

DiamondMind v2

Build Instructions



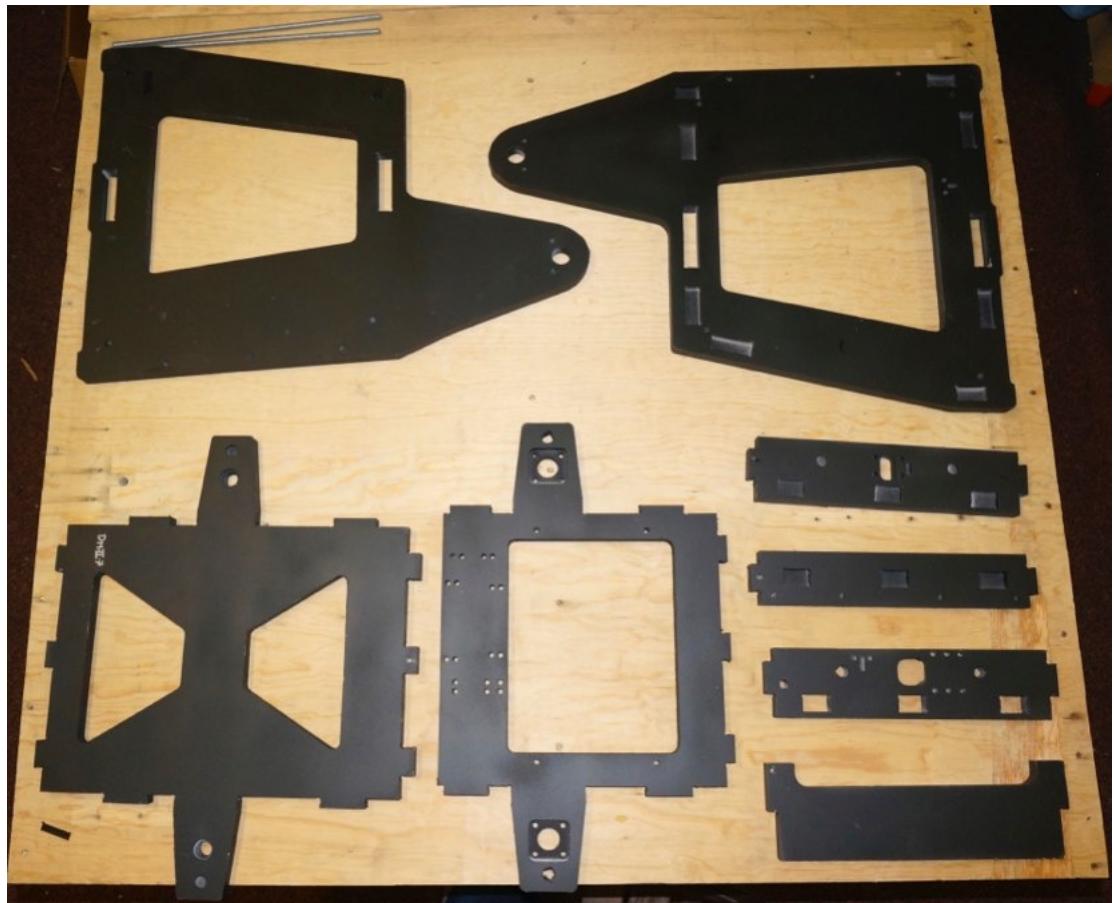
V0.05

Table Of Contents

DiamondMind v2	I
Build Instructions	I
Table Of Contents	2
Frame Build	5
Y Rods	12
Constructing the Y-Carriage	13
Y-Axis Idler	15
Attaching the Y Stepper motor	17
Belt Attachment	20
Y End Stop	22
X and Z-axis boxes	23
Attaching the Microswitch	25
Fitting the Z end-stop actuator	32
Assembling the X-Box idler	34
Assembling the extruder carriage	39
Rods in the X-Boxes	46
Fitting the Z Motors	49
Z End-stop	52
Adding the X-Boxes to the frame	54

Fitting the Z Guide Rods	56
Fitting the X Belt	59
Fitting the Electronics	63
Connecting the power	70
Wiring up the Extruder	75
Preparing the Printer Bed	77
Firing it Up	84
Software	85
Calibration	86
Feeding the Filament	89
Time to start printing	91

Frame Build

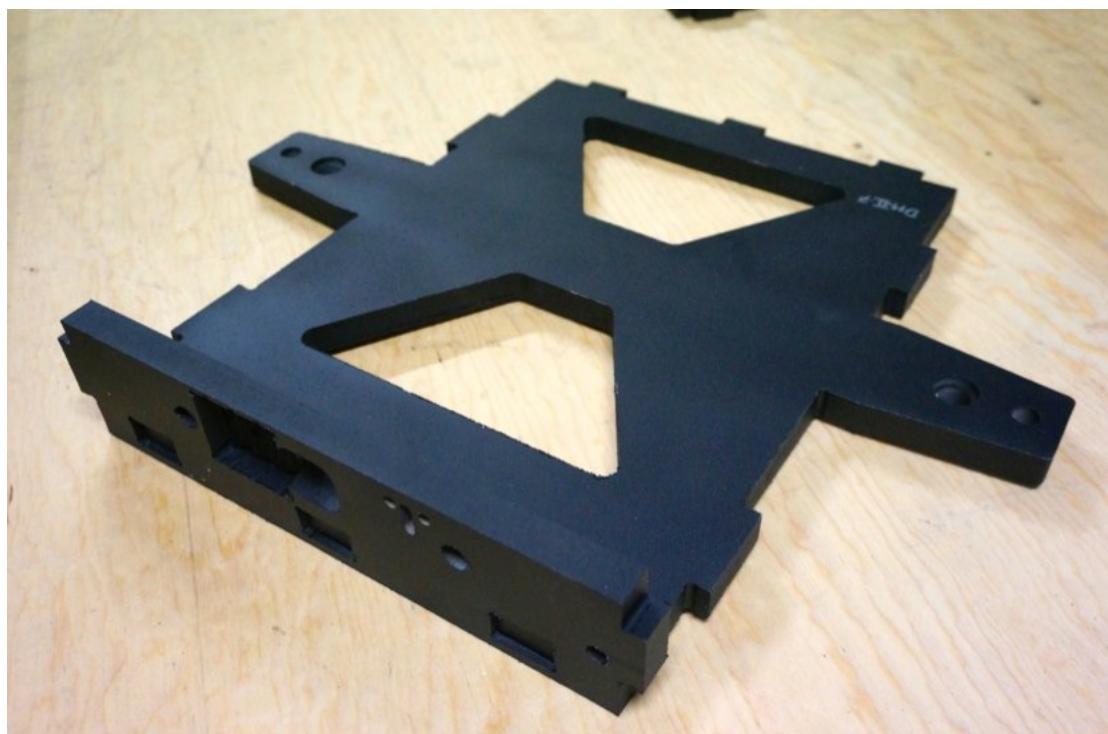


You should have all these parts.

Clockwise from top left:

- Right side panel
- Left side panel
- Bottom front panel
- Top rear panel
- Bottom rear panel
- Top front panel
- Top panel
- Bottom/base panel

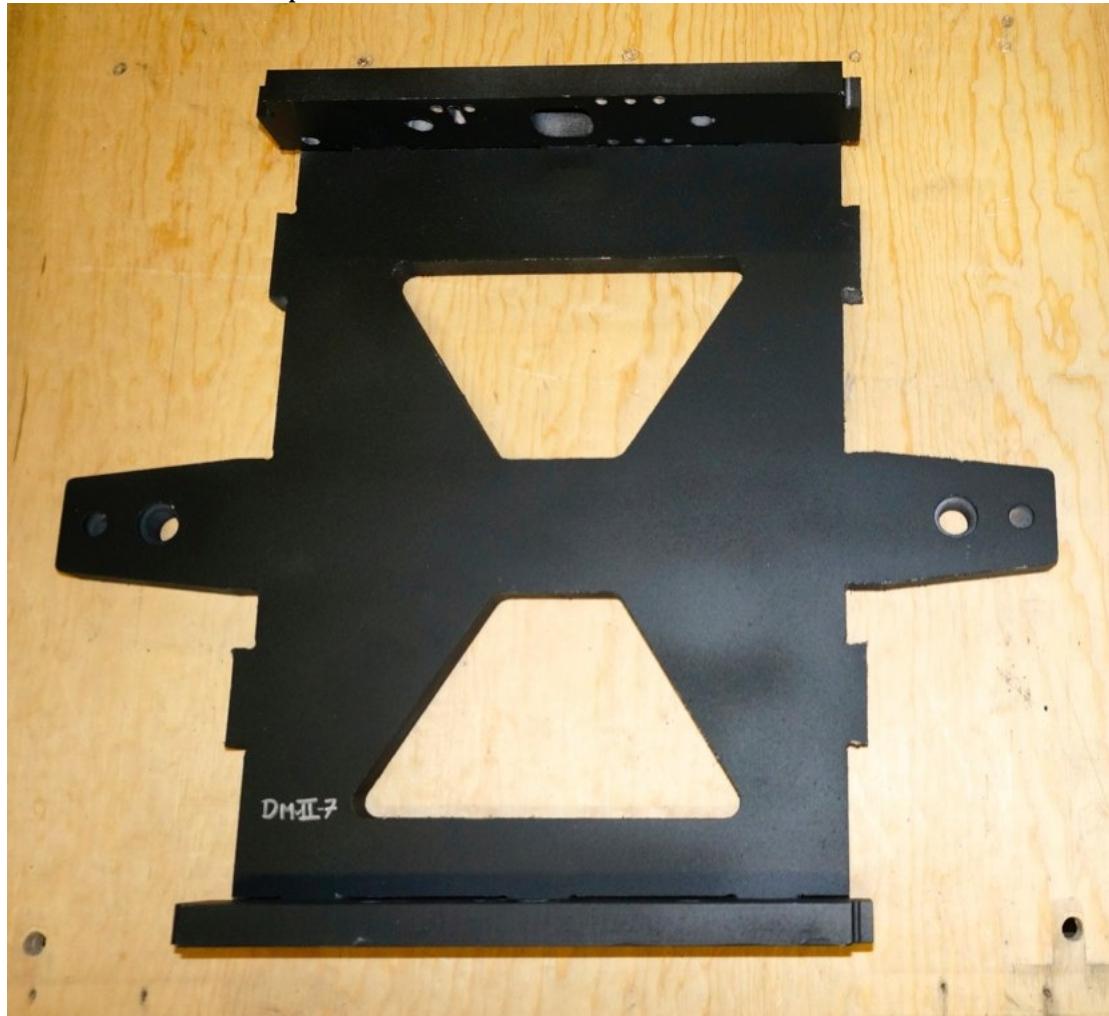
Take the base (panel with a serial number) and the slide the lower back panel onto the three long tabs at the back of the base panel.



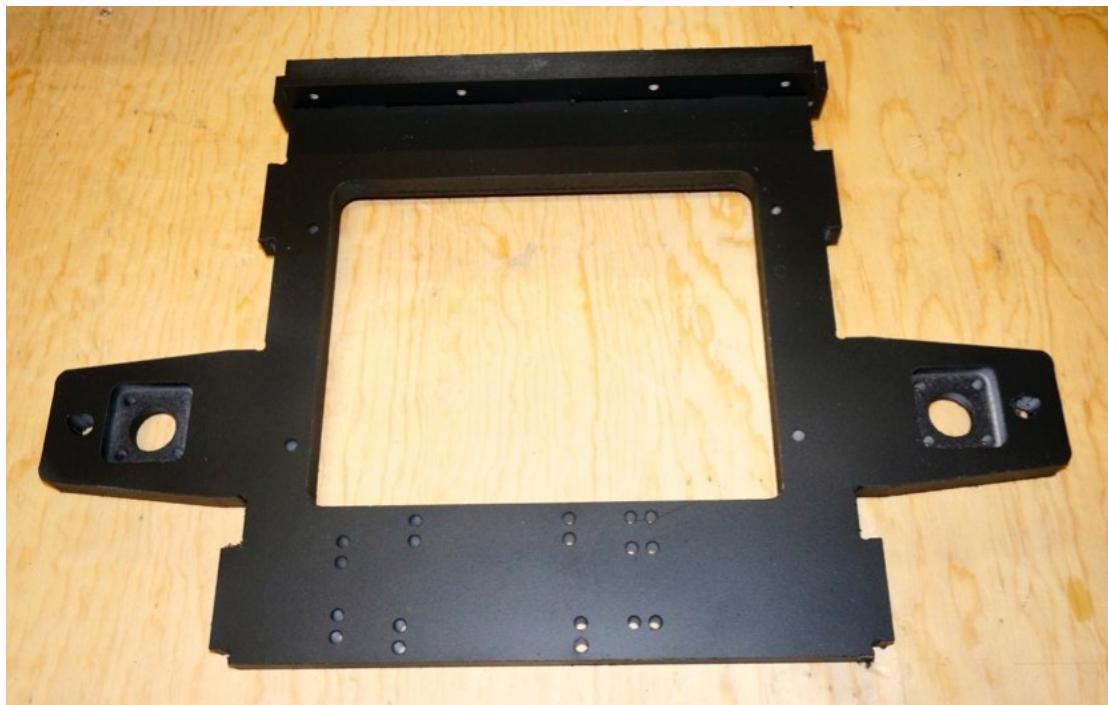
Similarly, attach the lower front panel to the three short tabs at



the front of the base panel.



Take the small back top panel (see picture) and slide it onto the three short tabs at the back of the top panel. Make sure the square motor cavities of the top panel and the round holes in the rear panel are facing upwards.

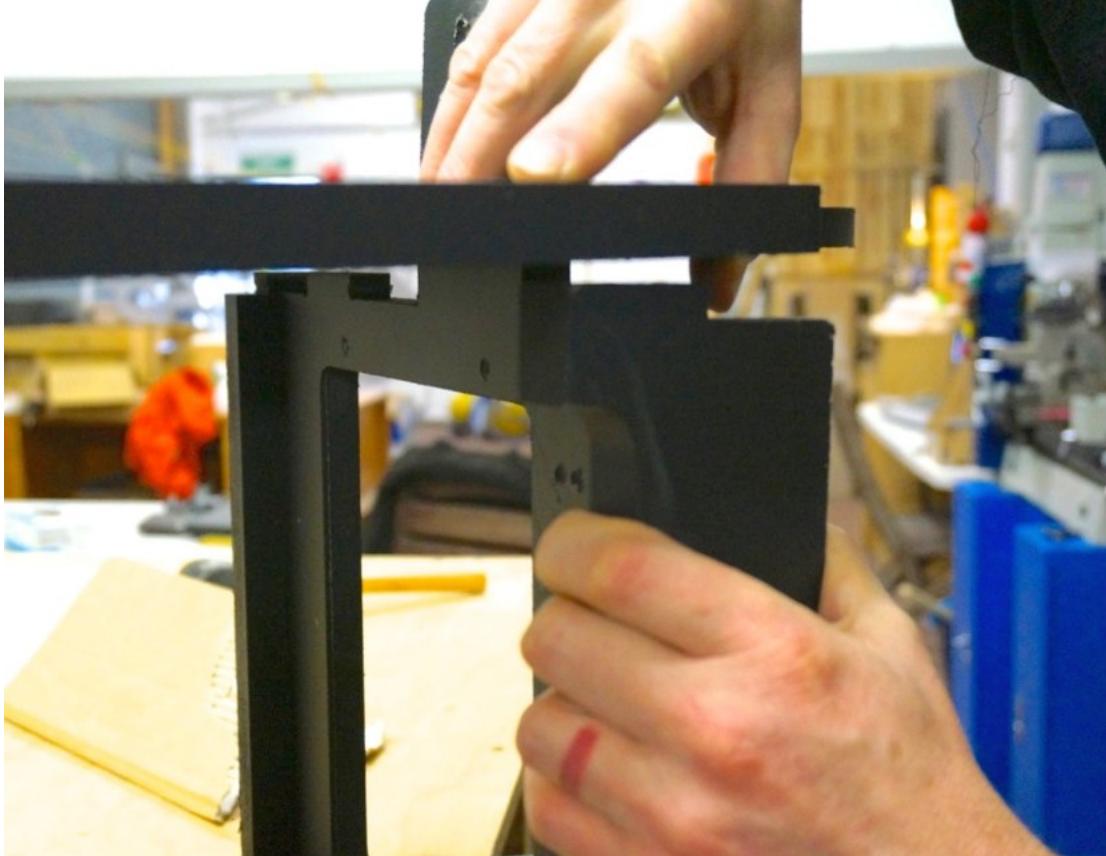


Take one of the side panels and slide the base assembly into the receiving holes. It will only go in one way around – check the tabs are all lined up. You will need to provide force – a rubber mallet and a protective piece of cardboard will help with this.

Then insert the top assembly in a similar manner.

Then put the other side panel on – once again checking the tabs line up to indicate you have it in the right orientation.

Just before the frame is totally closed up, insert the front top panel

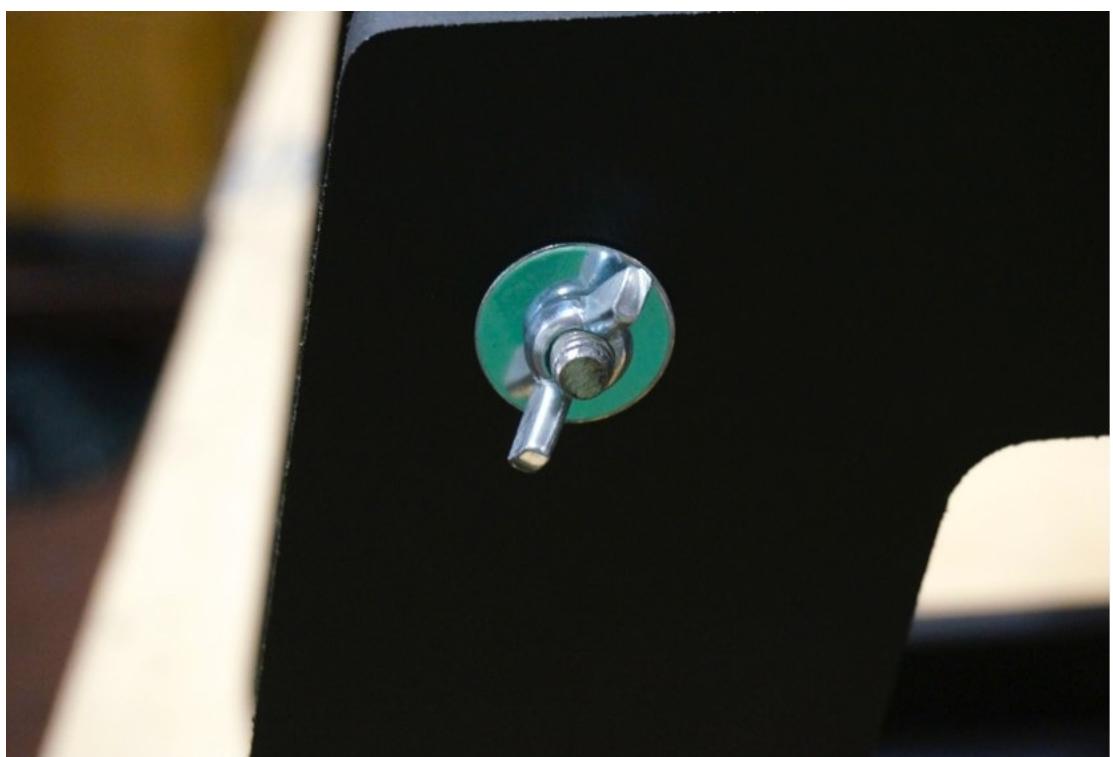
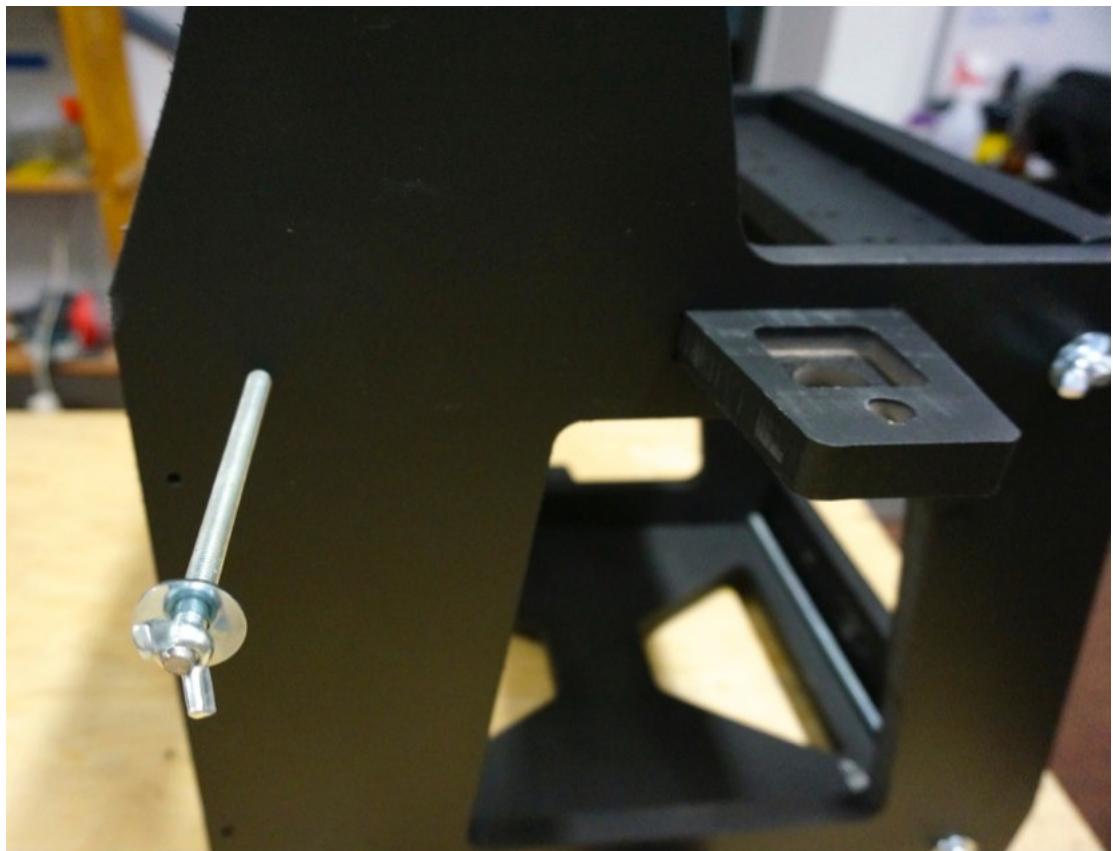


If you must, you may put the mallet down now. Sorry.

