

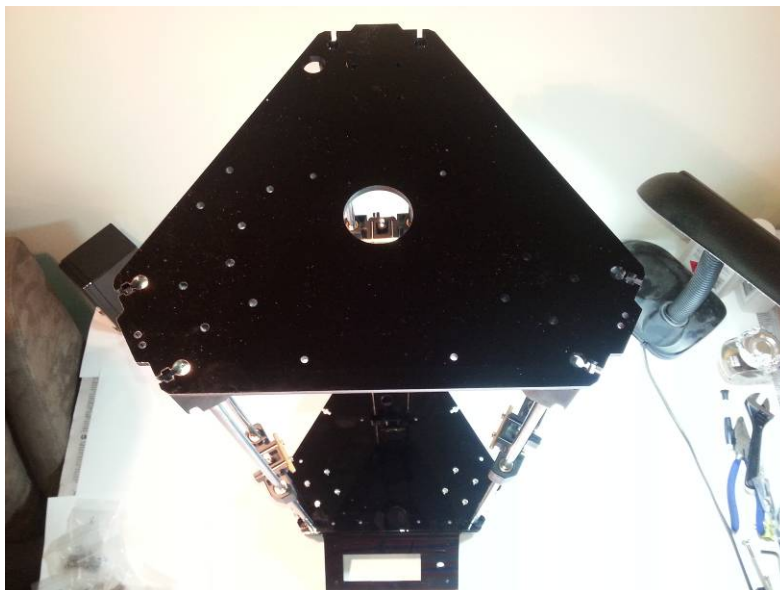
TL4100 Top 5 Build Tips

1: Top Plate

When assembling the top plate, align the top of the top plate brackets with the top of the rods. This can be done by placing a hard flat object (such as a ruler) on top of the plate and pushing down until the rods are touching the ruler. Then tighten the screws.

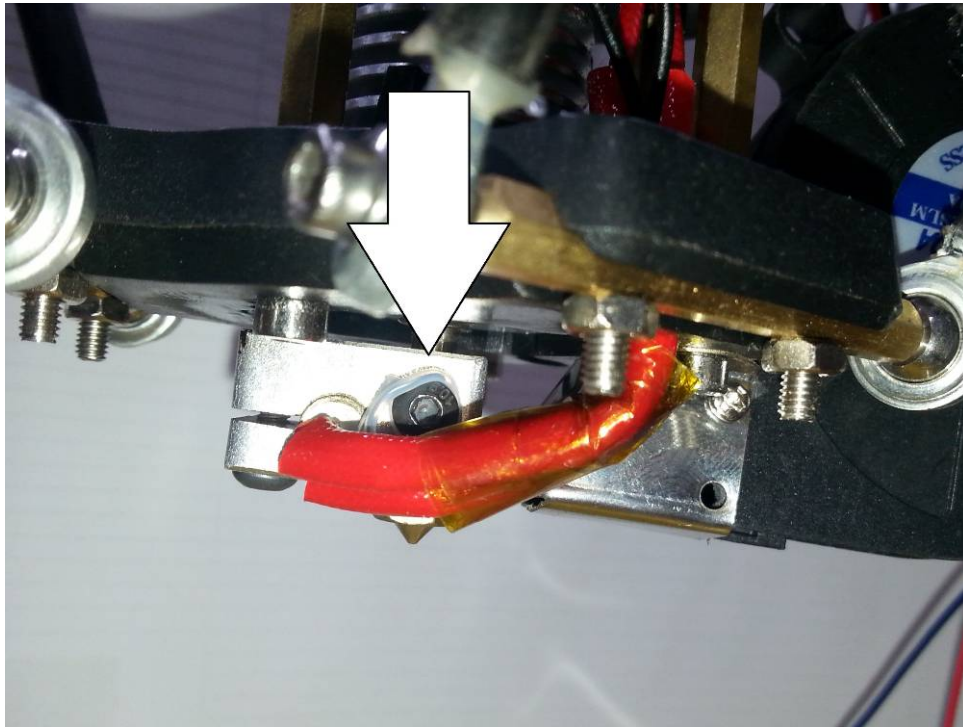


The top plate will then sit above the rods. If the holes in the top plate do not line up exactly with the holes in the top plate brackets, the rods may be pushed out of alignment and cause the carriages to jam. Lifting the top plate by 5mm also gives you 5mm more of travel for your calibration screws, which makes calibration less likely to damage the bed.



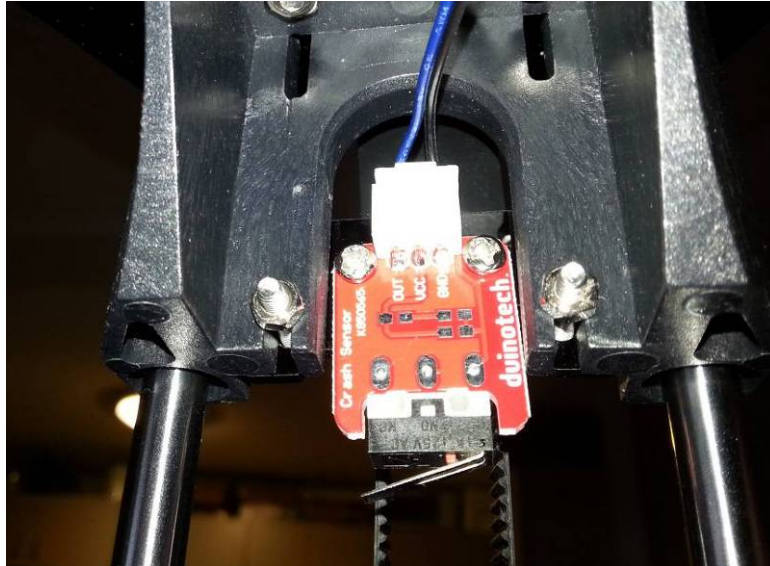
2: Extruder thermistor

If you encounter a MAXTEMP alarm during initial testing, chances are the fault is with the extruder thermistor. If the extruder is reading above 700 degrees, then the thermistor has a short circuit. It appears that many cases are caused by the bolt cutting into the insulation on the thermistor wires and shorting them together. A temporary fix for this is to undo the bolt completely, and then restart the printer and see if the error has cleared. A more permanent fix is to use a short length of WS5504 Vidaflex Tubing to reinsulate the wires before tightening the bolt. Keep in mind the extruder can get above 200 degrees, so any repair has to be able to handle this temperature.



