the “stop / reset” button after you re-insert the card.

The SD card contains 4 directories:

- Gcodes: This is where you will manually copy .gcode files if you’re copying them to the SD card. Unlike the F306, .gcode files in the root directory of the card will not show up in the files list.
- Macros: This folder contains the scripts that show up in the “macros” submenu.
- Sys: This folder contains the files that make your printer operate properly.
- Www: This folder contains the files that make up the web page the F400 puts on your local network.

9 Basic Tasks

9.1 Opening & Closing the Doors

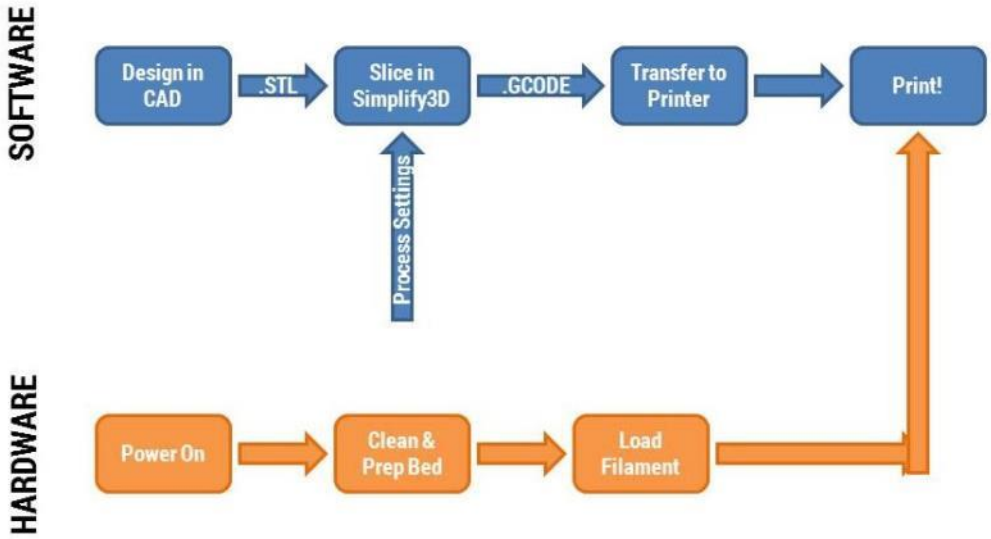
The main door and filament door on your F400 have high-friction hinges to help the doors stay open on their own.

When opening the doors, take care not to open them too far, as this can cause them to fall backwards.

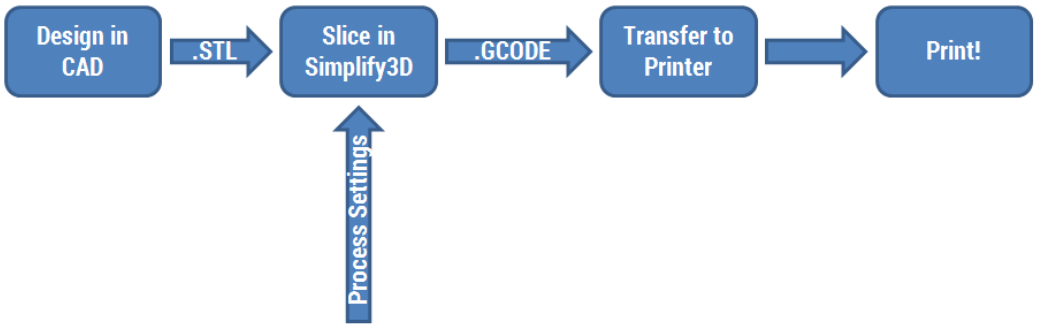
When closing the doors, keep your hand on the door all the way to the closed position. Don't let it go and let it fall closed.

9.2 Running a Print Job

Preparing for and running a print job can be thought of as 2 separate workflows: one for the physical side where you set up the printer, and one for the software side where you prepare your 3D model for printing. We'll cover them both here.

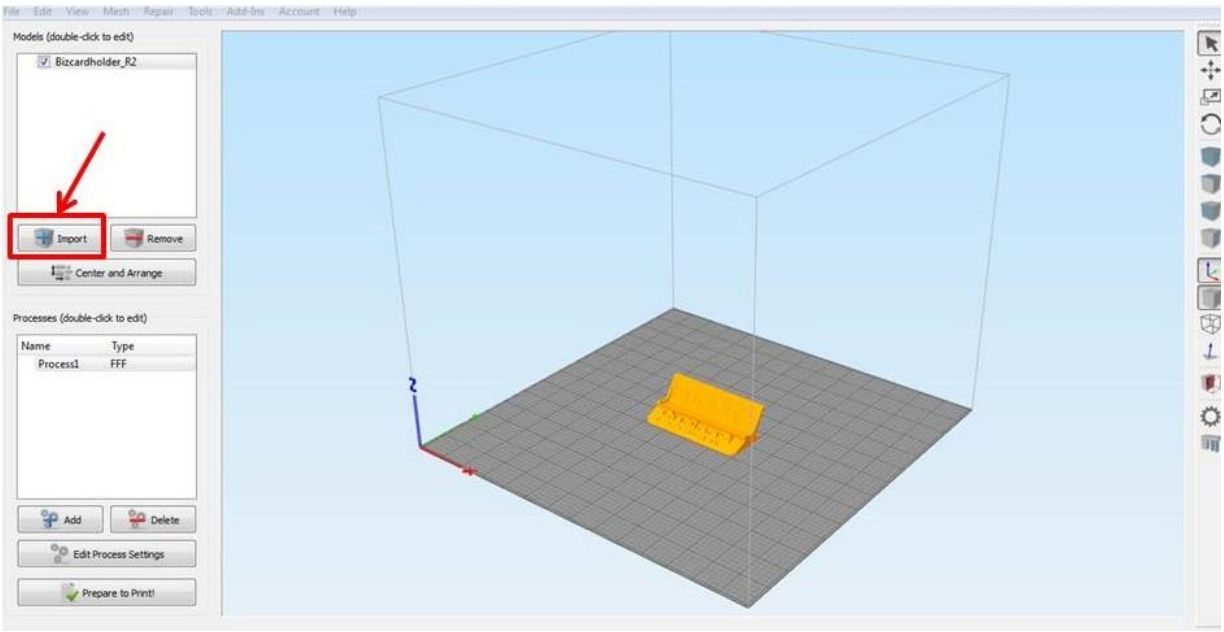


9.2.1 Software: Preparing Your File

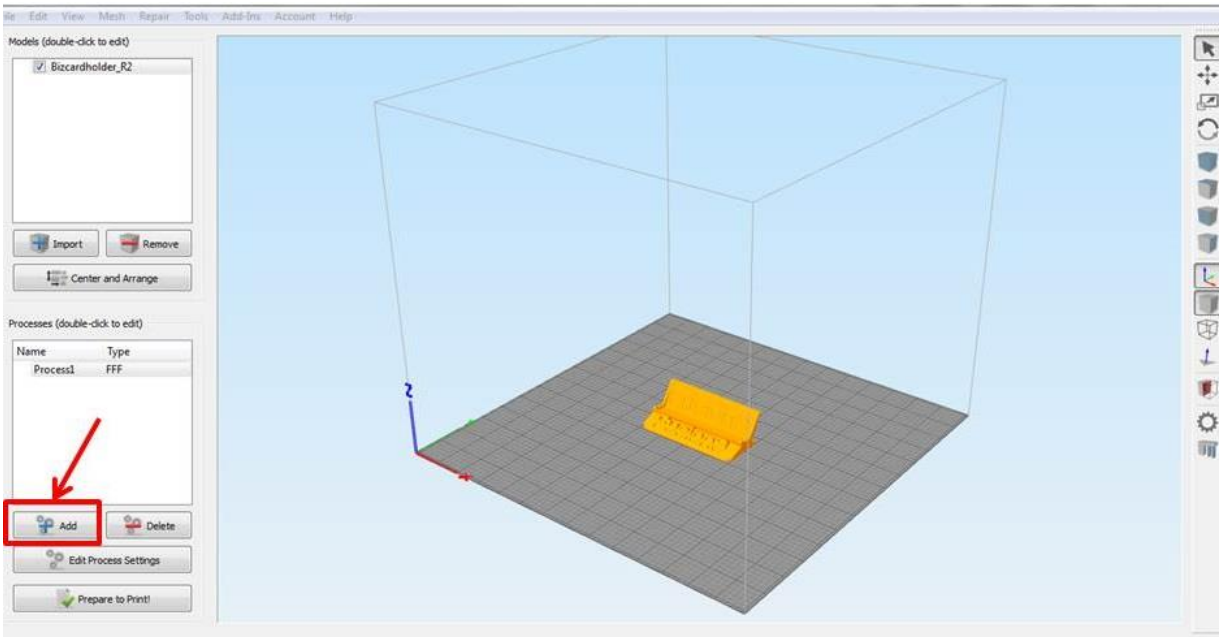


The first step is to design your file in a CAD program of your choice. Any program that can save a .STL file format is fine to use.

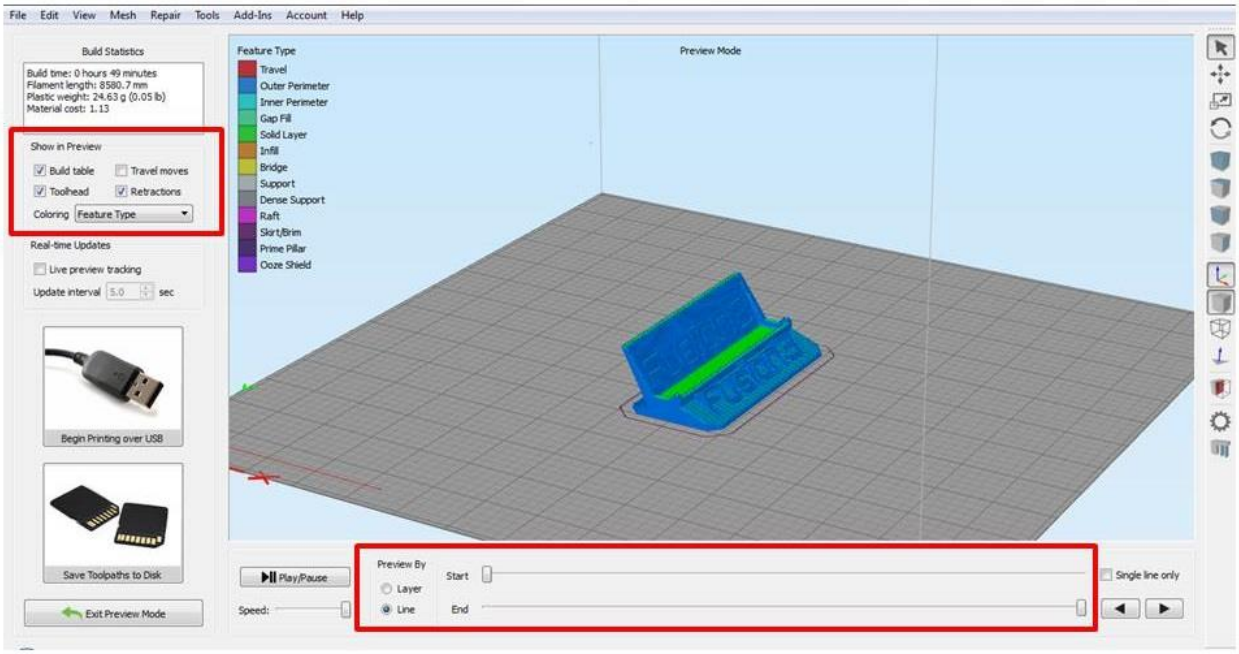
Once you save your model as a .STL file, you import that into Simplify3D using the “Import” button in the models section of the interface.



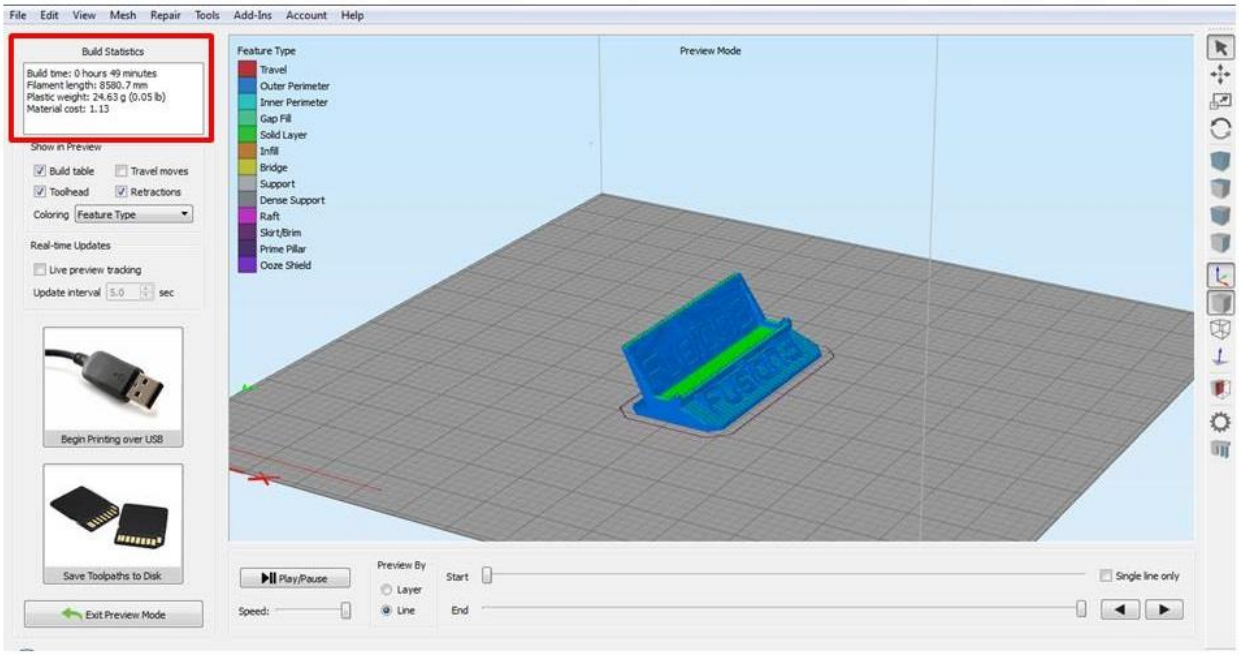
Next, add a Process and make sure the profile you've selected matches the material you have loaded, or will load, into your printer. Now is also the time to make any changes to the settings if you need to.



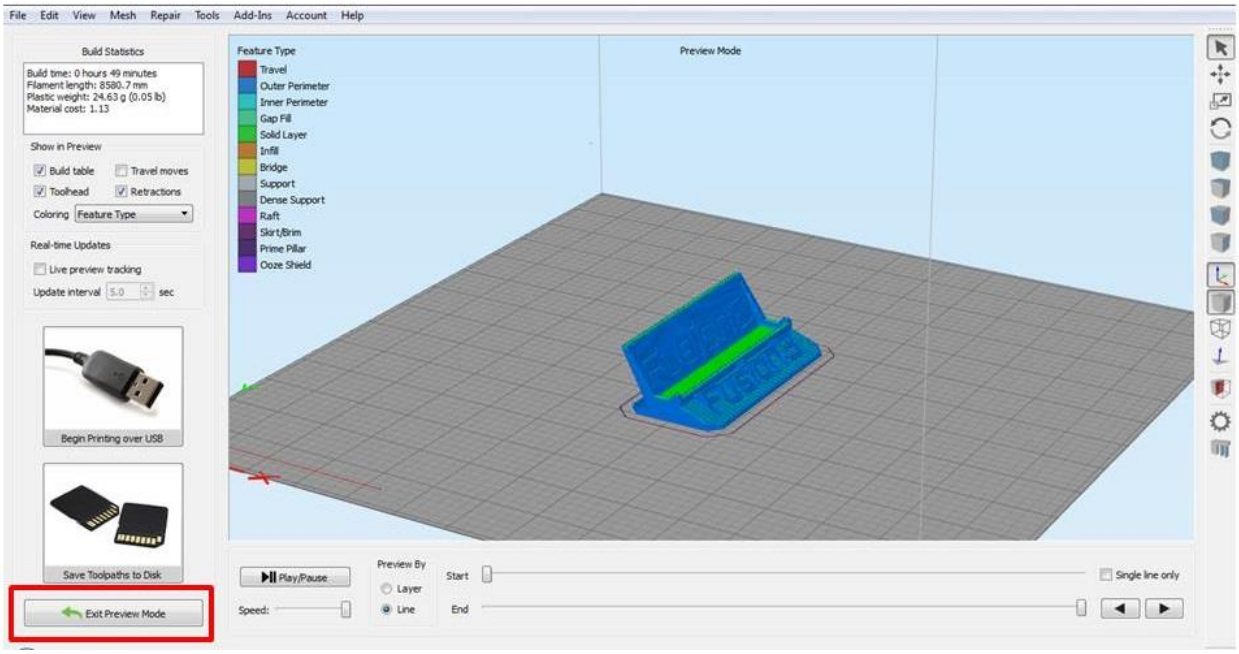
Next, click the "Prepare to Print" button. Simplify3D will slice your model and give you a preview of the toolpath (how it's going to build the part). You can use the sliders at the bottom and the visualization tools on the left side to preview the toolpath and verify it looks correct before printing.



Simplify3D also gives you a build time estimate and material usage estimate in the top left corner. Remember to multiply the time by 1.4 for a more accurate estimate.

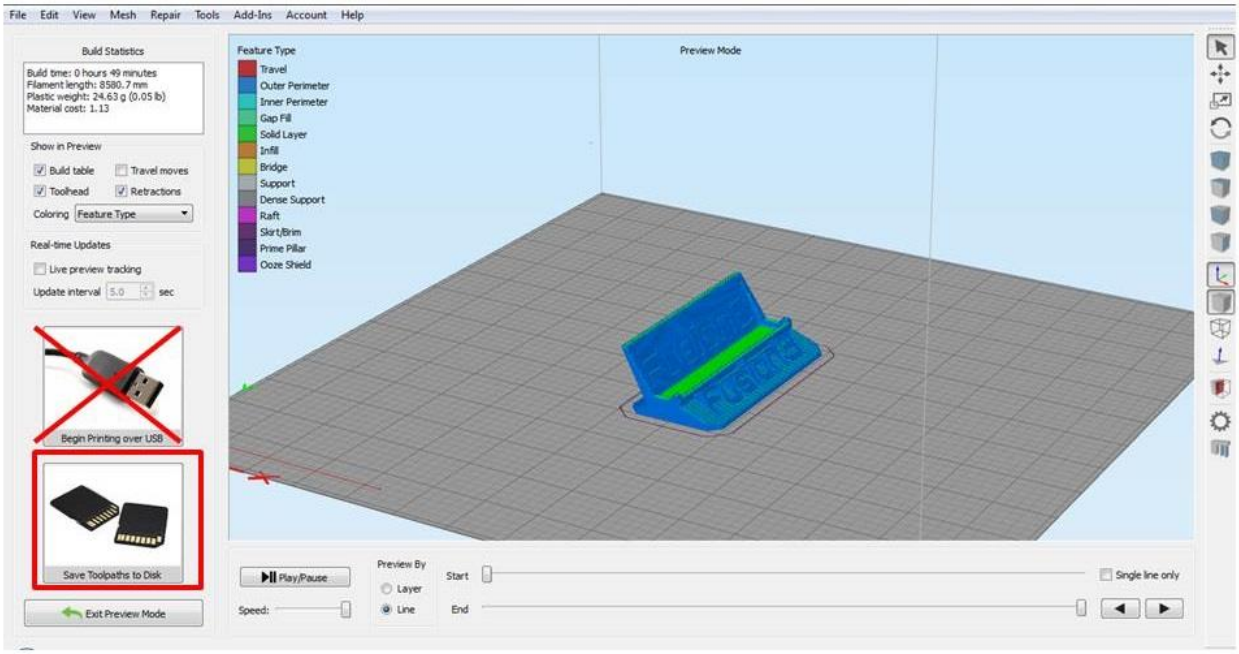


If you need to make any changes to the Process settings, you can click “Exit Preview Mode” to go back and make changes, and then re-slice the model.



