DeltaMaker 3D Printer
Getting Started
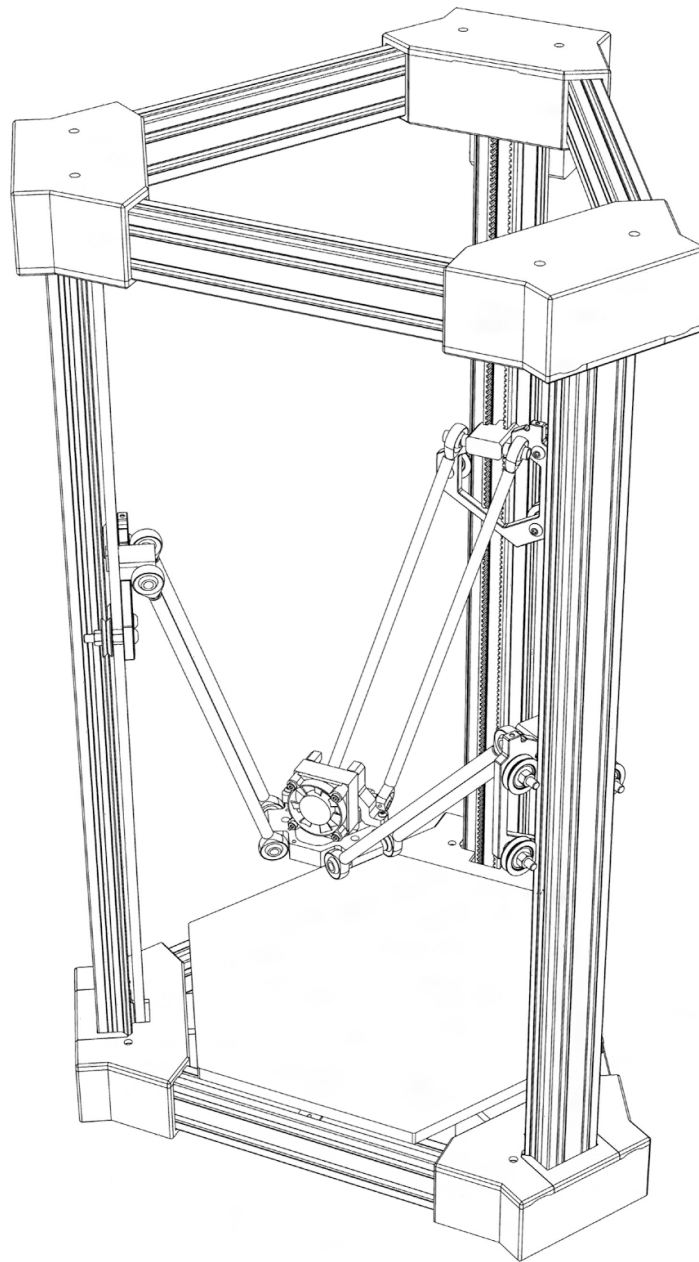
Last Updated: July 2017

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Welcome

This guide is designed to get you ready to start using your DeltaMaker 3D Printer. Even if you are familiar with other desktop 3D printers, it is important that you read through this guide, as there are several unique features on your DeltaMaker 3D Printer.

In section 1, you will learn how to safely unbox the DeltaMaker 3D Printer, and how to set it up. Sections 2 will show you how to calibrate you DeltaMaker 3D Printer. In section 3 and 4 we will discuss printing your own 3D objects. Section 5 includes tips for achieving the best results from your DeltaMaker 3d Printer.

The entire DeltaMaker Team is excited to welcome you to the world of 3D printing. By following the instructions in this guide, you are ensuring that you get the most out of your DeltaMaker 3D Printer, and will enjoy trouble-free 3D printing as you make cool things.

CAUTION: The DeltaMaker 3D Printer generates very high temperatures and contains moving parts that can cause injury. Never reach inside the DeltaMaker while it is operating. Always allow the DeltaMaker to cool down before touching the Extruder print head in the center of the machine. Do not leave the DeltaMaker unattended while it is operating.

Section 1: Unpacking/Setup

Removing the printer from the box

Please be very careful when removing your DeltaMaker 3D Printer from its shipping carton. When lifting your DeltaMaker 3D Printer out of the carton, be sure to hold it by the aluminum frame only. Never lift or pull on any of the wires or tubes that extend from the top of the printer frame to the print-head.

1. Carefully remove the foam packing material from the box.
2. Remove the Accessory Box. It includes the build plate, power supply, and other items (see the Packing List for the complete contents).
3. Lift the DeltaMaker 3D Printer by grasping the aluminum frame. DO NOT pull on the wires, carriages, arms, print-head, or other components.

Installing the Filament Spool Holder

Install the filament spool holder into the filament spool holder mount on the rear of the printer.

Installing the Acrylic Build Plate

Attach the acrylic build plate to the magnetic mounts on the base of the DeltaMaker 3D Printer. Make sure all three magnets are in contact with the mounting hardware on the acrylic build plate, and it is parallel to the front edge of the printer (the front edge is on the opposite side from the spool of PLA).

Plugging-in the Power Supply

Plug the power supply into the power connector on the DeltaMaker 3D Printer and turn on the DeltaMaker 3D Printer using the switch above the power supply connector.

It is important to note that the power cord locks into place once it is plugged into the DeltaMaker 3D Printer. In order to remove the power cord, do not yank or pull hard. Simply slide the black "box" around the end connected to the printer away from the printer to unlock. While holding this position, the cord should be easy to remove.

Connecting to the OctoPrint User Interface

Turn on the power switch on the back of the DeltaMaker 3D Printer. Wait a couple of minutes for the printer software to complete its startup process.

1. The DeltaMaker 3D Printer will broadcast its own WiFi hotspot called "DeltaMaker_WiFi_nnnn", where "nnnn" is the 4 digit serial number of your DeltaMaker 3D Printer. Connect to it using the password listed on the printed information included with your printer. You also have the option of connecting the DeltaMaker to your network (router) using an Ethernet cable. The Ethernet connector on the DeltaMaker is located near the the power switch.
2. In Google Chrome, or other modern web browser, browse to deltamaker-nnnn.local/ Be sure to omit the www and enter the correct 4 digit serial number of your printer, the same as in the WiFi name. If you are unable to connect to deltamaker-nnnn.local/, you may need to install iTunes to use the bonjour service (this is what allows you to connect directly to the DeltaMaker 3D Printer).
3. If you are still unable to connect, you may access the printer using its numeric address, by browsing to http://192.168.10.1/

    Note: Microsoft Windows users may also open OctoPrint from your File Explorer under Network.
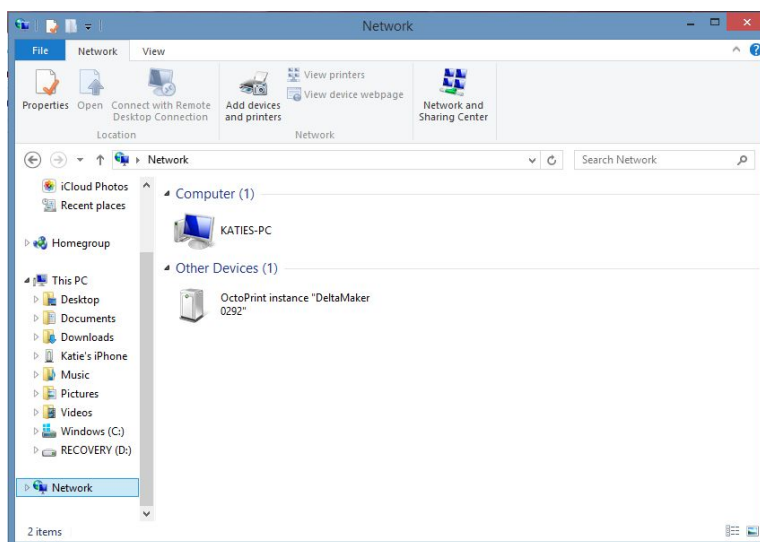
4. If you have not previously done so, please select the Login function in the top-right corner of the screen. The username is "admin" and the password is included on the printed information you received with your printer.
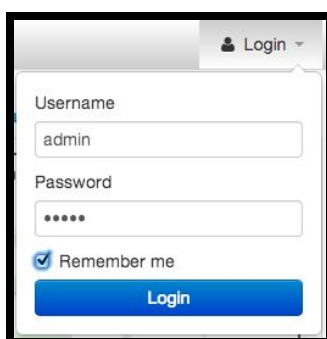
Section 2: Calibration

The DeltaMaker 3D printer is calibrated at the factory before shipping. The only calibration adjustments that are needed during normal usage is the automatic bed mapping (levelling), and adjusting the height of the nozzle. Both of these adjustments are performed with the build plate attached to the printer.