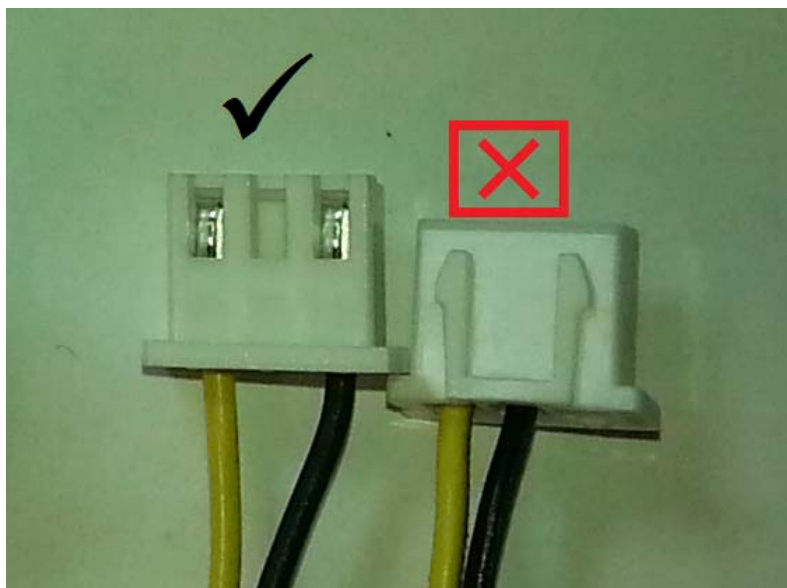
3: Limit Switch Wiring

The limit switch wiring is in a very awkward spot, and it is very difficult to push in the plugs after everything has been installed. To make things easier, the wires can be installed before the limit switch is installed.



Using the below colour code ensure the correct limit switch is installed on the correct tower. Also note that the ends of the wires are different and the plugs with the middle slot empty should be plugged into the limit switches. If the wires are fitted wrong, the limit switches will not work.

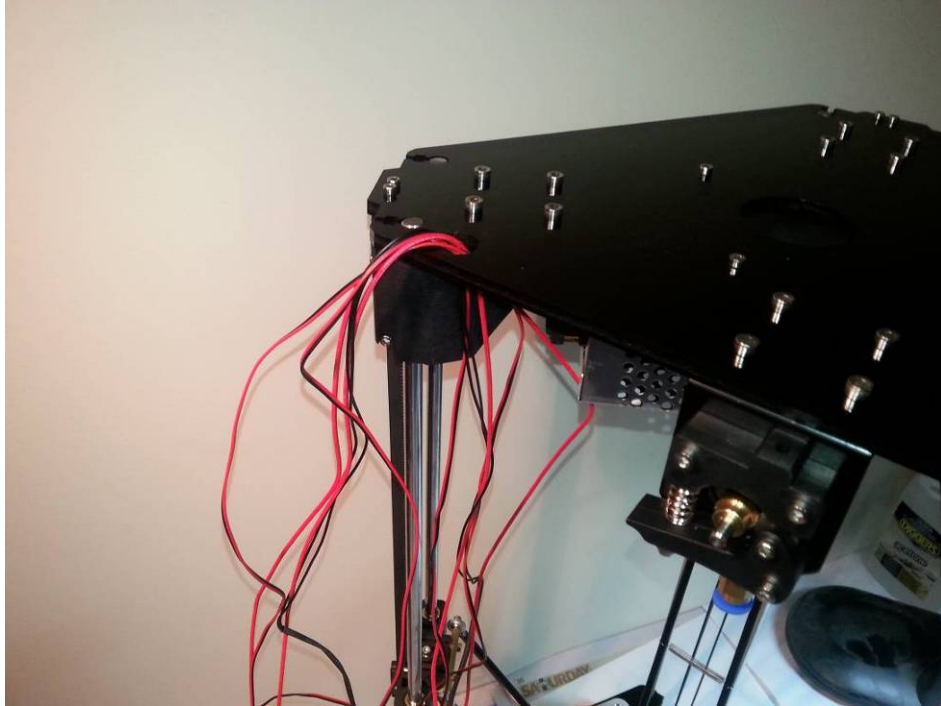
- X: black and blue
- Y: black and green
- Z: black and yellow



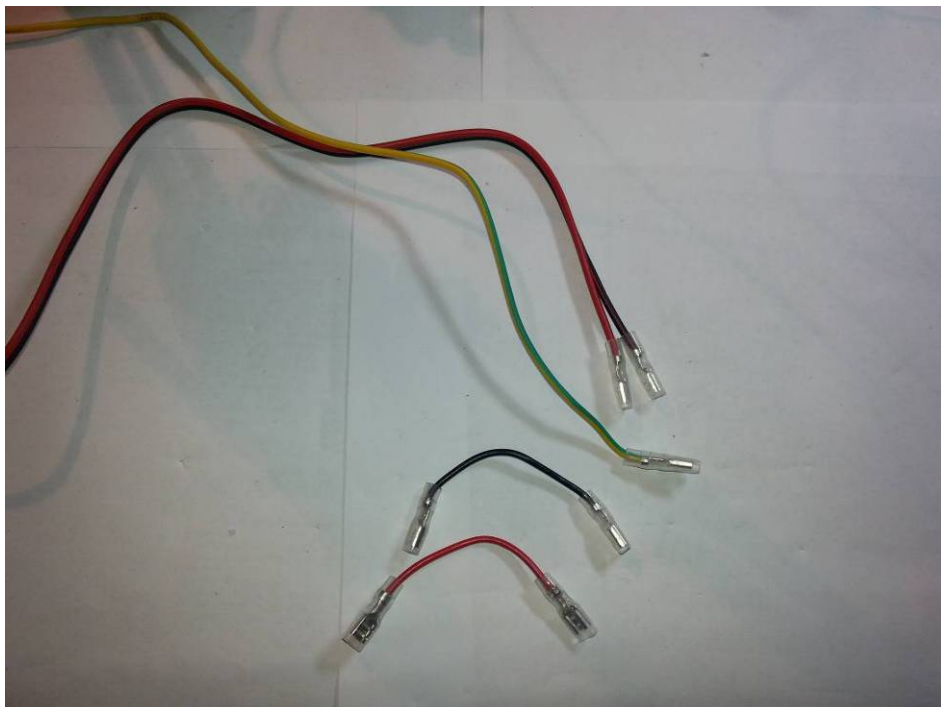
4: Wiring

The included manual is very brief on instructions for the wiring of the printer. The following detailed guide may help.