Once you are happy with the preview, click “Save Toolpath to Disk” to save the .GCODE file.

NOTE: **Do not use the “Begin Printing over USB” button**. Your F400 cannot be connected to a computer over USB so this button will not work.



Save the .GCODE file to your computer in a location you can find it.

To transfer this file to your printer, you have two options:

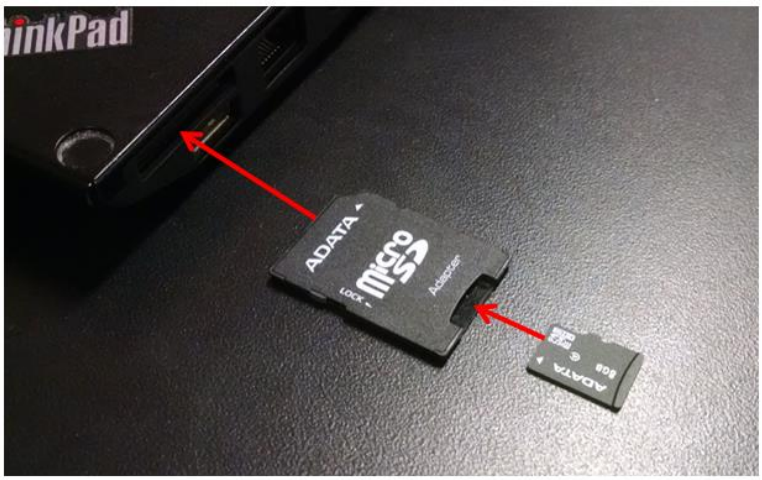
- You can manually copy the file to the printer’s SD card

- If your F400 is on your local network, you can upload this file through the web interface.

Transfer via “Sneakernet”

Make sure your F400 is not currently running a print. Remove the SD card from the control panel and carry it back to your computer.

Your toolkit includes a micro-SD to SD card adapter. You will need this to insert the card into your computer.

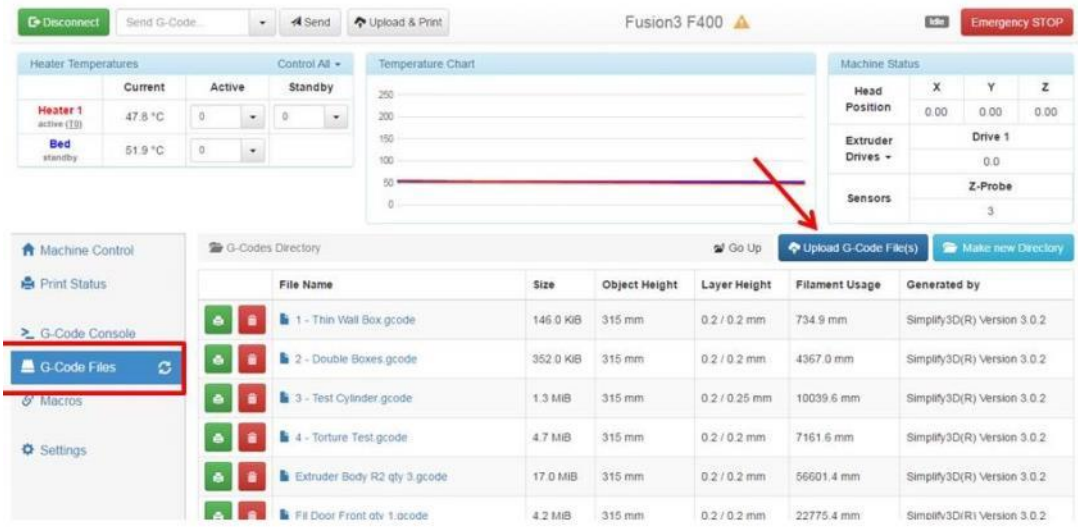


Open the /gcodes/ folder on the SD card and copy your .GCODE file to it. (Do not copy the file to the root directory of the card as it will not show up)

Once the file transfer is complete, eject the SD card from your computer and put it back in the slot in the control panel. Press the “Stop / reset” button to reboot the printer.

Transfer Via the Web Interface

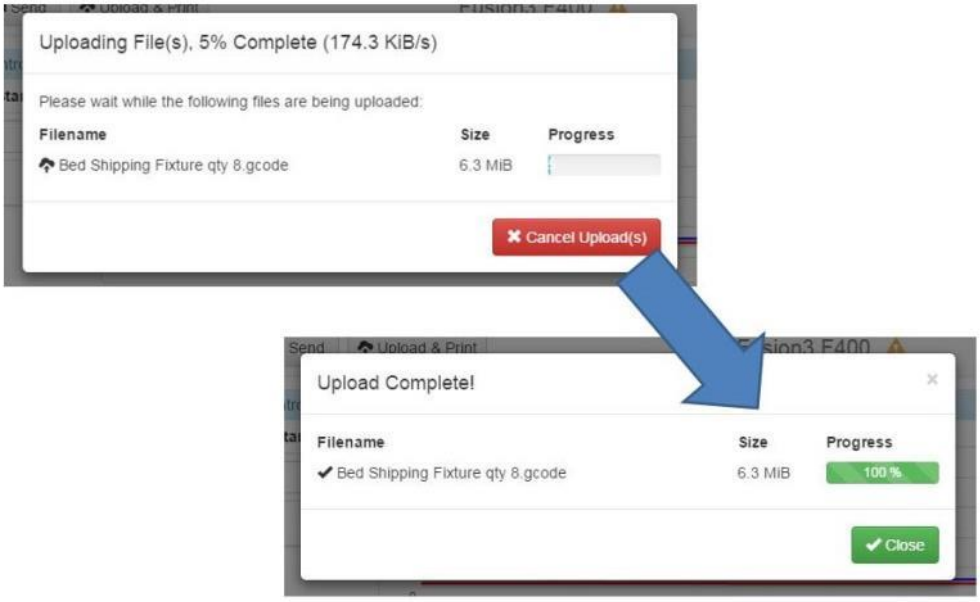
Log into the web interface and go to the “G-Code Files” tab. Click the “Upload G-Code Files” button.



A dialog box will open. Navigate to where you saved your .GCODE file on your hard drive and select it.

Note: You can upload multiple .GCODE files at once if you want.

The upload progress box will appear.



Before printing your file make sure you have completed the Hardware prep!

9.2.2 Hardware: Preparing Your Printer

Clean the bed: If there is residue (priming skirt or old gluestick) on the bed from a previous print, clean it off as described in section 9.6.

Prep the bed: Apply fresh gluestick to the bed as described in section 9.7. Remember some materials (for example ABS) get slightly different treatment.

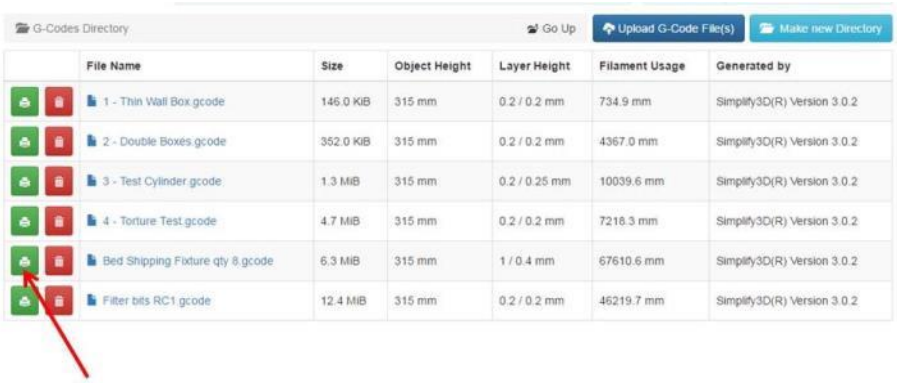
If filament is not already loaded in the printer, load the correct filament as described in section 9.4.

9.2.3 Starting Your Print

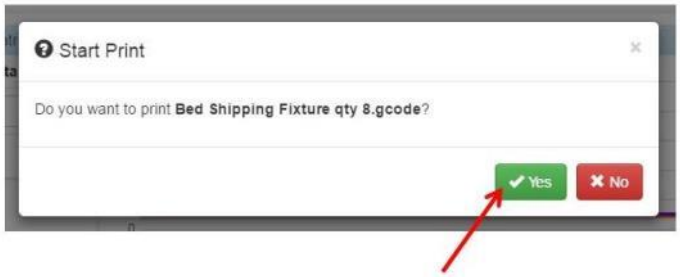
There are two ways to start your print:

1) Via the Web Interface

Log onto the web interface and navigate to the "Gcode files" tab. Locate the file you wish to print and click the green "print" icon next to it.

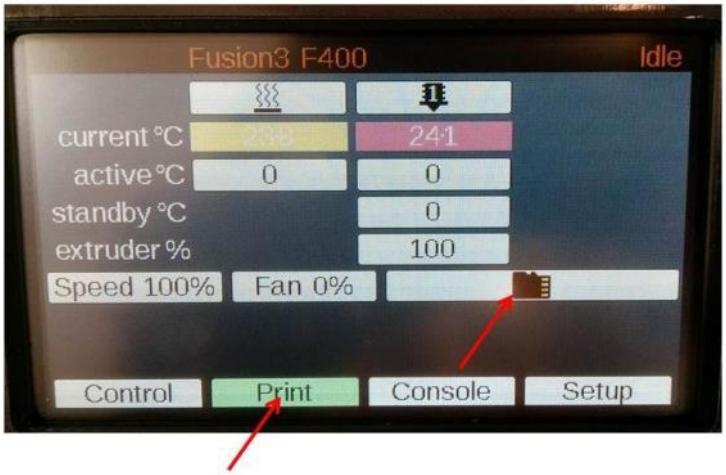


A confirmation box will pop up. Click "Yes" and the print will start.

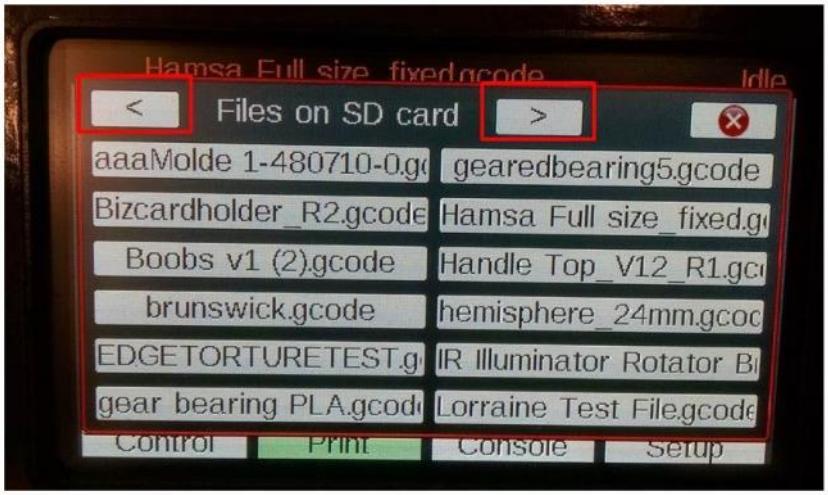


2) Via the Control Panel

Click on the “Print” tab, then click on the SD card icon.



A list of all the gcode files on the card will pop up. Locate the file you want to print and click it. If you have a lot of files on the card, you may need to scroll through the list with the “<” and “>” keys.



Select your file, and then click “Print” in the box that pops up. It’s a good idea to double check the file name in this box before you hit print – it’s easy to select the wrong by accident.

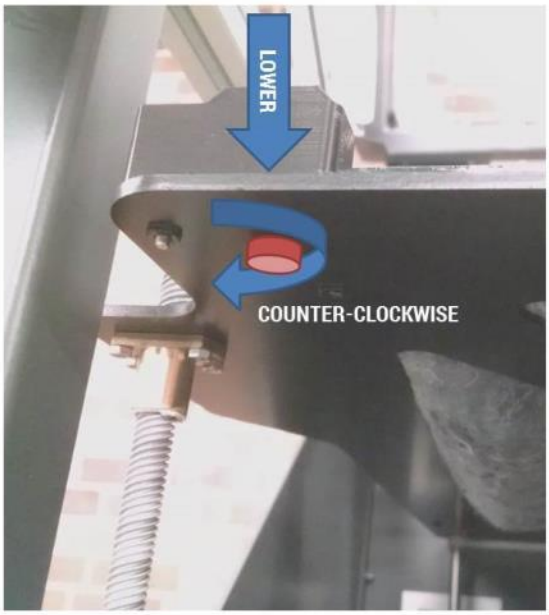
9.3 Leveling the Print Bed

9.3.1 System Description

Your F400 has 2 bed leveling systems: a manual leveling system and a sensor to detect the level of the bed and compensate for it during a print. While getting the bed exactly level is not critical to printing on your F400, you will get best results if the bed is level.

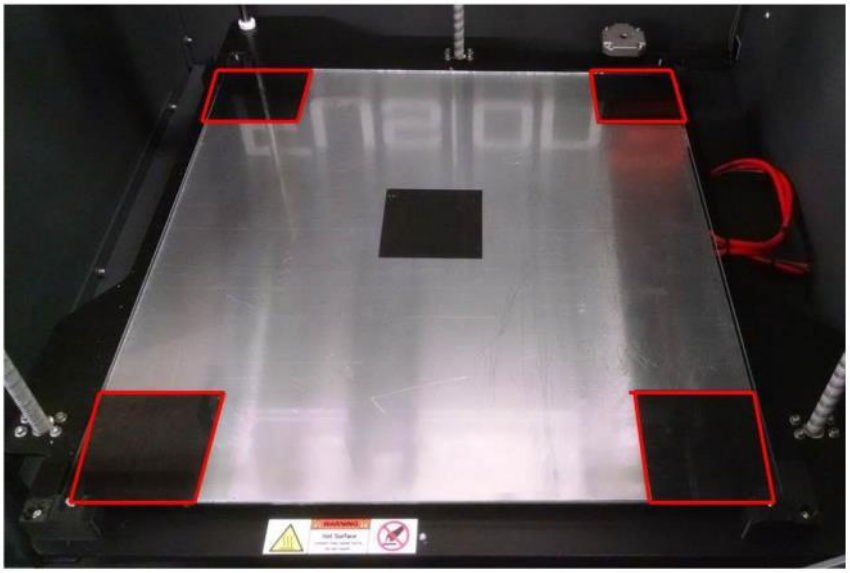
On the bottom of the bed plate you will see a small red thumbscrew at each corner of the bed. This is used to adjust the height of the bed corner.

Turning it **counter-clockwise** will **lower** the bed corner. And turning it **clockwise** will **raise** the bed corner.



Your bed surface has 5 squares of black material. The infra-red sensor uses these locations to check the bed level. Unless you are printing a part that's large enough to overlap these areas, you should refrain from putting gluestick over the squares since this will impact the reading the IR sensor gets.

Note: this only applies to the corner squares, NOT the center one. The center one is not used by the sensor.



The corners of the bed are supported on springs; this is what allows you to adjust the height of each corner. The center of the bed is supported on a fixed standoff.

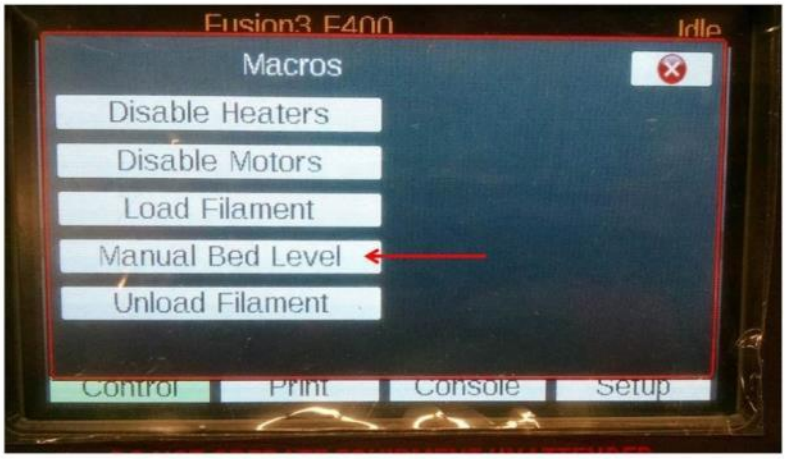
At the beginning of every print, the printer will check the bed level as part of the start sequence. You do not need to manually trigger the bed leveling procedure.

9.3.2 Manual Leveling

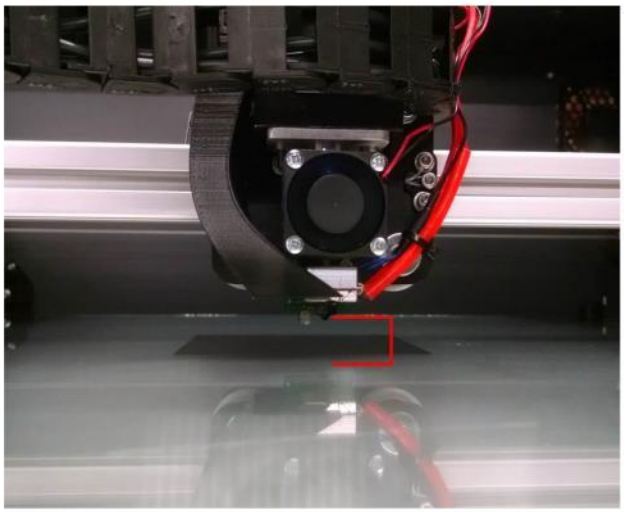
Make sure the bed is clean and the print head is clean of all residue or excess plastic. We will be using the tip of the print head as our reference so we want it to be clean.

Raise the bed enough to access the thumbscrews and tighten them all a half turn.

Run the “Manual Bed Level” macro.



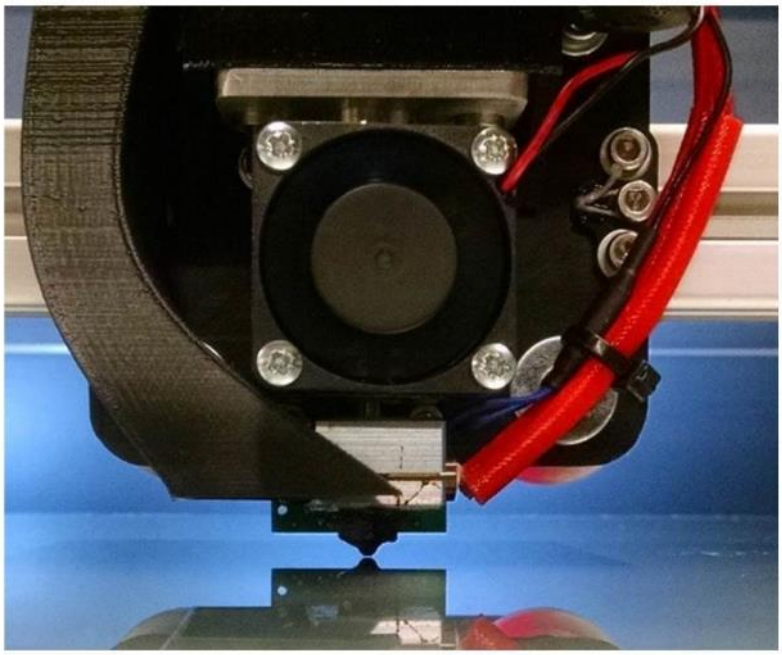
At the end of this macro the head will be positioned in the middle of the bed about 10 mm away from it, with the X and Y motors disabled (so you can move the head around by hand).