When to perform these adjustments?

1. Auto Bed Mapping - this is only needed whenever the built plate is removed and reattached to the printer.
2. Nozzle Height Adjustment - this is needed whenever the print head (or just the nozzle) is removed and replaced on the printer.

These calibration adjustments are always performed with the build plate attached to the printer. Make sure the acrylic build plate is positioned flush with the front edge of the printer (the front edge is on the opposite side from the spool of filament). In order for the auto bed mapping to work properly, the build plate must be securely attached to the printer.

NOTE: This procedure should not be done while the print head is hot. **If the nozzle is hot when you perform the calibration adjustments, you could permanently damage your acrylic build plate.** The recommended print head temperature for these adjustments is 100°C. At this temperature, the build plate will not be damaged if the nozzle accidentally comes into contact with it.

Automatic Bed Mapping

Under the Control tab, click "Auto Bed Mapping". This process will take about a minute. You will see the nozzle moving to the bed in several locations around the bed. This is how the printer maps out the bed and knows exactly where it is. This process needs to be done every time the build plate is removed or the printer is moved.
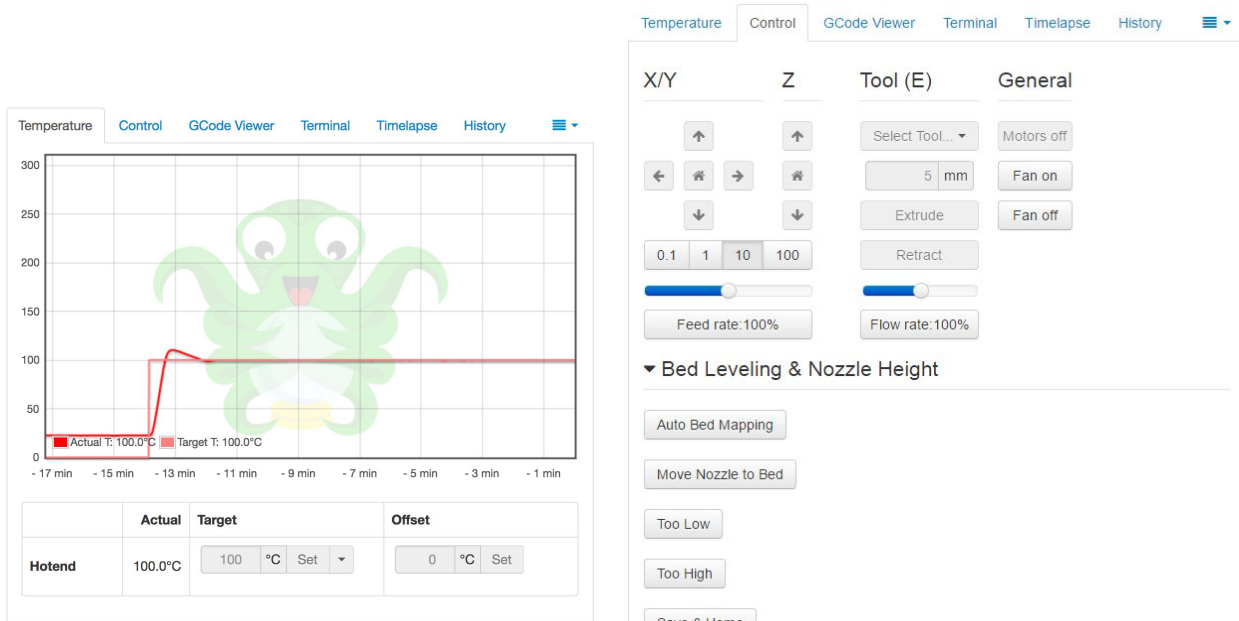
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Setting the Nozzle Height

The nozzle height adjustment is done to ensure that the print head will not touch the build plate when it is lowered to the lowest position.

1. Confirm that the print head temperature has levelled off at 100°C.
2. Place a regular sheet of paper on top of the build plate, and select "Move Nozzle to Bed". The print head will first move to the "home" position and then move down to the build plate.

3. After the nozzle is lowered, grasp the corner of the sheet of paper and attempt to move it; you should be able to move the paper under the nozzle with a little or no friction.
4. If you can move the paper without any friction, it either means that the nozzle is set correctly, or the nozzle is too high. To confirm that the nozzle is not too high, we will initially lower it, by clicking "Too High" until the nozzle touches the sheet of paper, and then raise it slightly.
5. With the nozzle touching the sheet of paper, click the "Too Low" button once, to raise the nozzle slightly, and attempt to move the sheet of paper again.
6. Repeat the above step until you feel little or no friction as you move the sheet of paper.
7. Finally, click "Too Low" one more time to set the nozzle height above the build plate exactly the thickness of the sheet of paper.

NOTE: If you have recently installed the print head, or changed the nozzle, it may be necessary to click the "Too High" or "Too Low" button 10 or more times move the nozzle to the correct height.
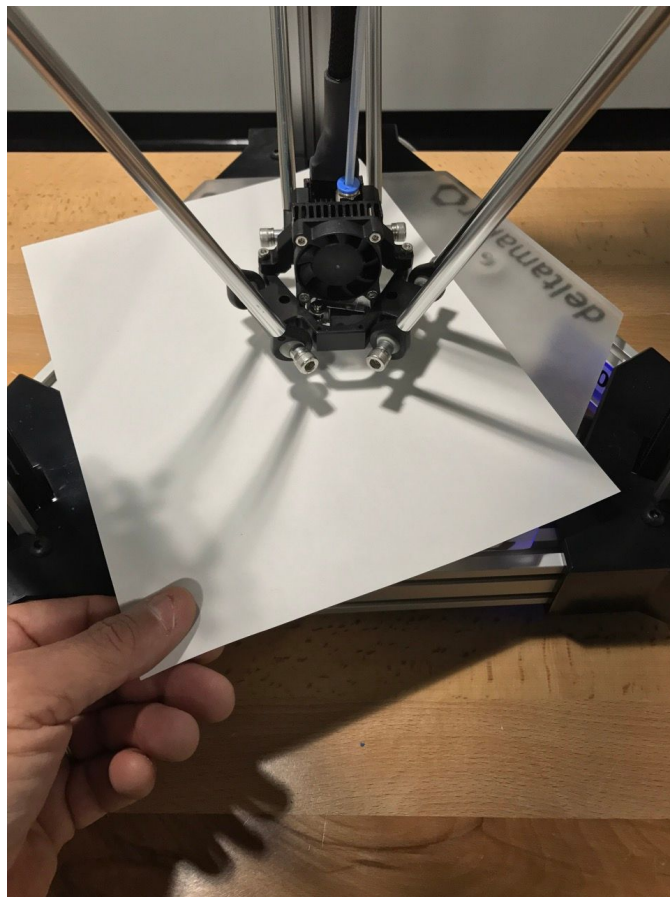
Saving the calibration adjustments

Click the "Save & Home" button to store the bed mapping data and the nozzle height adjustment in non-volatile memory in the printer. By doing so, you may omit the calibration step the next time you print an object on your DeltaMaker 3D Printer. This button also raises the print head to the "home" position.