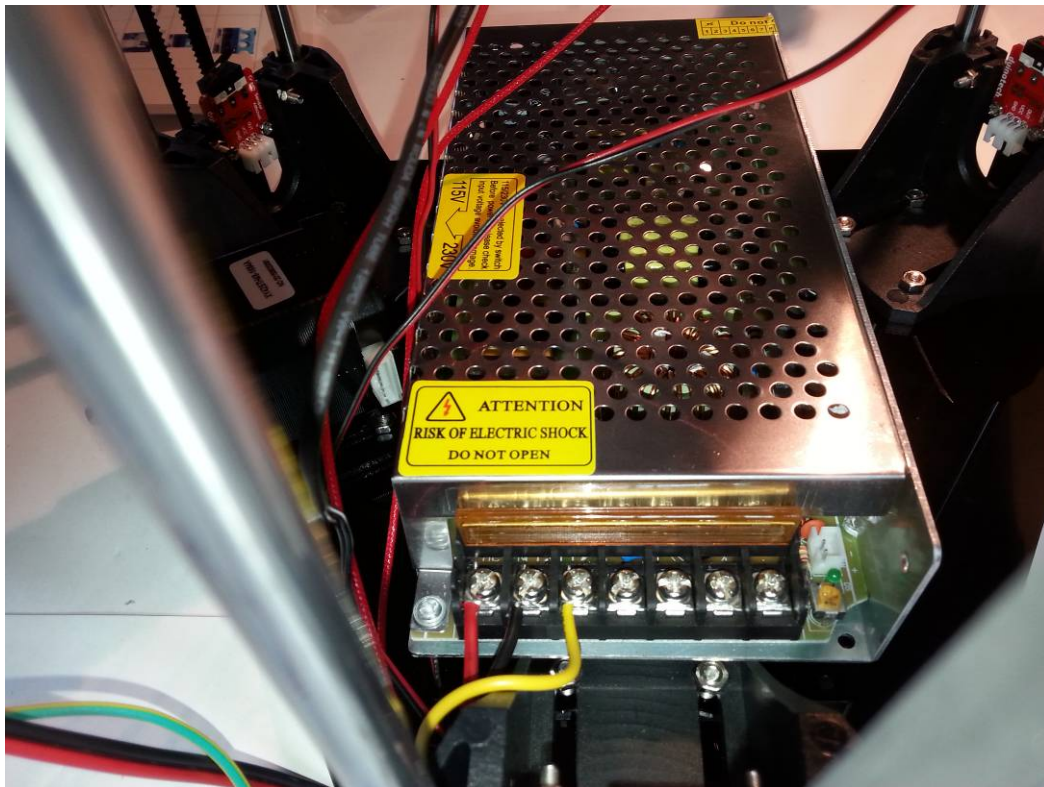
Thread the cables from the extruder through the hole in the top plate.



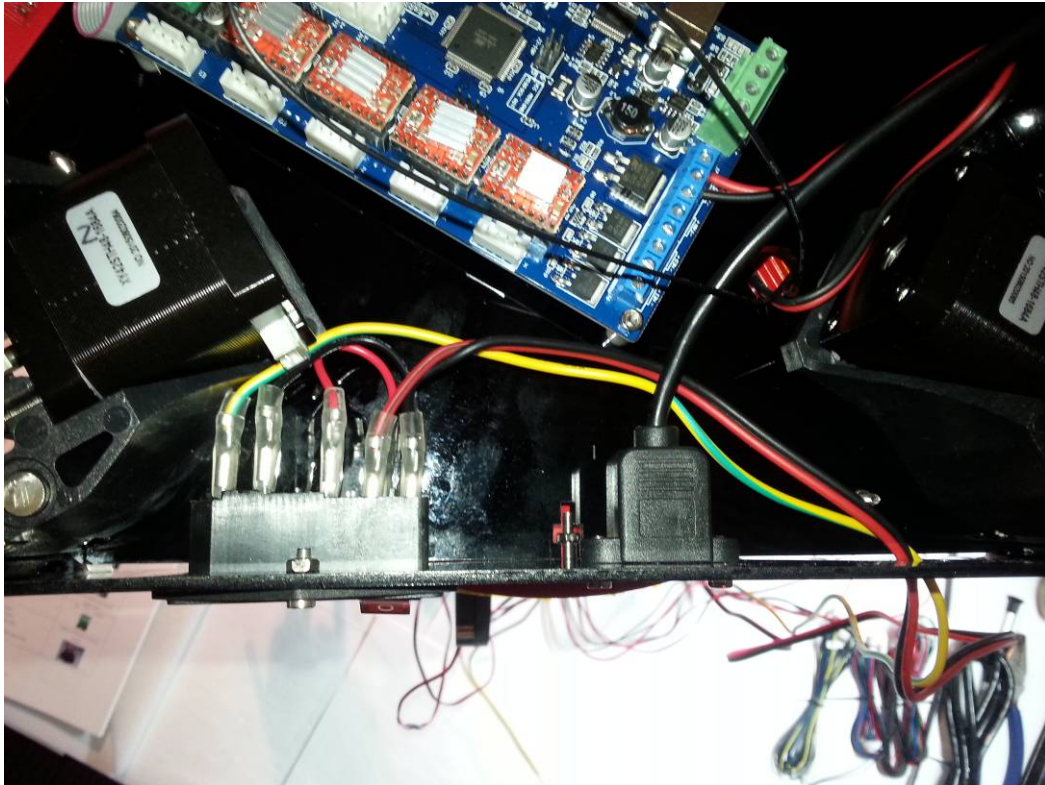
Turn the printer upside-down and point the power socket towards yourself. Find the following cables.



These are the mains power (240V) cables. Ensure that the printer is not plugged in to mains power, and that the main power switch is in the off position. Firstly take the three long wires, and tilt up the protective barrier on the power supply. Loosen the three left screws on the power supply, then insert the tinned cable ends and screw down firmly. Ensure the red wire goes into the connection marked 'L' (live), the black wire goes into the 'N' (neutral), and the green and yellow wire goes into the '⊕' (earth). Then thread the wires out to the top of the printer through the top plate.



Then feed the wires into the base through the side shield and attach the crimp ends of the red and black wires to the switch side of the power socket module, and the green and yellow wire to the power socket. The two short wires go between the switch and power socket. From left to right, the wires are green and yellow, black, red, red, black. The red and black wires going to the top of the printer are closest to the camera.