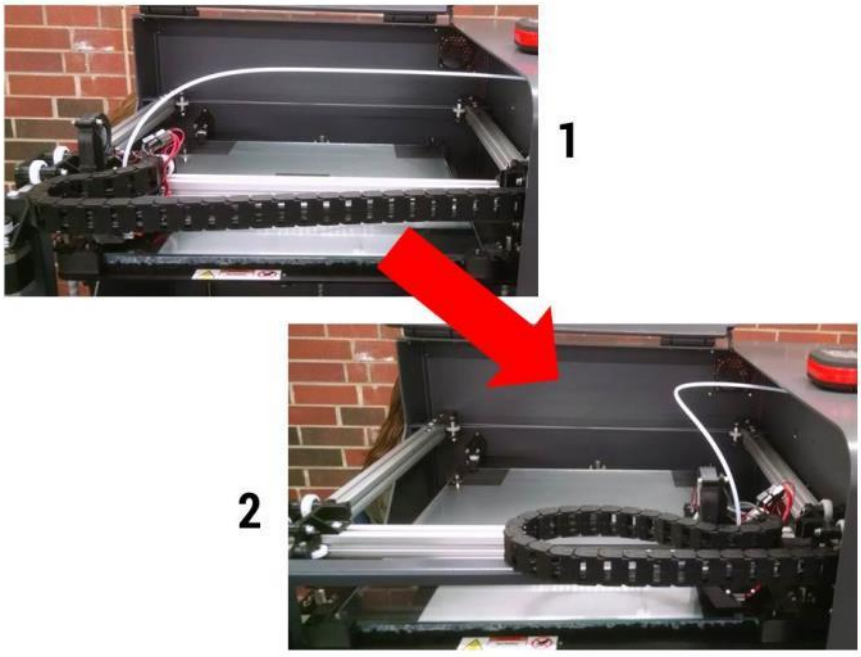
Use the “Move” menu to jog the bed up until there is a very small gap between the nozzle and the glass.

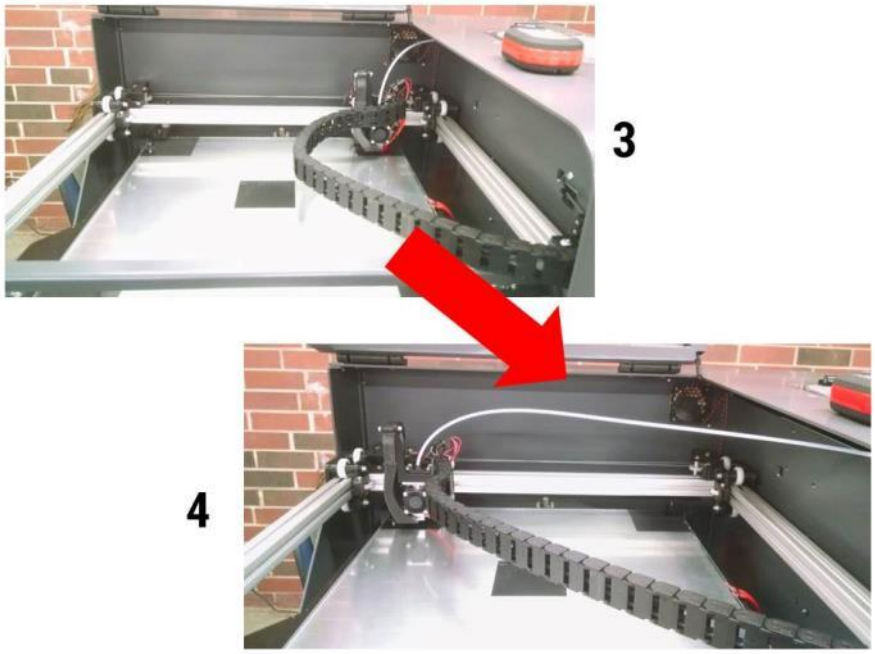
CAUTION: If you go too far up you can drive the nozzle into the bed and possibly damage the print head or the bed. Jog the bed up in small increments to avoid this.

Once the gap gets small use the "-0.05" button to go up in very small increments until you have just a tiny gap between the nozzle and the bed. It can help to shine a light on the wall behind the nozzle like you see in the pictures below.



Now move the head to each corner of the bed (by hand) and use the thumbscrew to adjust the height of the corner until you get the same gap you had at the center of the bed.





If you had to make large changes (more than 1 full turn) to any corner, you may want to check all the corners a second time to make fine adjustments.

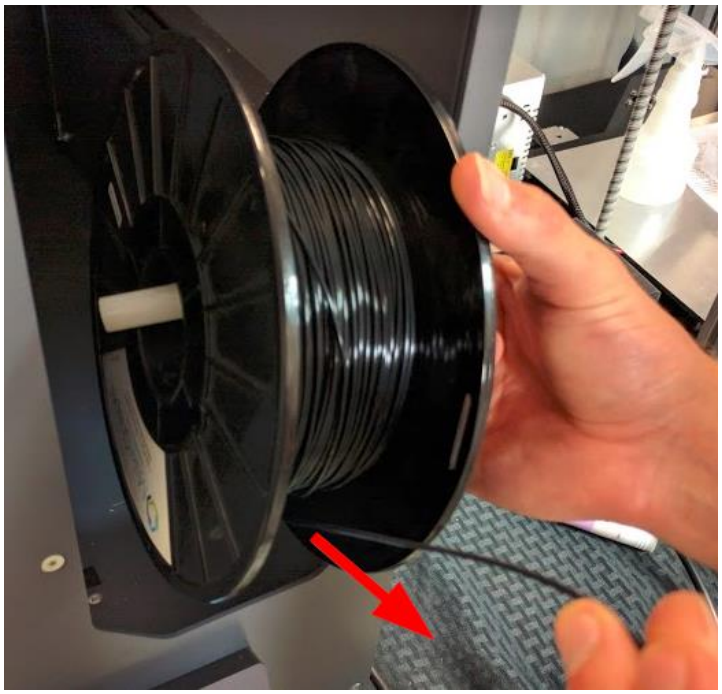
Finally, select the “Disable Motors” macro when you are done.

9.4 Loading Filament

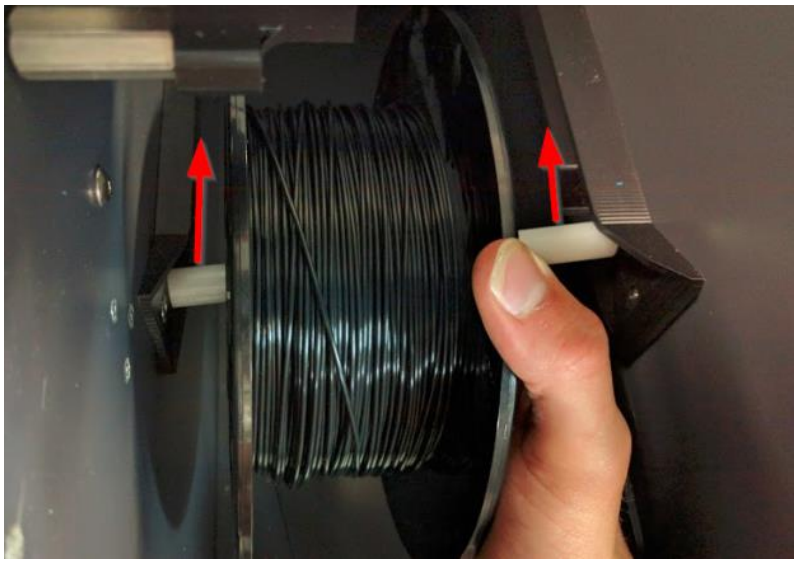
Your F400’s filament handling system is designed to accommodate a wide range of filament spool sizes from 1lb with a 0.5” center hole, all the way up to 5kg rolls.

First, insert the filament dowel through the center hole of the spool.

Orient the spool so the filament pays off the front side (or underneath) of the spool.



Place a hand on either side of the spool, using your fingers to hold the dowel in place. Slide the dowel into the tracks located on either side of the filament bay.



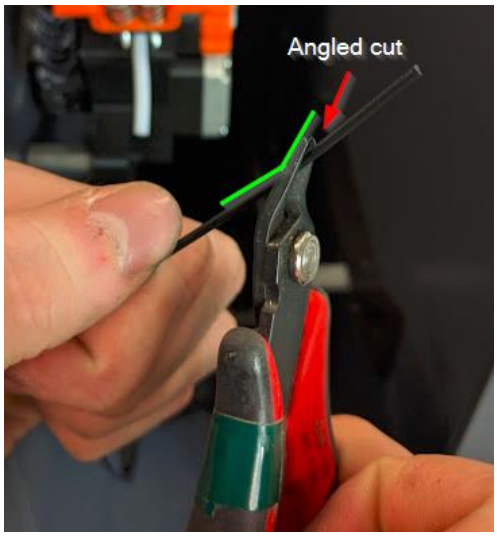
Continue sliding back until you feel the dowel drop into the detents in the track.

Now take the end of your filament and free it from the spool.

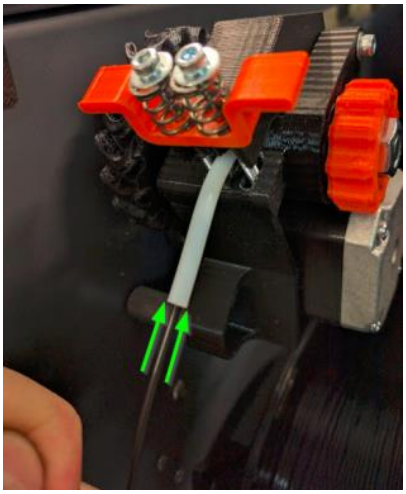
IMPORTANT: Try to avoid letting go of the free end. It can wrap under itself on the spool and cause the print to fail.

If the filament has been used before, trim off any length that's been melted or fed through the extruder. You can tell by the small teeth marks on the filament if it's been fed through the extruder before.

It can help to trim the end at an angle as shown below.

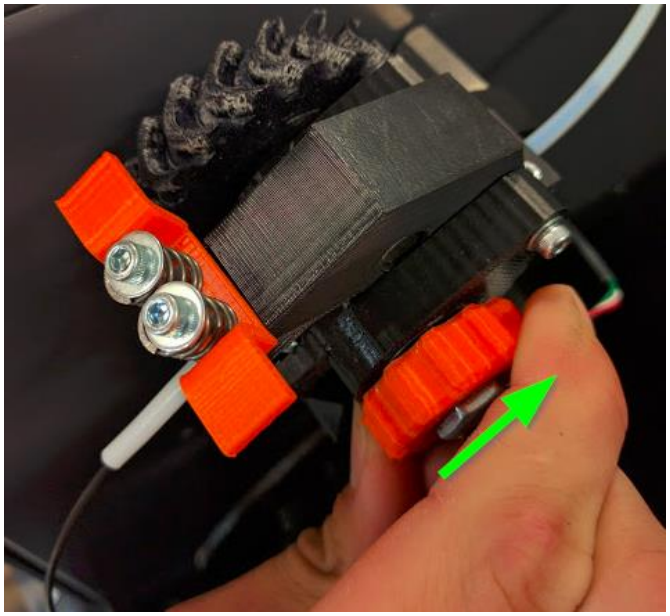


Feed the end of the filament into the inlet tube on the extruder.

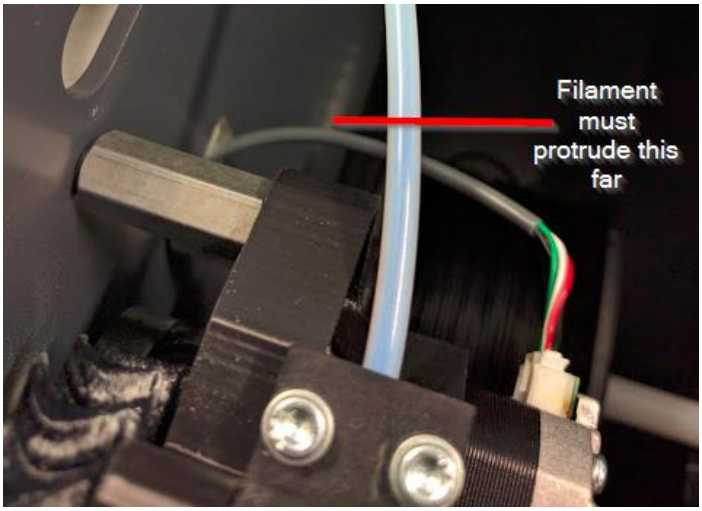


While continuing to gently push on the filament, slowly turn the orange knob until you feel the extruder “bite” into the filament and begin to pull it through. You will also see the idler bar jump up a little bit as the filament is pulled into the extruder.

NOTE: You **do not** need to open the idler bar in order to load filament.



Continue to turn the wheel until you see the filament protrude into the feed tube about 0.5 inches.



Now run the “Load Filament” macro. This will home the z axis (to make sure it’s out of the way), heat up the print head, and then feed the filament through the feed tube and into the print head. It will then slowly purge a few hundred millimeters of filament to clear out any old material or color.

Once the extruder stops turning, you can reach in and remove the strand of filament it made.

CAUTION: The print head will still be hot for several minutes after the “Load Filament” sequence is run. Use caution and do not come in contact with the print head.

NOTE: some filaments, such as polycarbonate and other very high temperature materials cannot be loaded with this automatic sequence; it does not get the print head hot enough for them. For these materials you will need to manually heat the print head and feed the filament through the feed tube and up to the print head by hand.

9.5 Unloading Filament

Unloading filament is simple: Simply run the "Unload Filament" macro. Your F400 will heat up the print head, feed forward a little, then reverse the filament out of the print head.

Once the extruder stops turning, simply tug the filament free from the inlet tube.

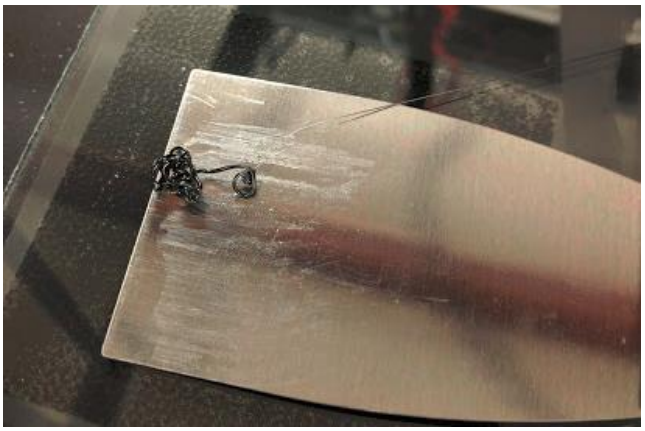
We recommend retaining the end of the filament to the spool with tape or by routing it through one of the holes on the side of the spool.

9.6 Cleaning the Print Bed

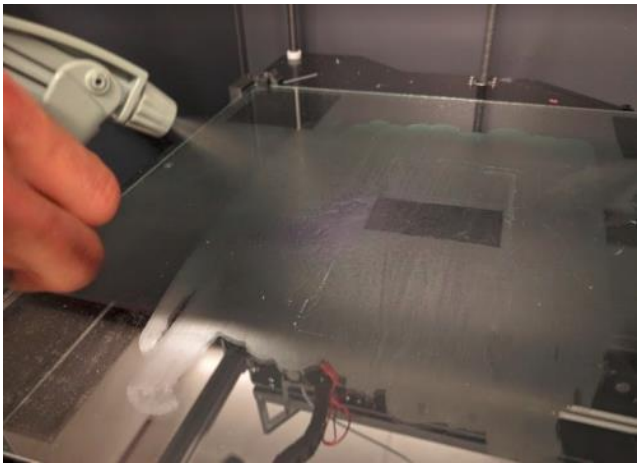
NOTE: Only normal tap water should be used to clean your print bed. Other cleaners such as Windex, rubbing alcohol, etc can leave residues that negatively impact part adhesion.

Wait for the bed to cool below 45^{o}C.

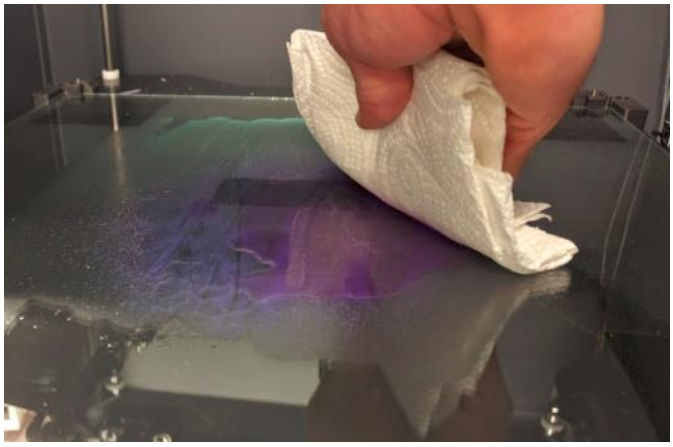
Use your fingers or your part scraper to remove the priming skirt (the loop printed around your part) and the priming pile from the bed.



Use a spray bottle filled with normal tap water to wet the bed down. This will cause the glue to turn purple again.



Use paper towels and/or your part scraper to scrape the glue off and wipe the bed down. It doesn't have to be perfectly clean, you just want to remove most of the glue.

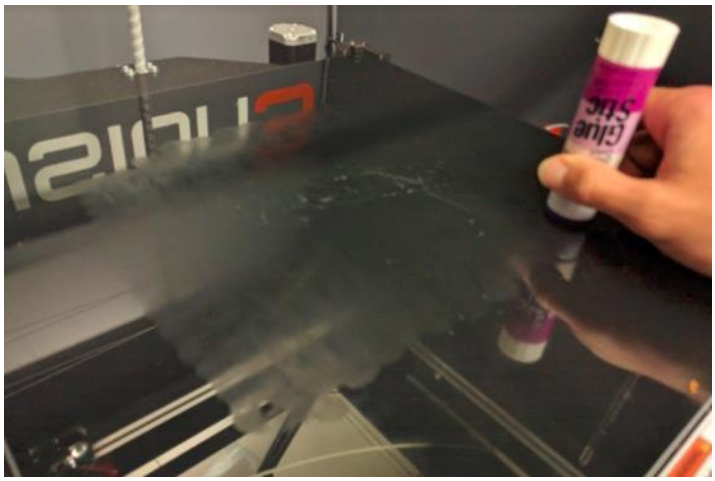


If you're immediately starting another print, make sure the bed is dry before applying fresh gluestick.

9.7 Preparing the Print Bed

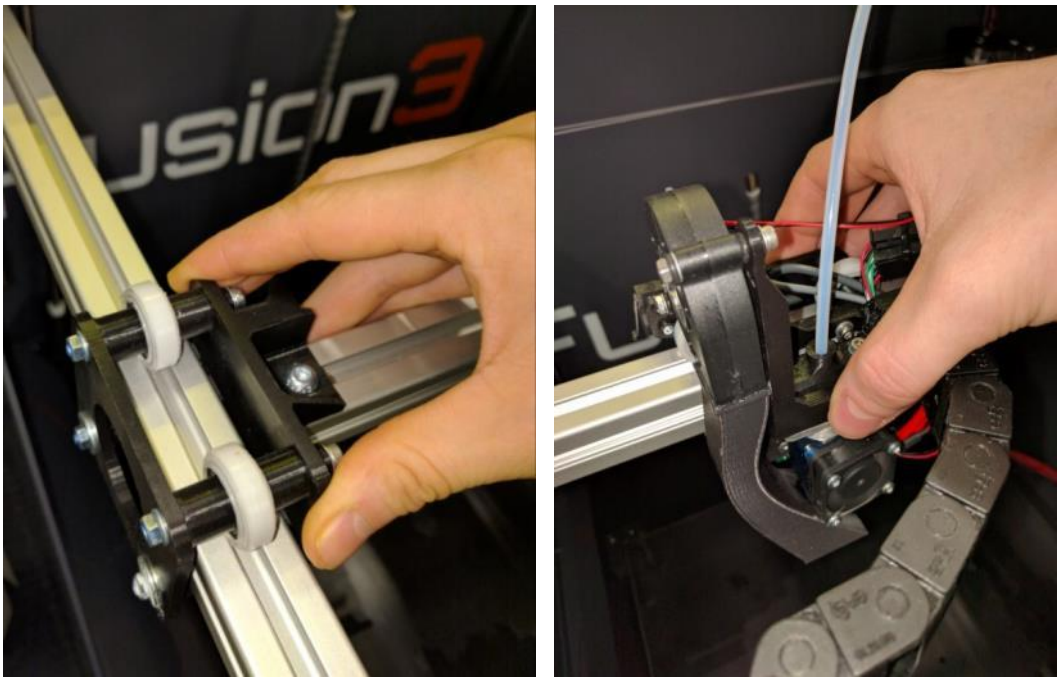
Use the gluesticks included with your toolkit to apply an even layer of glue to the bed.