Save & Home
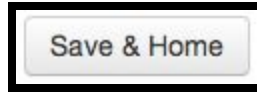
Section 3: Your First Print

Loading the Filament

1. Under the Temperature tab, select 230 degrees C from dropdown box for the hot end labeled "set". It is important to note that the nozzle gets extremely hot and should never be touched directly when the unit is on. Always use snips, pliers or other tools when removing scraps of PLA from the nozzle.
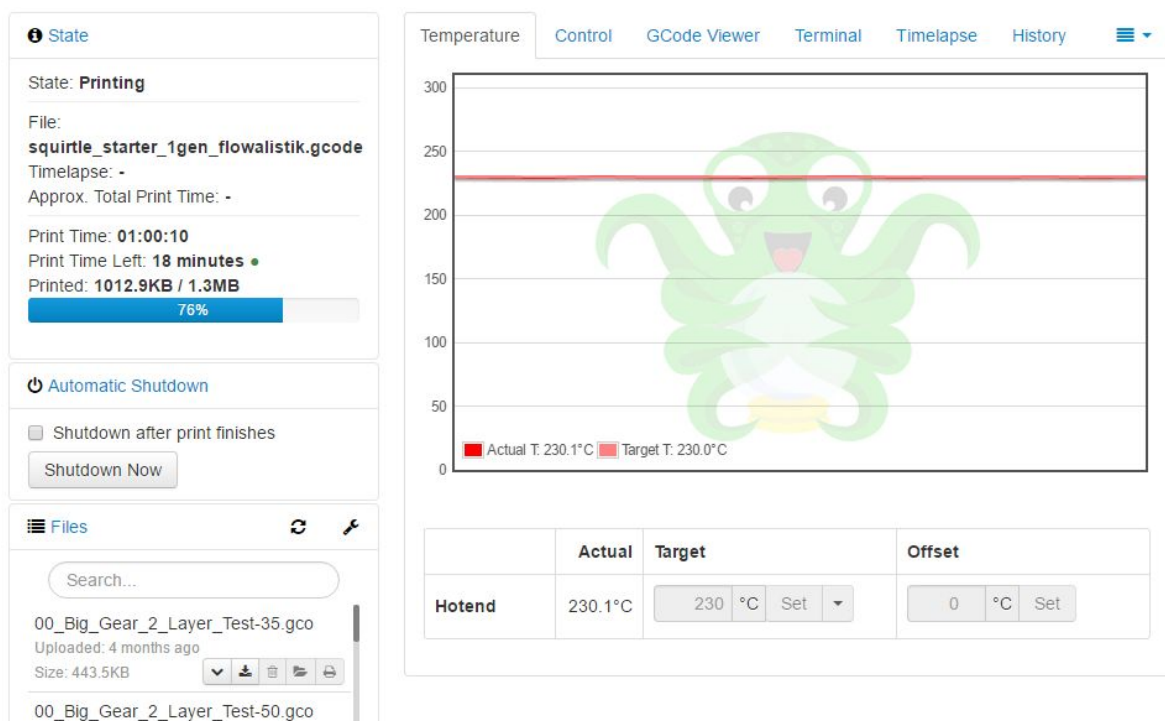
2. Snip the end of the spool of PLA (about .5" from the end or past any sharp kinks). You may find it easier to load if you snip at a slight angle.
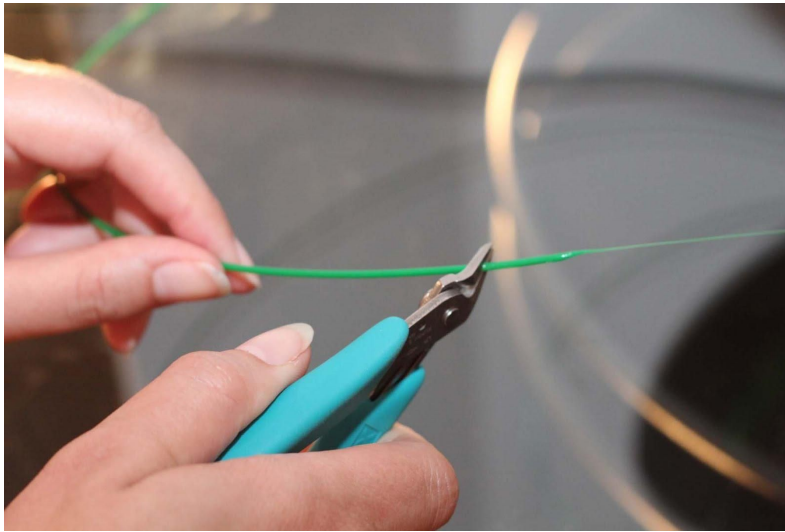
2. Straighten the first six inches of the PLA by gently bending it. The PLA does not need to be perfectly straight, but reducing any bends will make the PLA easier to load.
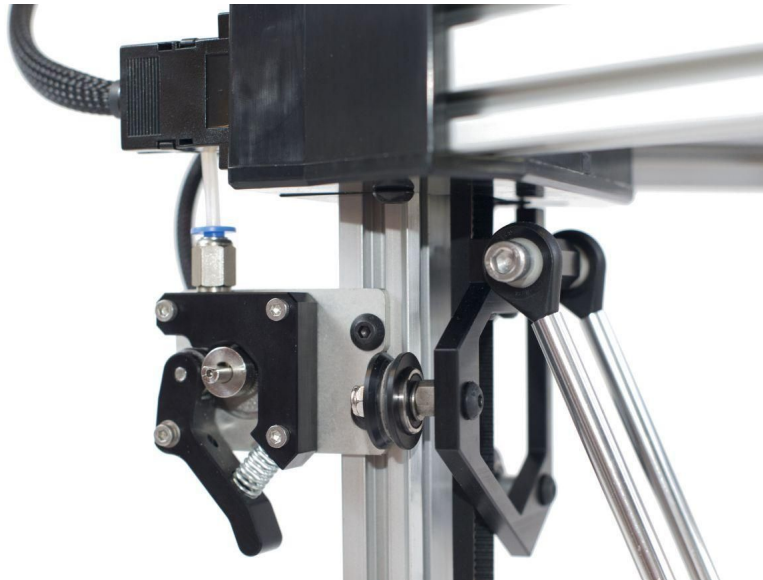

3. Slip the end of the PLA through the hole in the trigger.

4. Squeeze the trigger and push the PLA up into the Bowden (clear) tube. Keep in mind that getting it past the opening may require turning the PLA or adjusting hand position. Think