You will now need four m8 x 360mm threaded rod – we'll call these tie bars from now on. Eight wingnuts and eight large washers will hold these in place so find these now.

Put a wingnut and washer onto one end of each tie bar. Screw it in only enough so that thread just goes through the wingnut.

Push each of the tie bars through the 8mm holes in the side panel so that they go through to the matching hole on the other side. Hang a large washer on the projecting end and fasten a wingnut onto it. Do this for all four bars and tighten the wing nuts evenly – this will pull the frame together.



Congratulations. Your printer is starting to take shape.

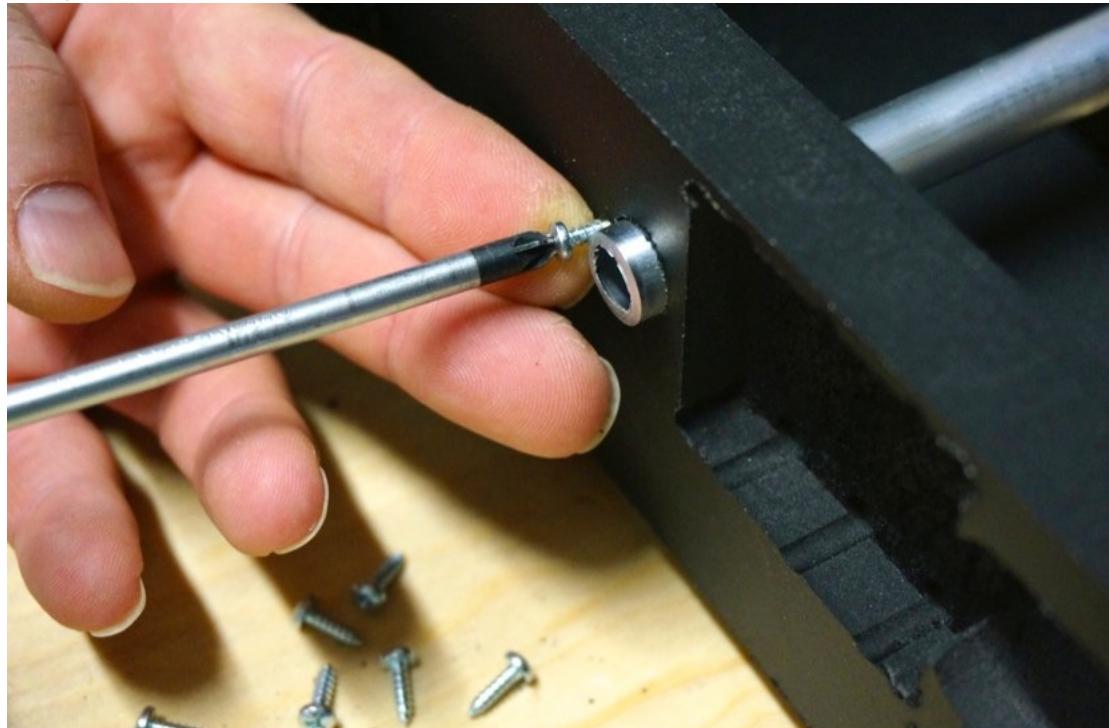


Y Rods

Take the two medium length smooth aluminium rods and insert into the 13mm holes in the lower rear panel. You can locate the correct rods, as they will be the same length as the printer frame from front to back. Slide them into the receiving holes in the front lower panel – they should not protrude from either end and there should be relatively little rod sticking out. If there is a lot, you have picked up the wrong rods.

Make sure there are no nicks or dings in the upper most side of the rail. If there are, rotate the rails until you find a smooth and unscathed side.

Secure the rods by screwing one of the small wood screws into the notch in the hole, which received the rod.



Constructing the Y-Carriage

Take the two long white bits of plastic, the two short threaded rods, four m8 wingnuts, four m8 nuts and eight m8 standard washers.

Thread the wingnuts (the wrong way around) onto both rods so that about 2cm of rod is protruding –the wings face inwards.

Add a washer and one of the white plastic pieces, another washer and an M8 nut. Leave as little thread protruding from the nut as possible and tighten using a spanner while holding the wingnut (barbarians can use pliers).

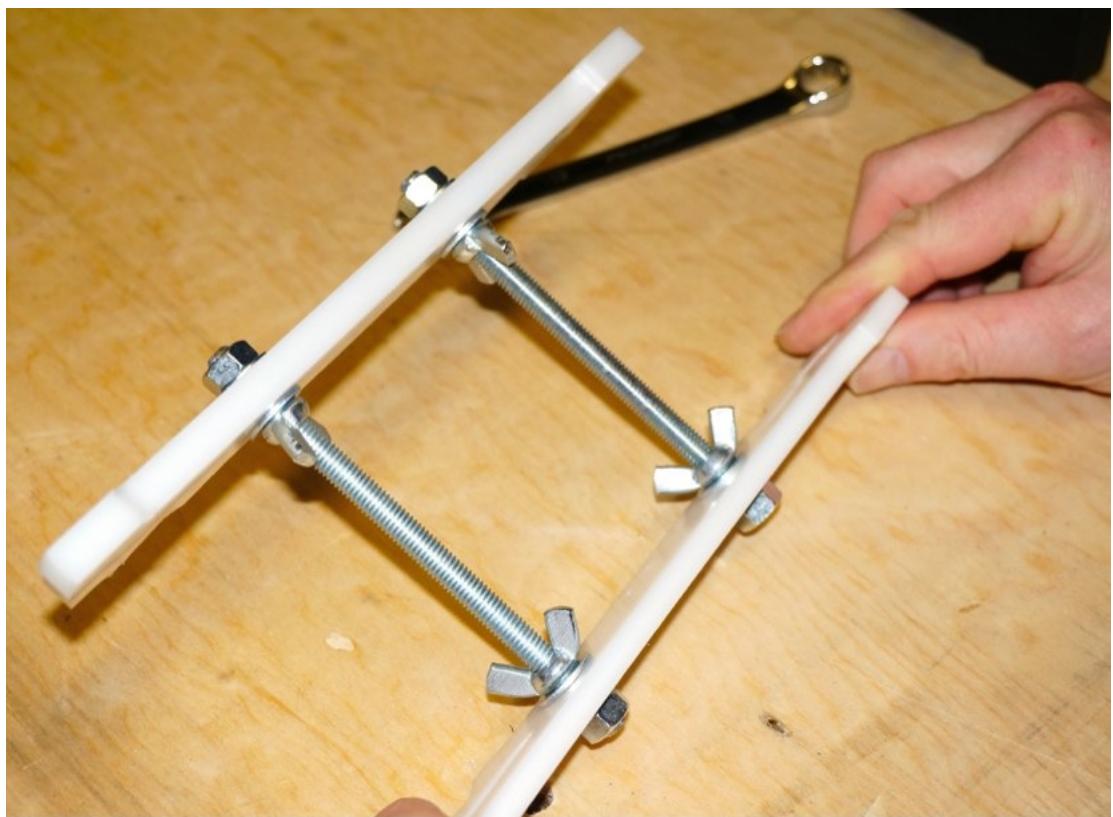


Do the same for the other hole and rod, taking care to leave as little thread protruding.

Take the other white plastic piece (called a Y-Runner) and place it onto the other ends of the rods, making sure it's in the same orientation as the other side. Add a washer and wingnut to each rod to secure it in place.

The Y-Runners should be parallel – but need not be absolutely exact at this point.

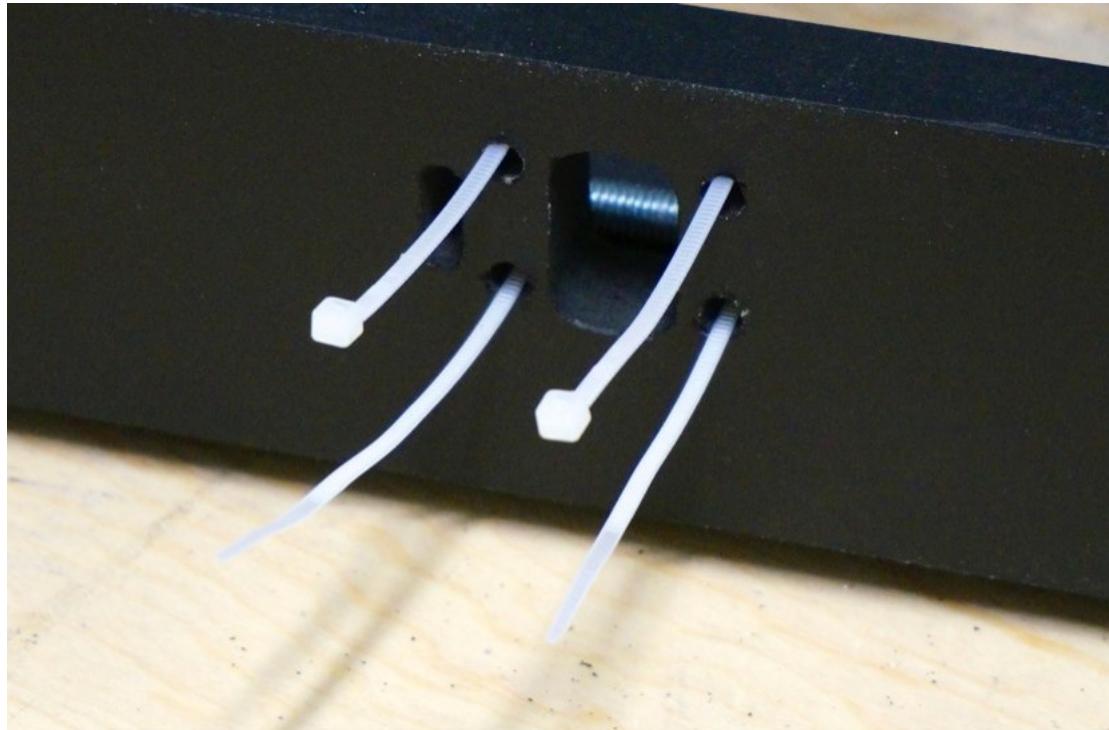
This assembly rests on the two rails on the base of the frame. Test that the carriage sits flat on the rods. If one corner sticks up, twist the carriage so that it sits flat. Once you have it sitting on all four corners without rocking when you add pressure then you can continue.



Y-Axis Idler

Take the 40mm M8 bolt, 608Z bearing, four standard washers and two large washers and a couple of small zip ties.

Thread the zip ties from the front through the top hole on the lower front panel and out the bottom hole on the same side – we want the zip tie fastenings on the outside.



Take the bolt and thread the following in this order – two standard washers, one large washer, one bearing, one large washer and the two remaining standard washers.

Place the head of the bolt sideways in the slot on the lower front panel between the zip ties. Now you can do up the zip ties which will hold the bolt snugly in

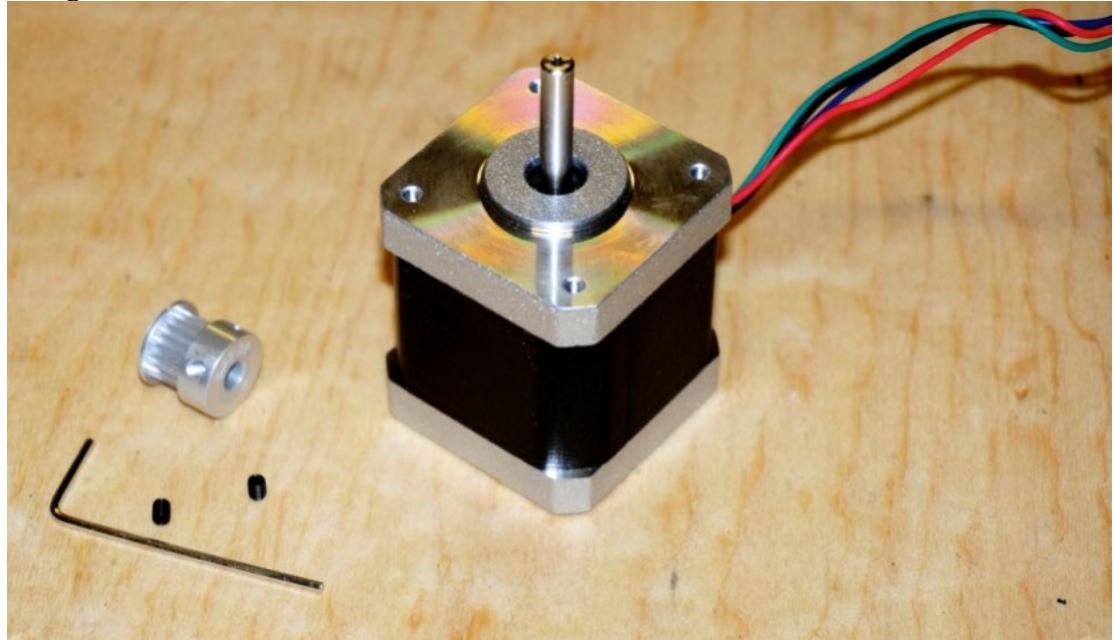
place – the bolt should have no movement.



Trim the zip ties.

Attaching the Y Stepper motor

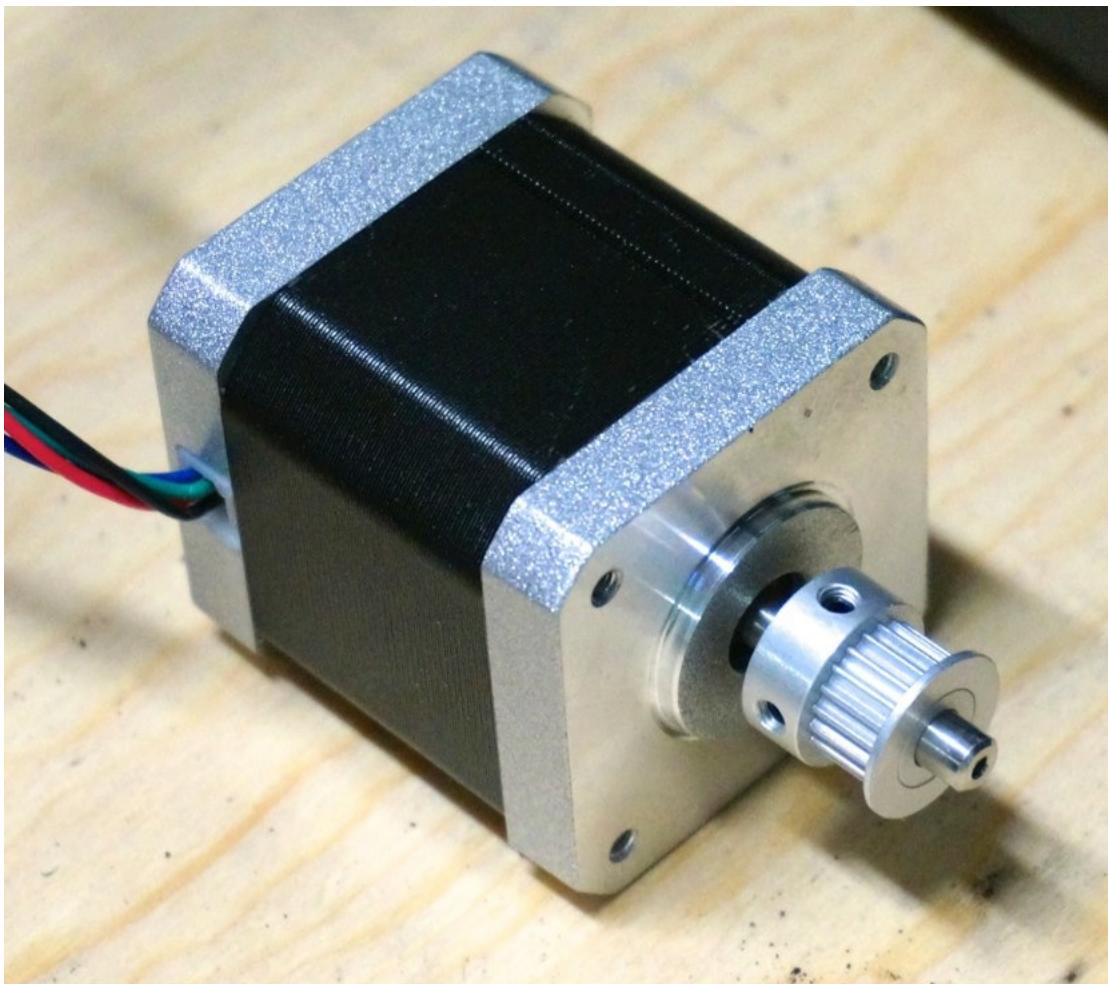
Take the stepper motor with the longest lead (if you're lucky we may be labeled it Y) and from the box of electronics one of the GT2 drive pulleys and the hex key and grub screws.



Using the hex key put the grub screw into each of the holes in the pulley – make sure you don't screw them in too far just yet.

Place the pulley on the shaft of the stepper motor leaving around 3mm of shaft sticking out the top of the pulley. Grub screws should be closest to the stepper body.

Gently tighten both grub screws and then go back and tighten them both fully.

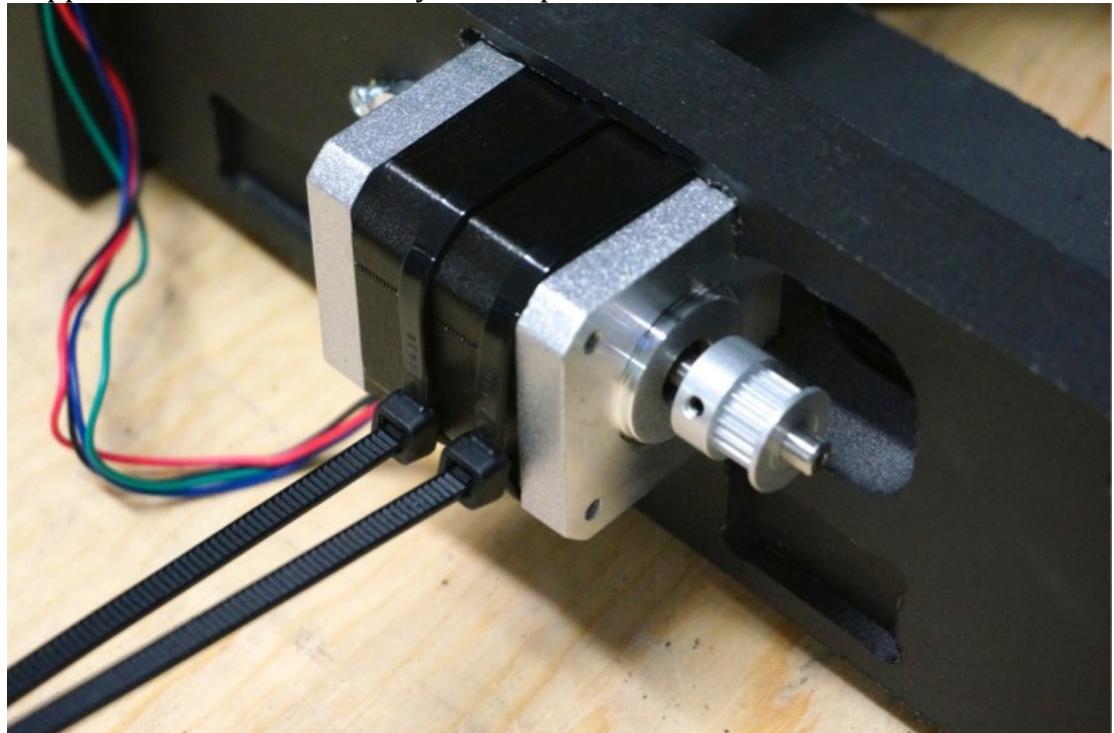


Thread a black cable tie through the left hand pair and right hand pair of the motor recess in the lower back panel – leaving the tie ends on the outside of the frame. Do not tighten them yet!



Place the stepper motor in the receiving motor recess so that the pulley is lined up with the hole in the panel. Tighten the cable ties as tightly as you can – the

stepper motor should be firmly held in place.