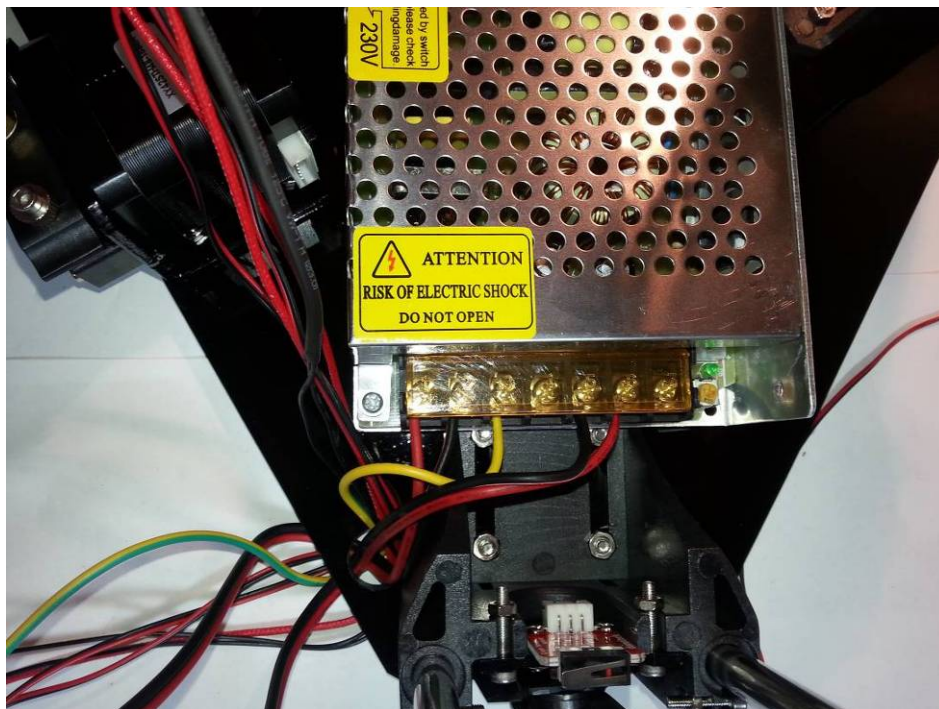


Find the single black and red cable. This is the main 12V power feed to the board.

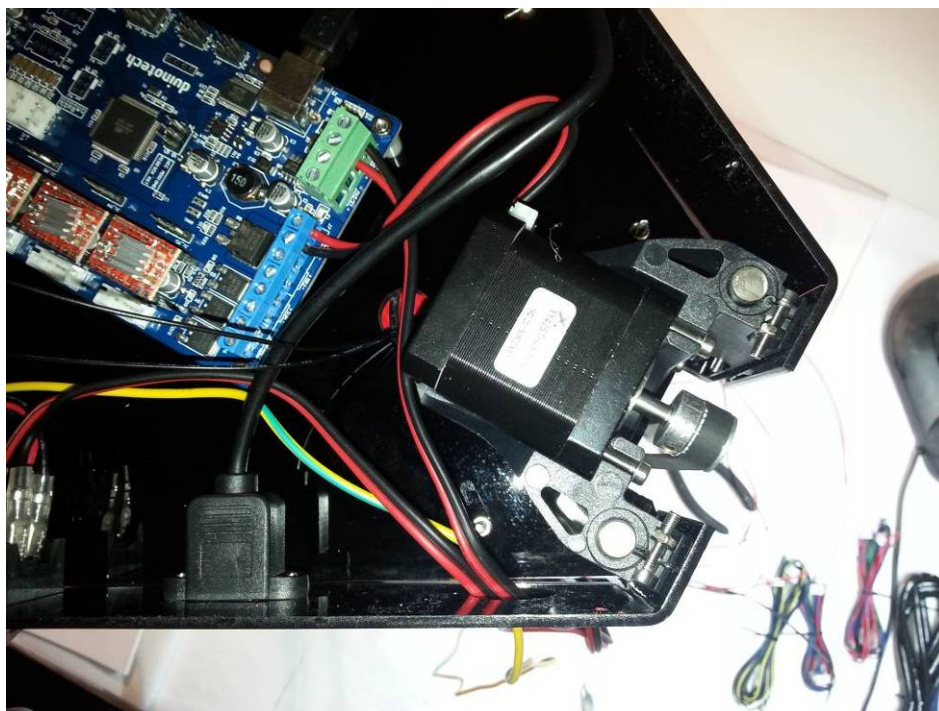


Loosen the fifth and sixth screw terminals on the power supply and screw one end of the red and black cable into it. Line up the black wire with 'V-' and the red wire with

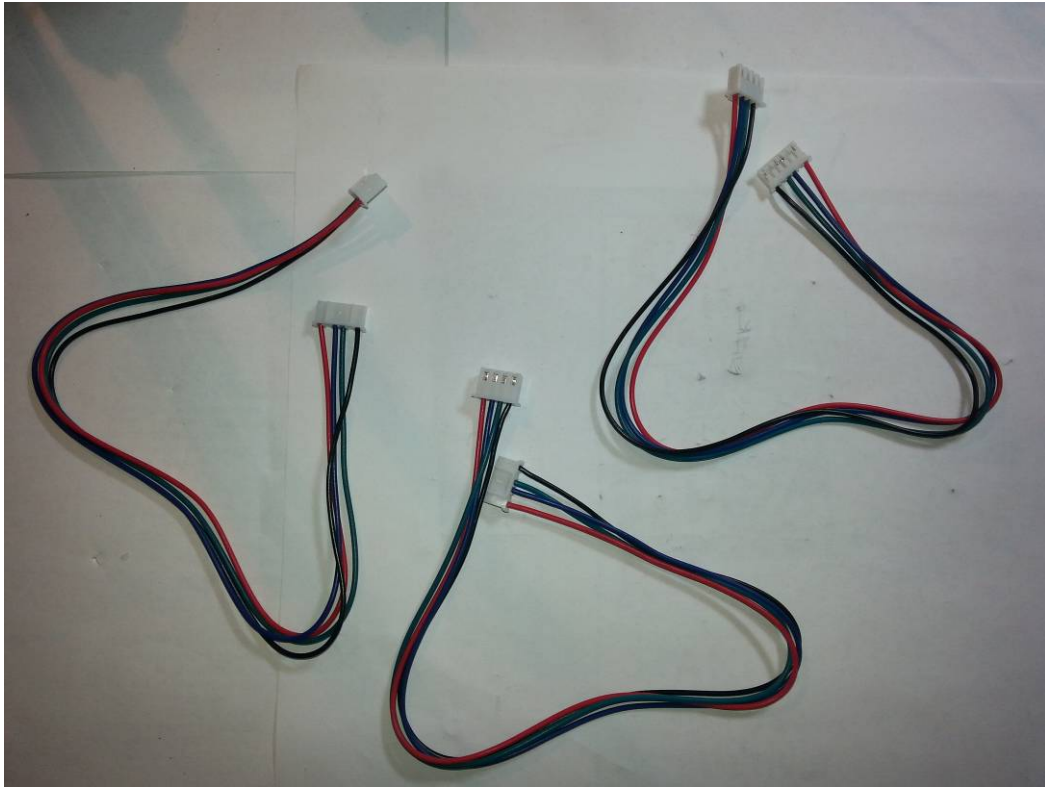
'V+'. Then press the protective barrier down to lock it into place, and feed the cable out the hole in the top plate like the other cables.