of it as trying to slide something through multiple holes that have been aligned. Resistance means that it is caught on an edge just inside the opening and you will need to turn the PLA or reposition your hand. You can try snipping flat or at an angle to see what works best for you.
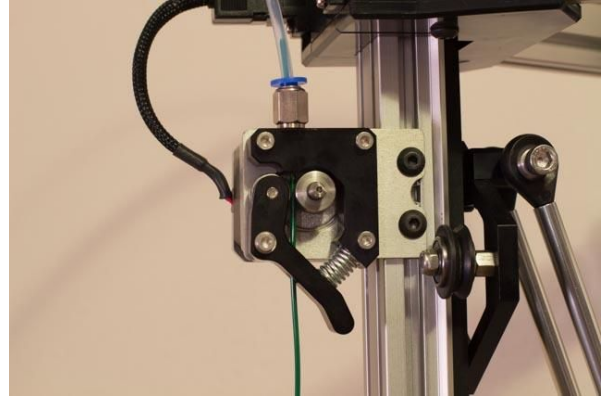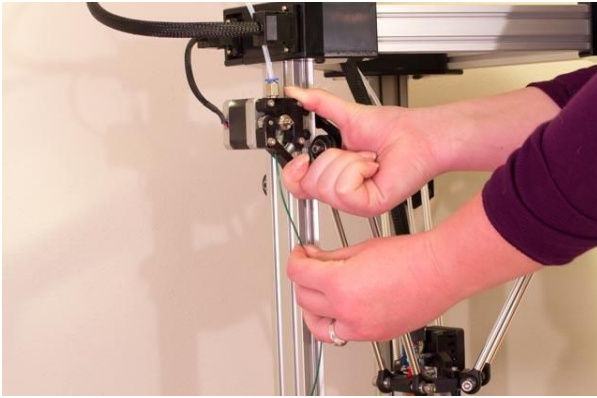
5. Once past the opening, you should be able to see the PLA going through the tube toward the extruder. You will feel the PLA stop, but you aren't quite there just yet. Keep feeding the PLA while squeezing the trigger.
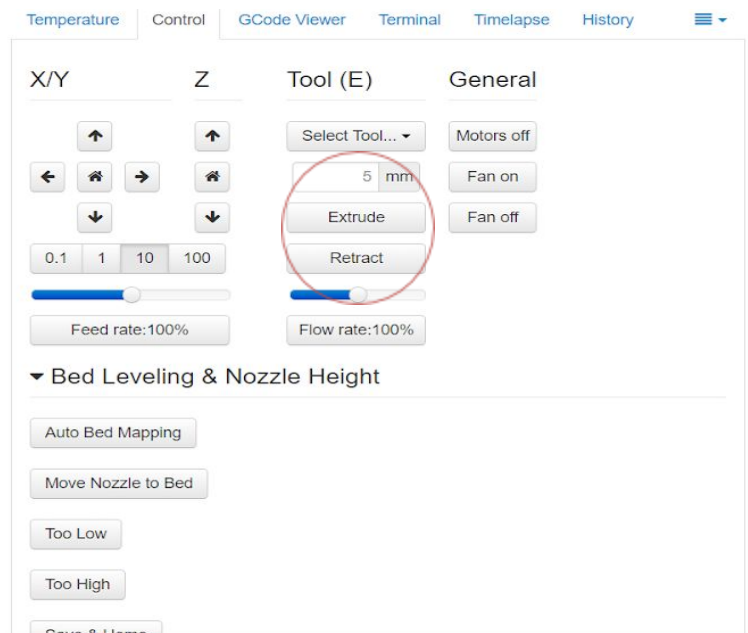
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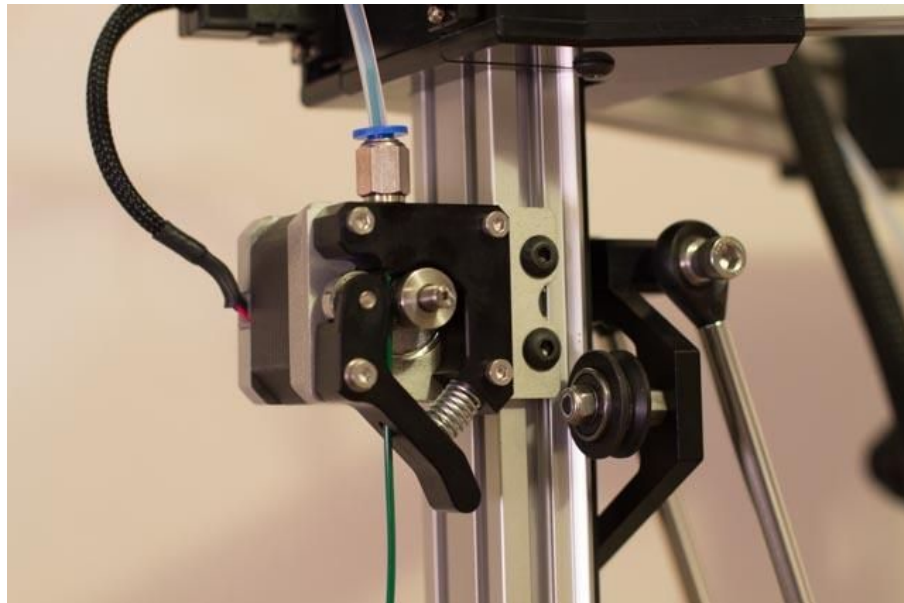
6. Slowly and easily push the PLA past the resistance point at the end of the tube. You should be able to feel it give way and then see PLA flowing from the print head.
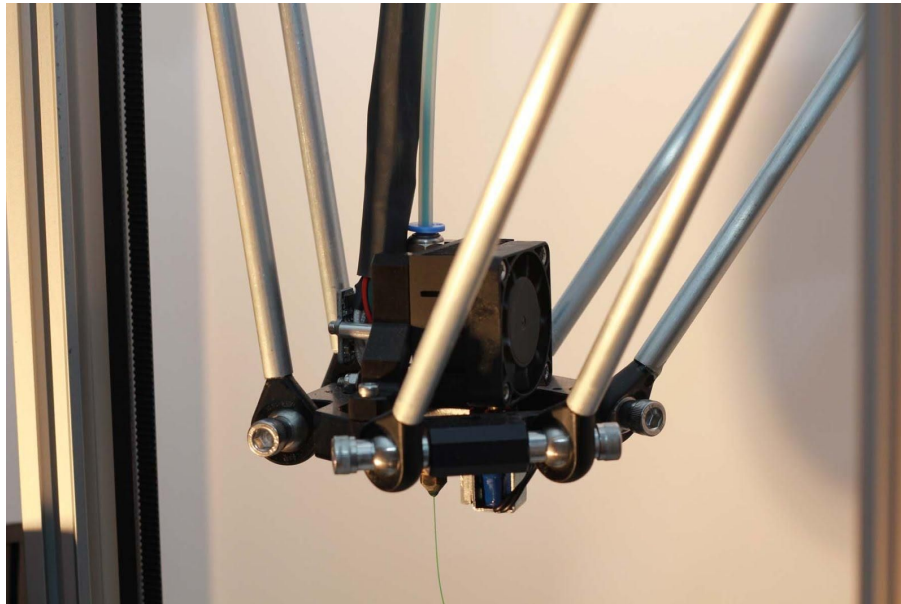
7. It is possible to load PLA with the unit cold, but NEVER remove PLA from a cooled unit. Make sure the printer is warmed up to at least 100c when you remove or change the PLA.

Preparing to Print

Once your unit reaches the correct temperature (you can check this on the temperature tab), go to the control tab and click on the "extrude" button. Let it sit at temperature for a couple of minutes for best results. You should extrude at least 20mm of PLA. Once you have flow, then you are ready to print.

Printing a Sample Object

For your first few prints, we recommend that you print from the sample files preloaded on your printer. Your DeltaMaker 3D Printer is pre-loaded with some sample 3D objects, so you may begin printing immediately. Many of these are also available on thingiverse.com.
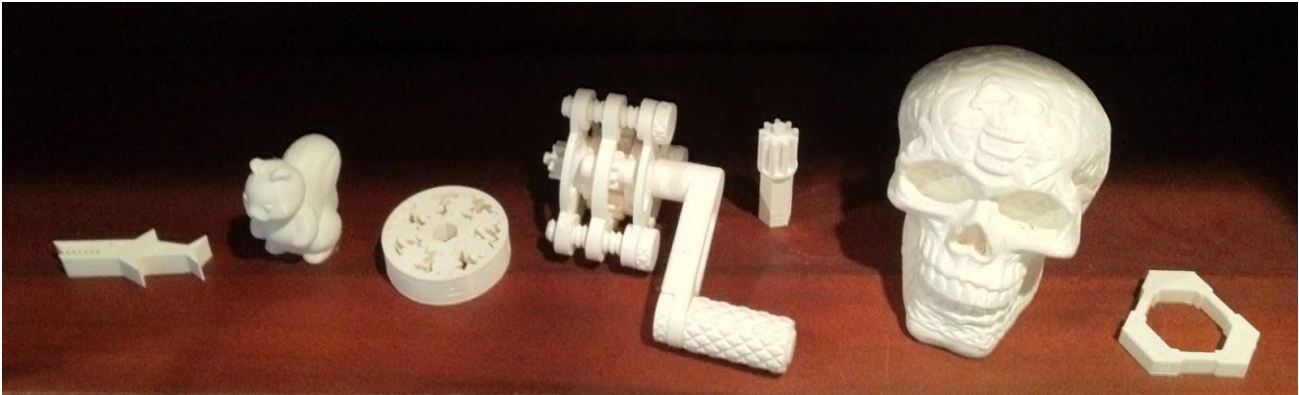

Pre-Loaded Samples
These files are displayed on the left side of the OctoPrint screen.
- 01_Calibration_Cube
- 02_DM_Logo
- 03_Mr_Jaws
- 05_Squirrel
- 06_Tree_Frog
- 07_MAKE_Robot
- 08_Big_Gear
- 09_Clock_Gear
- 10_DM_Gear_Bearing
- 11_Planetary_Gear_Set
- 15_Printable_Wrench
- 17_Better_Whistle

These preloaded samples will need to be sliced, and turned from an .stl file to a .gco or GCode file in order for Octoprint to communicate with the printer to successfully print the item.