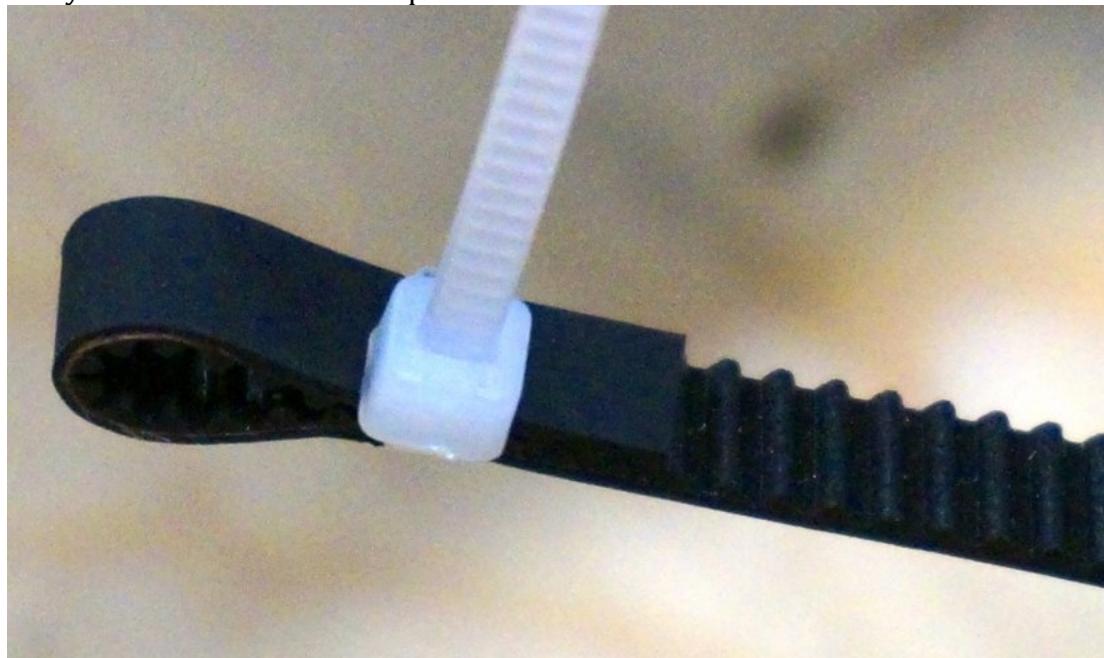


Clip off the rest of the cable tie leads.

Belt Attachment

Take one of the belts (they're all the same size) and double over one end about 30mm and wrap a cable tie around it to hold it in place – it's really important to make sure the catch on the zip tie is on the same side as the teeth (else the belt will hit the pulley before the carriage hits the end stop later).

Make sure the teeth of the belt mesh together – this will hold it securely in place and you're left with a nice loop at the end of the belt.



Thread two more cable ties into the Y carriage so they protrude out of the holes (i.e. the ends of the cable ties are facing out)

Thread one of the cable ties through the loop you made in the belt – with the teeth facing down.

Tighten the cable tie that you previously threaded through the Y carriage until you have around 15mm space between the belts – e.g. you tighten it around your finger.

Clip the lead off the cable tie leaving enough to grab hold of later for adjustments.

Thread the cable around the drive pulley and back underneath the Y-carriage, out underneath the idler (bearing), back over the top of the idler and finally make a loop in the belt that would place it around 10mm short of the carriage when taught.

CAUTION: make sure that the belt is actually running around the pulley and idler when you make this measurement as it can slip off and mess with your mind. Experience speaking.

Connect the loop you just created to the cable tie on the Y-carriage in the same manner as we did for the other side.

Tuning: Gradually tighten both of the cable ties until the belt is tight and can be strummed. Not so tight it makes a 'twang'.



Y End Stop

Grab one of the microswitches with the longest leads attached and pull a cable tie through the hole in the microswitch that is closest to the roller- you may need to use pliers and force. There are two switches with long leads and one with short leads – make sure you grab the long leaded switch.

Thread the plug and wire through the slot in the lower rear panel from the inside out and recess the microswitch leads into the slot with the roller at the top. You should now have a length of cable on the outside.

Thread the cable tie (that goes through the switch) out the hole in the panel and back through the other hole and finally through the securing end of the cable tie – this will hold the switch firmly in place.

You should now be able to test if the Y-Carriage activates the end stop. If it doesn't then it's likely the folded section of the belt is hitting the pulley on the stepper motor – trim off the excess belt and test again. If it still hits, adjust your cable ties or remove them and start again to remove the offending piece.

Take out the four Velcro tabs and place them on the four corners of the Y-Carriage. Don't remove the adhesive stickers for the topside yet. We'll do this later.

Put the printer aside for a while. We're now going to build the X and Z-axis.

X and Z-axis boxes

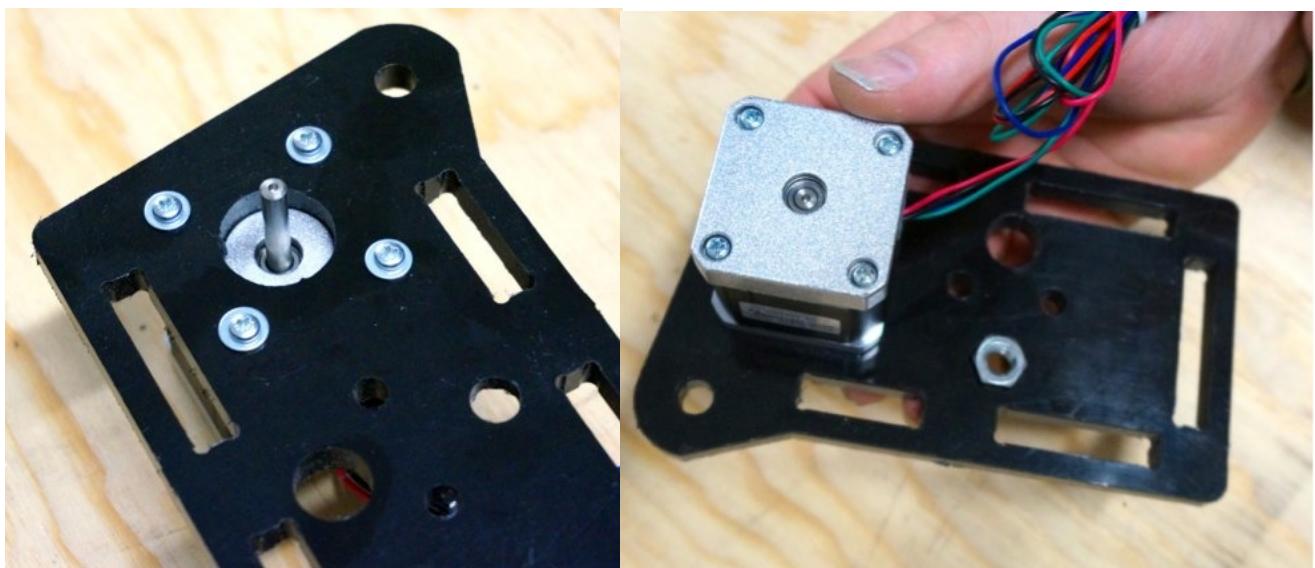
The X-axis consists of two boxes that support the rails and a carriage that slides back and forth between them. We'll call these the X-Boxes (ahem) and the X-Carriage.

X Boxes

Find the black plastic panel with a 22mm hole in it and four holes around it – this is where the stepper motor connects.

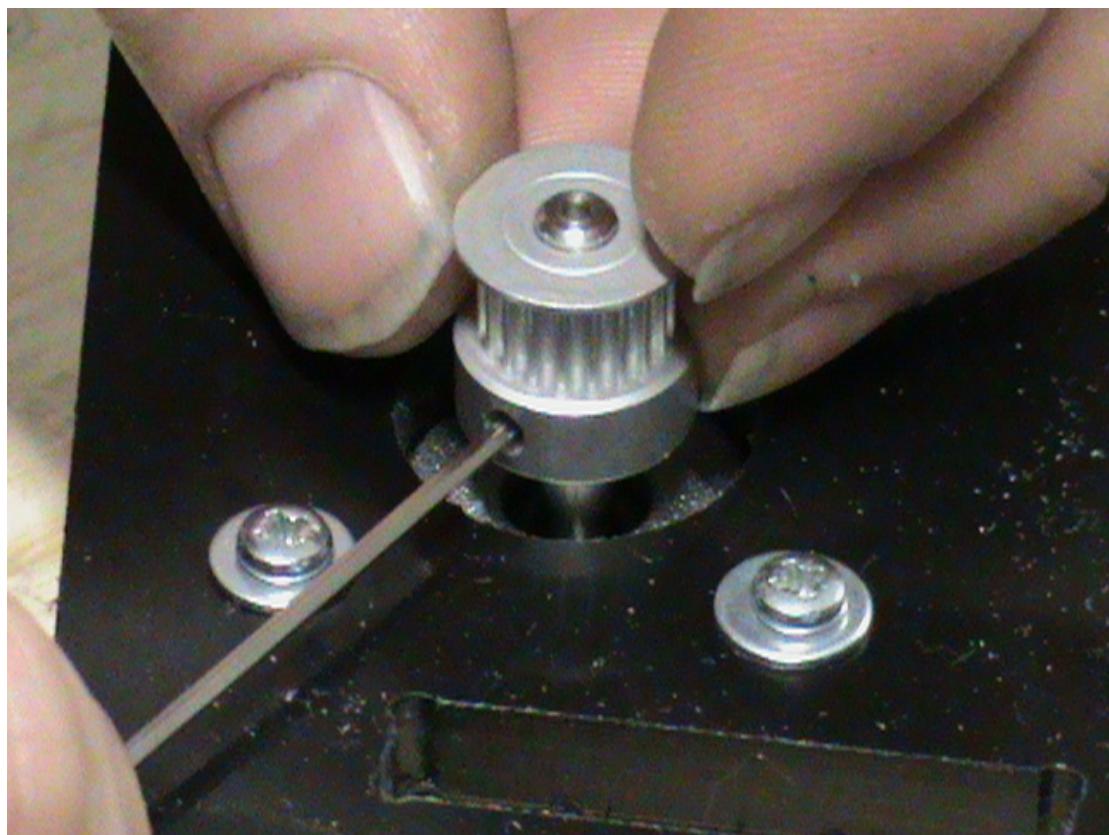
Put the motor on the side with the hexagonal cutout in it. See the picture

Turn the motor and panel over and secure the motor in place with four m3 x 12mm machine screws and m3 washers.



Take two of the tiny black grub screws and the hex key from the packet (in the electronics box) and put a grub screw in each of the two holes of the pulley. Ensure you don't wind them in all the way at this stage – we still need to attach it to the stepper shaft before tightening them. Slide the pulley on to the stepper shaft until the shaft just peeks out the top by around a millimeter or two.

Gently tighten the two grub screws. Then go back and tighten them fully.

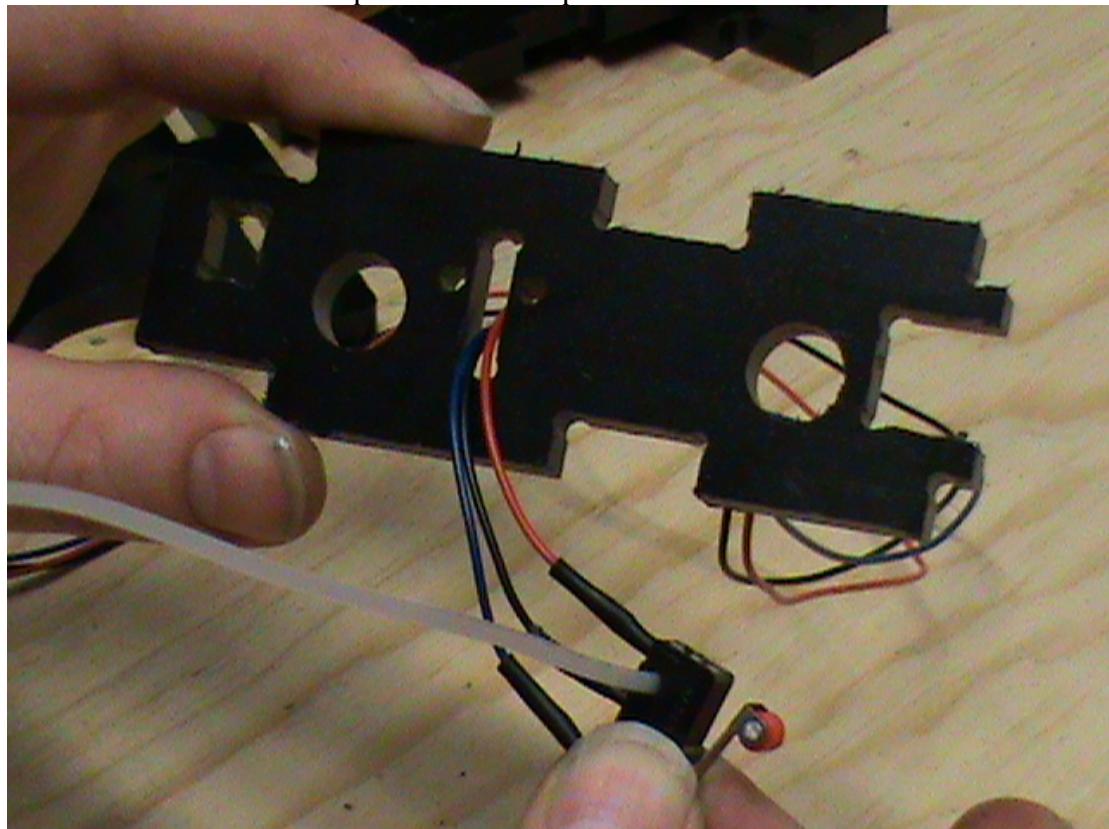


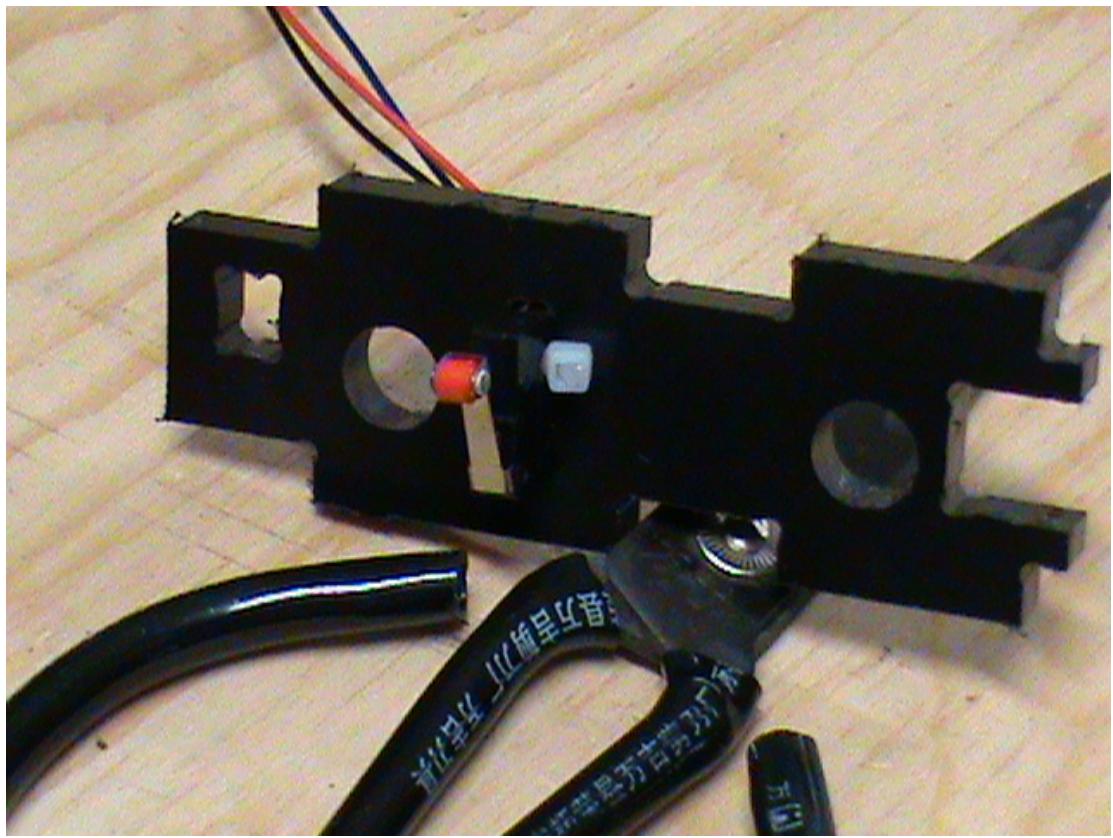
Orientate the base of the X-box with the stepper attached so that the stepper is furthest away from you and resting on your table.

Find the two side panels of the X-box – one will have a slot cut in it to hold the microswitch and this goes on the same side as the dogleg sticking out on the panel with the stepper attached. The two holes for the zip tie go toward the top.

Attaching the Microswitch

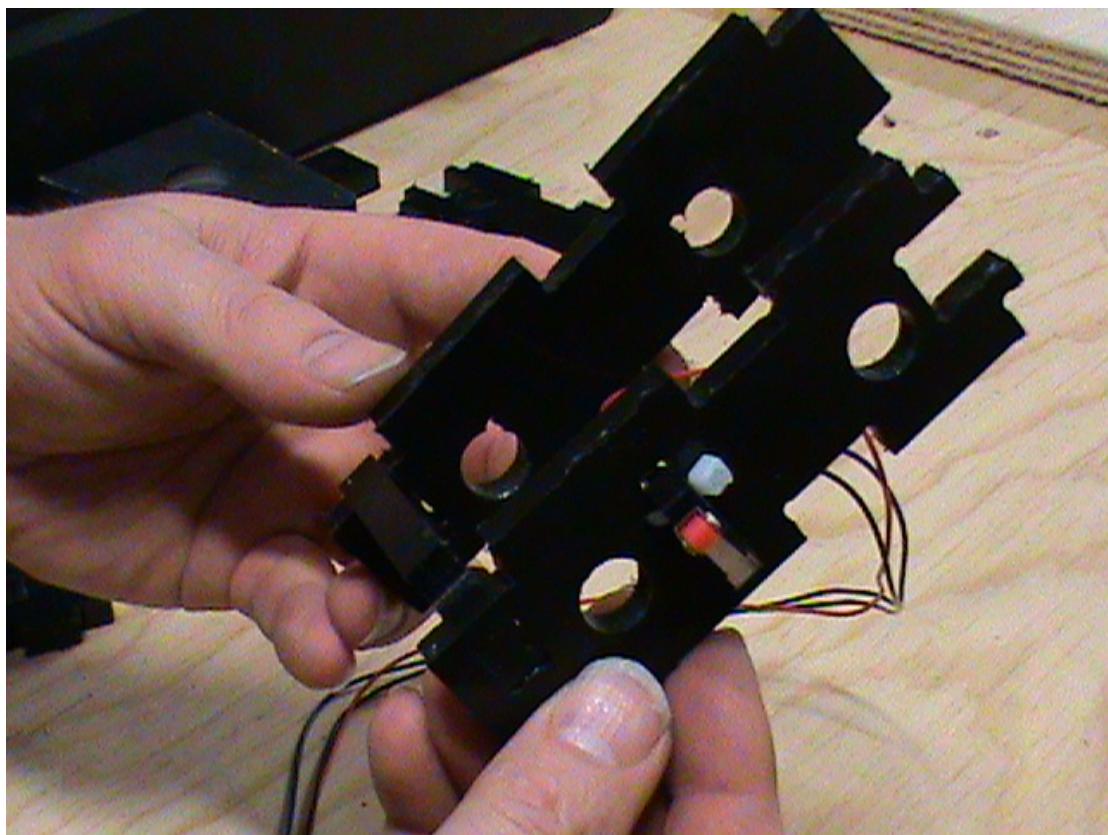
Take the microswitch with the shortest lead and thread the lead through the slot in the side panel and put a zip tie through the hole in the microswitch that is closest to the roller. Poke the back of the microswitch into the slot and secure it in place using the two nearby holes and the zip tie. Make sure you put the switch on the correct side of the panel – see the picks for confirmation.



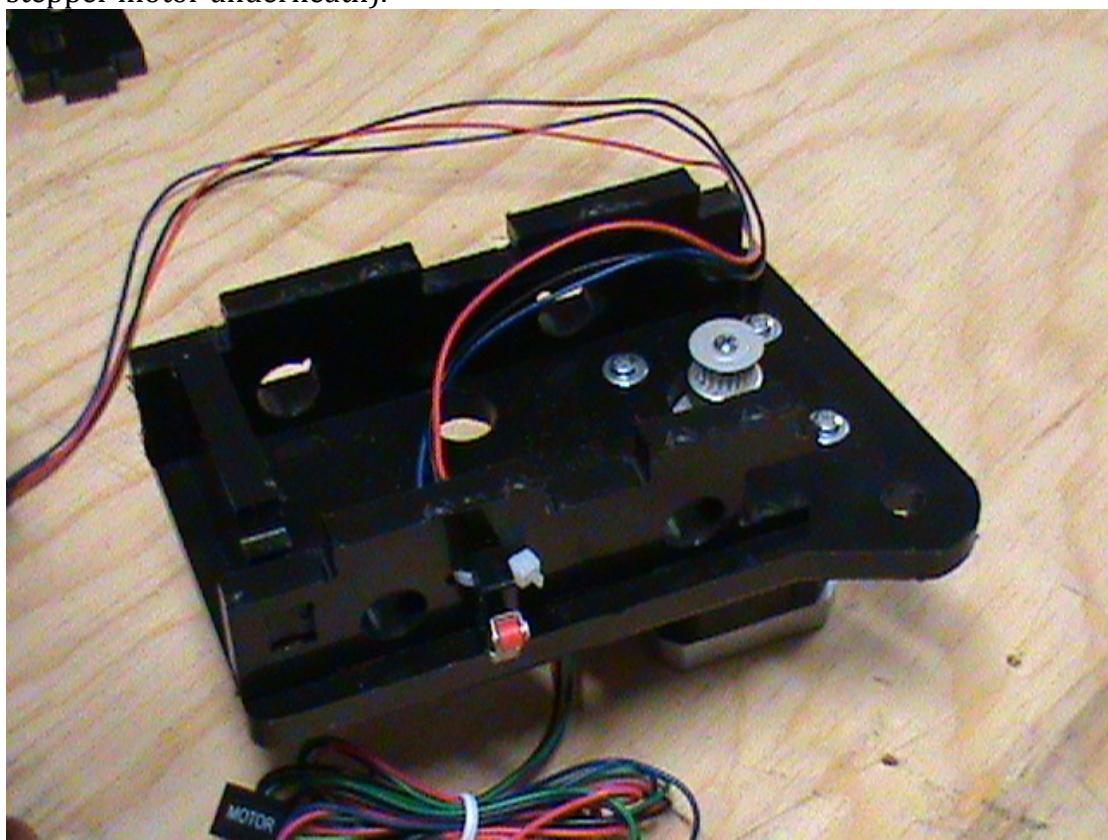


Take one of the side panels that have notches in the circular holes and one of the short solid black panels. You'll notice that the tabs on the ends of the short panel are off-center.