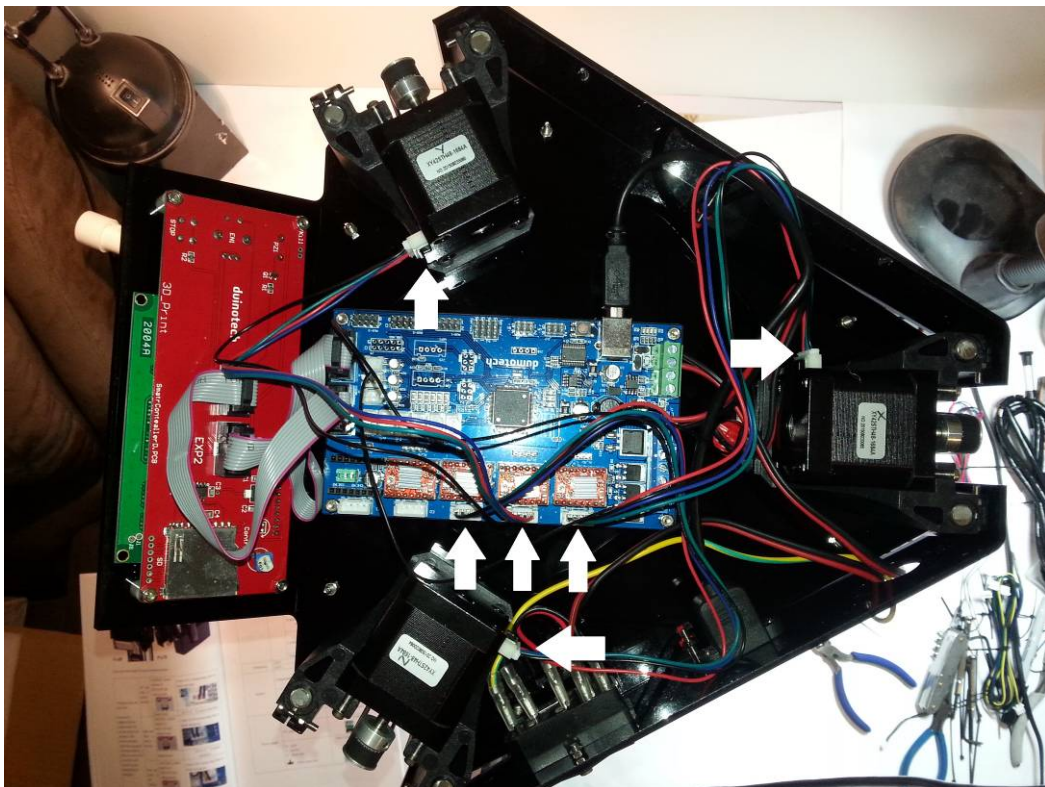
Following the other cables, feed the red and black cable through the side shield, and attach it to the green terminal on the main board, ensuring the red wire goes to the '+' terminal and the black wire goes to the '-' terminal.



Now find the three stepper motor cables. All three cables are identical- one end has a six-way plug, the other end has a four-way plug. These short leads are for the three stepper motors in the base.



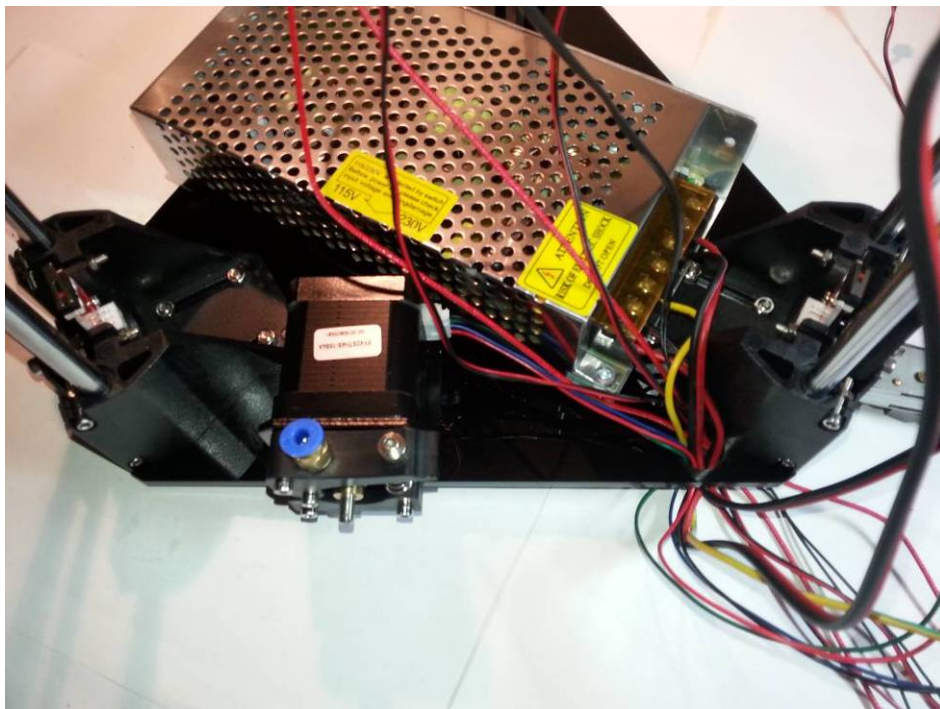
Using the X, Y and Z marks made on the steppers motors when they were installed and the X, Y and Z marks on the main board, run a cable from each stepper motor (the six-way plug) to the main board (four-way plug).



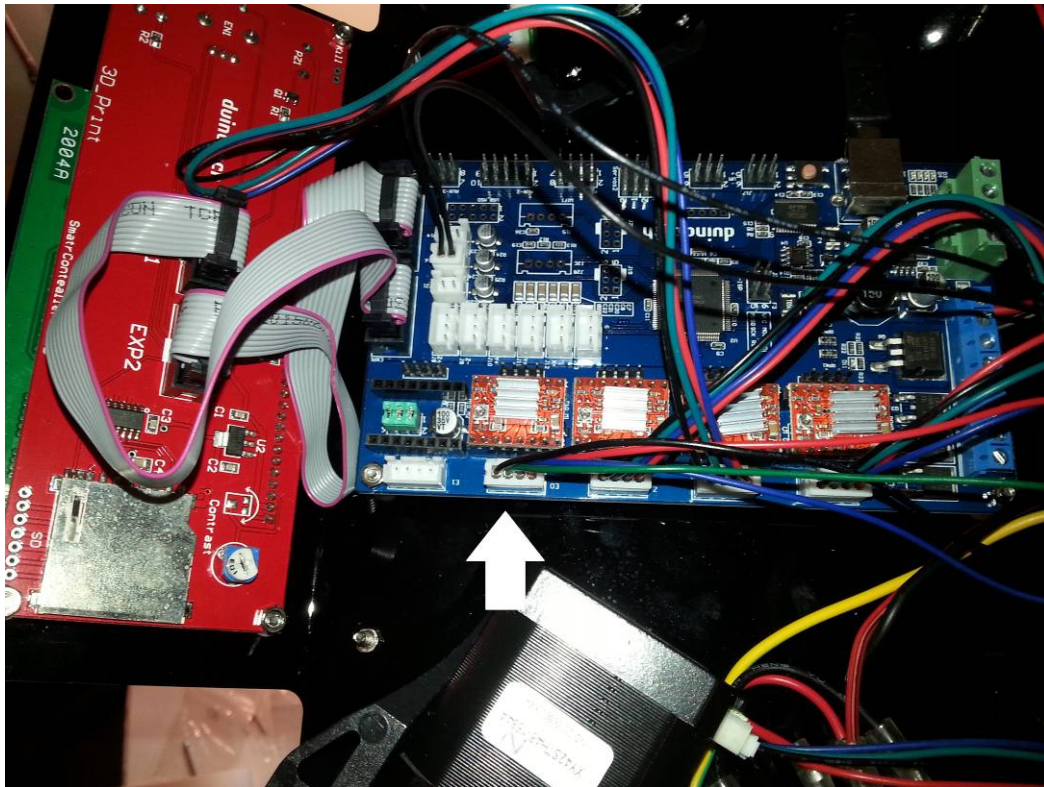
The next cable is for the extruder stepper motor, and it is a longer version of the other stepper motor cables.