You can learn how to slice these items with the onboard slicing program that comes with Octoprint by following this slideshow here.
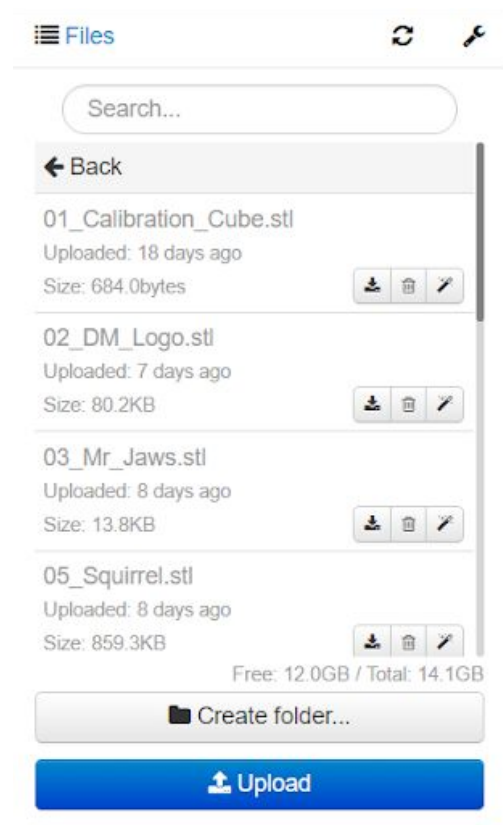
Printing Flow

1. Once the items have been sliced into a .gcode, choose a file and click on "print". The printer may not begin printing immediately. DO NOT place your hand on the bed, as the DeltaMaker 3D Printer may begin printing at any time and contact with skin will cause a severe burn.
2. Keep in mind that the estimated print times are only estimates and are not meant to be exact. Actual print times may be longer or shorter.
3. You can watch the progress of your print in the "state" box which gives you current status, estimated print time, remaining print time, file size, and the name of the file being printed.
4. By clicking on the tab labeled "GCode Viewer", you can watch the progress of the file being printed layer by layer.
5. While your object is printing, you may continue to use the OctoPrint User Interface to monitor its progress, if you wish. Alternatively, you may close the OctoPrint window and use your computer for another purpose, or turn off your computer completely.
6. The DeltaMaker 3D Printer does not need to be connected to your computer to operate; it is fully functional as a stand-alone printer once the print has started.
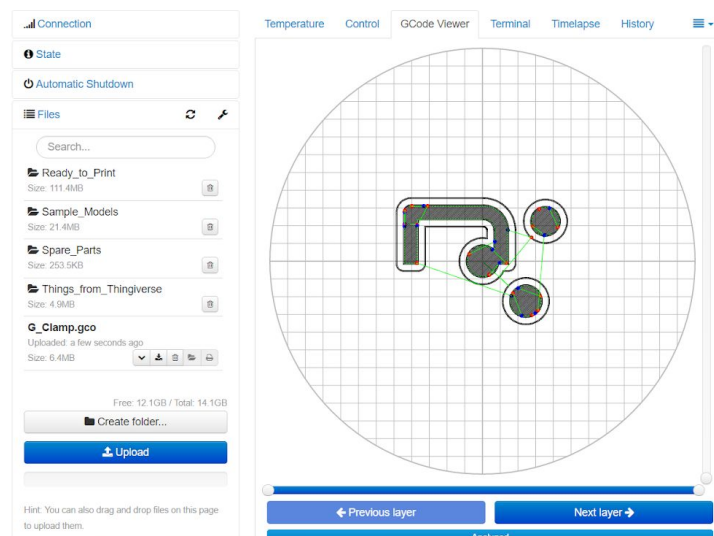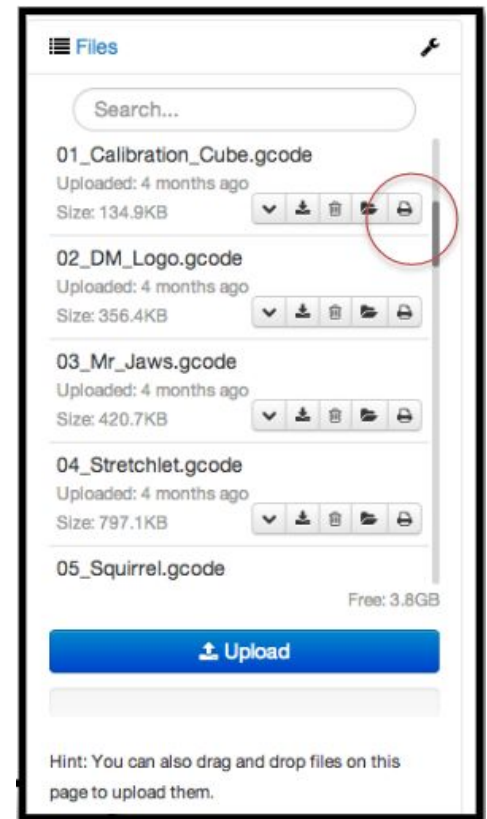
Unloading the Filament

Whenever you wish to change filament colors, or remove the filament spool from the printer, you should use the following procedure to unload the filament. If you plan to use the same spool of filament for your next print, you may leave the filament loaded in the printer while the extruder nozzle is cooling down. Always heat the nozzle to between 90 and 100 C before removing the filament.

The filament is unloaded at a lower temperature, by pulling the filament out of the extrusion nozzle, directly above the print head. The procedure is also called a "cold-pull" and will remove the filament from the inside of the nozzle. This is useful for removing old filament and debris, which can cause clogs, from the nozzle.