- The glue layer does not have to be thick; you do not have to push down on the gluestick as you apply it.
- You do not need to cover the entire bed if you're printing a small part.
- Remember to avoid putting gluestick over the black corner square unless you know your part will overlap those areas.
- Apply fresh glue to a clean bed for every print!
- For ABS, use 2 layers of glue applied at right angles. For most other materials, use a single layer of glue.



9.8 Moving Axes by Hand

Occasionally you will need to manually move part of the printer by hand. This is safe to do if the printer is powered on. **DO NOT** move axes by hand if the printer is powered off. Doing so can cause damage to the electronics.



9.9 Changing Filament Mid-Print

During long prints it's likely you will exhaust all the filament on a single spool. It is possible to change filament spools mid-print so you can keep printing.

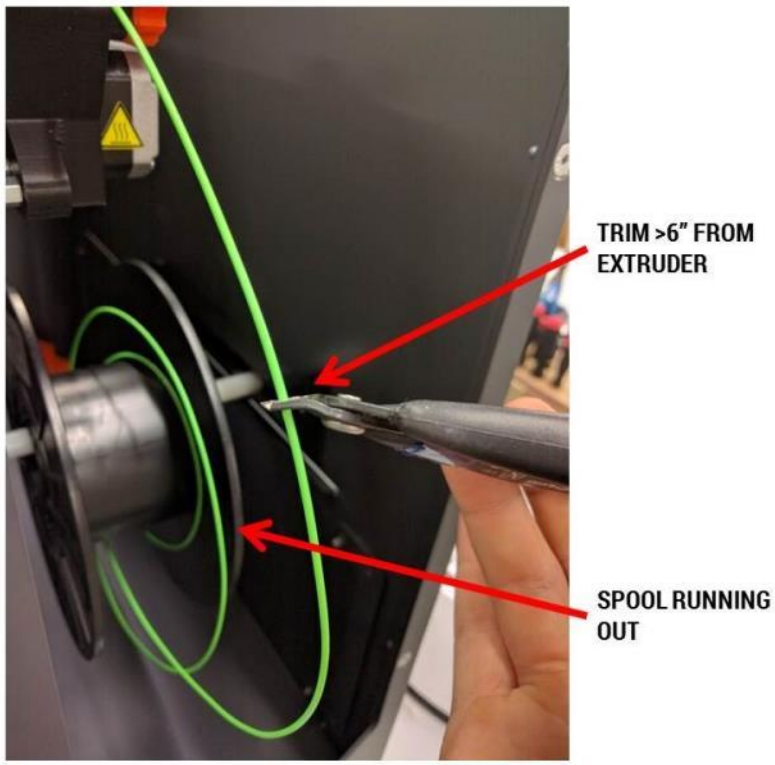
IMPORTANT: Your F400 does not have the ability to detect when it is out of filament, so it will not automatically pause the print job if the current spool is exhausted. Therefore you need to perform a spool change **before** it runs out.

9.9.1 Recommended Procedure: "Hot Swap"

This procedure avoids pausing the printer entirely.

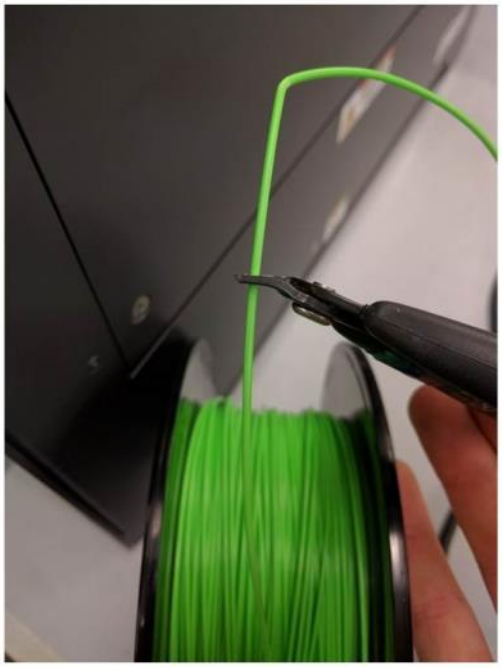
Locate and prep your new spool of material (trim end clean, make sure there are no tangles, etc).

On the old spool, cut the filament about 6 inches in front of the extruder.

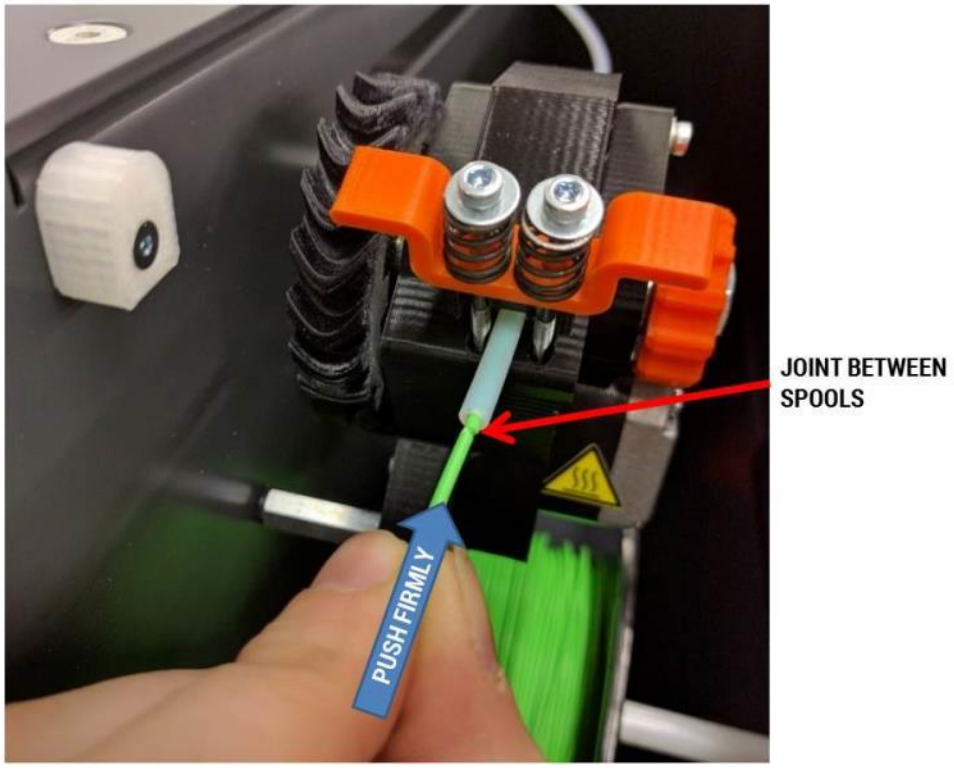


Remove the old spool from the printer. Install the new spool into the filament bay.

If you're impatient, you can now trim the tail of the filament in the extruder shorter. Or you can wait for the printer to consume the 6 inch tail you cut originally. Make the cut square with the filament – do not angle the cut like normal.



Cut the end of the new spool square as well. Align the ends and press forward as it feeds into the extruder



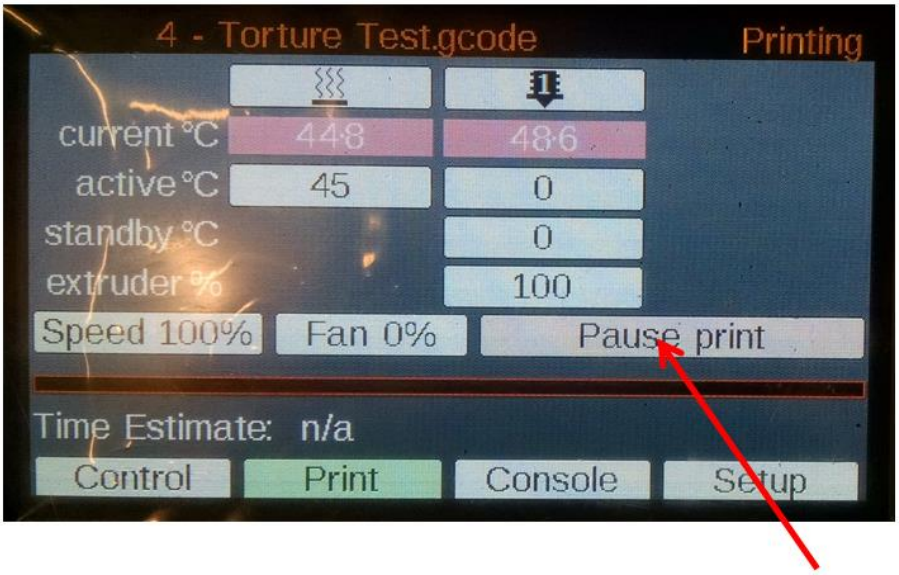
Continue to hold pressure on the new filament until you're sure the tip is well past the feed gear in the extruder. This way if there is a retraction it will not spit the end back out.

And that's it!

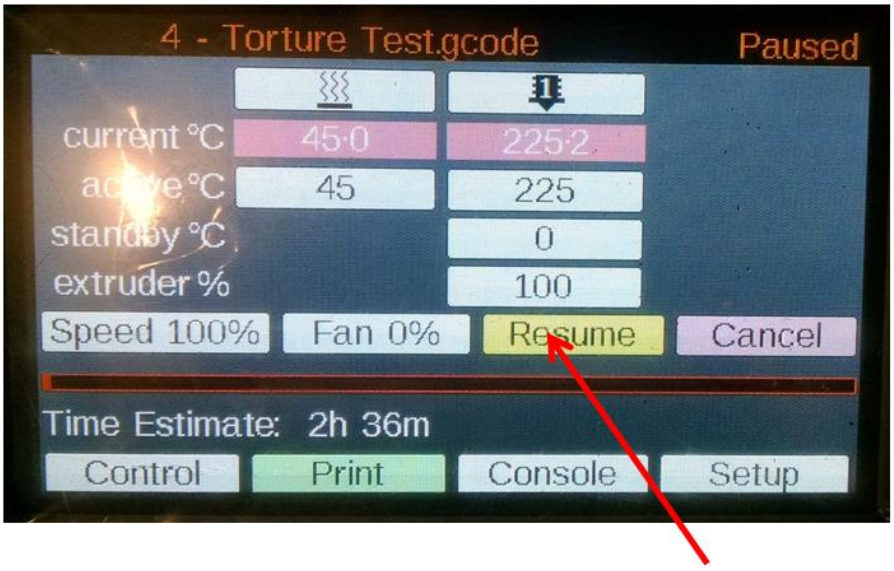
9.10 Pausing & Resuming a Print Job

Your F400 allows you to pause and resume prints. This is a "hot pause"; in other words all motors and heaters remain energized and at printing temperatures. Using this functionality is not appropriate for long pauses, for example overnight. It's meant to pause a print for a few minutes at most.

Click "Pause" on the control panel. The print head will move to the back left corner.



When you're ready to continue printing, click "Resume". The print head will move back to the part and continue printing.



10 Filament

We have an open materials philosophy: We do not require you to buy filament from us, nor do we equip our products with DRM or other technology to control what filament is used.

That said, there is a lot of poor quality filament on the market. Using this filament may produce poor results and also may damage your printer. And at first glance it's not obvious what is good quality filament and what is not.

Our solution is to maintain a list of filament suppliers whose filament we have tested and approved for use. In many cases we optimize our profiles specifically for these materials to achieve the best results.

- **We ask that you please use material from these suppliers only**
- **If you use material from a non-approved supplier and it causes damage to your printer, we may decline to cover the cost of those repairs under your warranty.**
- If you need a specific material that is not currently available from an approved supplier, please contact us! In many cases we can locate a source for the material and test it to confirm it works as expected. Customers with our optional Advance Exchange Support Plan have priority in our material test queue.

A material that's been through our testing process generates 3 pieces of information:

- Verification that the material is able to be run on our equipment without damage to the equipment
- A Material Release Notes document that gives you an overview of the material's properties, what it's good for, where to buy, and any helpful hints for running it
- A material profile for Simplify3D that correctly sets up your printer to run the material

We are constantly adding new suppliers and materials, so you can find up to date information on where to buy filament on our website here:

https://fusion3design.com/3d_printer_filament/

11 Maintenance

11.1 Cleaning the Print Head

It's a good idea to keep the underside of the print head relatively clear of debris and molten plastic. If plastic builds up on the nozzle or heat block, it can detach and drop into your print.

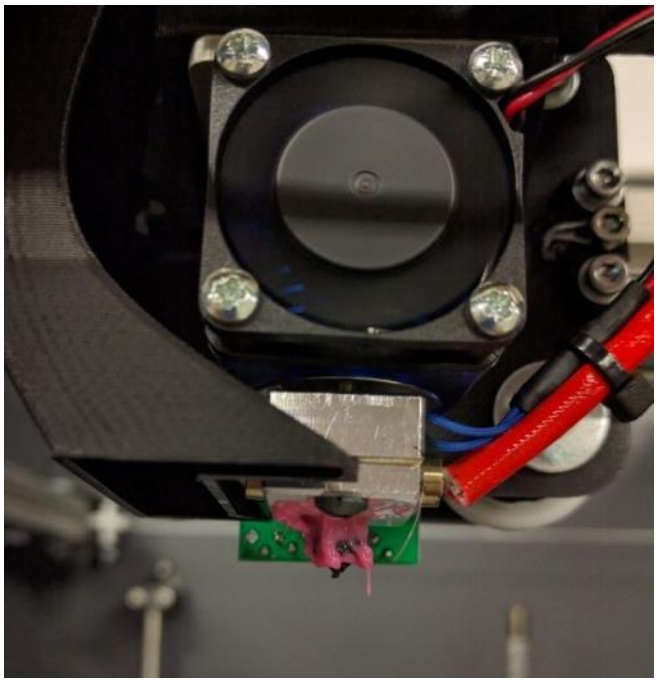
Service Interval: As needed

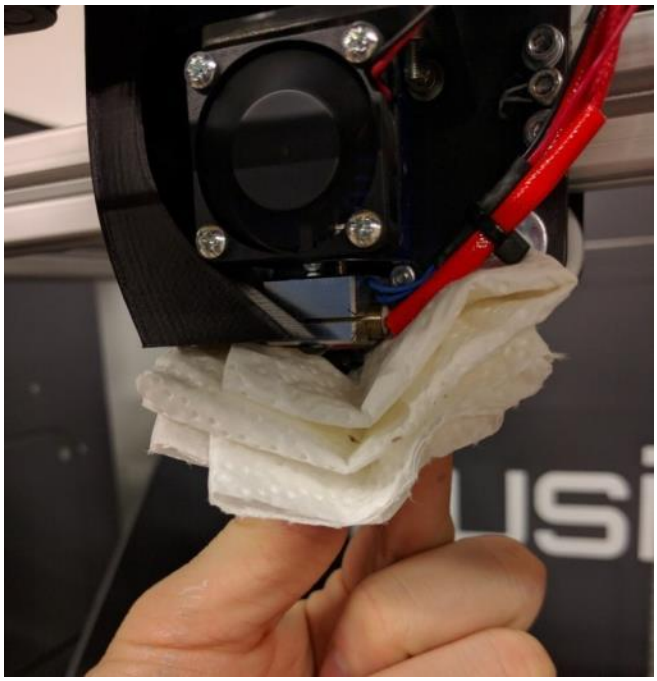
Manually heat the nozzle up to:

- 200°C for PLA
- 230°C for ABS
- Somewhere between these temperatures for other materials

Use a dry folded over paper towel to clean the debris off the head. Fold it over several times to insulate your fingers and remove debris with a pinching motion.

CAUTION: The print head will be hot. Avoid contact with your bare skin.





Note: It's normal for the surface of the print head to become dark and coated with carbon after a while. This buildup does not pose an issue and can be left alone.

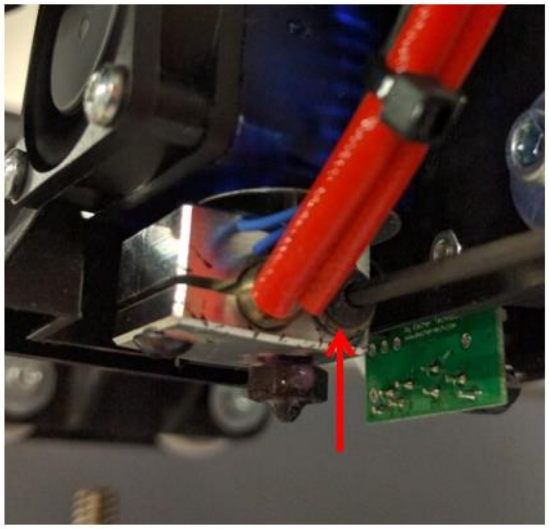
11.2 Check Thermistor Hold Screw

Visually inspect the thermistor hold screw to ensure it's in place.

Service Interval: When the print head is cleaned

The thermistor hold screw is what keeps the temperature sensor in the print head in place. If it comes loose or falls out, the sensor can become dislodged and cause your print head to not function properly.

You should **not** use a hex wrench to check the tightness unless it's obviously loose; continuously tightening it can damage the sensor leads under the washer. If you need to tighten it, you will need a 2mm hex wrench.

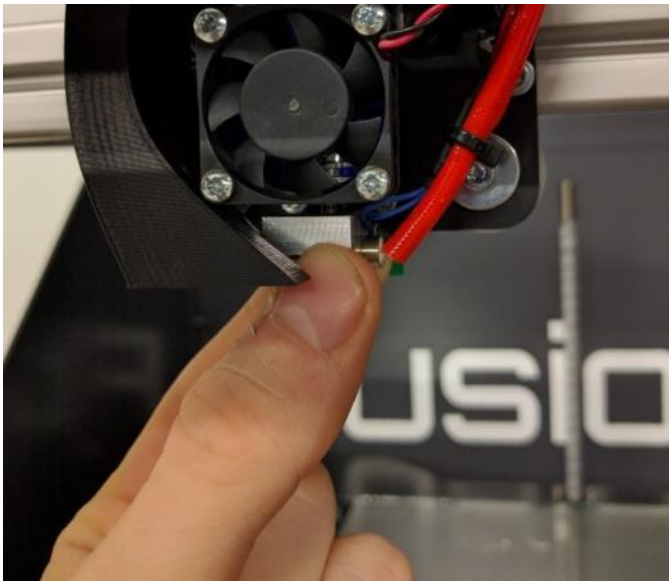


11.3 Check Heat Break

Make sure the hot section of the print head is still firmly threaded into the cold section.