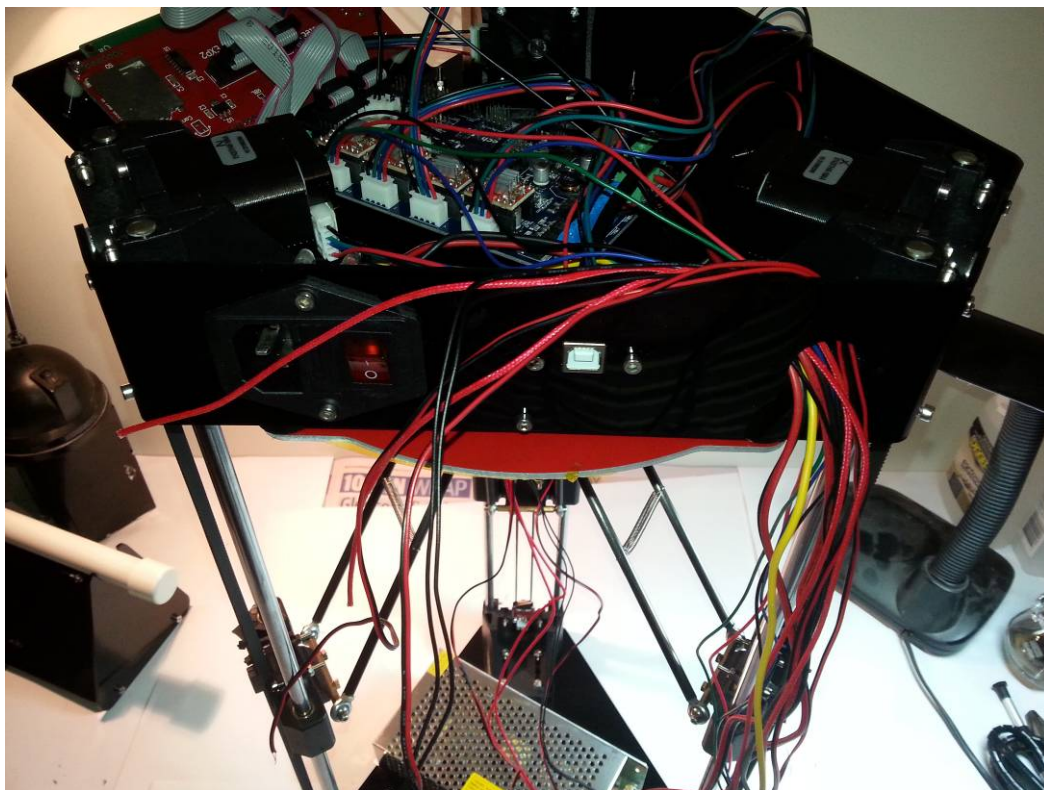
The easiest way to feed this cable through is to take the four-way plug end and feed it first through the top plate, and then through the side shield, following the path of all the other cables. Then plug the six-way end into the extruder stepper motor.



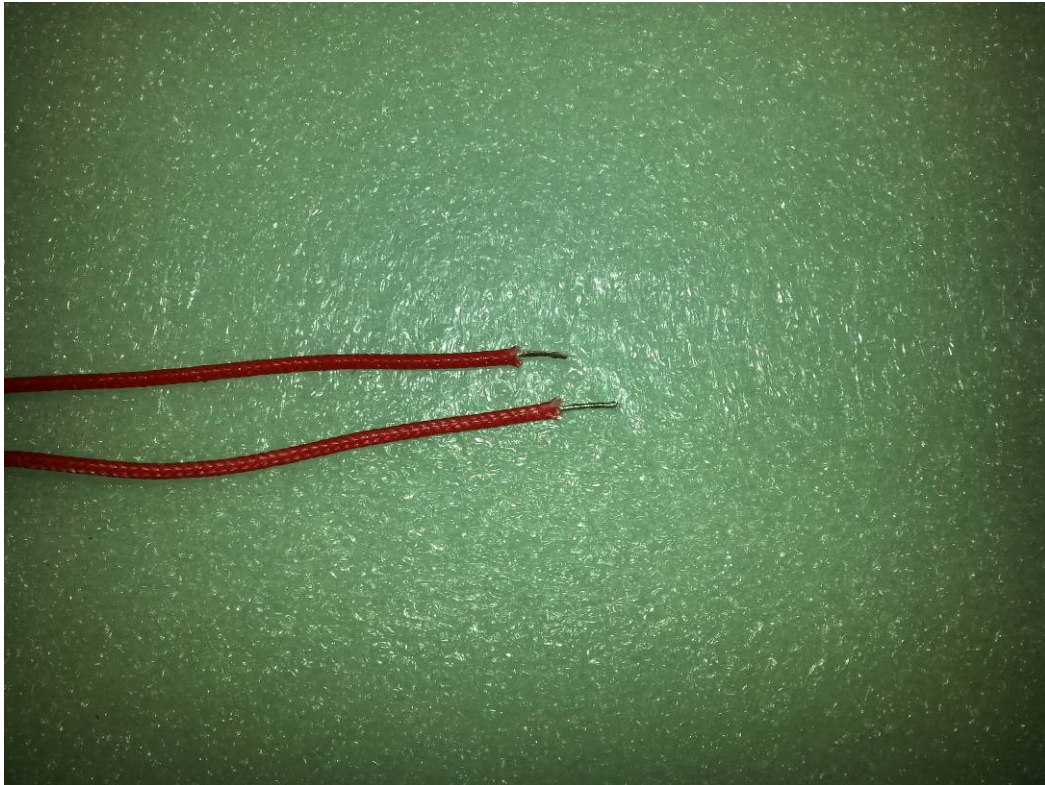
Then plug the four-way end into the E0 connection on the main board.