1. In OctoPrint, set the hot end temperature to 100 C.
2. Press the "home" button to lock the printhead at the home position.
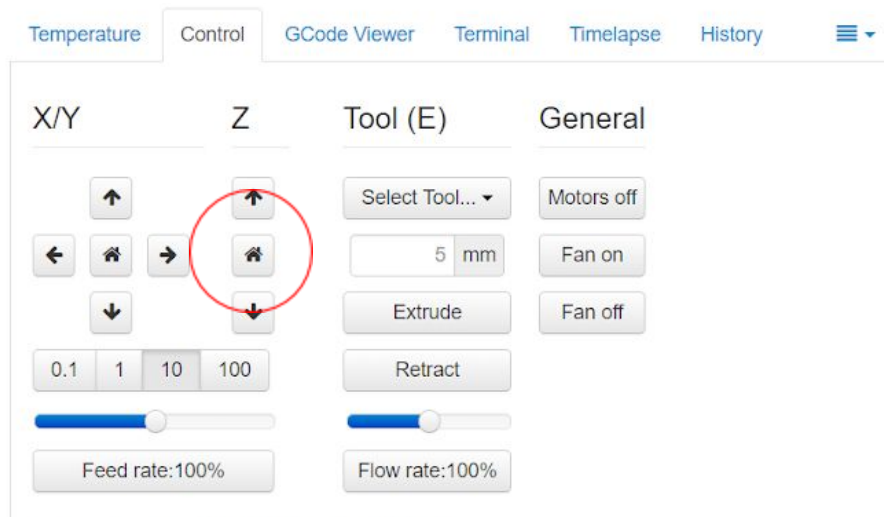
3. When the temperature is at 100 C, remove the filament guide tube (Bowden tube) from the top of the print head. This is performed by simultaneously pressing DOWN on the blue ring at the top of the print head while pulling UP on filament guide tube.
4. Continue pulling the filament guide tube up slowly until all of the filament is removed from the nozzle.
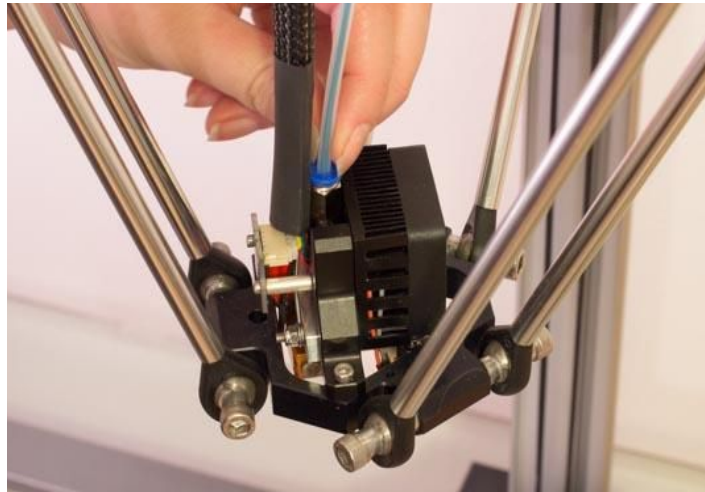
5. Snip off the filament just below the end of the guide tube, and reinsert the guide tube in the blue circle.
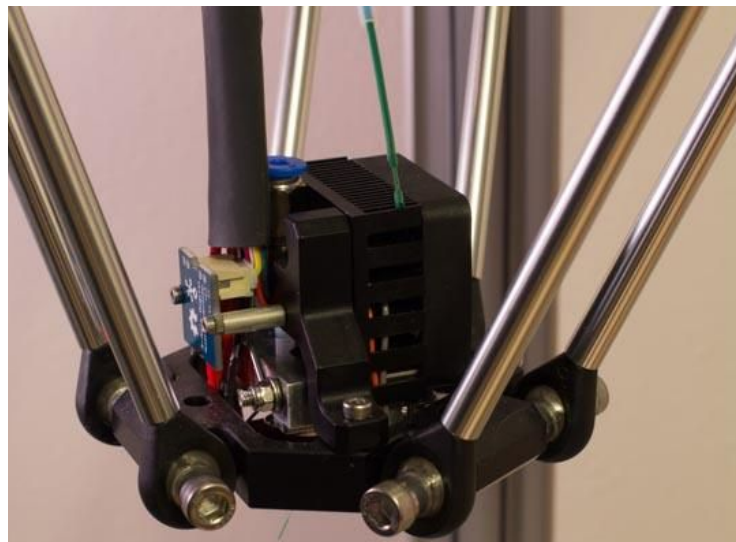

6. Recoil the filament on the filament spool

Shutdown Procedure

When you are finished with a printing session, you'll want to shut down your DeltaMaker 3D printer. Shutting down the printer conserves power and will help to protect the electrical components from power fluctuations. To properly shut down your DeltaMaker 3D printer, use the following step-by-step instructions. Failure to properly shut down your printer could result in damage to your SD card or other electronics. Most importantly, after completing the shutdown sequence, you must wait at least 30 seconds before powering down your DeltaMaker 3D Printer. The 30-second wait allows the internal computer to shut down. Failure to wait 30 seconds to allow the shutdown can irreparably damage the computer powering your DeltaMaker 3D Printer.

1. Ensure that the DeltaMaker is not printing and the nozzle is cool. If you have recently printed and the fan on the printer head is still bowing, the nozzle is not yet cool enough. The fan will stop when the nozzle is cool.

2. Select the "Shutdown" command from the System menu in OctoPrint or click the "Shutdown Now" button.
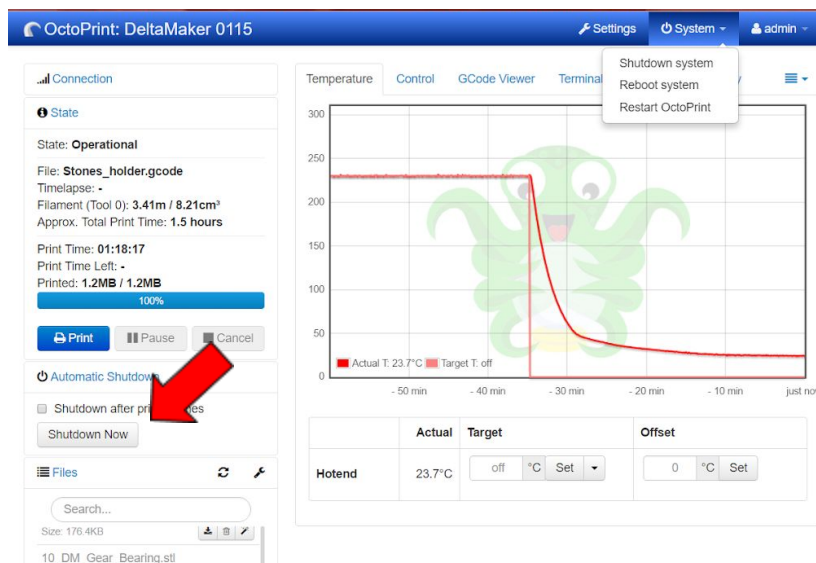
3. Select the "Proceed" button to confirm the shutdown.
4. After the confirmation message, you must wait at least 30 seconds, and then turn-off the power switch on the back of the printer.

Section 4: Printing Other 3D Objects

After you have printed a few of the sample objects included with your DeltaMaker 3D Printer, you will be ready to print objects of your own choosing. You may wish to download additional objects from Thingiverse, or design your own objects using 3D modeling software or a CAD program (computer-aided design).

To achieve the best results with your DeltaMaker 3D Printer, it is important that you understand the 3D printing "workflow" that should be used with your printer. The steps in this work-flow are outlined below and explained in further detail later in this section.
1. Begin with a 3D object in the correct (STL) digital file format.
2. Prepare the 3D object (STL file) for printing.
3. Send the 3D object to the DeltaMaker 3D Printer.
4. Print the 3D object.