Put them into the receiving square holes in the two side panels (one of which has the microswitch in it)

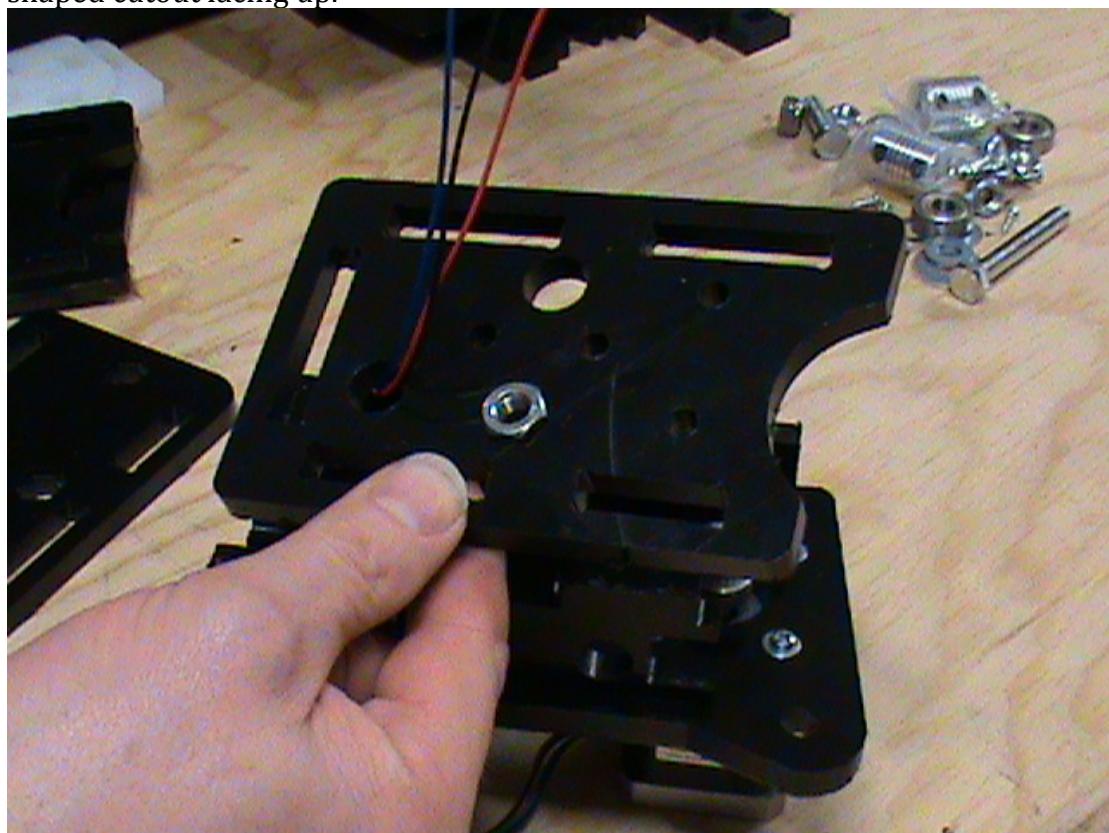


This U-shaped assembly fits onto the top assembly we made earlier (with the stepper motor underneath).



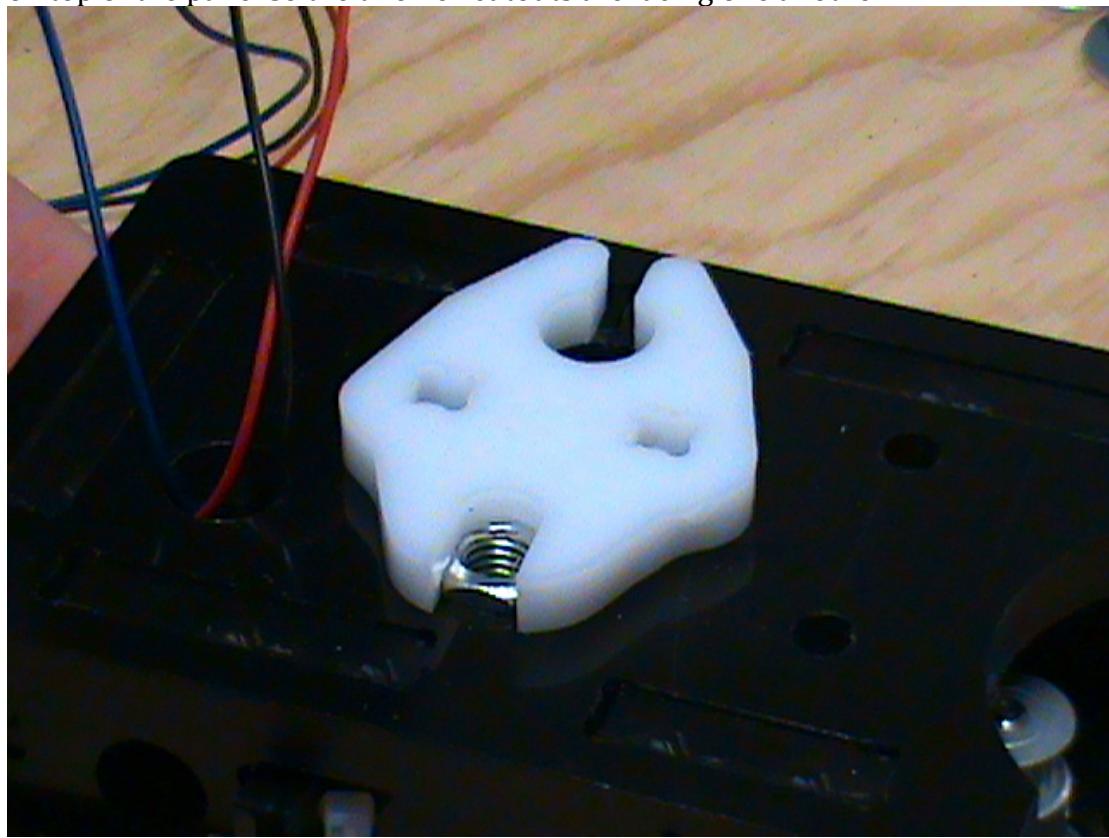
Poke the microswitch lead through the large hole in the corner of the top panel.

Take the large top panel and attach it to the rest of the box assembly with the hex shaped cutout facing up.

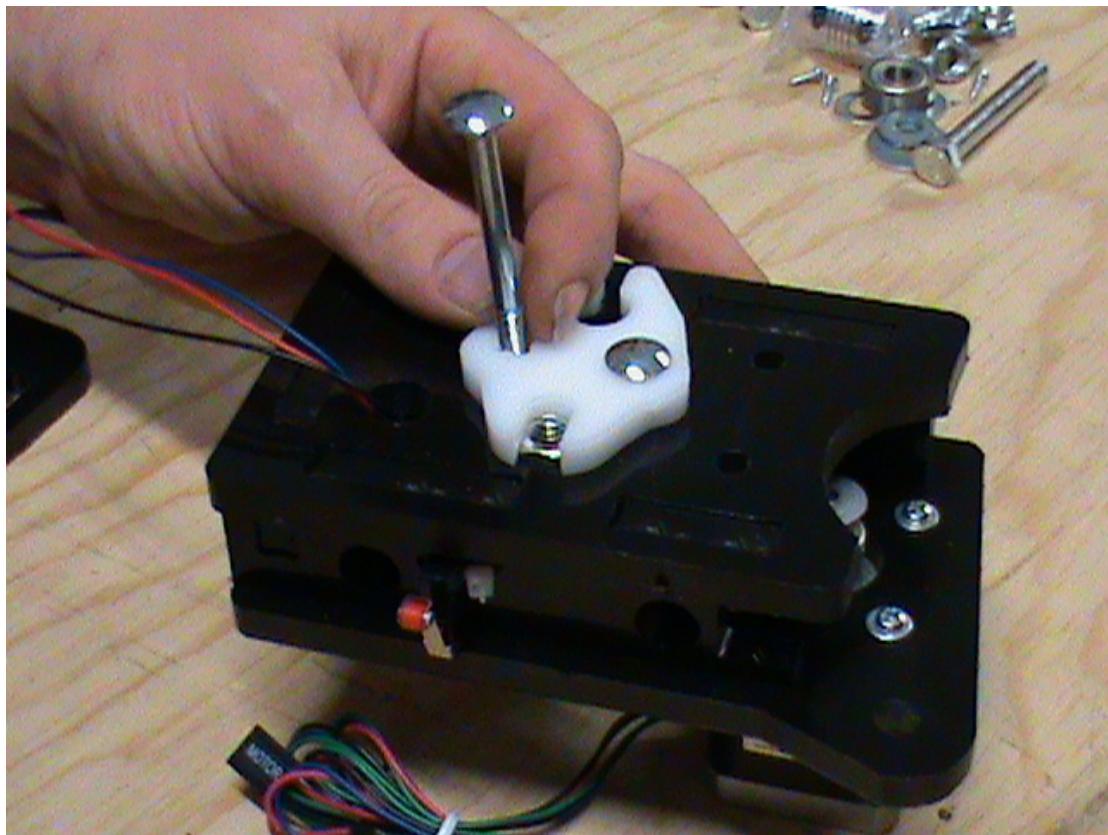


Put a full M8 nut in the hex cutout in the top panel.

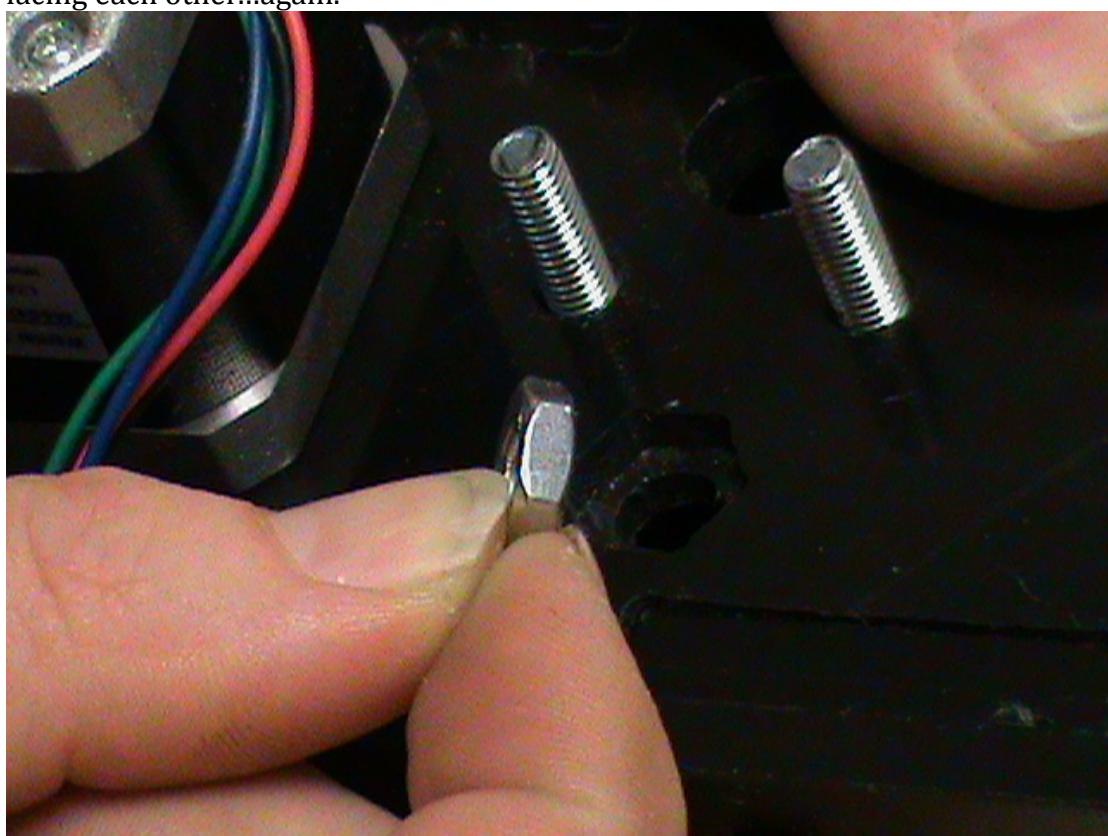
Take one of the small white bearings with the two cross shaped holes and place it on top of the panel so the two hex cutouts are facing one another.

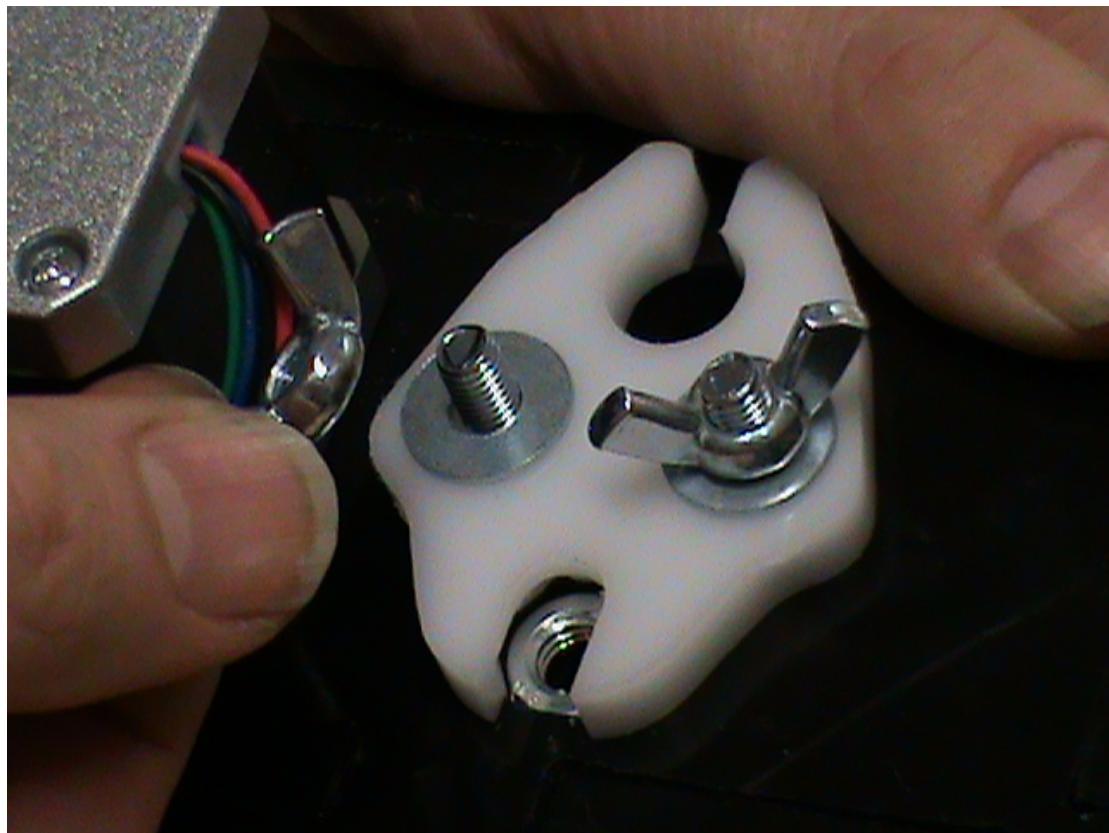


Put a 60mm M6 bolt (the short ones) in each of the cross-shaped holes, hold them in place and flip the assembly over.



Put an M8 half nut in the hex cutout put the other white bearing (this one has two round holes whereas the other had crosses) in place with the hex cutouts facing each other...again.

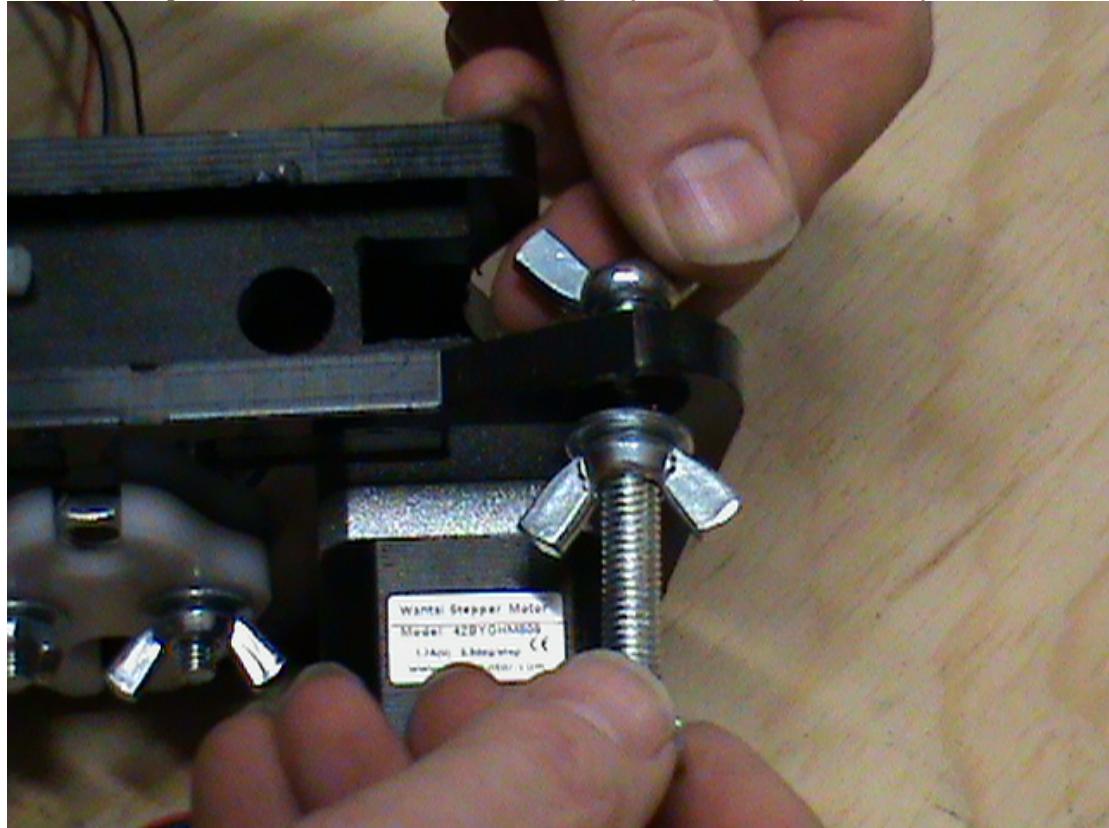




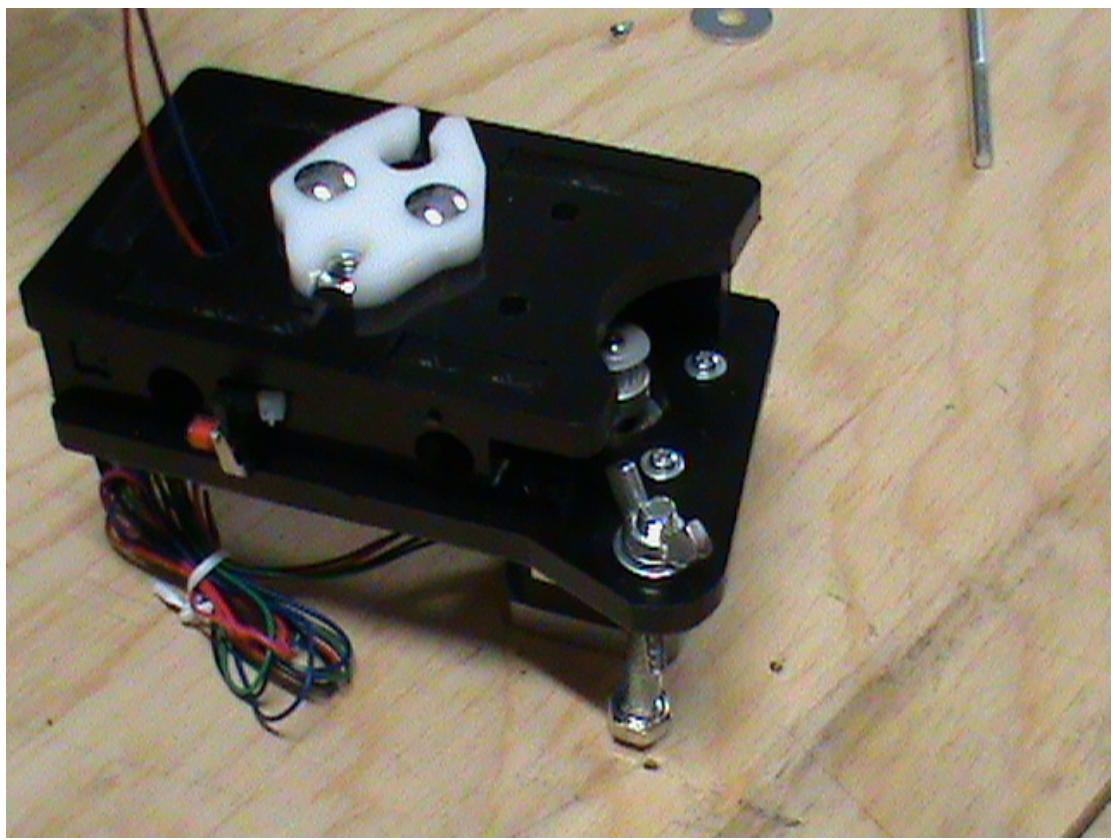
Secure the assembly in place with a pair of M6 washers and wingnuts.