Service interval: When the print head is cleaned

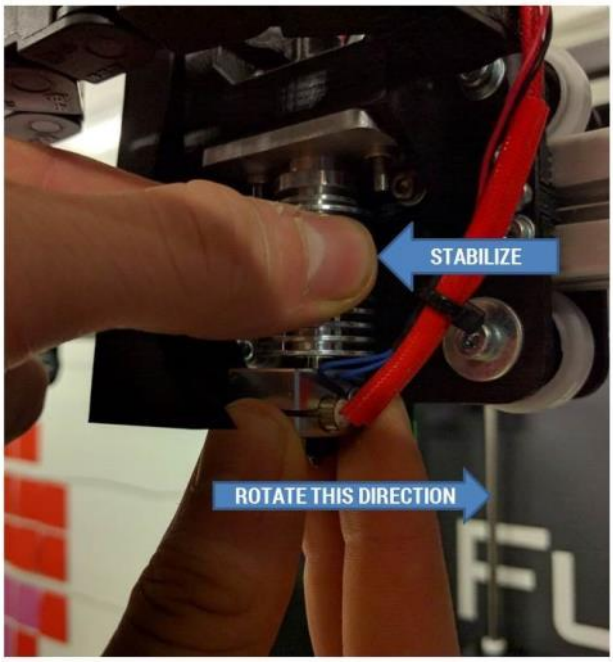
WITH THE PRINT HEAD COLD, grasp the heater block with your fingers and gently twist it counter-clockwise. If you see it spin independently of the cold section, that means it's come loose.



If it is loose:

Remove the 30mm fan and duct from the cold section. The duct is a snap-fit on the fins so you can just gently and firmly pull it off.

Use your other hand to stabilize the print head and prevent it from rotating while you tighten the hot section back up. Do not over-tighten as you can bend the thin heat break section; aim for approx. 10-15 in-lbs of torque.



11.4 Inspecting & Cleaning the Extruder

Check the extruder for:

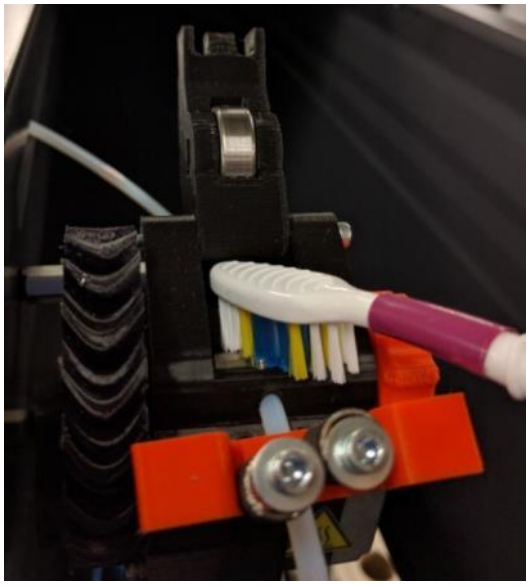
- Debris in the feed gear
- Slop or lash in the gears
- Correct spring preload

Service interval: Every 40 hours of print time

11.4.1 Feed Gear Debris

With filament removed from the extruder, open the idler bar. Visually inspect the teeth in the metal feed gear for debris. Rotate the extruder by hand and inspect the full gear.

If you see debris in the teeth, use the toothbrush included in your toolkit to brush the debris out of the teeth.

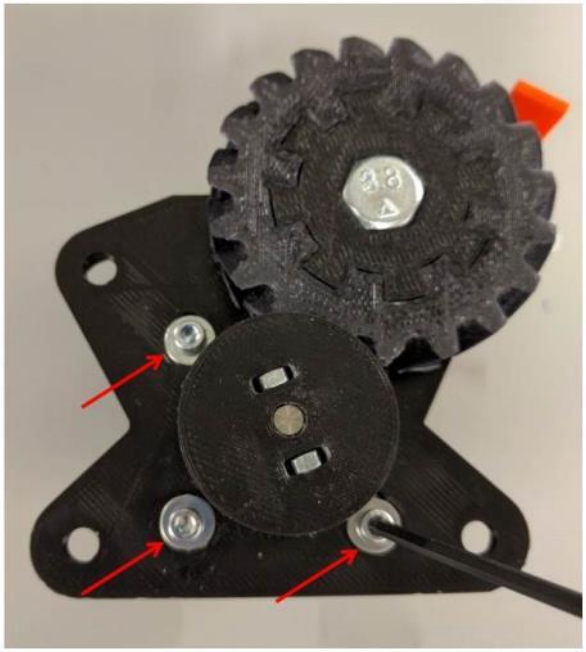


11.4.2 Gear Lash

While spinning the extruder by hand, check for lash in the gears by gently reversing the direction you're turning the extruder. Observe the gears and make sure there isn't a "dead spot" where one gear turns but the other stays still. If you wiggle the extruder shaft back and forth you may be able to feel a small tap or click if there is lash.

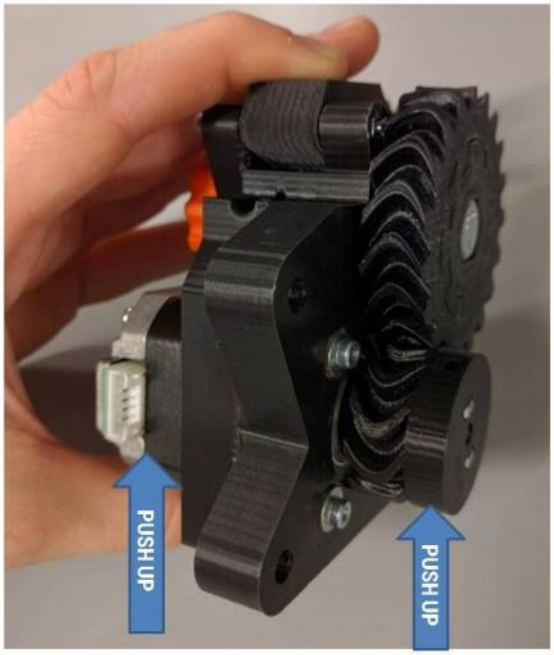
To fix gear lash, remove the extruder from the printer (see section 11.9).

Turn the extruder onto its back and loosen the 3 M3 screws the hold the motor onto the main assembly



If you have Loctite on hand, you may want to completely remove the screws, add Loctite, and then reinstall them.

Slide the motor up until the gears mesh firmly. Tighten the 3 screws finger tight.



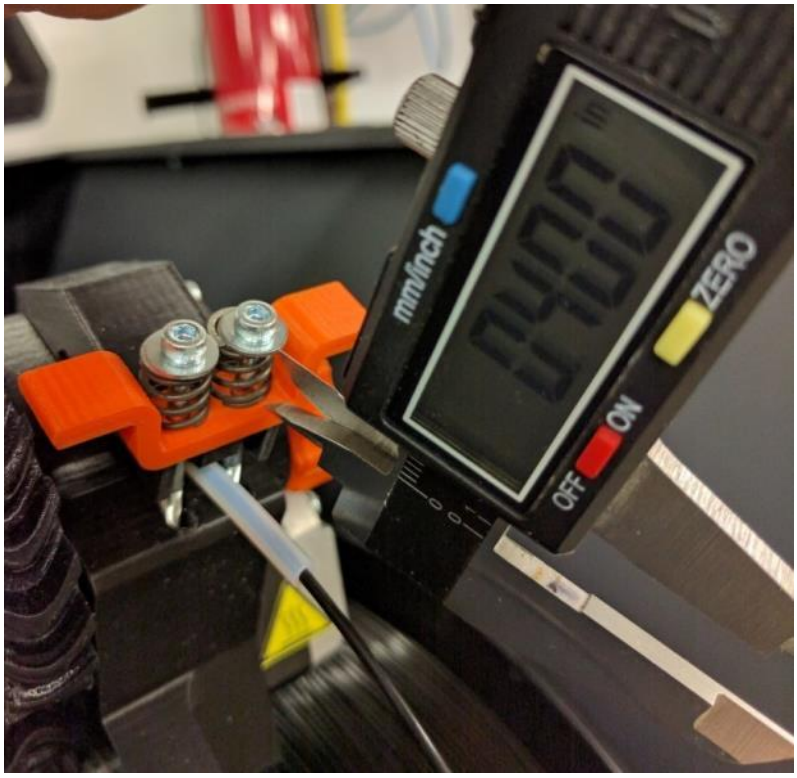
Spin the gears by hand and make sure they spin freely with no binding. If there are tight spots the gears are too tight; slide the motor down just a little bit.

Once the gears mesh well all the way around, firmly tighten all 3 screws.

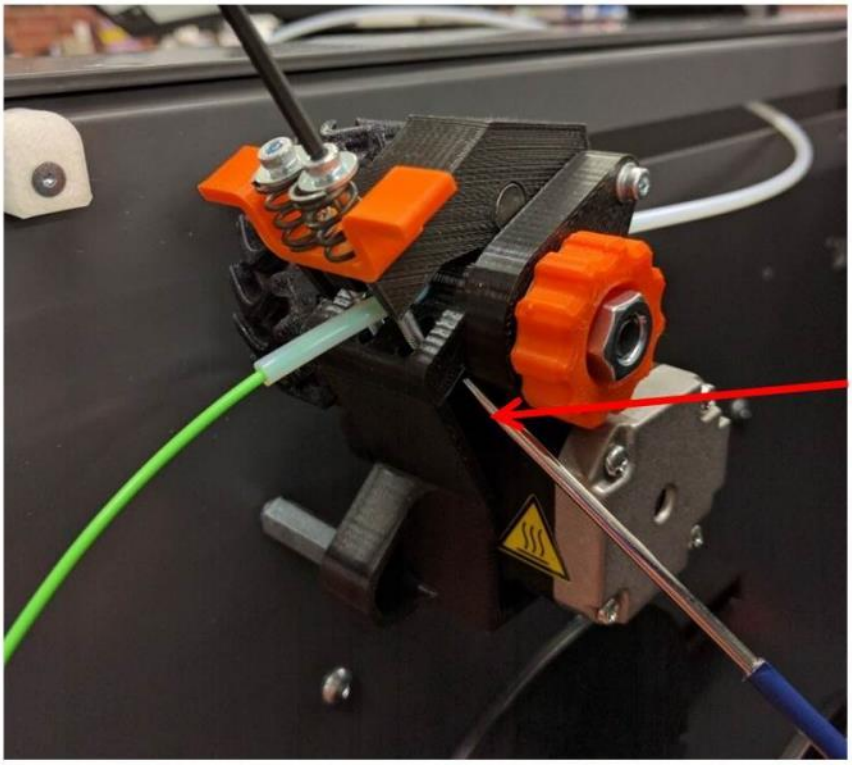
Reinstall the extruder onto the printer.

11.4.3 Spring Preload

With filament loaded into the extruder, measure the distance from the face of the spring grabber to the underside of the washer. This distance should be 0.43 inches.



If you need to adjust the springs, use the 2.5mm hex wrench from your toolkit. You will need to hold the nut still with a small flat bladed screwdriver or similar implement to adjust the preload.



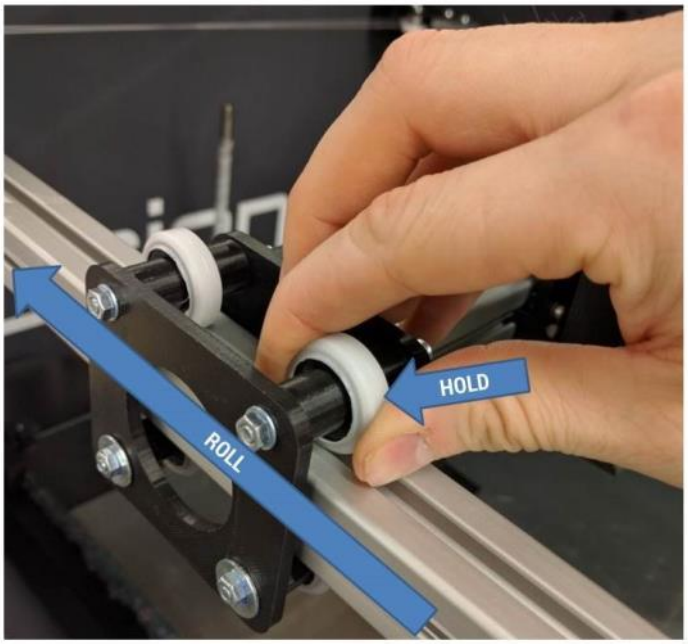
11.5 Check & Adjust Bearing Preload

The linear motion assemblies on your F400 have adjustable preload. Periodically inspect them to ensure they are still tight on the rails for best performance.

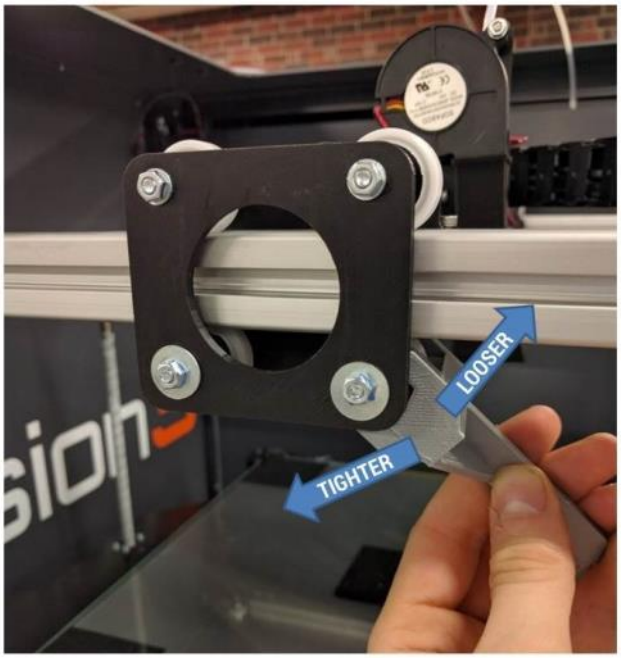
Service interval: Every 300 hours

With the printer powered on and motors disabled (macro > disable motors):

Grasp the wheel in your fingers as shown. Slide the carriage along the rail while preventing the wheel you're holding from rotating.



If there is little to no resistance, the preload is too loose. Use the preload adjustment wrench (download from our website: https://fusion3design.com/manuals) to rotate the eccentric cams to adjust the preload. You can also use two 13mm wrenches with the handles lined up.



NOTE: It's possible to over-tighten the cams. Aim for roughly 10 in-lb of resistance when you slide the carriage while holding the wheel still.

Repeat this for all 6 pairs of wheels on the linear motion assemblies.

11.6 Check & Adjust Drive Cable Tension

Check the XY drive cables for sufficient tension, and make sure the X axis is 90 degrees to the Y axis.

Service interval: Every 300 hours

11.6.1 Check Cable Tension

The easiest point to check the cable tension is at the rear of the print bay, where the drive cables cross over each other.

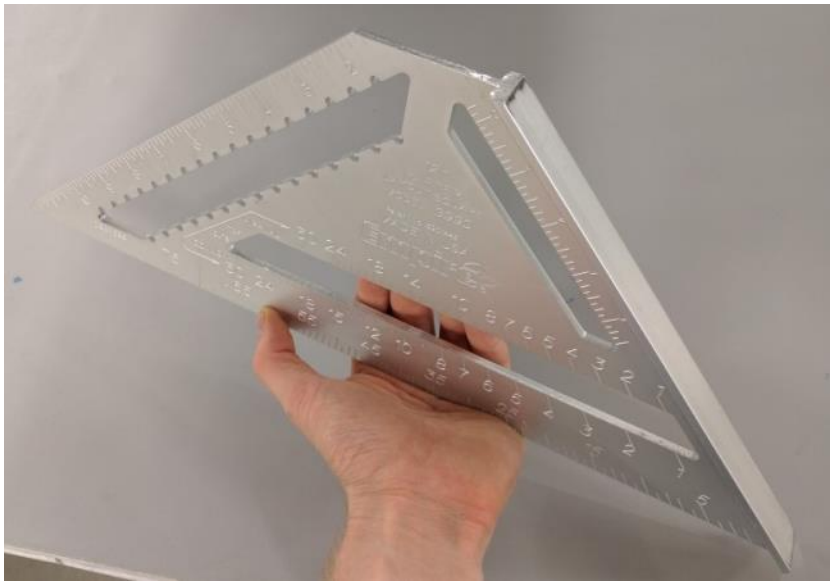
Use a light finger touch on the cables to ensure they are not slack. A wide range of tension is acceptable; as long as the cables are not actually loose they are fine.

If you print a lot of high temperature materials, you may find the cables are slightly loose at room temperature.

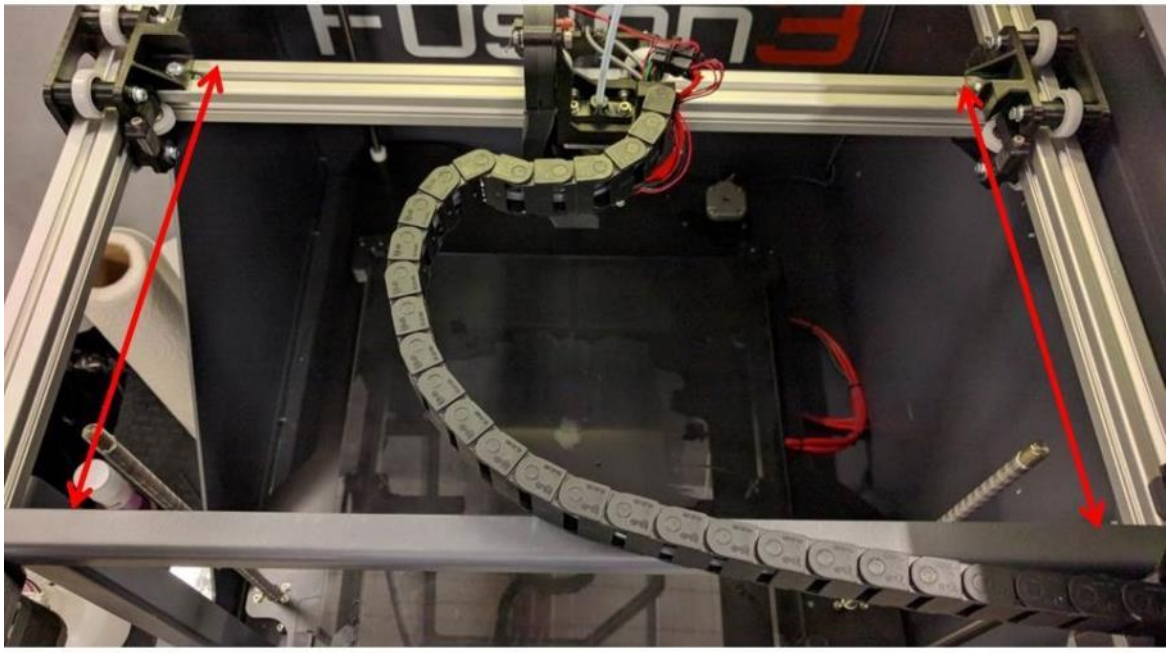
11.6.2 Check X Axis Square

The angle the X axis makes relative to the Y axis depends on the relative tension in the two drive cables. This makes it easy to adjust the square if needed.

Here at Fusion3, we use a 12 inch carpenter's square with 2.5 inches cut out of the vertex as a tool to check the square of the X axis. This is faster than measuring.



You can also measure the distance from the x axis to the front brace as shown below. It doesn't matter exactly where you measure from, just so long as you're consistent. Move the X axis to the back of the machine and measure the points shown below.