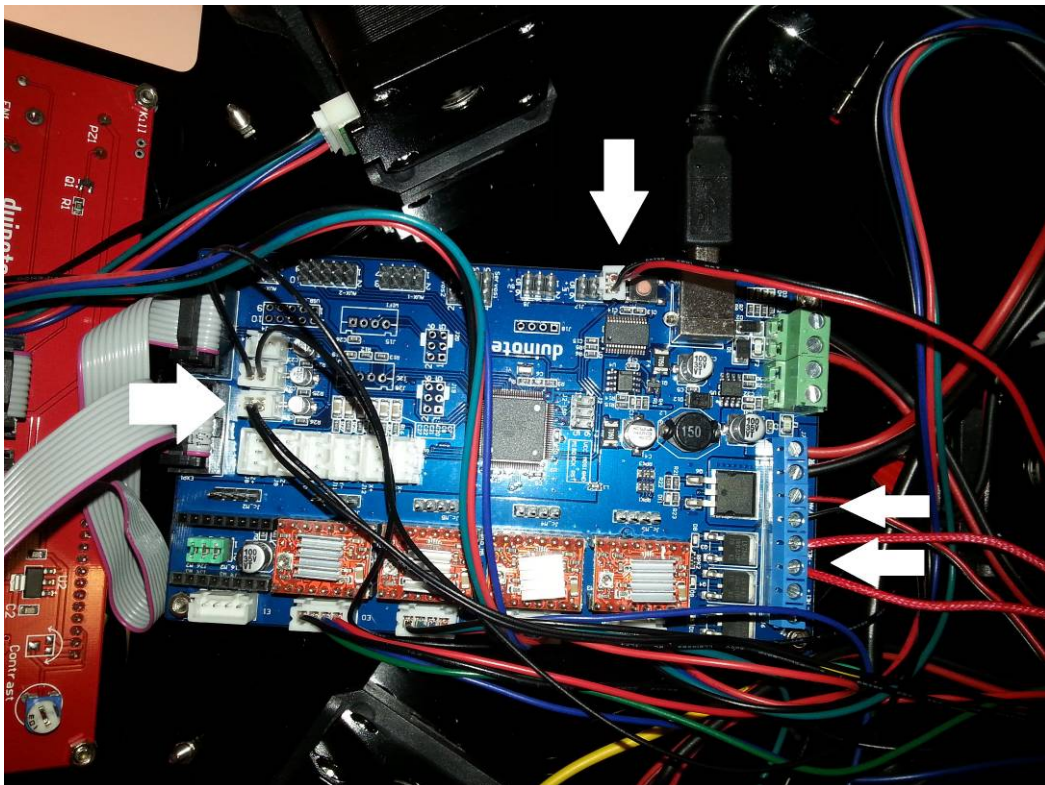
Now thread the last four cables from the extruder back along the same path as the other cables and back to the main board.



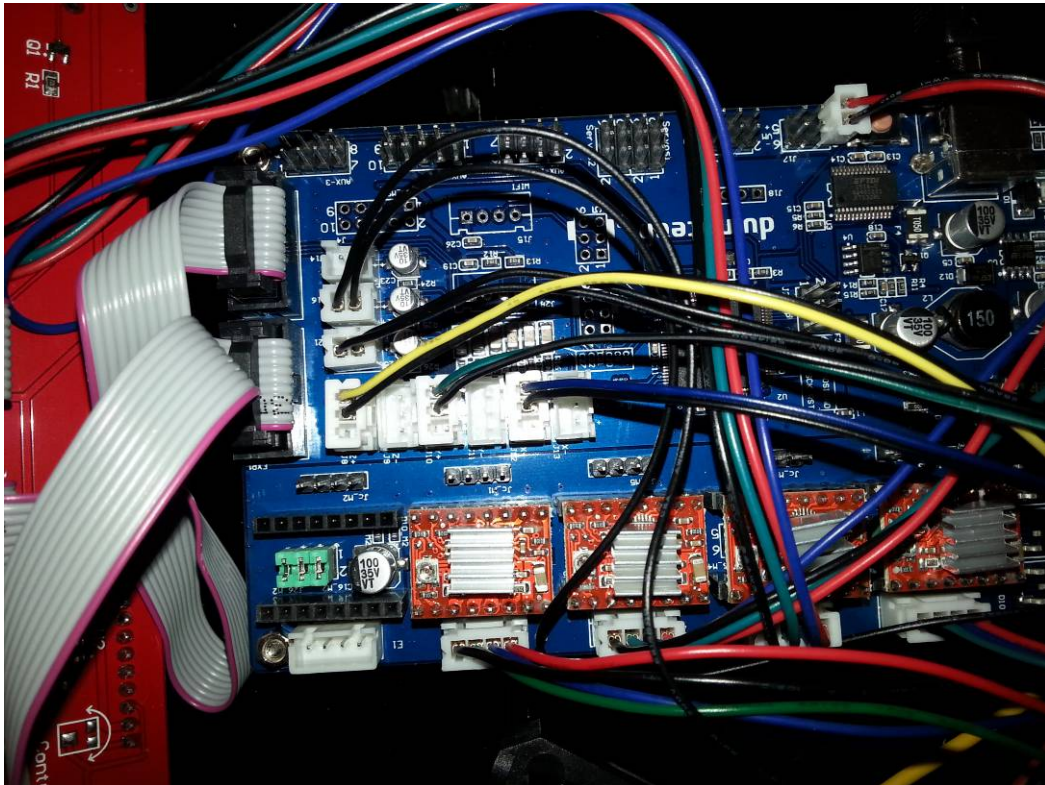
Strip about 5mm from the end of the extruder heater (these are the two thicker red cables with a woven appearance).



These red wires are connected to HE0 screw terminals on the main board. The other two bare red and black wires go to the FAN connection on the main board, ensuring the red wire goes to '+' and the black wire goes to '-'. The extruder thermistor has two black wires and is plugged into the J21 connector. The last connector goes to J17 on the main board, again ensuring that red goes to '+' and black goes to '-'.



The last three cables are the collision board (limit switch) cables. As you have already attached the limit switch ends, thread the wires along the same path as the other wires- out through the top plate and back through the side shield. The connectors are pressed into the sockets on the collision board- use the X, Y and Z tower markings to ensure the correct cable is installed. The connections at the main board go to the X+, Y+ and Z+ limit switch position (as the limit switches are at the maximum X, Y and Z positions).



5: Z-Calibration

Assuming you have already powered on the printer, and everything appears functional, you can do the Z-calibration.

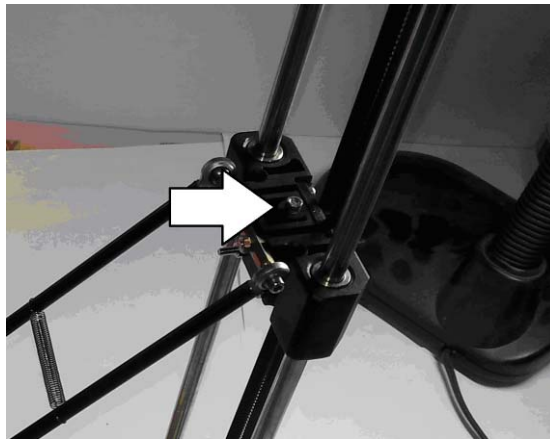
The aim of the Z-calibration is to get the extruder as close as possible to the printer bed (when $Z=0$) without actually touching it, as this will damage the kapton surface.