Fitting the Z end-stop actuator

Take the longest M8 bolt (60mm) and put a wingnut on it backwards. Thread on a small M8 washer and poke it through the underneath of the hole in the dogleg. Secure it in place with a washer and wingnut (the right way around).

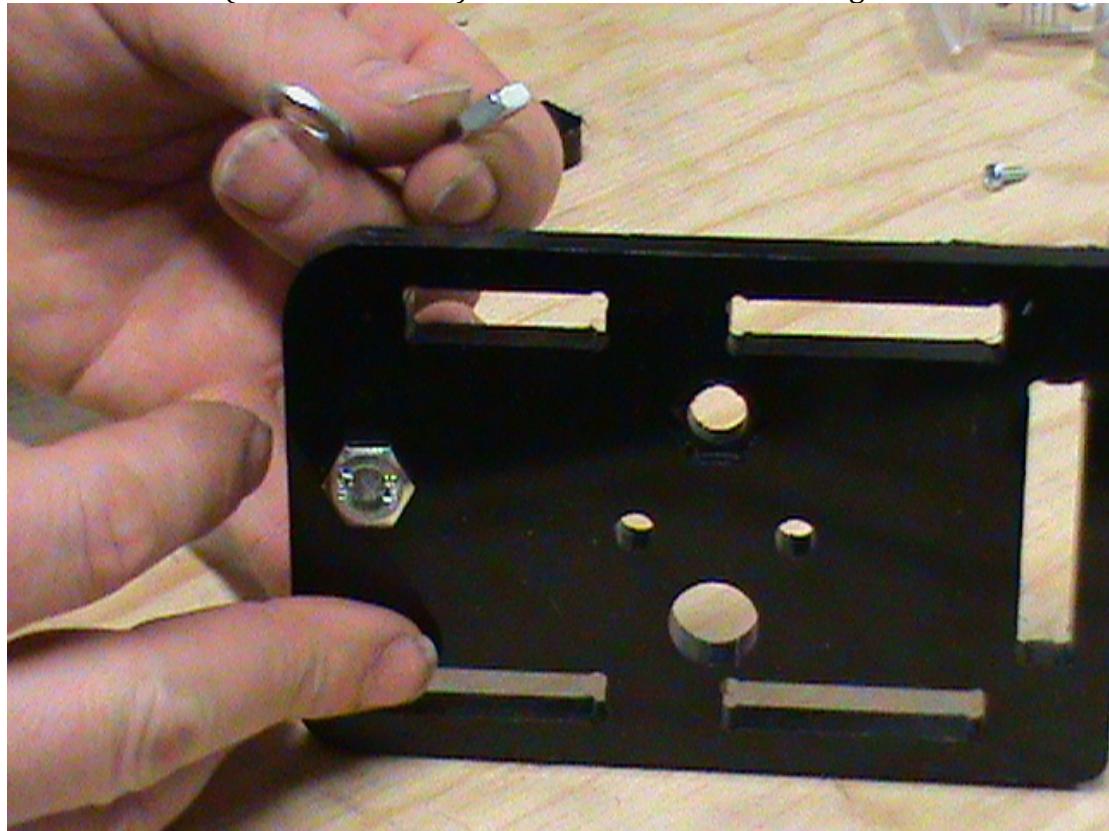


You should now have an assembly that looks like this one.



Assembling the X-Box idler

Find the large bottom panel with two hex cutouts in it (see picture) and put an M8x30mm bolt (the shortest one) in the cutout nearest the edge.



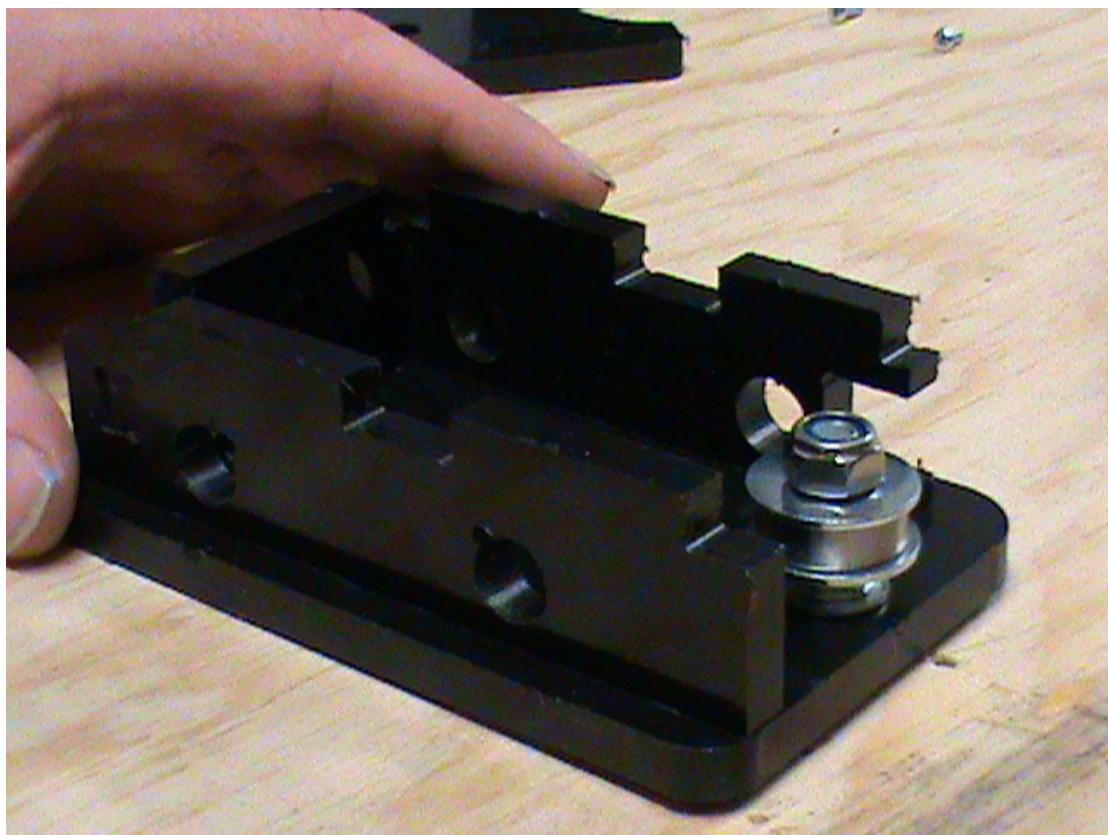
On the other side put on a small washer, a half nut, another small washer, a large washer, a 608z bearing, another large washer and top off our metallic sandwich with a Nylok nut (has plastic in the nut).

You will need a spanner to tighten the Nylok nut – barbarians will use pliers and should be shunned.

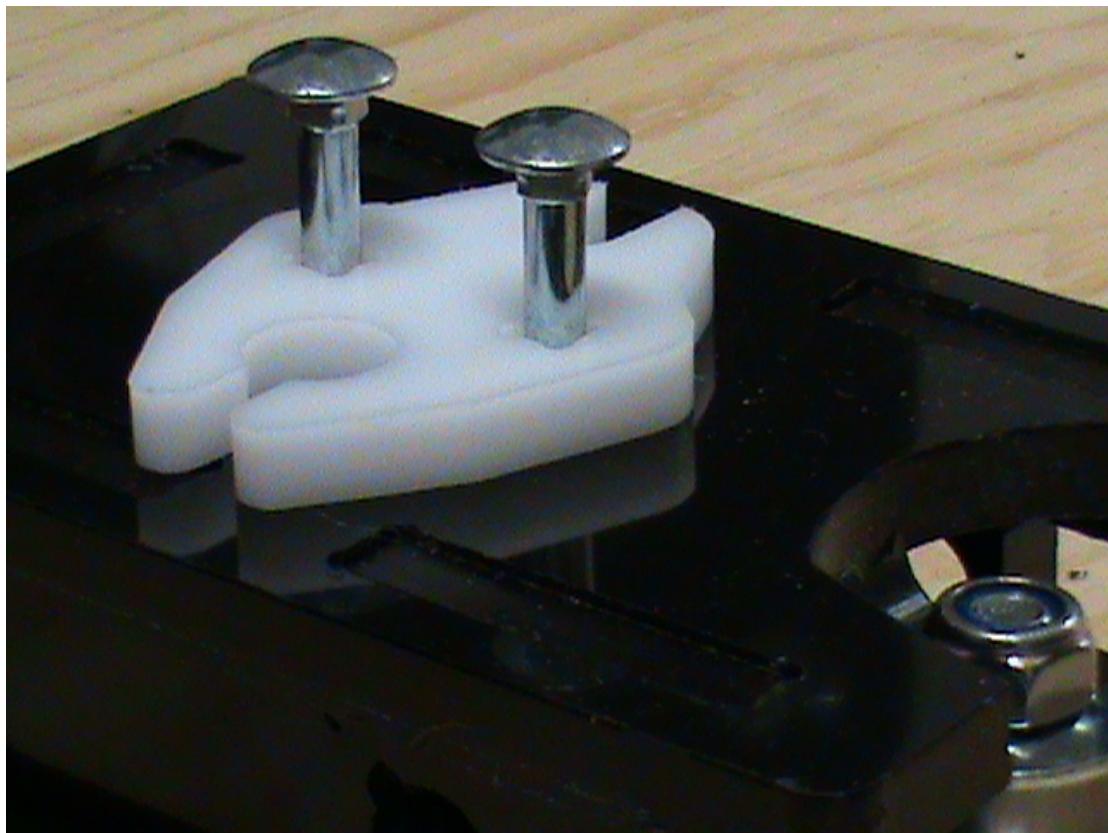
Make sure the washers can still rotate freely.



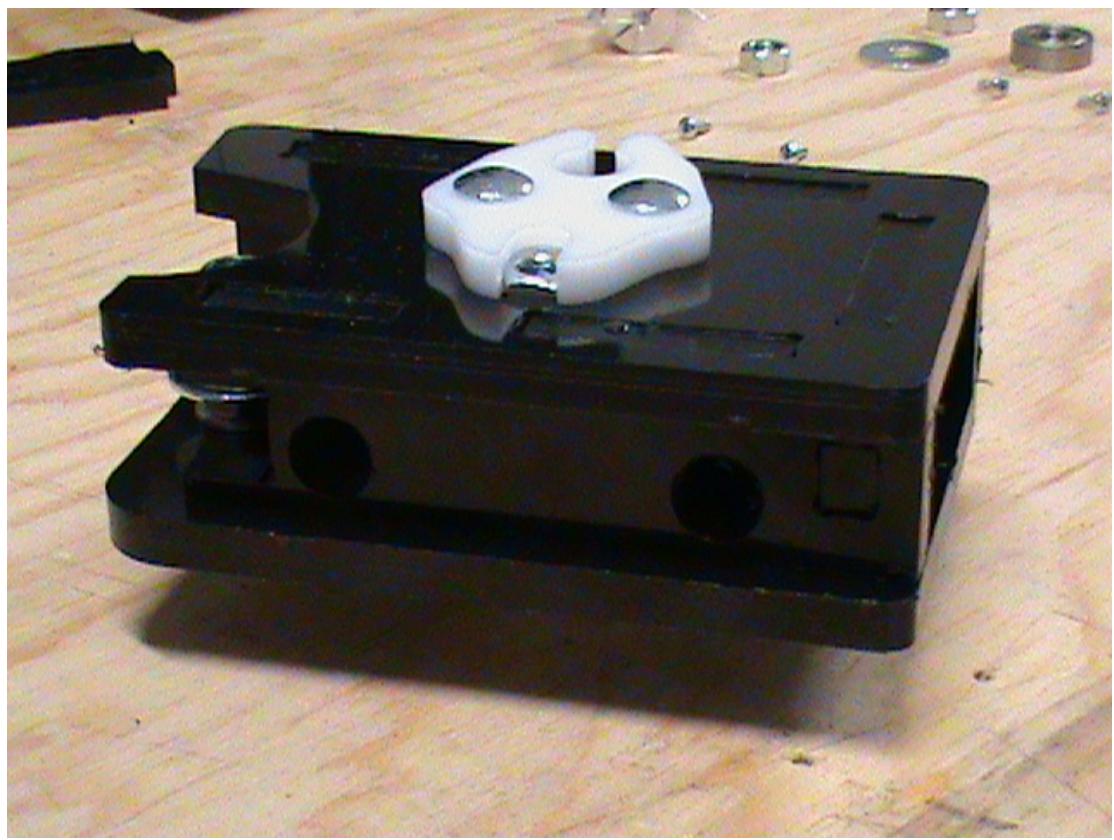
Make a U-shaped assembly from the remaining three panels as we did before. Make sure that the off center tab is at the top. There are no switches or wires in this box.



Fit the trapped Hex nuts (one is a half nut and the other is a full nut) and attached the white plastic bearings as you did earlier. The bearing with the cross-shaped holes goes on top and the one with round holes on the bottom.

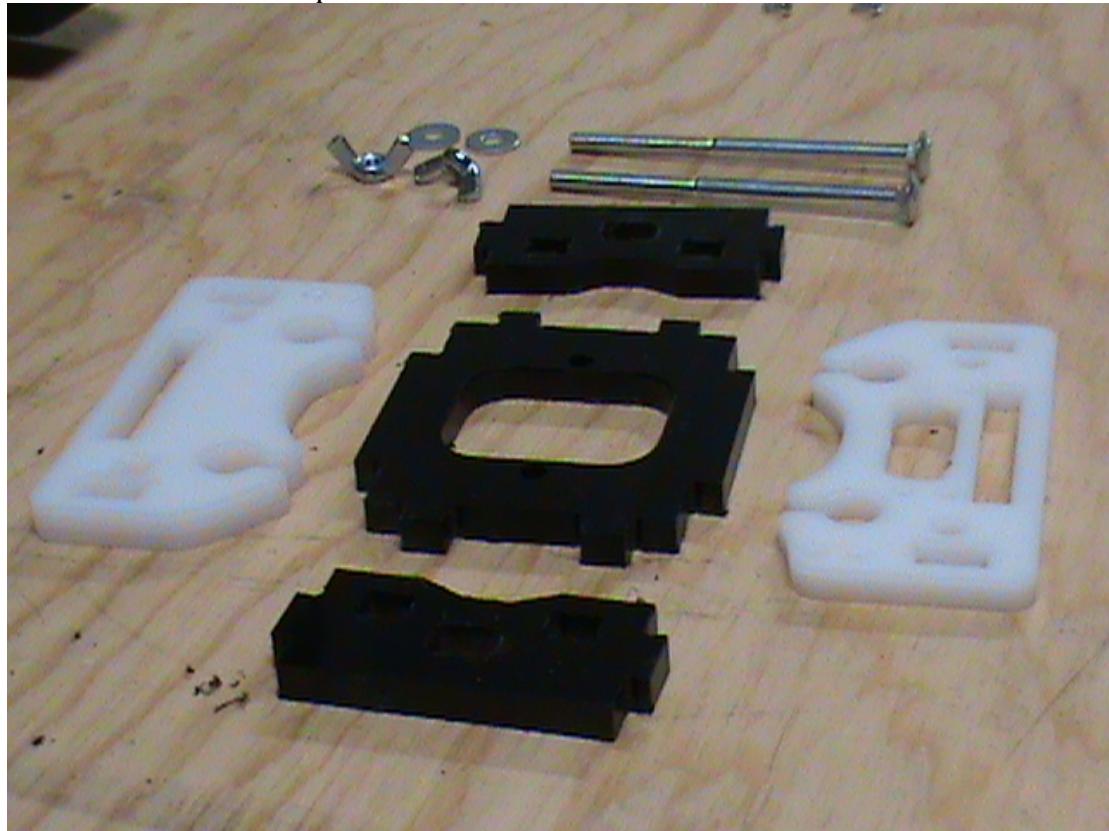


You should now have something that looks like this.

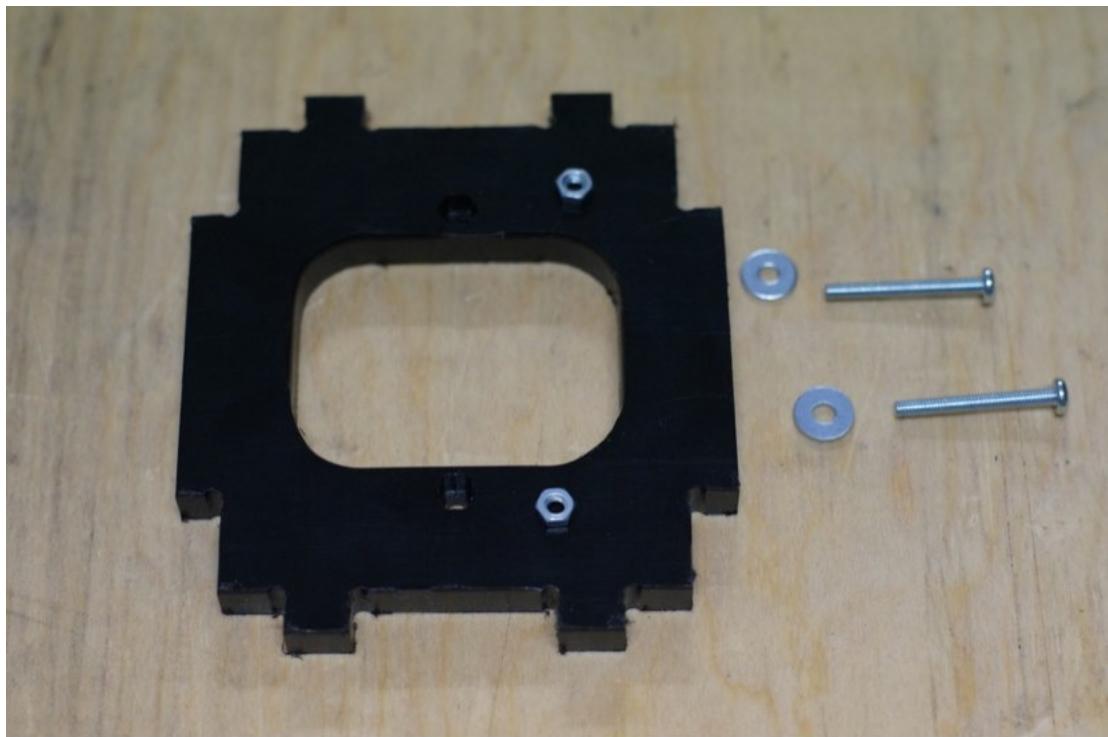


Assembling the extruder carriage

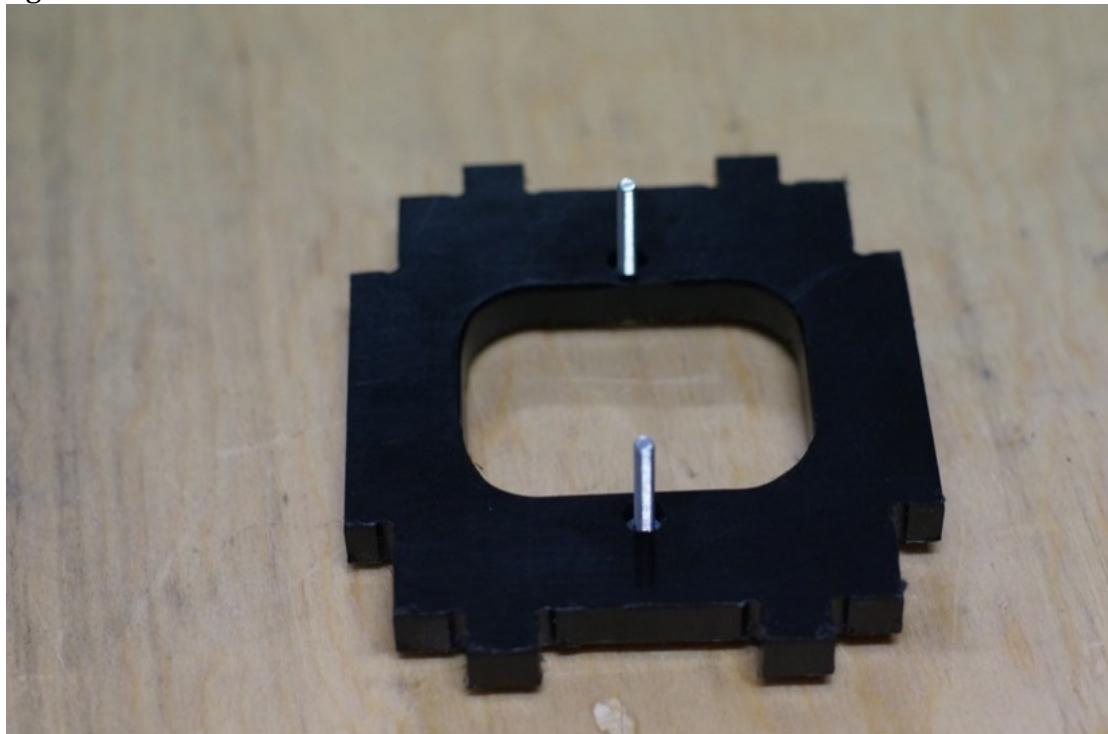
You should have these parts left over.