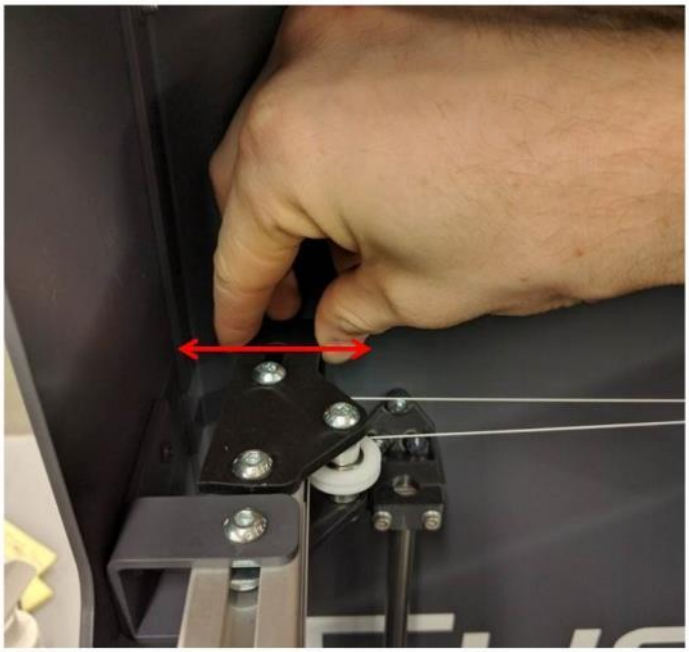
If your right measurement is smaller, tighten the left idler

If your left measurement is smaller, tighten the right idler

11.6.3 Adjusting the Cable Tension

If Both Cables Are Loose:

The easiest way to adjust the cable tension is to rotate the idler brackets.



If One Cable is Loose, or You are Adjusting the X Axis Square:

You will need a 4mm hex wrench and a 10mm wrench.

At the rear of the print volume there is a bracket that holds 2 idler pulleys on each Y rail. One of these pulleys is mounted in a slot. By loosening the screw you can slide the pulley to adjust the tension.

Once you adjust the pulley, tighten the screw and re-check the square.

11.7 Adjusting Configuration Values

Many parameters for your printer can be changed as needed in the SD card/sys/config.g file. Unlike the F306 and other 3D printers, you do not need to reflash your firmware to update these parameters.

11.7.1 Changing the Z Probe Offset

The most common parameter you may need to adjust is the probe offset. This value tells your printer how far away from the bed the tip of the nozzle is when the probe triggers. You might need to adjust this value if:

- You remove and reinstall the print head
- You install a different print head than the one that shipped on your printer
- The probe is shifted (either by accidental contact or on purpose)

The line you need to adjust is:

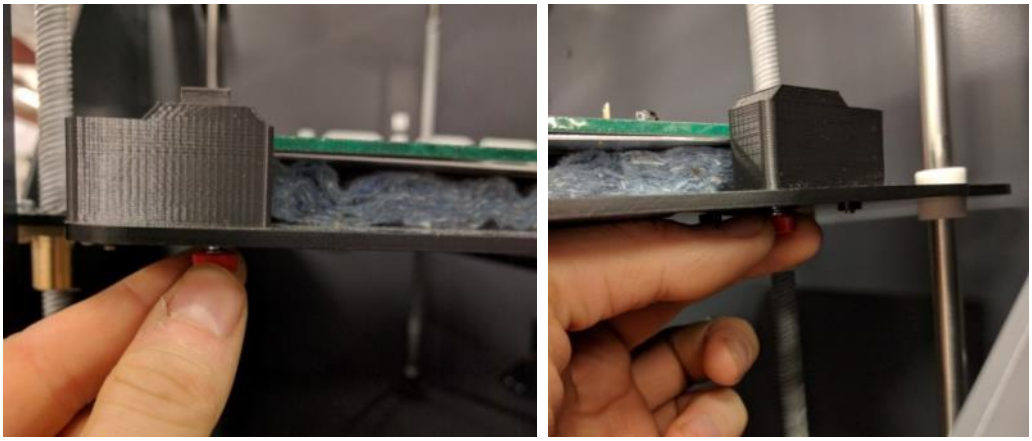
```
; Z probe
M558 P1 X0 Y0 Z0                    ; Set probe type and if it's used for axis homing (no in our case)
G31 Z1.25 P500                      ; Set the probe height and threshold (smaller number = further away from bed)
```

The simple way to adjust this value is by observing your first layer height and just bumping it higher or lower in increments of 0.1mm.

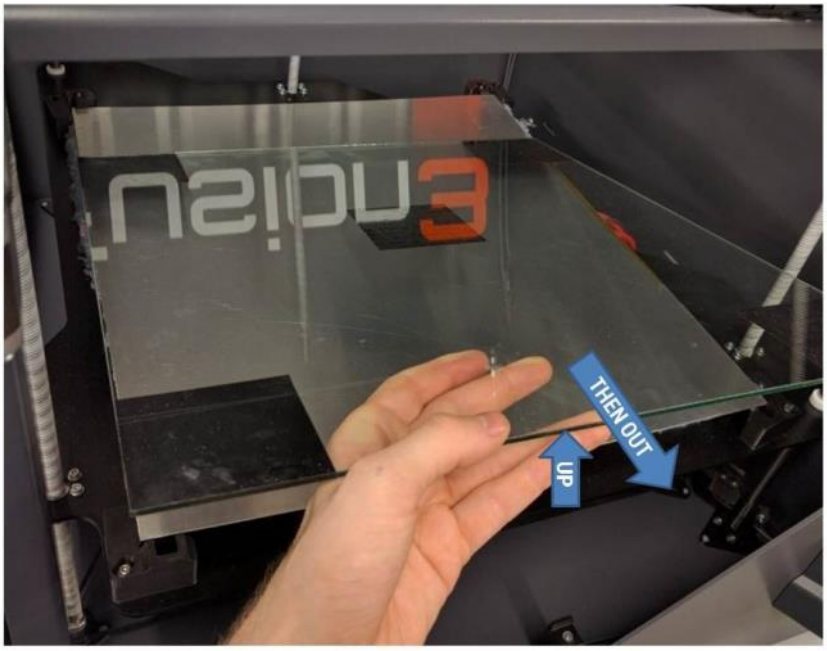
- If your first layer is too close, you need to make the value smaller
- If your first layer is too far away, the value needs to be larger

11.8 Removing & Installing the Print Bed

Loosen the 2 front bed clips completely so that the screws drop out of the clips.



Lift up the front of the glass 1-2 inches and gently slide it towards you. The aluminum plate will stay in place.



Slide the replacement glass under the rear clips. You may need to reach under the bed substrate and hold the clips up to get the glass underneath them.

NOTE: The glass is not square, so it matters which way you install it.

Re-install the front corner clips and tighten them so the front of the glass is lower compared to the back. How much doesn't matter right now.

Run the manual bed leveling sequence (section 9.3.2).

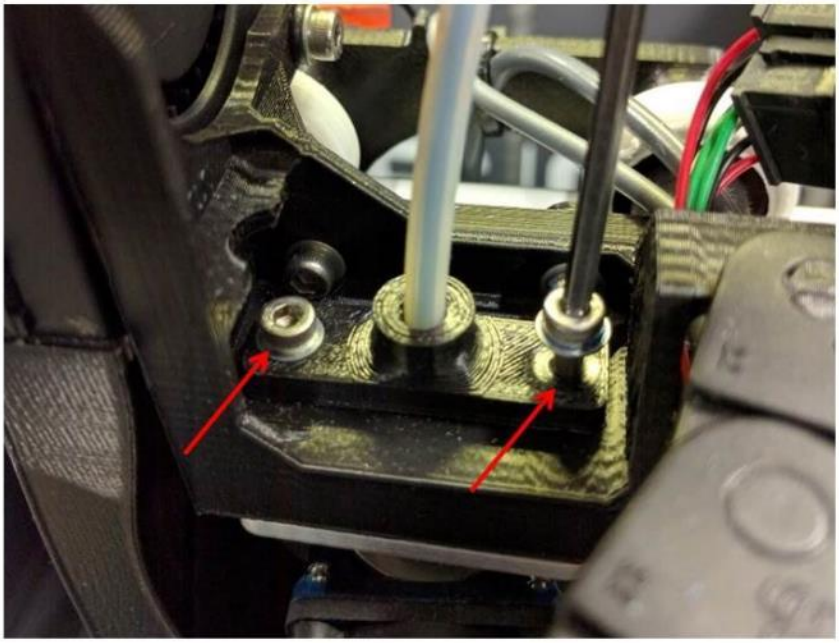
11.9 Removing & Installing a Print Head

Setup:

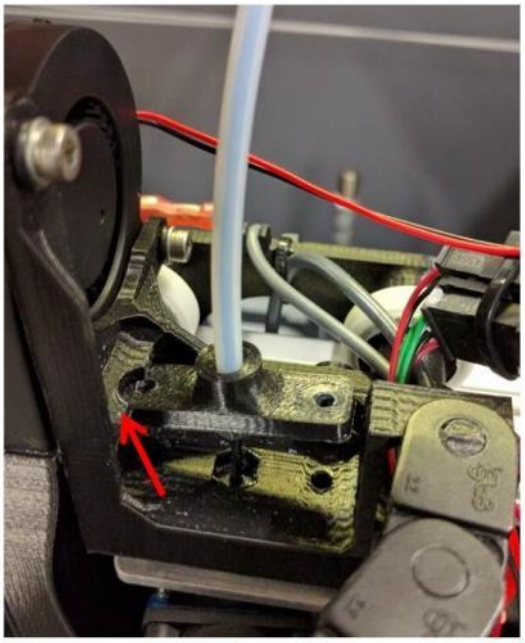
- If possible unload the filament from the printer. If you are attempting to recover from a jam, you won't be able to unload the filament; that's ok.
- Print head should be **COLD**
- Printer should be **POWERED OFF**

11.9.1 Removal

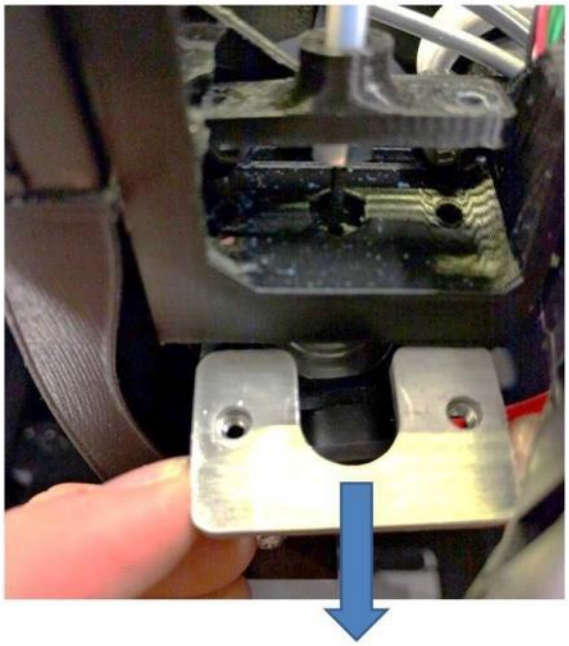
Use the 2.5mm hex wrench to remove the 2 M3 screws shown below



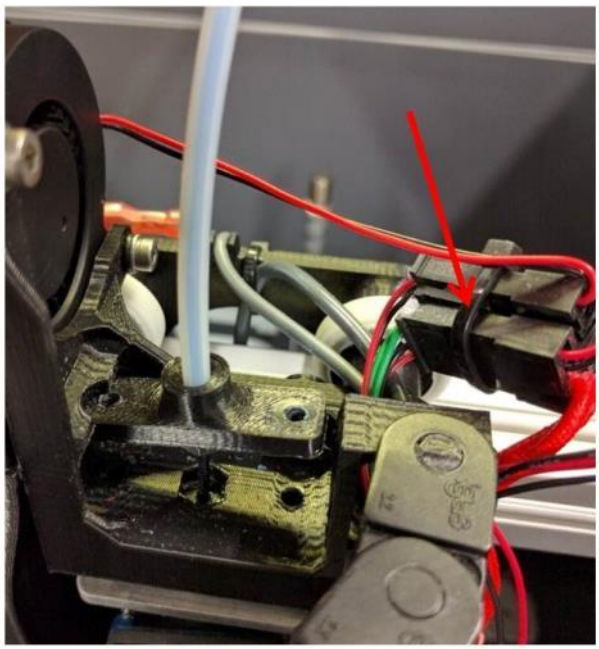
Tug the tube retention plate straight up until it hits the blower mount on the left



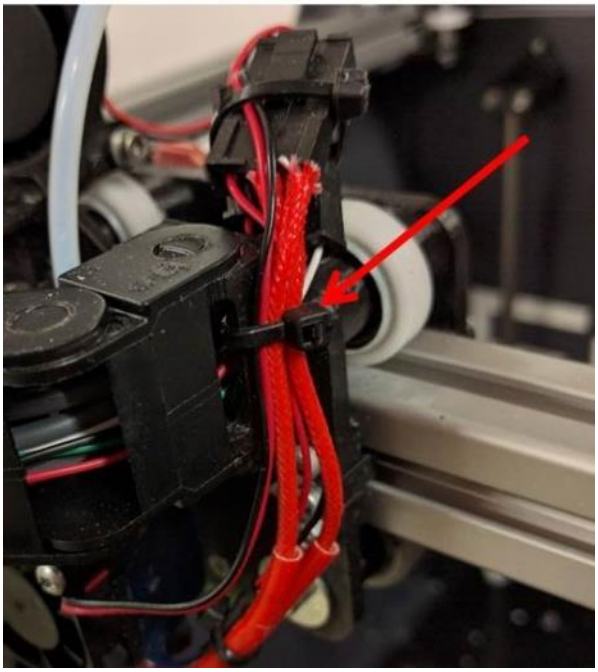
Now slide the aluminum clamp plate straight forward and remove it.



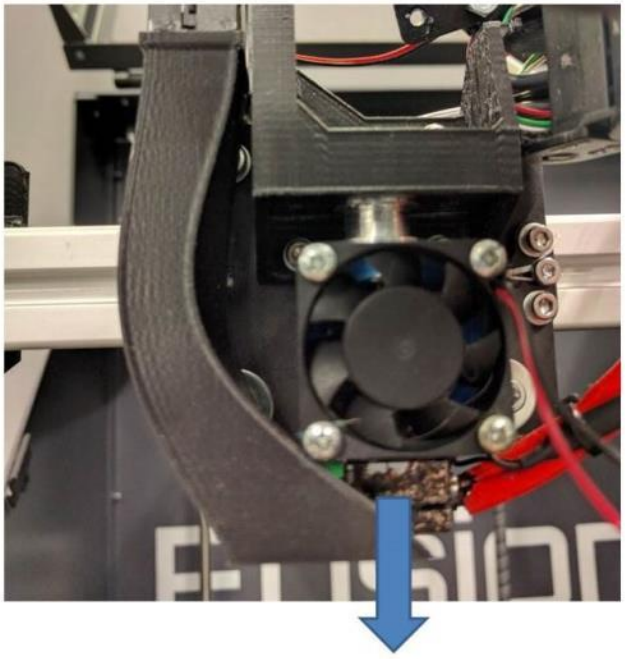
Clip the zip tie holding the 3 electrical connectors together. Disconnect the 4 pin connector and the 2 pin with the green and white wires.



Clip the zip tie holding the print head wires to the print head assembly.

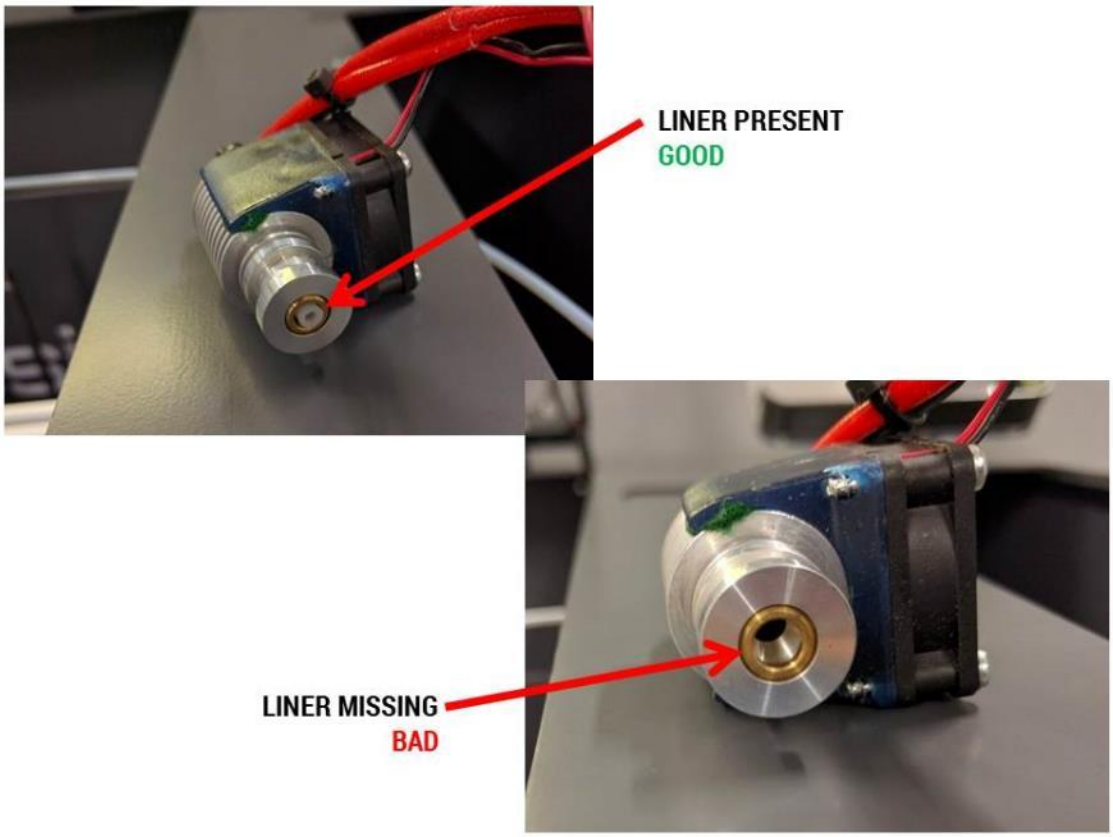


Now you can gently wiggle the print head free of the assembly

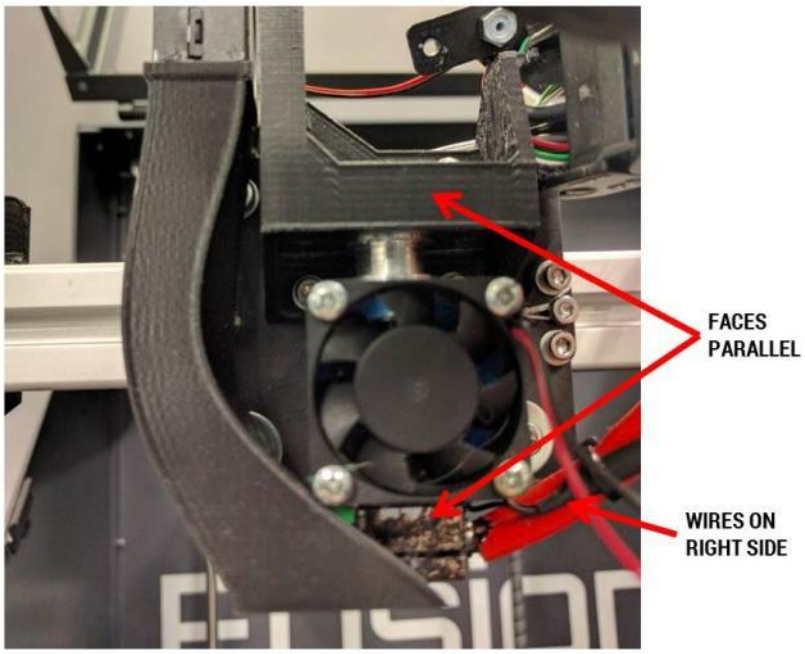


11.9.2 Installing

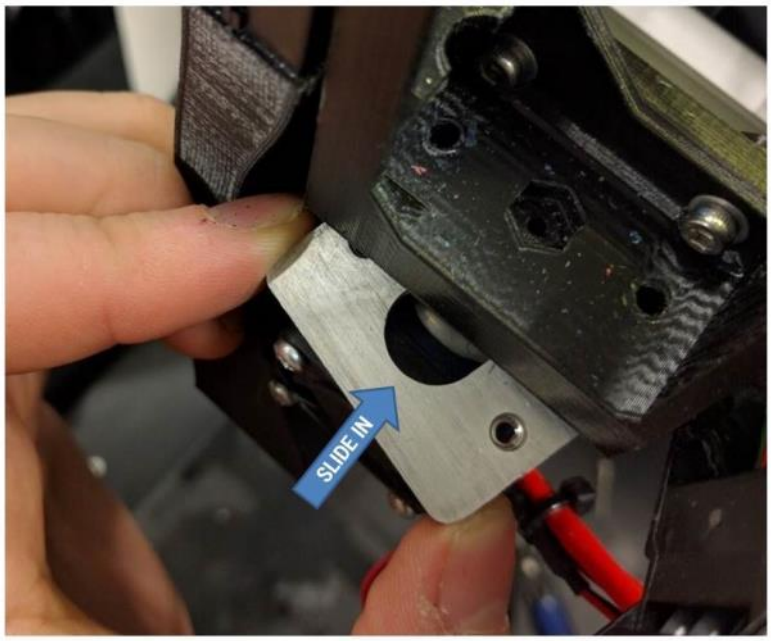
IMPORTANT: Make sure the PTFE liner is present in the top of the print head! When the head is removed these can fall out and sometimes people don't notice. The print head will not perform properly without this liner!