The manual goes into some detail about changing the firmware to complete the calibration, but this is not necessary for a good calibration. You'll probably find that ongoing adjustment of the calibration is necessary, and having to reload the firmware every time you need to make a minor tweak is very time-consuming. We're going to adjust the small screws on the top of each carriage to complete the calibration. A safe place to start is to screw all the calibration screws down, which gives us the most clearance above the bed.

The procedure is as follows:

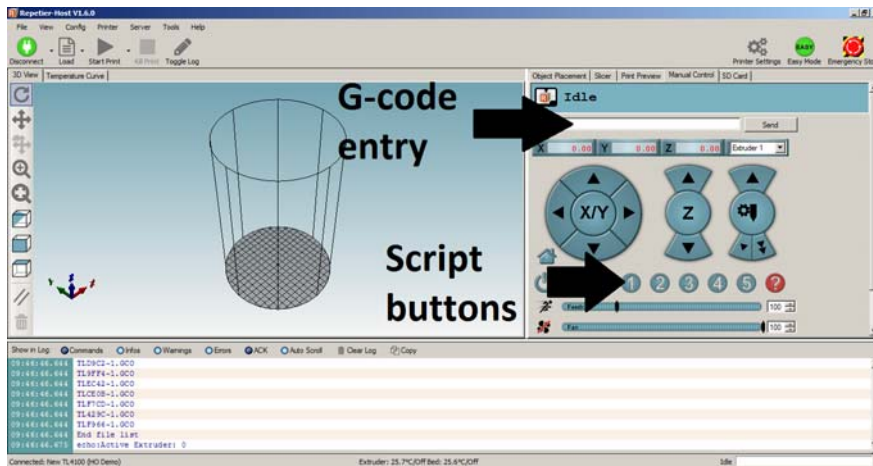
1. Home printer.
2. Move extruder towards bed, and check height at various places around bed.
3. Adjust calibration screws and repeat from step 1 until calibration is good.

Note that the printer does not recognise changes to the calibration screw positions until it has completed a homing sequence.




You'll need to open Repetier and ensure your printer is connected and communicating. I've used version 1.60 of Repetier, but any new or recent version will work. Switch to the Manual Control Tab.

Note the manual arrow controls can be used to move the extruder around, but the following instructions use the script buttons to run G-code commands to precisely locate the extruder, as well as entering in G-code commands manually.

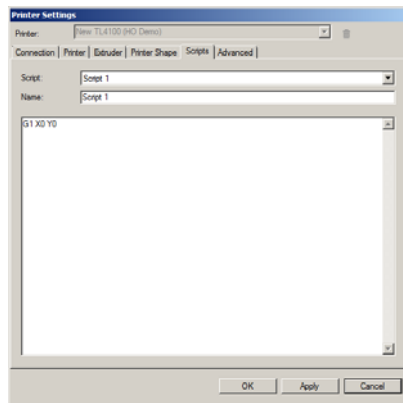


The two G-codes used are 'G28' and 'G1'. G28 homes the printer, and G1 move to a specific X,Y,Z location. The aim of this calibration is to ensure that when Z=0, the extruder nozzle is just above the print bed for as much of the print bed as possible.

As before, arrange the printer so that the off switch can be easily accessed if the printer needs to be switched off quickly.

The small house symbol  to the bottom of the X/Y control is the home command, so there is no need to set up a script for the home command.

Right click on the script 1 button  to open the script editing window.



In the large text box type G1 F5000 X0 Y0 and press OK. This is a command to move the extruder so above the centre of the bed. The z-coordinate is unchanged. The F parameter is the federate, or speed of movement, and is measured in mm per minute.

Edit the scripts as listed below:

Script 1	G1 F5000 X0 Y0	Centre of bed
Script 2	G1 F5000 X-50 Y-25	X tower
Script 3	G1 F5000 X50 Y-25	Y tower
Script 4	G1 F5000 X0 Y55	Z tower

Scripts 2, 3 and 4 take the extruder near one of the towers. The idea then is that the height of the extruder above the bed at that point (the z-coordinate) can be adjusted by the calibration screw on that tower, without affecting the other towers. The z-coordinate is not set to zero in these commands, as the extruder may crash into the bed if the calibration is not correct.

Press the home button and see that the printer homes correctly. As each carriage moves up, check that the wires do not get caught in the limit. The next step involves getting an idea of how far away from the bed the zero point is, then type G1 Z100 into the G-code box and check that the extruder moves to about 100mm above the bed. This will also confirm that the travel distances are calibrated correctly. If the printer is still not within 20mm of where it should be, then the printer construction should be checked again.

Try the script 2, 3 and 4 buttons and check that the extruder moves to the correct tower- the X tower is to the left of the display, the Y tower to the right and the Z tower to the rear.

Press Script 1 (to centre the extruder) and try the G1 command again with lower Z values- I would try G1 Z50, then G1 Z20, G1 Z10 and G1 Z5. If the extruder is at least that many millimetres above the bed, then try G1 Z0 to take it to its lowest point. This will give you an idea of how much you need to adjust the calibration screws.

If you have Z=0, move it to Z=5 with G1 Z5 before running the scripts to move the extruder across the bed, then move it back down to measure at each corner of bed.

The M3 nuts have a thread pitch of 0.5mm, so one full turn will change the calibration by 0.5mm. For each of the three towers, if the calibration is too far above the bed, unscrew the calibration screw. If the extruder appears to be too close to the bed, screw the calibration screw in. Make conservative adjustments to avoid overshooting and check each tower even if that screw has not been adjusted, as the adjustments tend to interact slightly. About 0.5mm clearance is a good point to start doing test prints, after which small changes can be made to the screws between prints to fine tune the calibration.

Overview of calibration cycle:

Home printer with G28

Use G1 Z10 to move extruder down.

Press script 2 button, note clearance- if it is more than 10mm, use G1 Z0 to move to lowest position. Note clearance and adjust tower X screw.

G1 Z10 to move extruder away from bed.

Press script 3 button, note clearance- if it is more than 10mm, use G1 Z0 to move to lowest position. Note clearance and adjust tower Y screw.

G1 Z10 to move extruder away from bed.

Press script 4 button, note clearance- if it is more than 10mm, use G1 Z0 to move to lowest position. Note clearance and adjust tower Z screw.

G1 Z10 to move extruder away from bed, then press script 1 to check overall calibration. Most printing will take place in the middle of the bed, so this is important too.

Repeat until calibration is satisfactory.