Download an Object

Begin with a 3D object in the correct (STL) digital file format. The industry standard digital file format for 3D printing is the STL file. STL files may be downloaded from a variety of website, or created by 3D modeling and CAD programs.
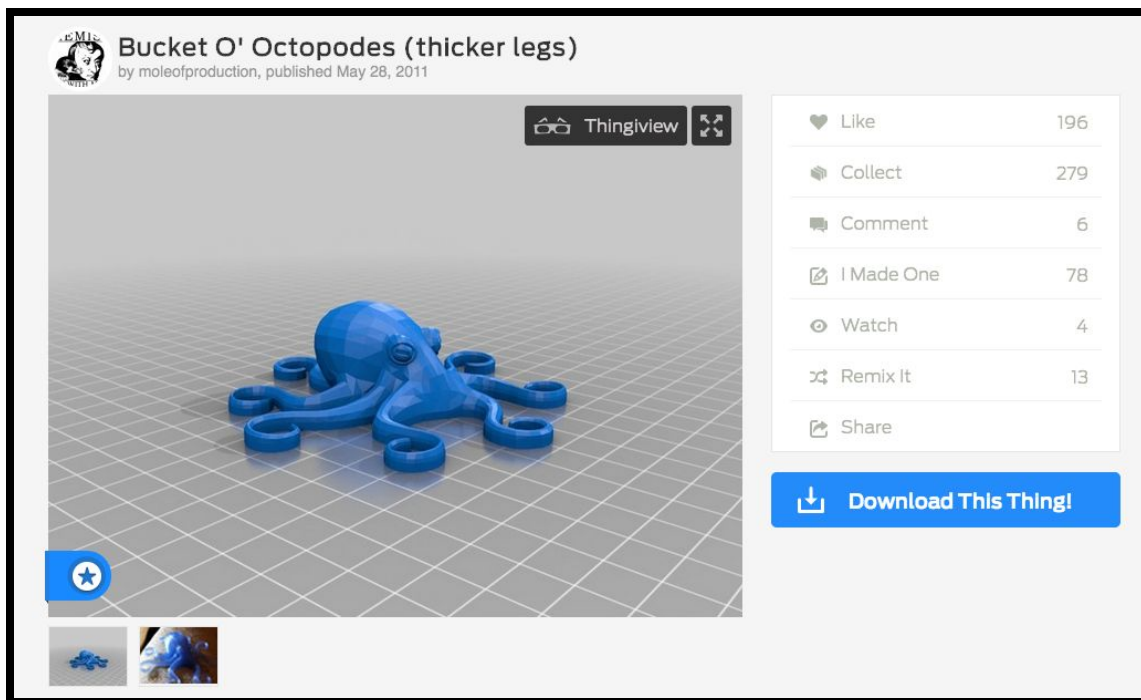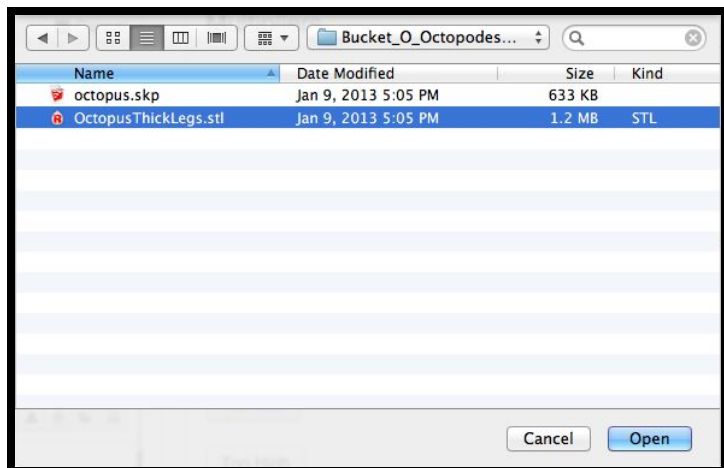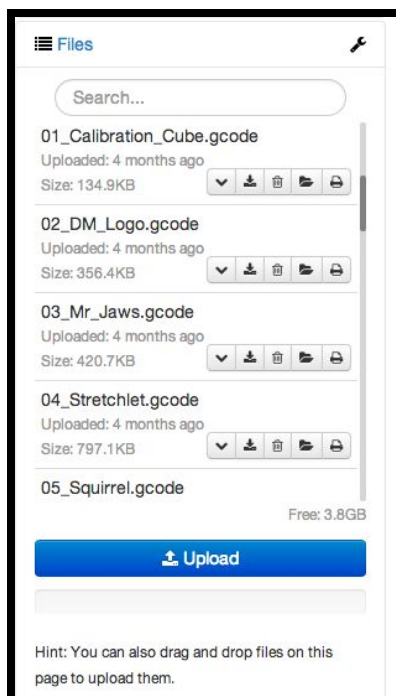
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Prepare the Object

For simple 3D models, such as this one, no preparation for the model is required. The STL file may be sent directly to the DeltaMaker 3D Printer for printing.

In this step, the STL file is checked for errors and automatically repaired if necessary. The "repaired" STL is then converted to a set of detailed instructions that will be used to control the motion of the DeltaMaker 3D Printer while the object is being printed. These detailed instructions will be stored in the digital file format called GCode.

To print more complicated 3D models, please see our documentation on "slicing" for detailed instructions.

Send Object to Printer

The "Upload" button is used for sending 3D models (STL or GCODE files) to the DeltaMaker 3D Printer. In the example below, the upload button is pressed, and the desired STL file is selected. Your printer includes built-in memory to store hundreds of 3D objects. This allows you to easily print additional copies of your 3D objects in the future.   After you upload your object, it will appear in the printer's file list, alongside the sample objects included with your printer.
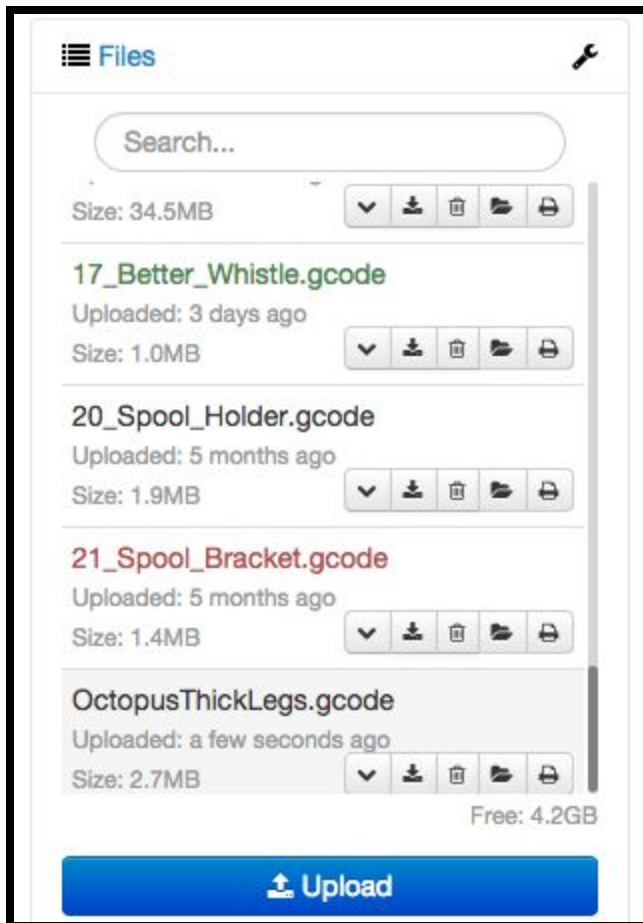
The DeltaMaker 3D Printer will immediately begin "slicing" the 3D model. In a few moments, the model will be ready for printing.
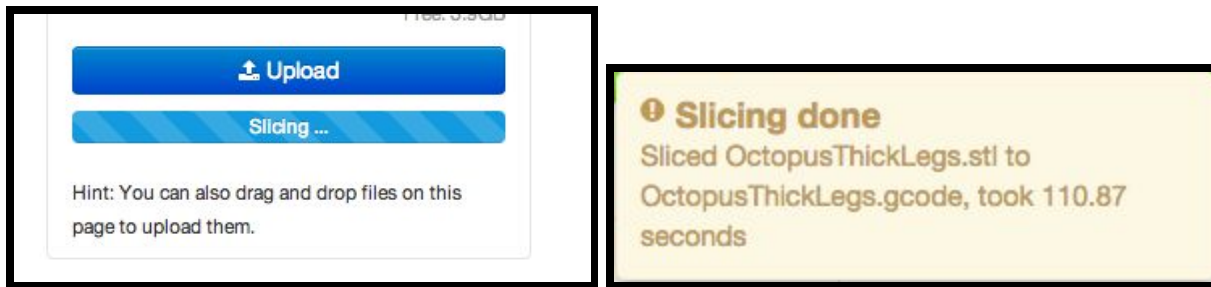
Print the Object

Once the object has been sliced, it will appear on your list of files. To print your object, use the same procedure as you did to print the sample object(s) as explained in section 3.