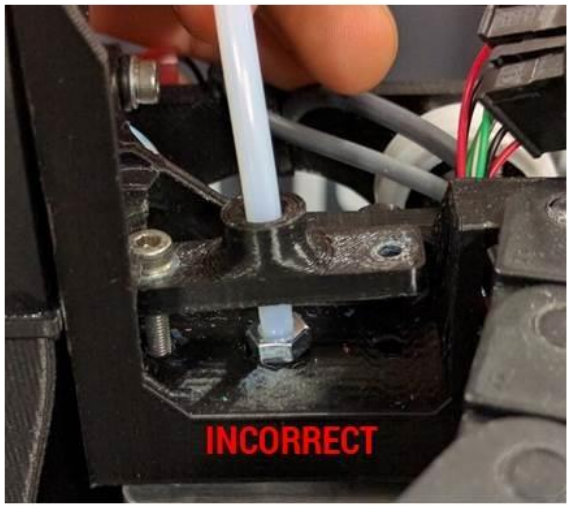
Press the print head into the pocket on the underside of the part. It should be a light press fit so you can press it in and then it will stay put by itself. Orient the print head so the flat face of the heater block faces forward and the wires exit on the right side.

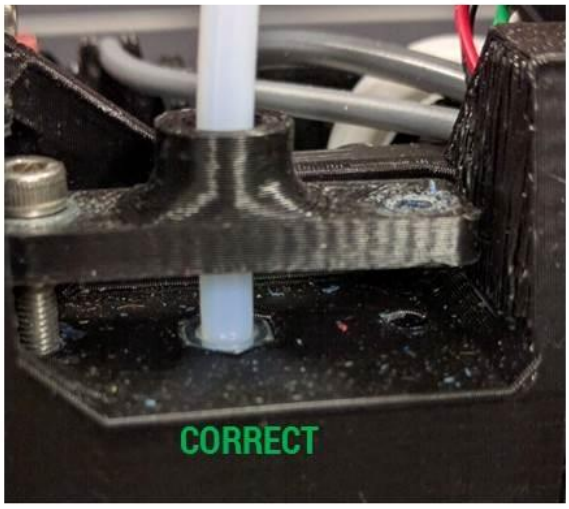


Slide the clamp plate in. Note that the PEM nuts go on the bottom face.



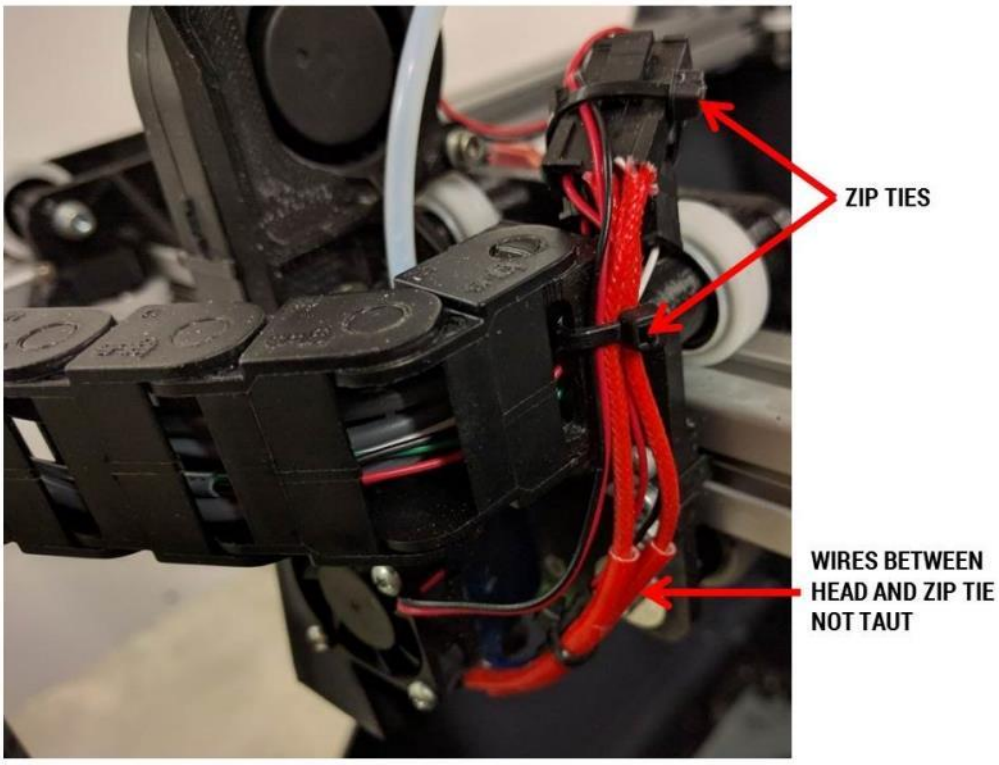
Push the tube retention plate down into position (make sure the feed tube nut is still in the pocket) and begin to thread the screws into the clamp plate.





Tighten the screws in an alternating pattern to make sure the print head is seated squarely.

Reconnect the electrical connectors. They are polarized so it's impossible to connect them backwards. Add zip ties as shown below to retain wiring.



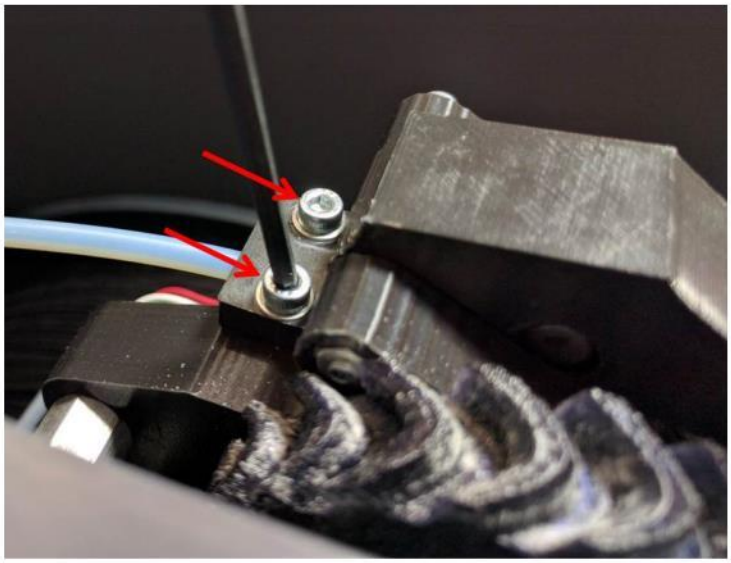
11.10 Removing & Installing the Extruder

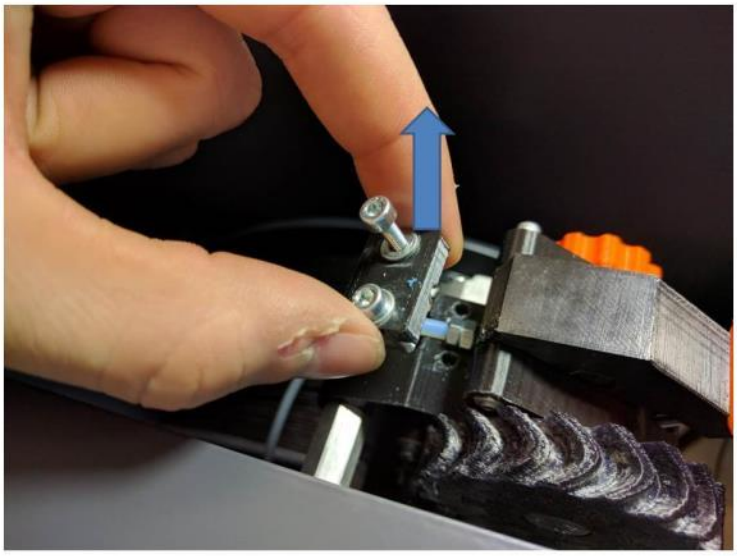
We recommend unloading filament before removing the extruder.

Printer must be **powered off.**

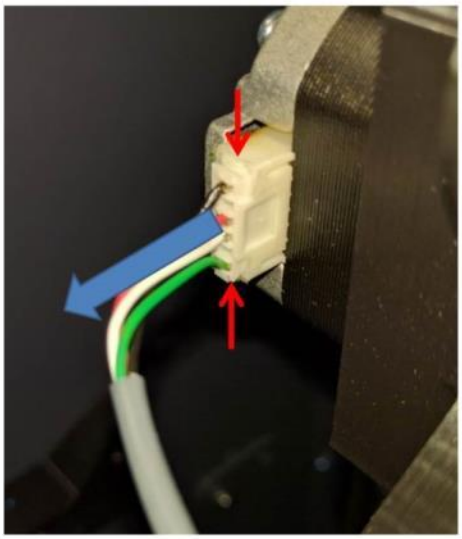
11.10.1 Removal

Use the 2.5mm wrench from your toolkit to remove the 2 M3 screws that hold the feed tube clamp in place. Lift the feed tube clamp straight up.





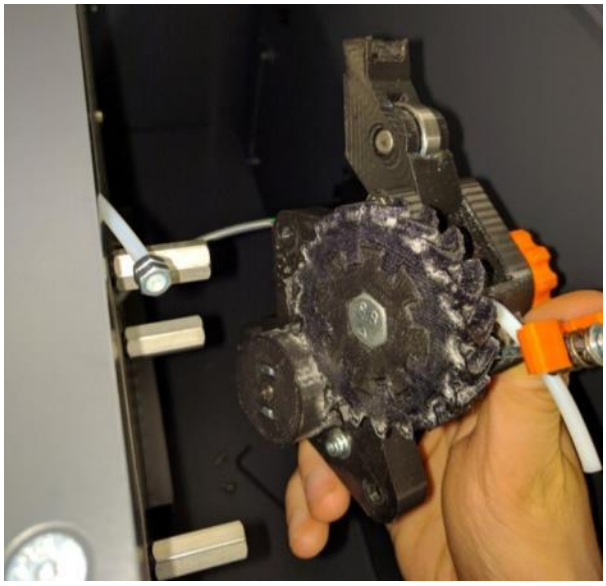
Remove the electrical connector from the motor. DO NOT tug on this connector by the wires as you may break them. Grasp the top and bottom of the connector body (there are some small flanges you can grab with your fingernail) and remove it from the motor. It does not have a latch; it's just a friction fit.



Use the 3mm wrench from your toolkit to remove the 3 M5 screws that hold the extruder onto the standoffs. You may need to use pliers to stabilize the standoffs so they don't rotate while you loosen the screws. Support the extruder with your free hand while you remove the last screw, so it doesn't fall.

Note: the standoffs are supposed to be somewhat loose on the sheet metal panel. This allows the rubber vibration dampers to do their job.

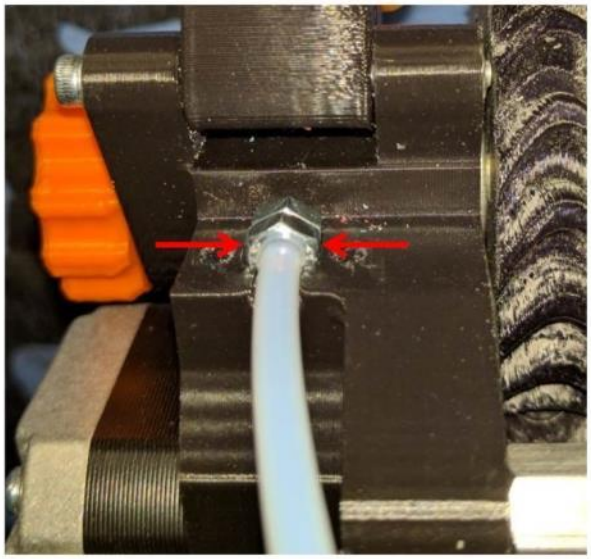
Now the extruder can be removed from the printer.



11.10.2 Installation

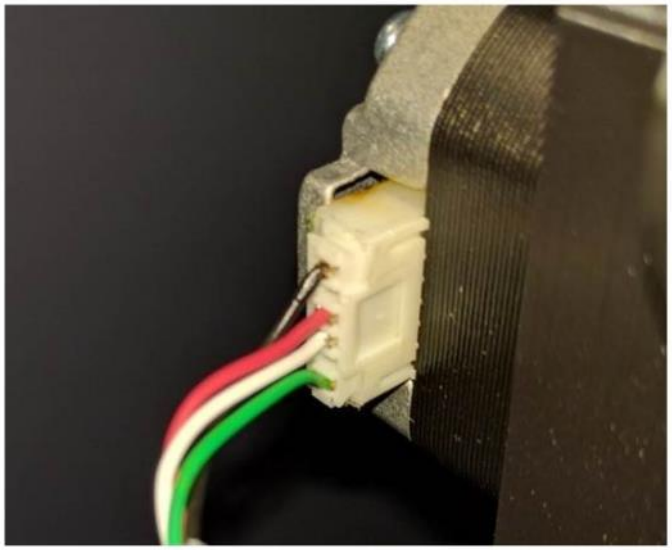
Install the 3 M5 screws that hold the extruder onto the standoffs.

Place the feed tube into the tube clamp. It's very important that the flats on the nuts are UP and DOWN. If the nuts are not oriented correctly the feed tube won't line up with the filament path and the printer will not operate correctly.



Install the clamp block and tighten the 2 M3 screws.

Install the electrical connector. Make sure you install it in the orientation shown in the picture below.



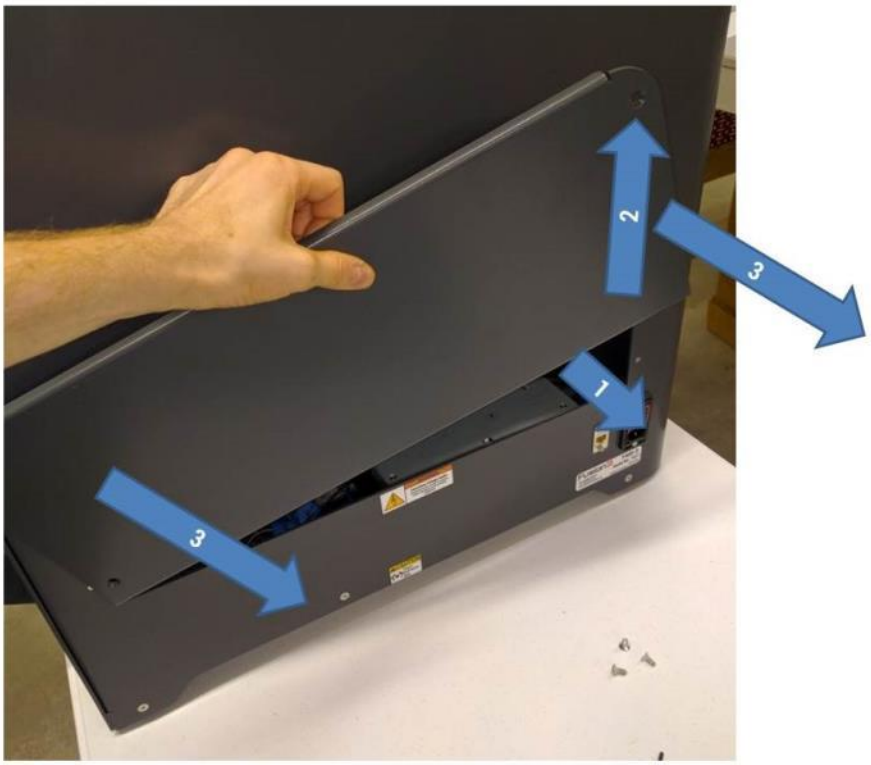
11.11 Accessing the Electronics Bay

WARNING: The electronics bay contains some high voltage components. Do not open the bay until you have unplugged your printer and waited 10 minutes for the power supply to fully discharge.

11.11.1 Removing the Door

Use the 3mm hex key to remove the 3 screws shown below.

Remove the door by lifting the back edge up and out, and then rotating the door to remove it from the printer.



Now you have access to the electronics bay.

11.11.2 Installing the Door

Start with the door positioned as shown.

Rotate and slide it into position. Make sure you:

- Do not pinch any wires between the door and the printer as you install it
- Ensure the tabs on the bottom edge are fully seated in their slots. The outside of the door will be flush with the outside of the printer when it's positioned correctly.

Reinstall the 3 screws.

11.12 Updating Your Firmware

Periodically we may provide firmware updates for your printer. These updates will improve performance or add additional functionality to your F400. We will provide a .zip file containing the firmware binary and the tools to write it to the board. If needed, we'll also provide updated SD card files.

WARNING: This procedure involves touching or manipulating static sensitive components. If you have a ground strap, we strongly recommend you wear it. If you do not have a ground strap, keep 1 hand touching the metal chassis at all times to keep yourself grounded to the printer.

Tools Needed:

- 3mm hex key from your toolkit
- MicroUSB cable (same connector type Android phones use)

11.12.1 Prep

Power off the printer and unplug the power cord.

Remove the service door (see section 11.11).