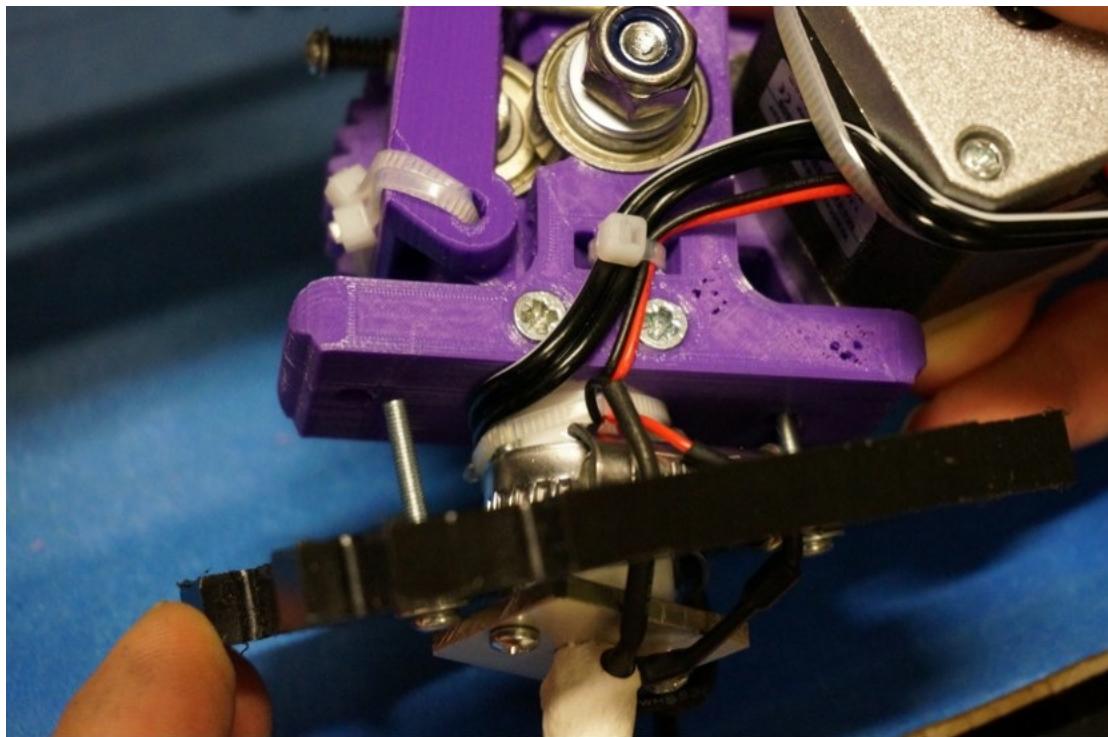


You will also need the extruder assembly – it will have a screw protruding from its base. You can see it here on the left of the photograph.



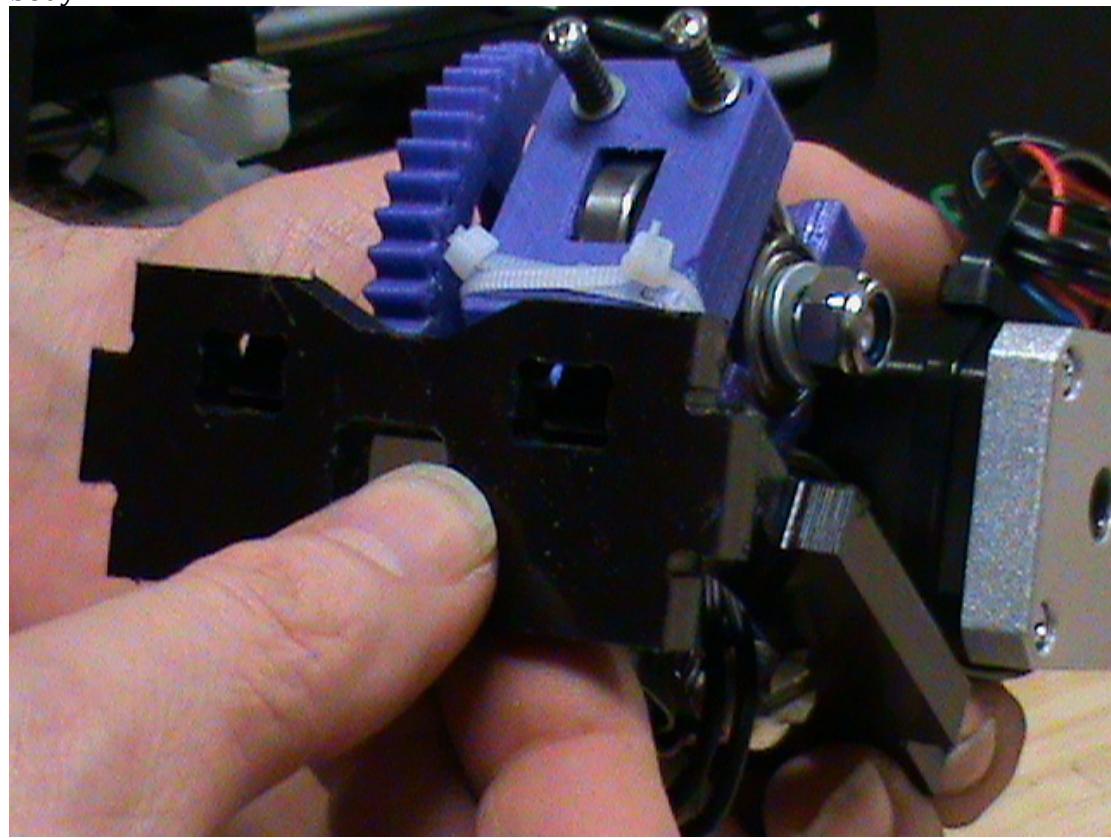
Put the two m3 nuts into the little hex cavities and put a washer on each of the m3 x 25mm machine screws. Thread them through from the other side and tighten.



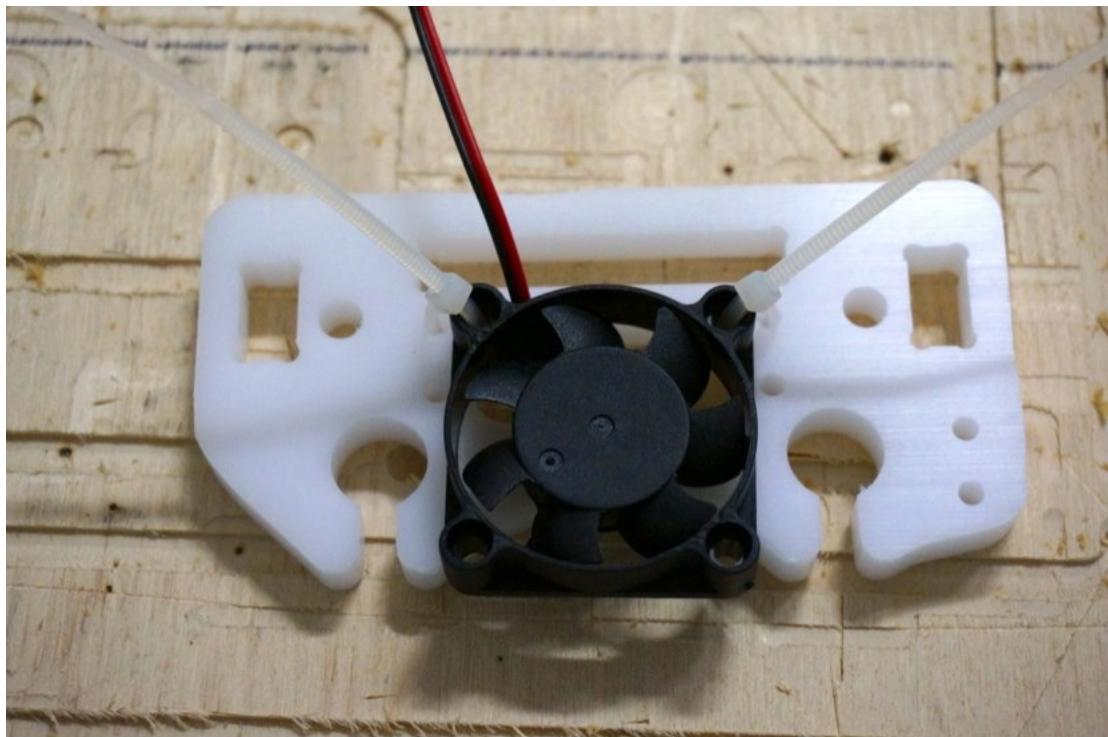


Insert the protruding machine screws into the two holes in the base of the extruder. Don't be afraid to wiggle, push and manipulate to get it into place. Fasten in place with ONE nut and washer on the screw furthest from the stepper motor. You don't need one on the screw that's directly under the motor.

Put the black sides on the base. The indent goes on the same side as the extruder body.



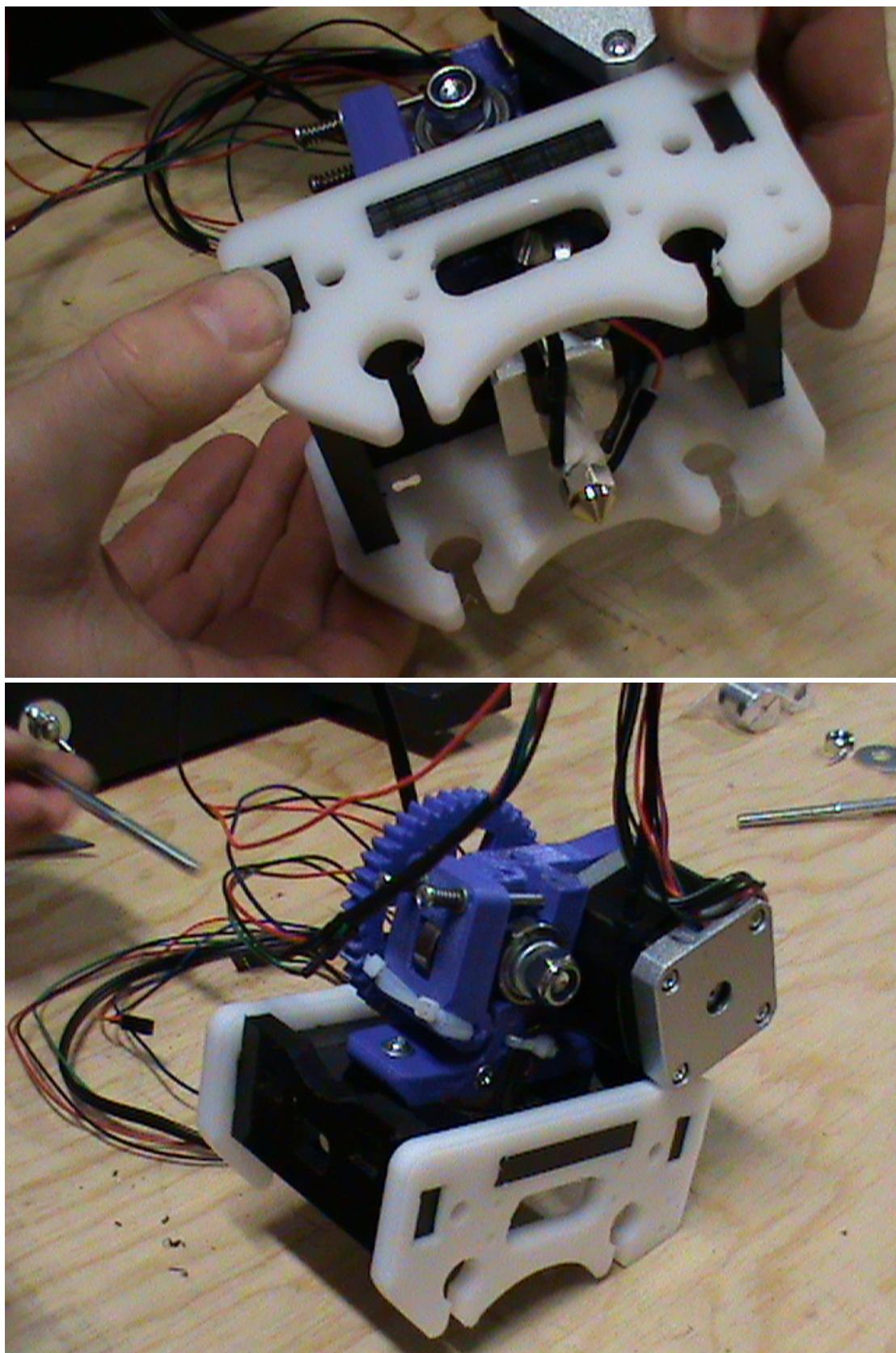
Attach the white sides to the assembly and pay careful attention to the orientation. The two tiny holes on each panel go closest to the stepper motor. The white panel with the extra letterbox slot goes on the side furthest from the gears of the extruder.



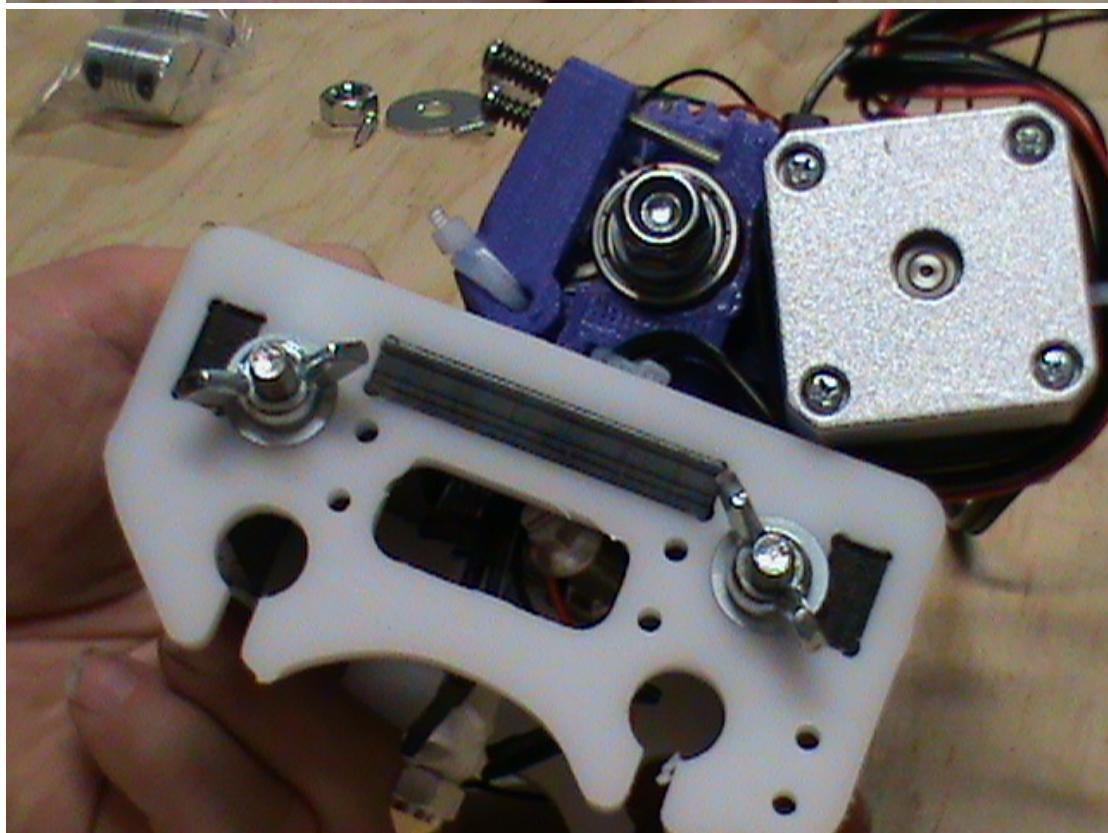
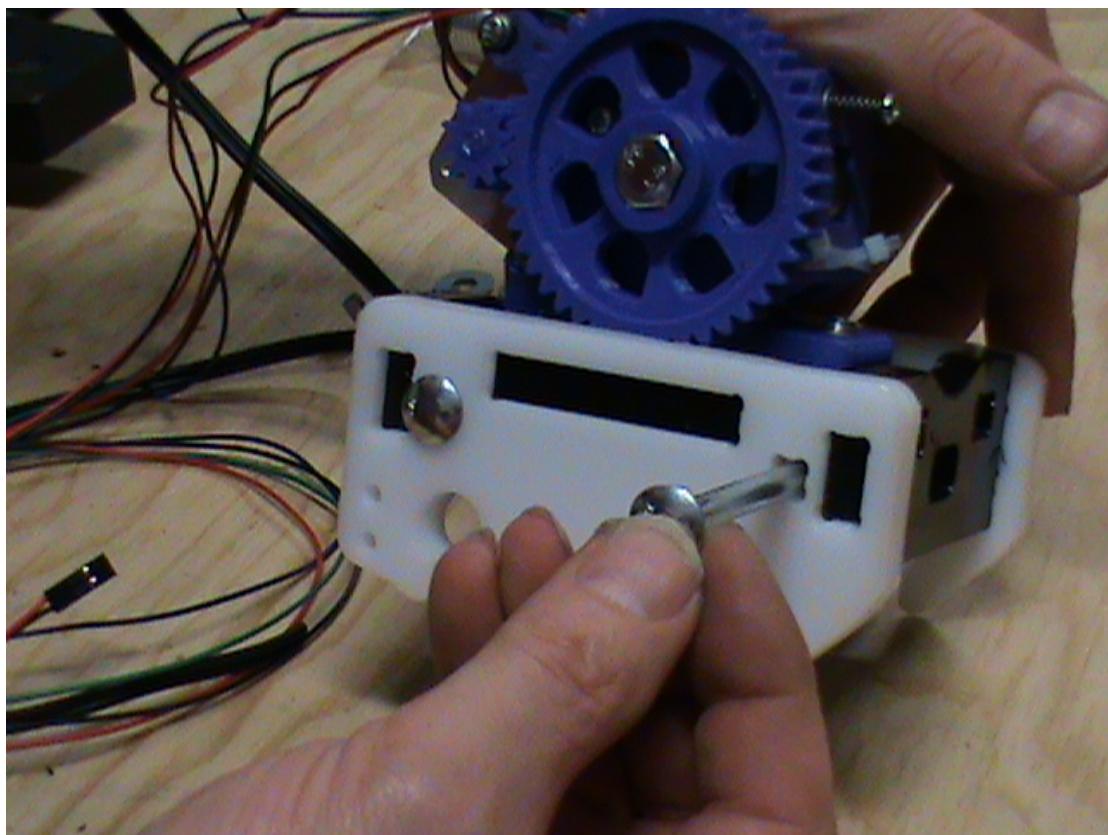
Attach the fan this way around and secure with trusty zip ties over the top of the rectangular hole.

When your printer is finished the fan should always be blowing air over the extruder. Do not use the machine if the fan doesn't work or else you will have a melted extruder.

Note: It's worth noting that in future photos we've left the fan off for clarity...but it's really there. Honest.

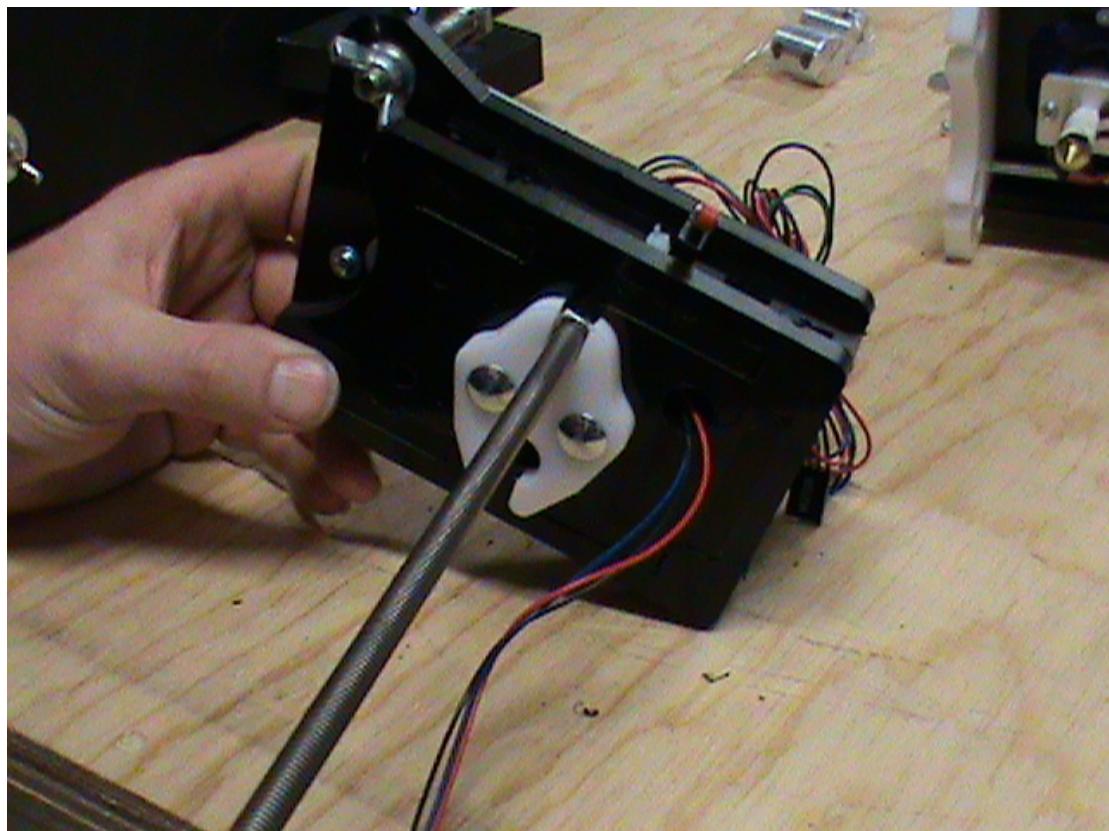


Locate the two 100mm M6 cup head bolts and insert them into the two holes with crosses in the side of the extruder carriage assembly. Fasten them in place with an M6 washer and wingnut each.