Section 5: Troubleshooting

Common Problems

Problem: The item being printed does not adhere to the print bed.
Solution: As your object begins to print, watch the filament carefully as your DeltaMaker 3D Printer lays the skirt and first layer of filament. After a few inches of the skirt are printed, lightly rub your finger across the filament. If the filament moves, your print nozzle may be positioned too high. While your DeltaMaker 3D Printer is still printing the skirt or the first layer of the object, you can use the "Real Time Nozzle Height Adjustment" feature. If you notice that the object is not adhering well, click the "Too High" button immediately. Click it once more if the new filament is still not adhering. After the printer has started the second layer, you will need to cancel your print, remove the filament from the print bed and restart the print. Initiate this sequence by clicking "Pause and Restart" from your menu.
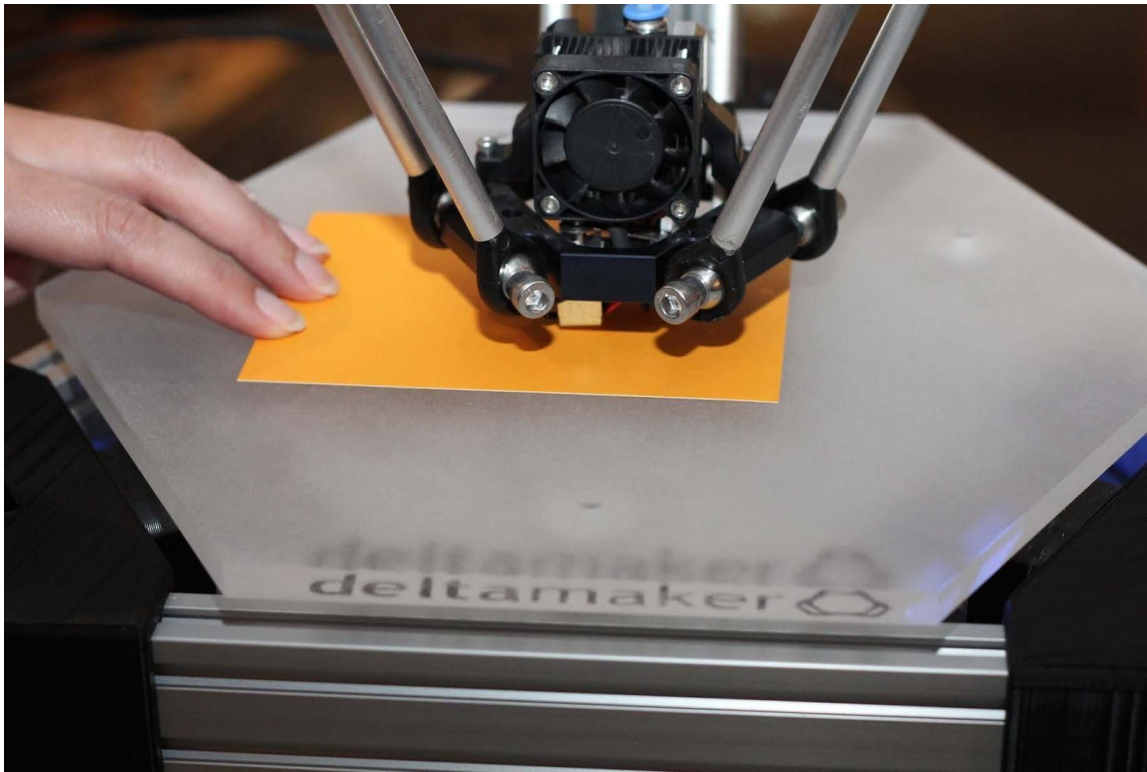
Problem: The item being printed sticks to the bed and is very difficult to remove.

Solution: Sand the build plate with coarse sandpaper. Using a sanding block with "80 grit" sandpaper, sand the surface of the acrylic build plate. It is important not to be too rough and take care not to put pits in the acrylic surface. If the bed is too smooth, the cooled PLA will be difficult to remove. If it is freshly sanded, items should be much easier to remove.

Problem: The print started out just fine, but PLA began to flow inconsistently and print layers are not adhering to each other.


Solution 1: The PLA spool may be caught on something and not rotating correctly. Make sure that the spool is able to spin freely and make sure that the PLA is not caught on the trigger, which would keep it from flowing through the Bowden tube properly

Solution 2: The print head may be clogged. With the unit fully warmed up, try gently pulling the PLA (while squeezing the trigger) back part way through the Bowden tube then pushing it back in. Keep pushing until you see PLA beginning to flow from the nozzle. You will need to restart your print from the beginning.

Problem   I want to print on my DeltaMaker 3D Printer without having to connect to it's individual WiFi.

Solution   You can add your DeltaMaker 3D Printer to your home or office WiFi so it will always be available when connected to your main WiFi.

1. While connected to your DeltaMaker 3D Printer's WiFi and logged into OctoPrint, Go to settings > Network Connection.
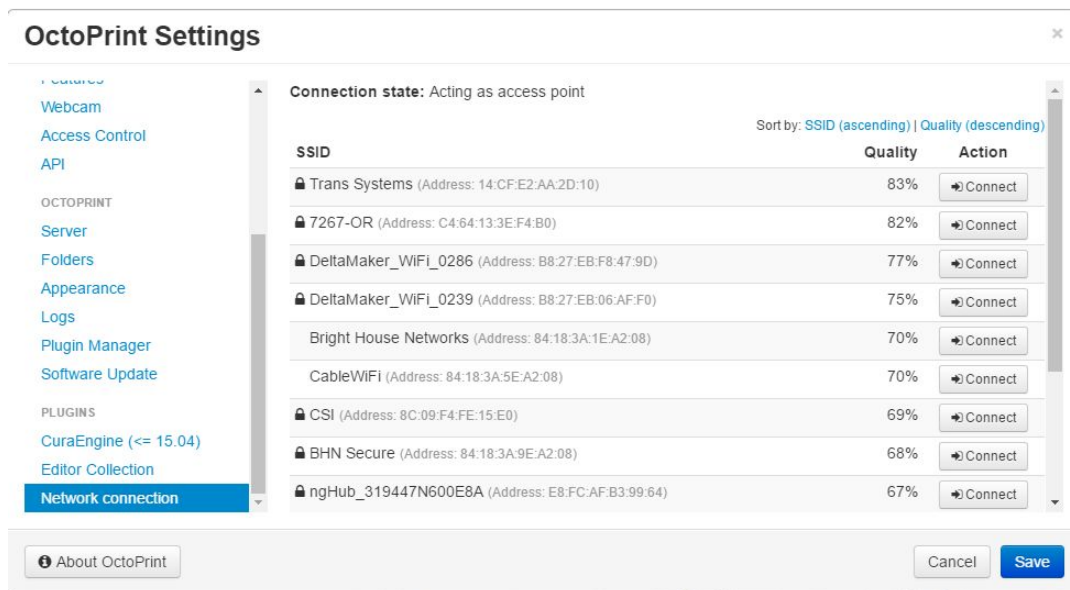
2. Connect to your home or office WiFi and enter the password.
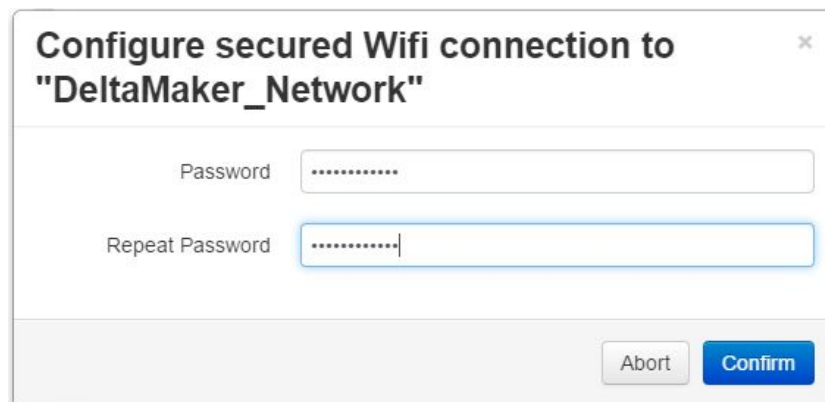
3. Once connected, the website will reload with an error saying there is no internet connection.
4. Reconnect to your home or office WiFi.
5. Your DeltaMaker will now appear on your Network file as an "Other Device" with any other devices or printers you may have. You will now be able to open OctoPrint at any time and the printer will connect as long as it is on, while staying connected to your main WiFi.