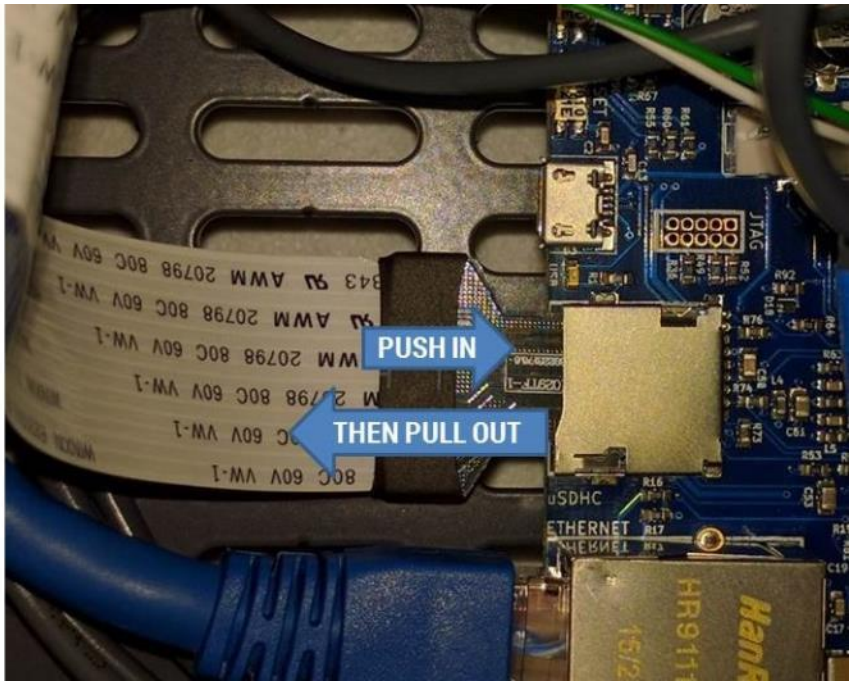
Unzip the files somewhere you can find them on your computer. In the firmware zip file will be:

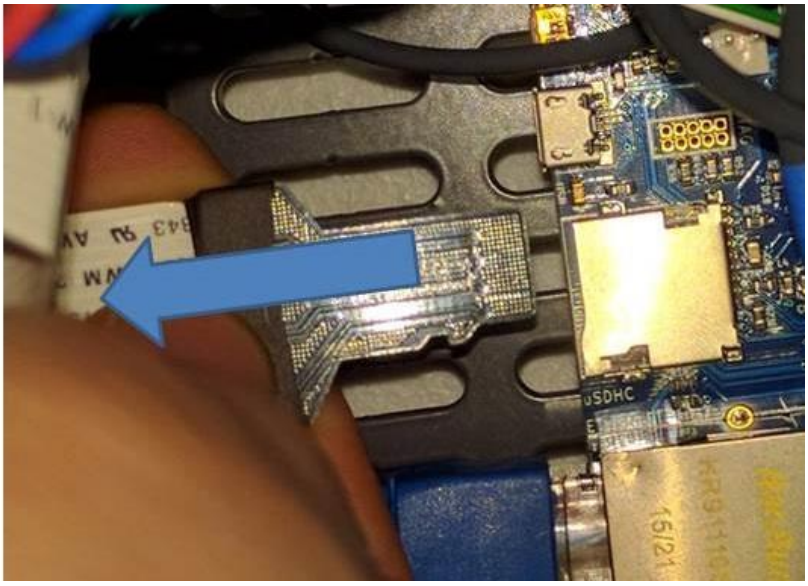
- The firmware .bin file. This will usually have a name like "RRFW_4-1-16.bin" although our naming convention may change in the future.
- Bossac.exe; which is the program that actually uploads the firmware to the printer.
- RunMe.bat; a batch file you will run to start the firmware upload process.

11.12.2 Connect USB Cable

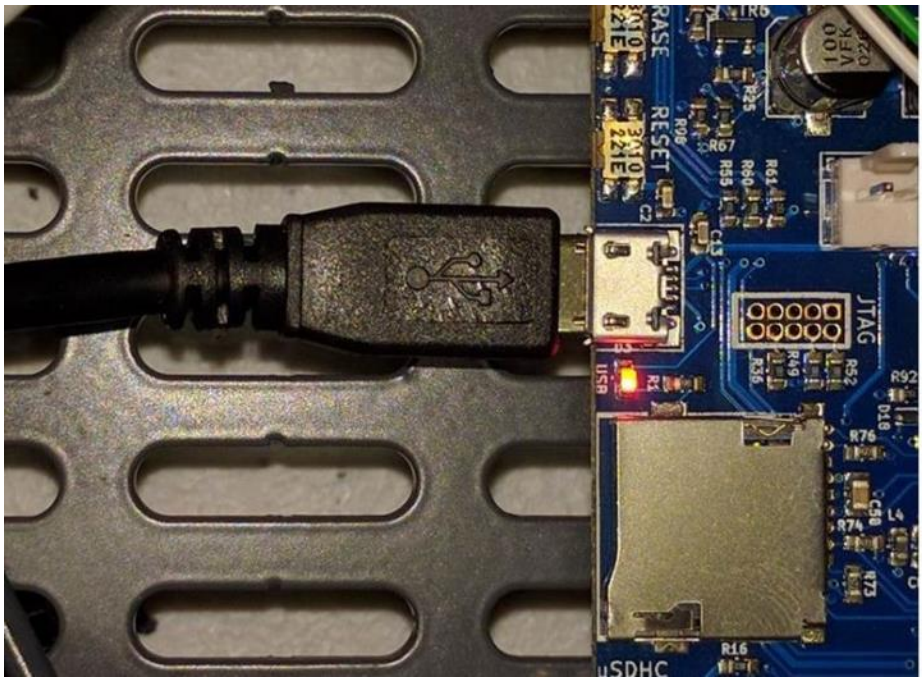
The control board is located in the front of the electronics bay. The USB connector is located on the front edge of the board.

In order to insert the USB cable, you need to remove the SD card extension cable. Gently push on the connector to release it, then gently pull it free from the socket on the board.





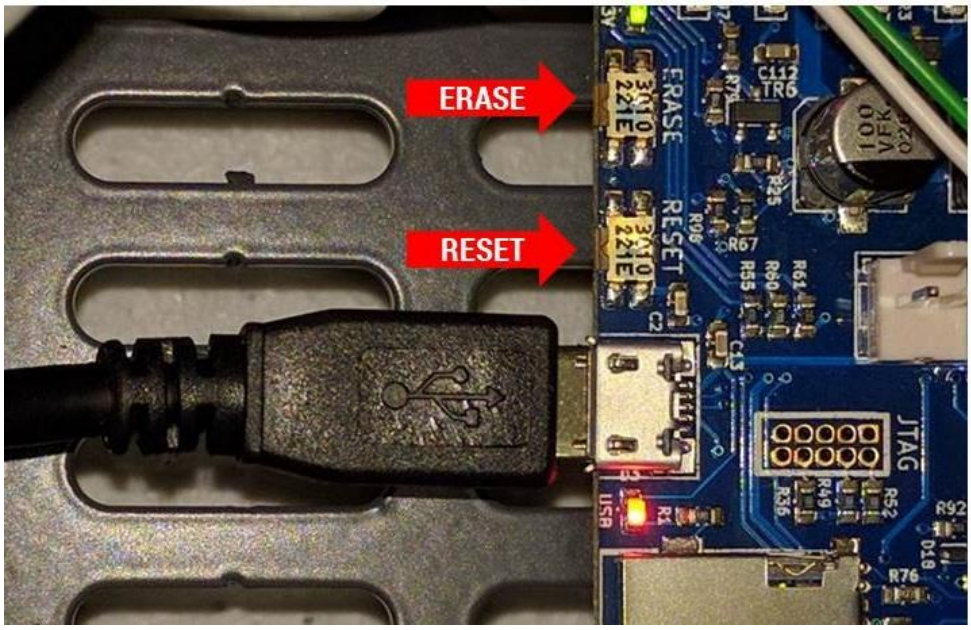
Now you can insert the USB cable. The wide side of the connector faces up.



Now connect the other end of the USB cable to your computer. Your computer may take a few minutes to install some drivers.

There are two small edge-mounted buttons on the front edge of the board. They are marked “RESET” and “ERASE”. Reach in with 2 fingers and do the following:

1. **Press and hold** ERASE
2. **Press and hold** RESET
3. Release ERASE
4. Release RESET



If this is the first time you've connected your computer to the board, it's likely it will now install additional drivers.

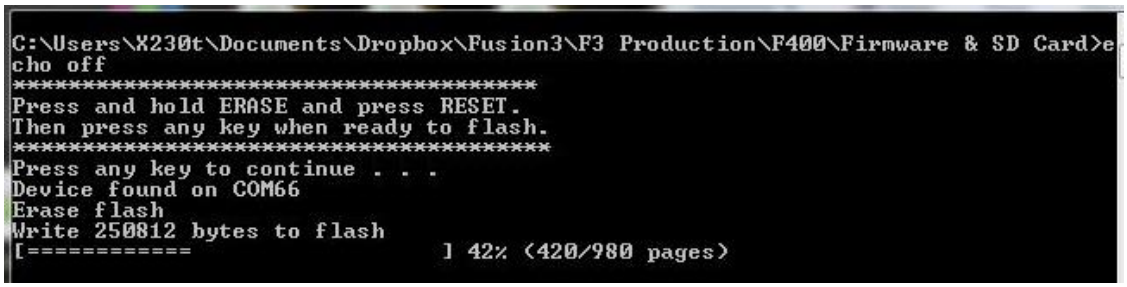
These buttons can be hard to press. If you have trouble, you can use something **non-conductive** to press them. **DO NOT USE** something like a screwdriver or other metallic object.

11.12.3 Upload the Firmware

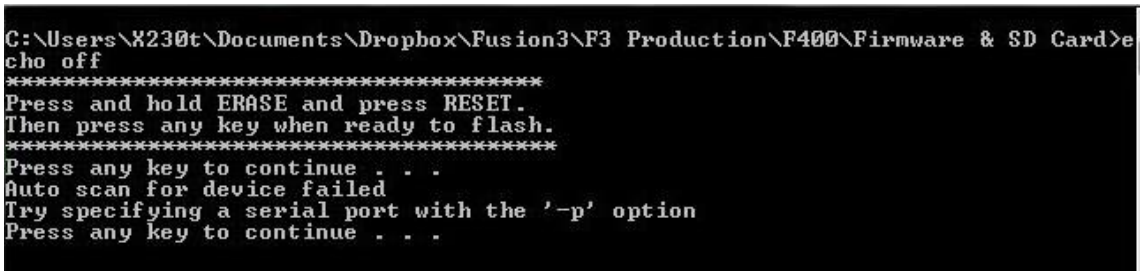
On your computer, navigate to the unzipped folder containing the firmware.

Double click on the "RunMe.bat" file. It will open a terminal window. It will instruct you to press the RESET and ERASE buttons (which we've already done; no need to do it again). Go ahead and press the enter key to continue.

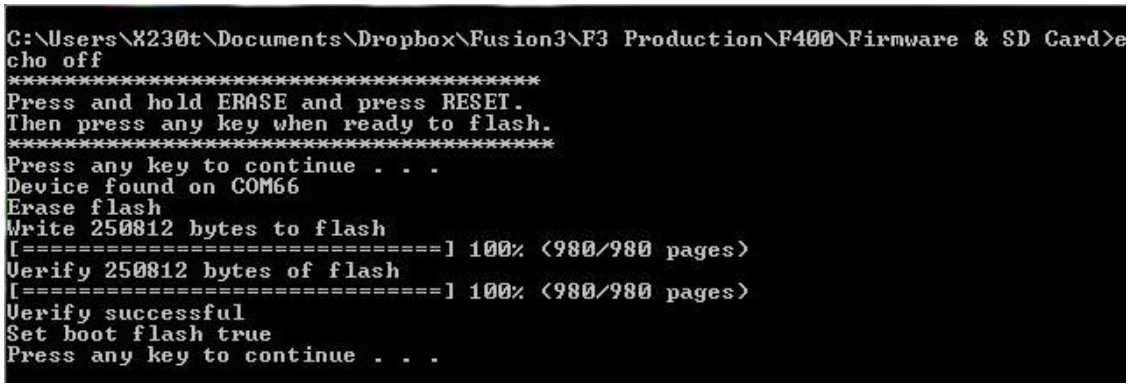
If everything has worked successfully, you will see a progress bar as it uploads the firmware.



If you see the following error message, it means the board was not successfully put into firmware write mode. Try pressing the RESET/ERASE buttons again.



The program will upload the firmware and then verify the upload. Once finished it will prompt you to press enter to close the terminal window.



Disconnect the USB cable from your computer.

Disconnect the USB cable from the board.

Reinstall the SD card reader wire. Make sure it's fully seated.

Reinstall the service door.

11.12.4 Update SD Card (if applicable)

Some firmware updates will not require changes to the files on your SD card, and some will. We'll provide instructions for each specific update covering what to do here.

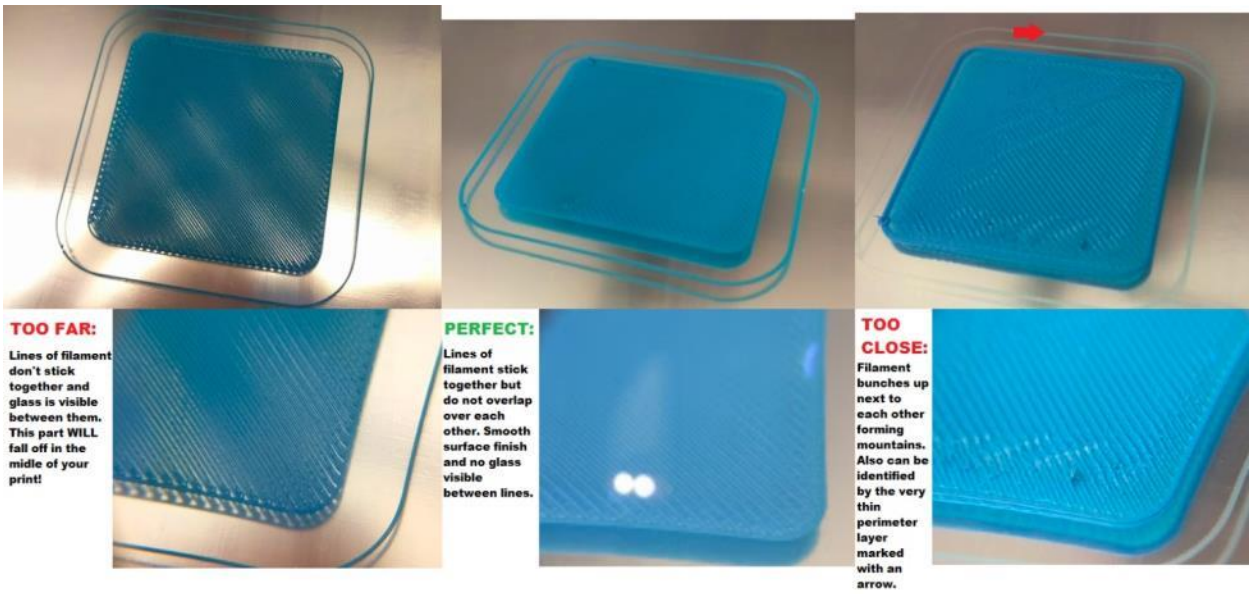
12 Troubleshooting

3D printing is a complex activity and there are a lot ways things can go wrong, or not quite work as intended. This troubleshooting section covers the most common issues, but it's not comprehensive. If you don't see anything that describes the problem you're having, please contact Fusion3 Support (see section 13).

12.1 Correct First Layer Height

First layer height refers to the height of the nozzle above the print bed when printing the first layer of your part. This is important because an incorrect first layer height can result in a failed print later. Your F400, thanks to its auto bed leveling system, takes most of the guesswork out of this, but it's still possible that adjustment will be needed.

The first layer can be too far away, correct, or too close as shown in the graphic below.



NOTE: Before making any adjustments, make sure your bed is level by running the Manual Bed Leveling steps in section 9.3.2.

Too Far Away

In extreme cases the filament squirting out of the nozzle won't stick to the bed at all. It will get dragged around under the nozzle and eventually form a ball of filament on the print head. If you see this, cancel the print and manually check your bed level.

In less extreme cases of too far away, you will see gaps between the traces laid down by the print head as shown on the left of the graphic.

Too Close

In extreme cases the nozzle will be pressed so firmly against the bed that no plastic will come out. This usually only happens if the bed leveling probe has been knocked out of alignment or damaged.

In less extreme cases you will see excess plastic bulging up in rows as shown on the right side of the graphic. Usually it's ok to let the print continue if you see something like the picture in the graphic; your part will remain stuck to the bed just fine.

12.1.1 How to Adjust

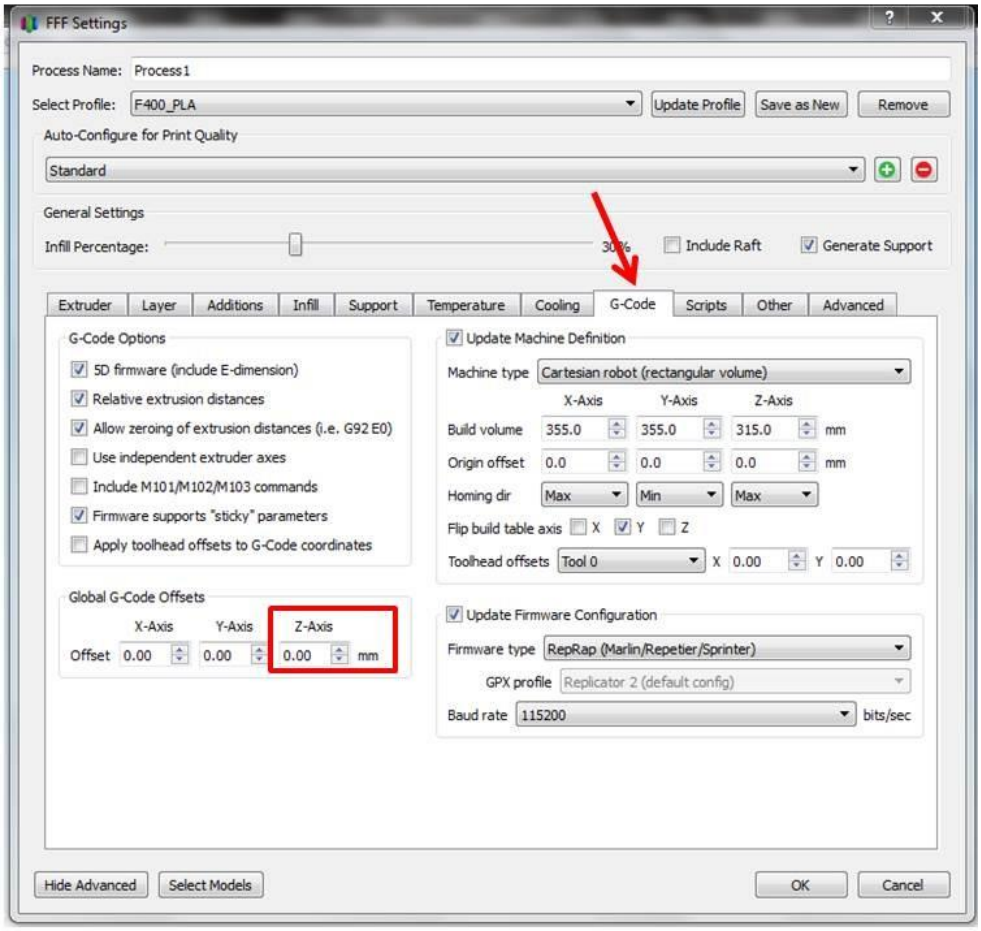
We have several tools available to adjust the first layer height:

- The probe offset value in config.g
- Material-specific offsets in each profile in Simplify3D
- Physically adjusting the bed

Which one is best to use depends on what you're experiencing. Some helpful guidelines are below:

- If you see an incorrect first layer height across multiple materials, adjust the probe offset (see section 11.7.1).
- If you see an incorrect first layer height with just one material, adjust that material's gcode offset (see below).
- If you see inconsistent first layer heights, or one area of the bed is too close and another area is too far away, manually check the bed level (see section 9.3.2).

12.1.2 Using the Gcode Offset



On the “gcode” tab, you can adjust each material’s offset individually.

- A negative number will make the first layer closer to the bed.
- A positive number will make the first layer further away.
- Adjust this in 0.05 increments.
- Make sure to click “update profile” to save your changes when you’re done.

13 Getting Help

Two ways to contact Fusion3 Customer Support:

- support@fusion3design.com
- 877-452-0010 extension 2

Our support line is staffed M-F 8am to 5pm Eastern time. Within these hours, our goal is to respond to issues within an hour.

If you run into something that isn't covered in this manual, please contact us first. Many issues we see are caused by people guessing on how to fix an issue, and as a result things get damaged worse.

Your printer comes with free lifetime phone and email support. That means that even out of warranty, you can contact us for help diagnosing if there is a problem with your printer.