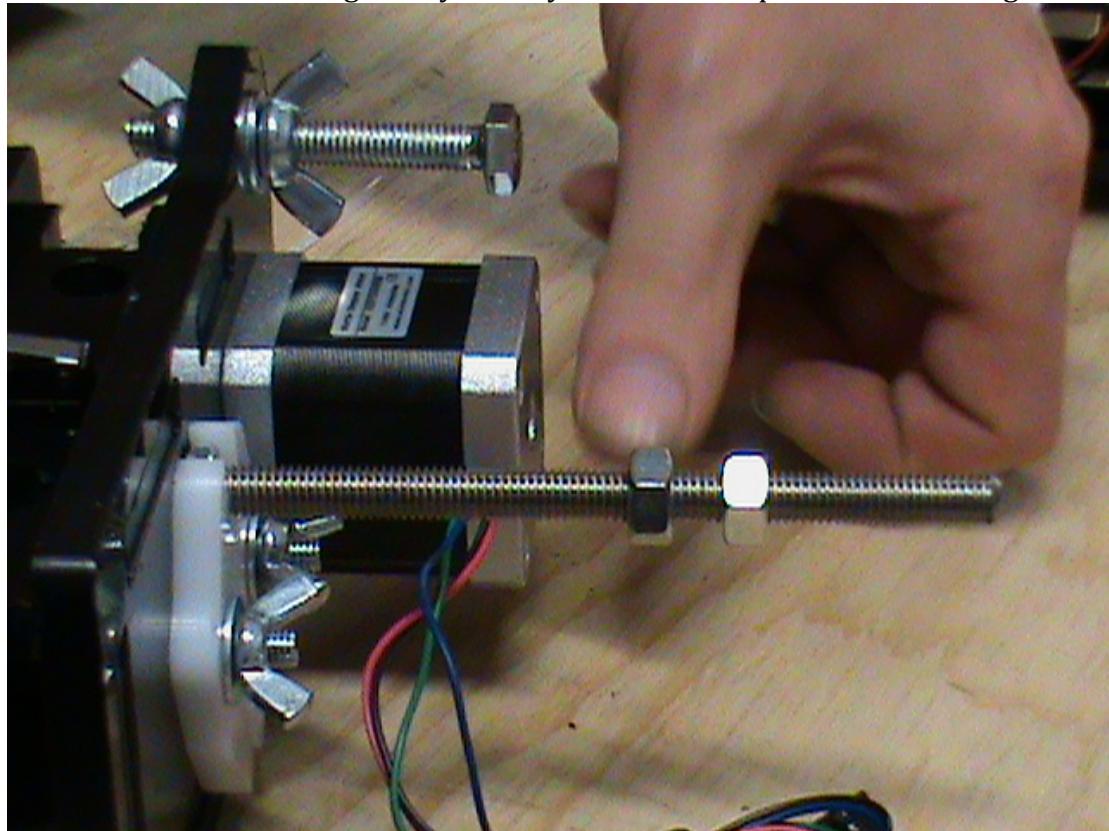
Rods in the X-Boxes

Find the threaded stainless rods and screw them into the X-Box holes where you captured a hex nut previously. The end without tape on it goes into the hole. The end with yellow tape will be threaded into the coupler on the Z stepper motor later. Wind it through around 120mm.

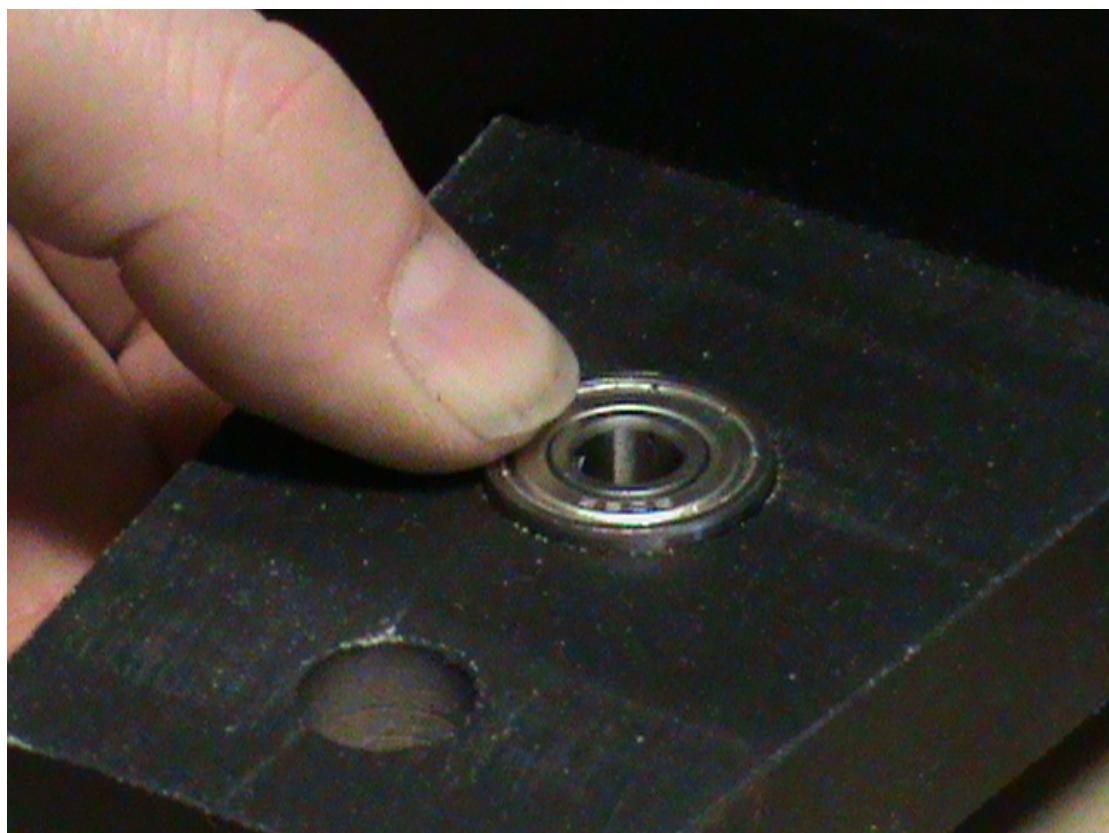


Wind two nuts onto the under side of the X-box with the motor about 60mm.

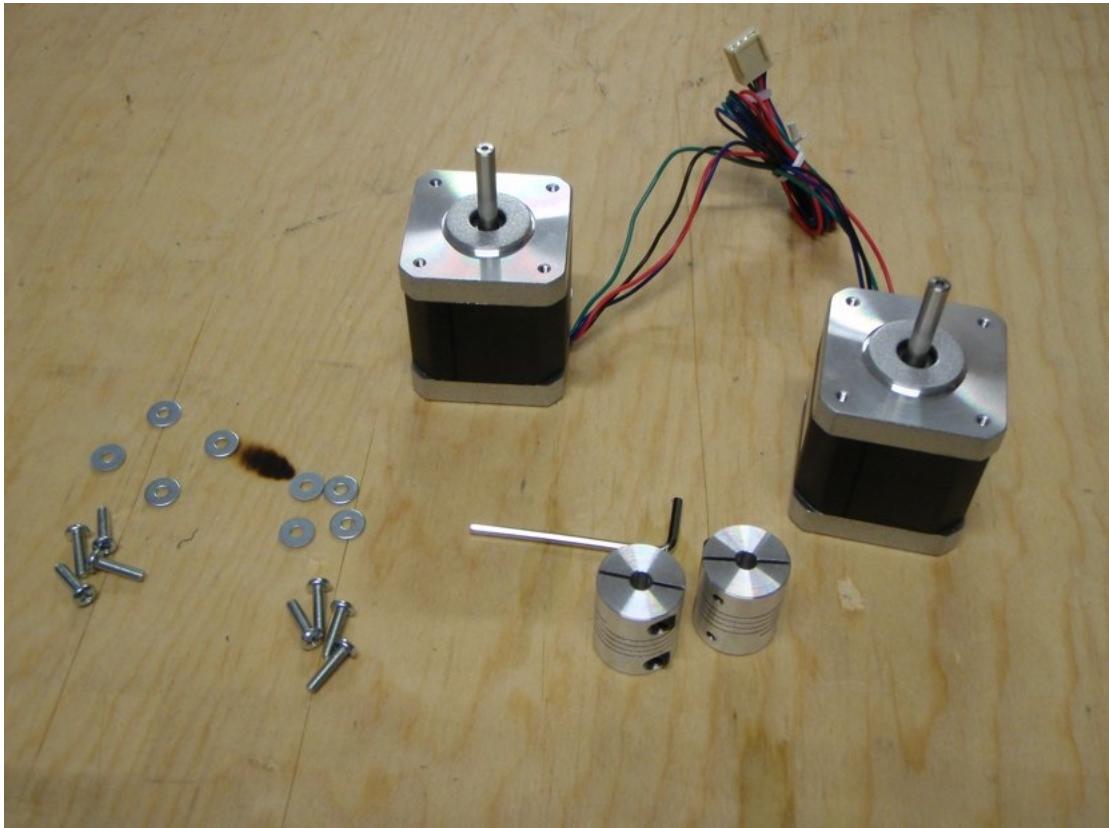
Do not lock these nuts together yet. They will rest on top of a 608z bearing later.



On the bottom left hand side of the frame there is a cavity for a 608z bearing, drop one into position.

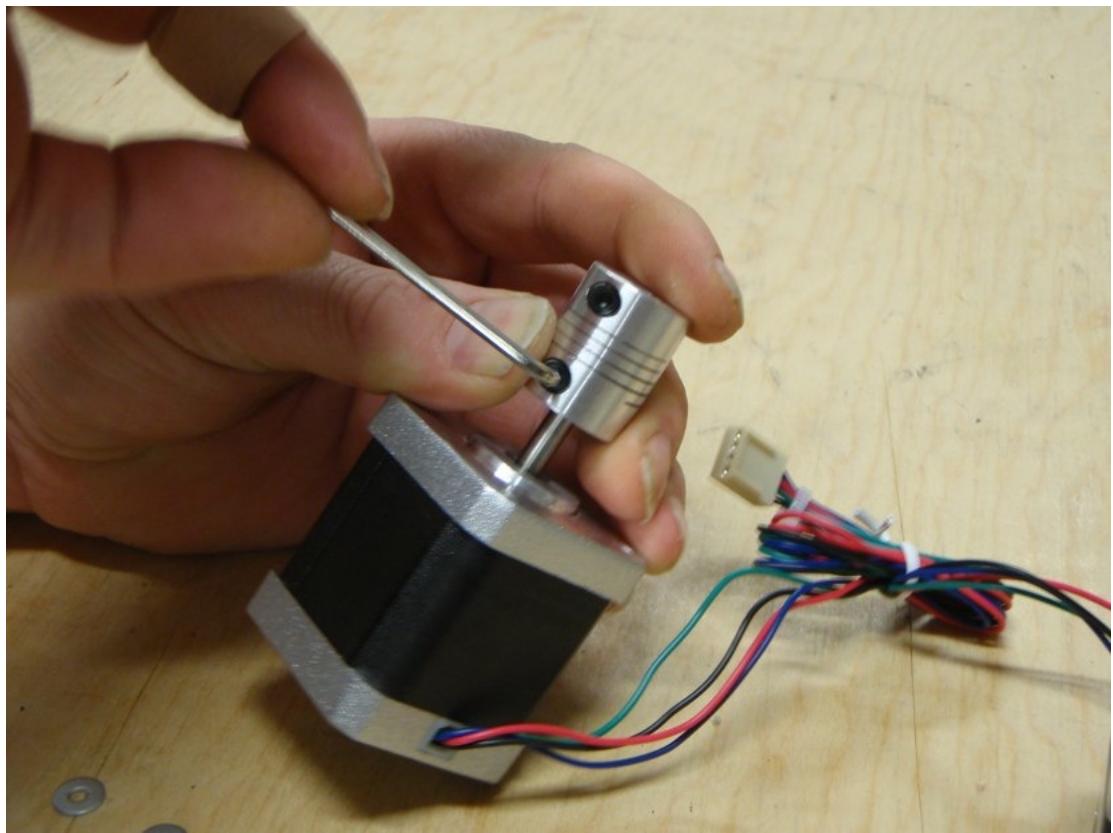


Fitting the Z Motors



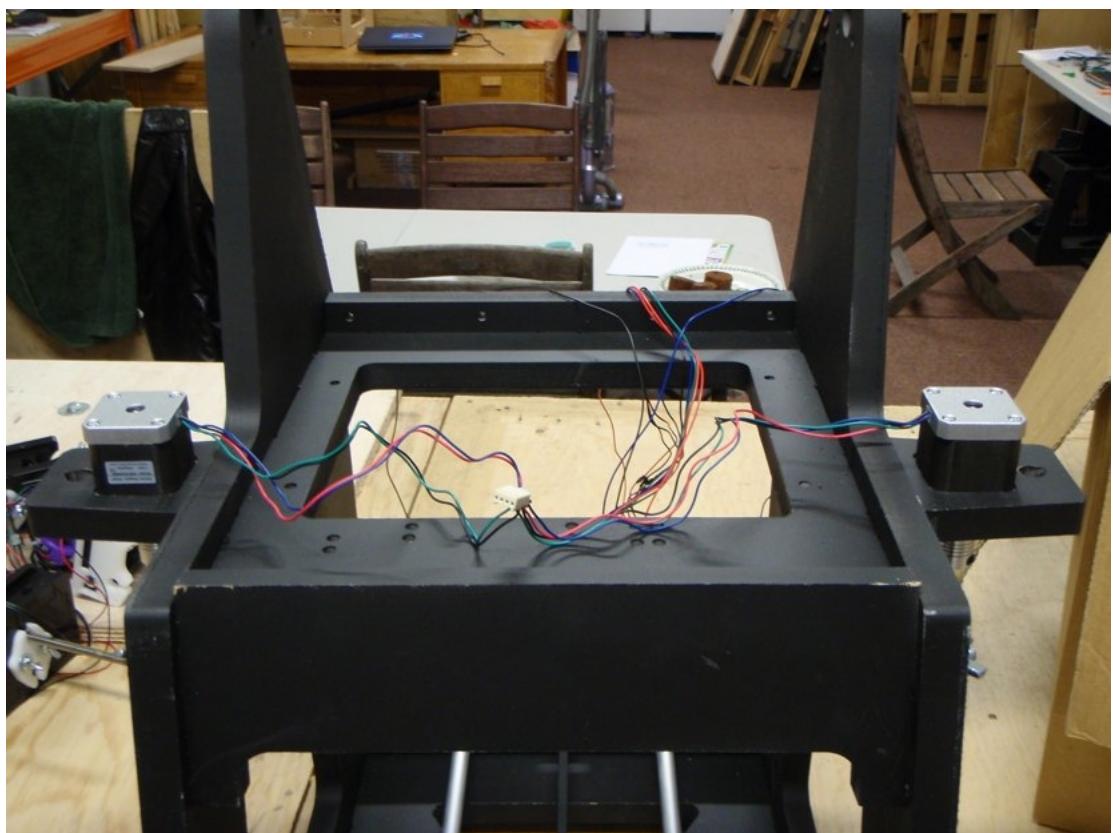
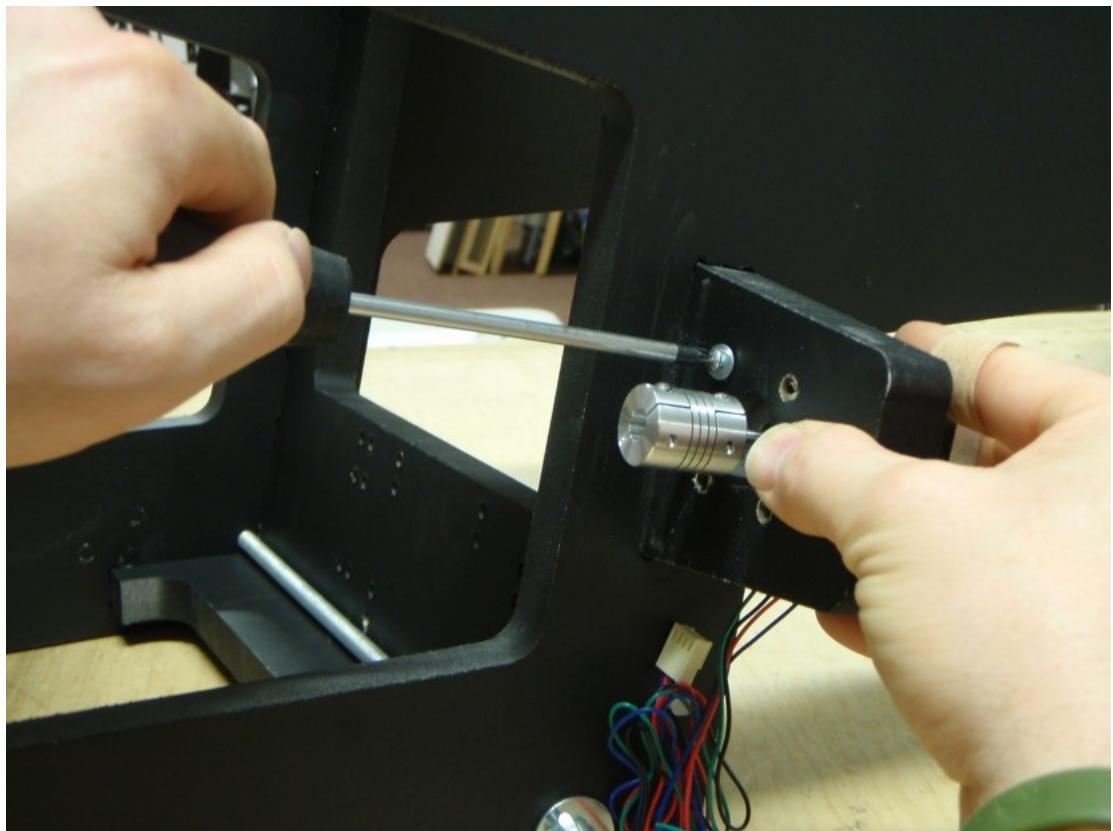
Locate the items in the picture above. The eight screws are M3 x 12mm.

Connect the two couplers to the shafts of the stepper motors. The shafts go about half way in as per the picture below. Fasten them in place with the supplied 2.5mm hex key.



Tip the frame of the printer over so it's lying down, this will make it easier to fit the stepper motor screws.

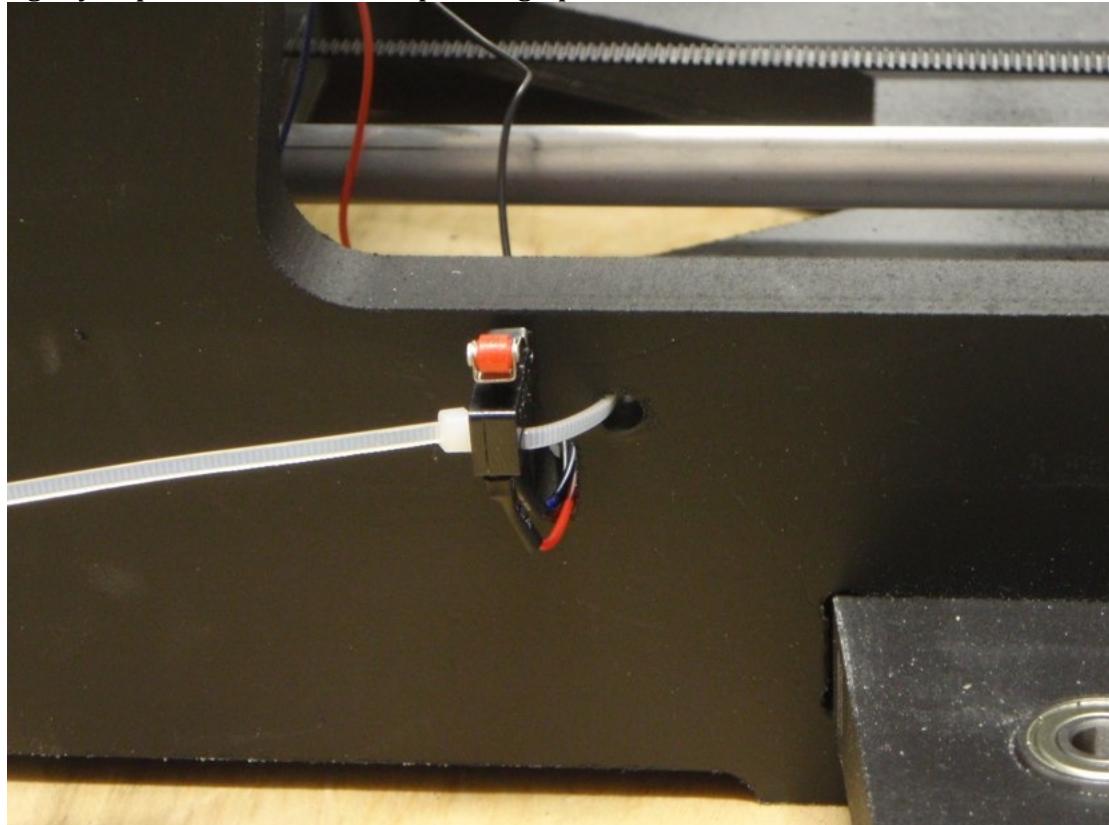
Push each stepper motor into the conveniently shaped stepper motor cavity in the frame and secure in place with the screws and washers. The leads of the stepper motor should face toward the middle of the frame.



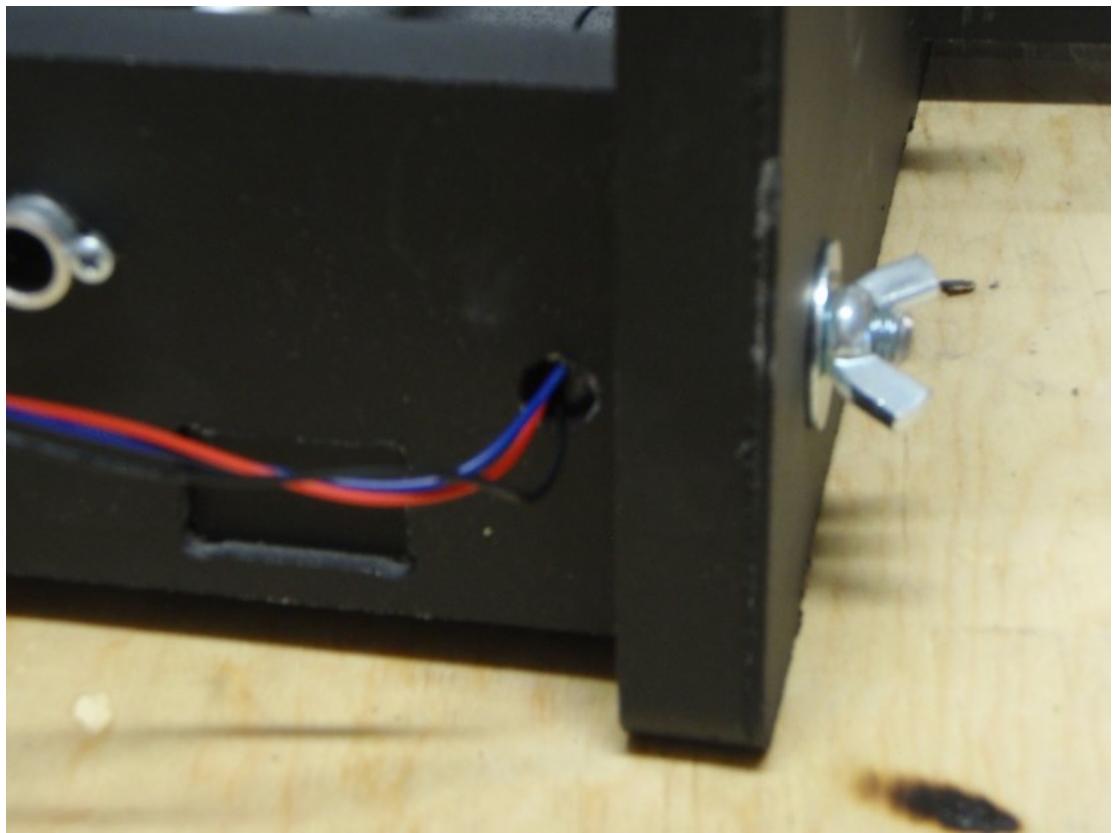
Z End-stop

Pull a zip tie through the remaining microswitch. The zip tie goes through the hole closest to the roller and then through the two holes in the frame on the left hand side near the bottom.

The legs on the microswitch point down – they DO NOT go into the hole. Secure it tightly in place with the roller pointing up.

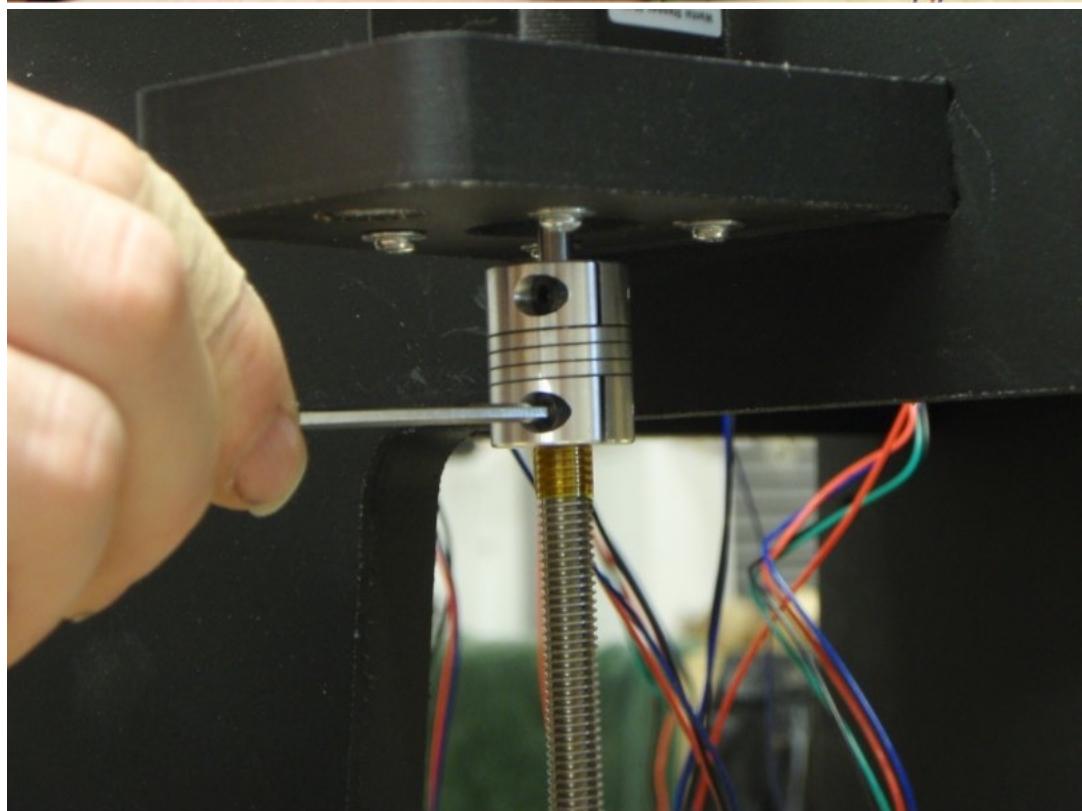
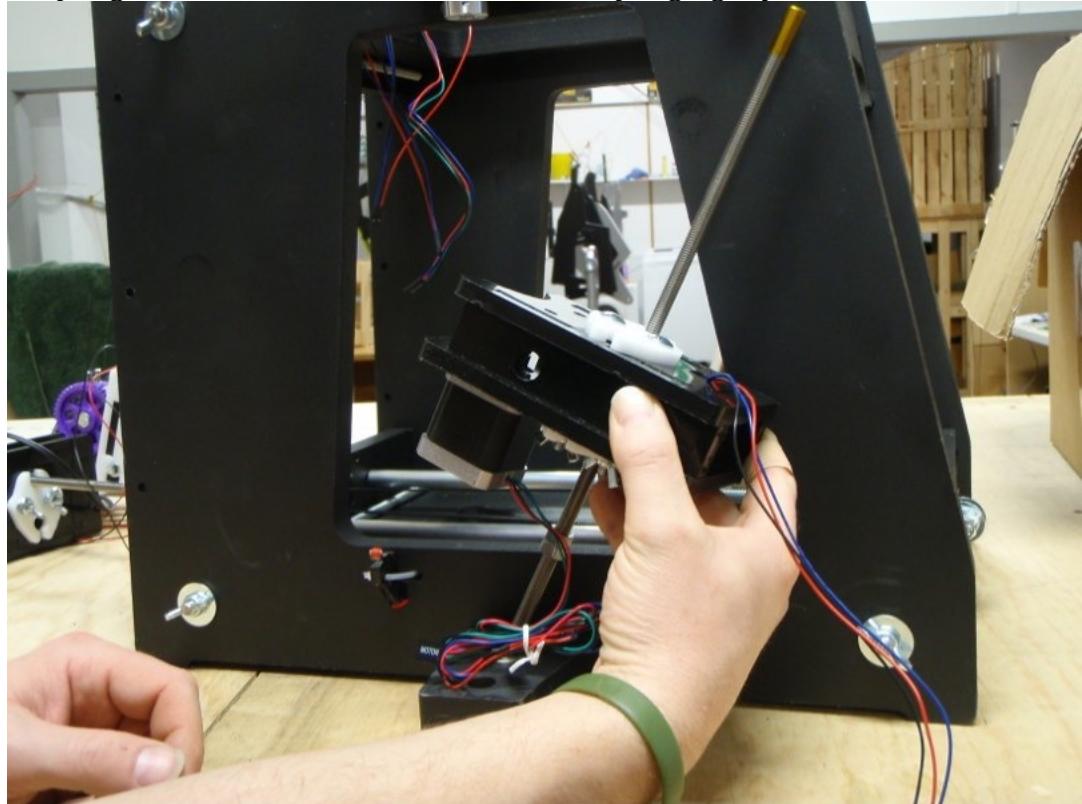


The microswitch lead goes in through the slot in the side of the frame and out through the large round hole in the bottom of the rear panel.

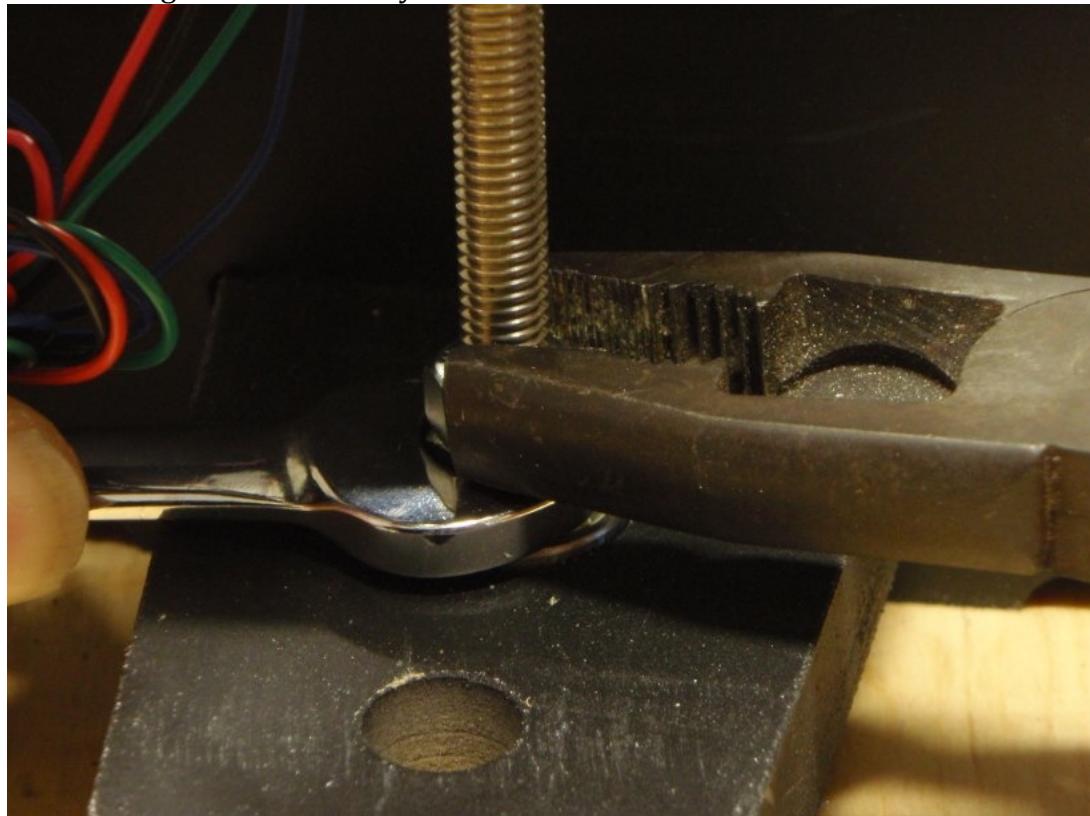


Adding the X-Boxes to the frame

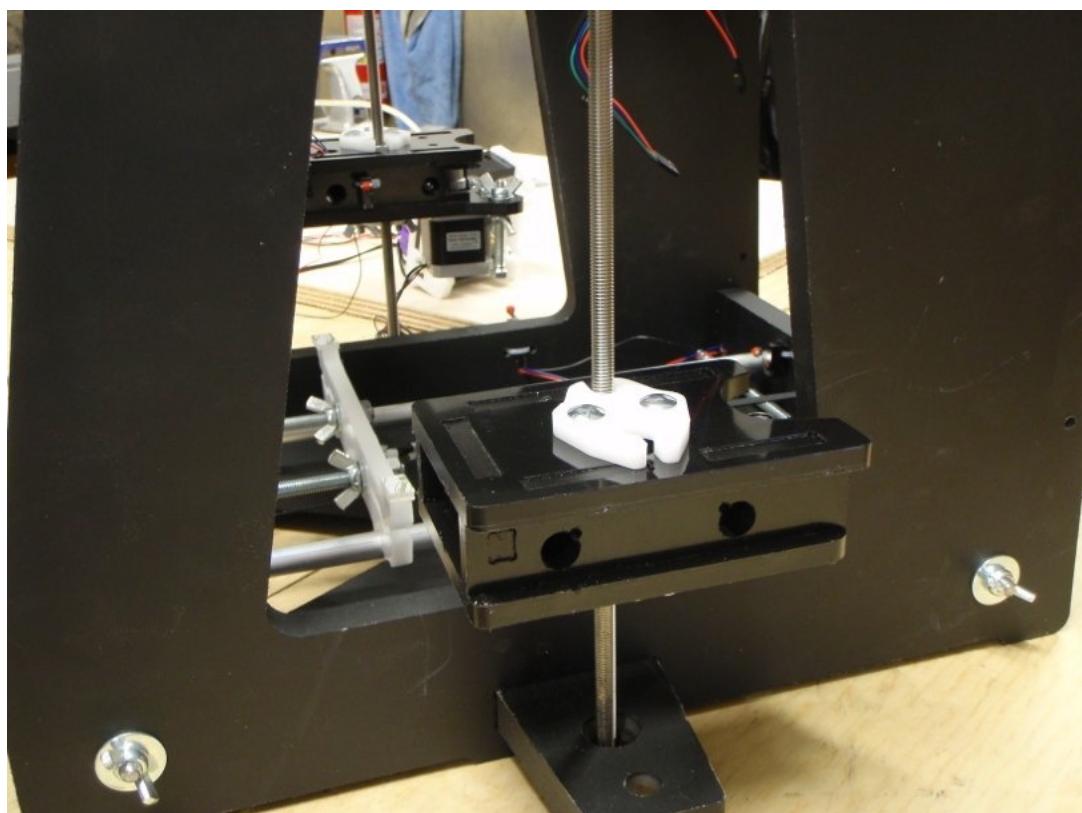
Put the threaded rod of the X-box with the motor into the 608 bearing at the bottom of the frame and then maneuver the end with the yellow tape into the coupling on the motor above. Fasten the coupling tightly.



Wind the nuts down so they rest gently on top of the 608 bearing and lock the two nuts together. This is only done to one side.

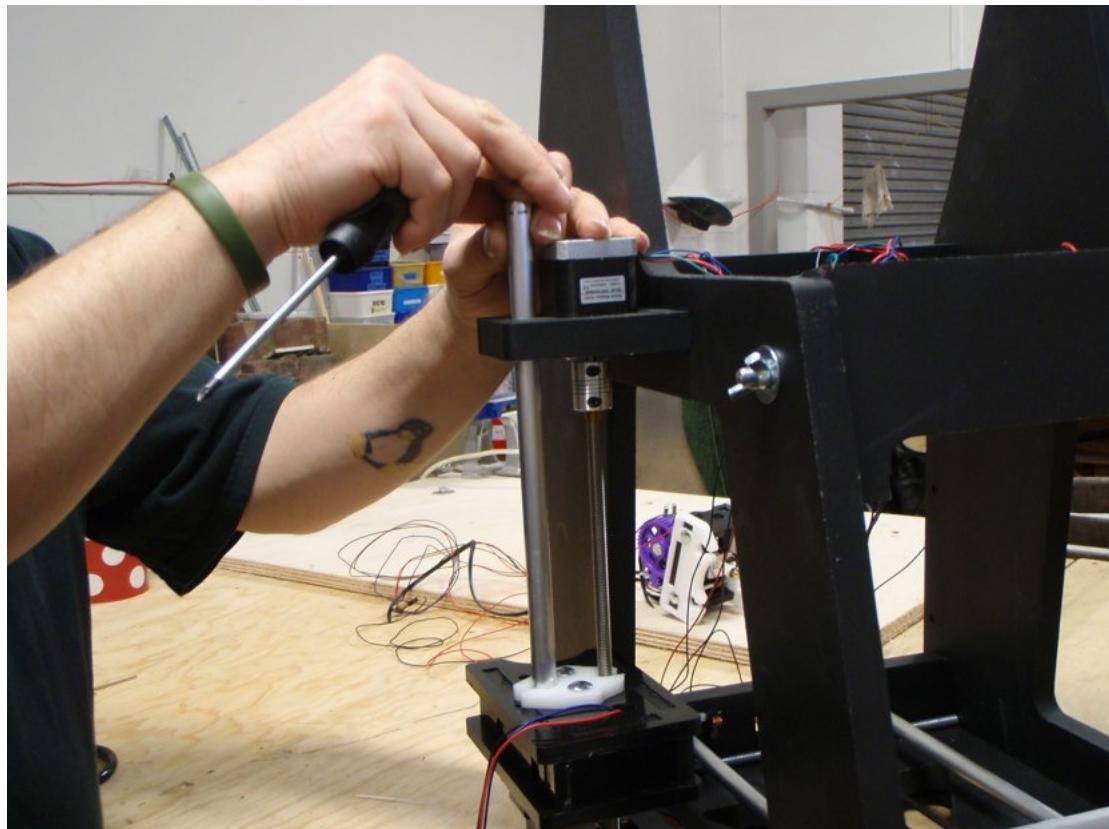


Do the same with the idler X-Box but do not fit a 608z bearing in the frame.

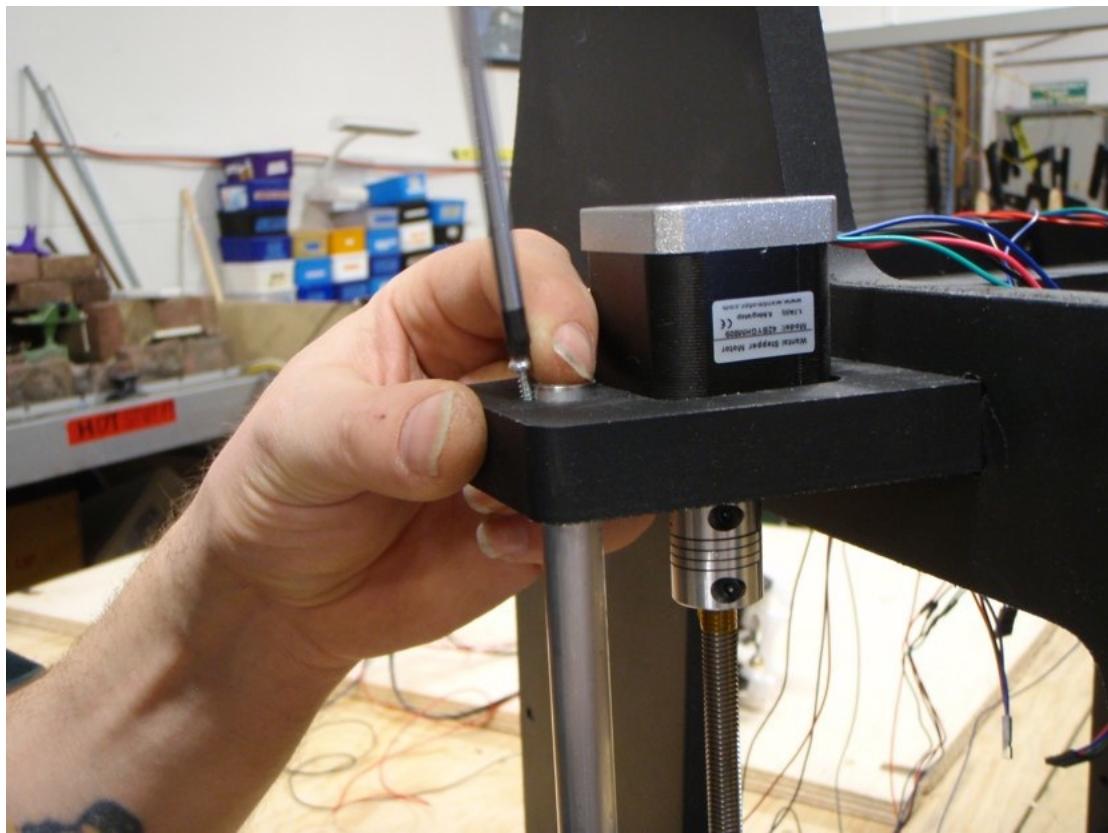


Fitting the Z Guide Rods

Take the two shortest lengths of aluminium tubing and push one through the hole next to the Z motor from the top, through the white bearings in the X-Box and into the receptacle in the base.



Once the rod is pushed firmly all the way down, secure it in place by putting a wood screw in the little notch at the top.



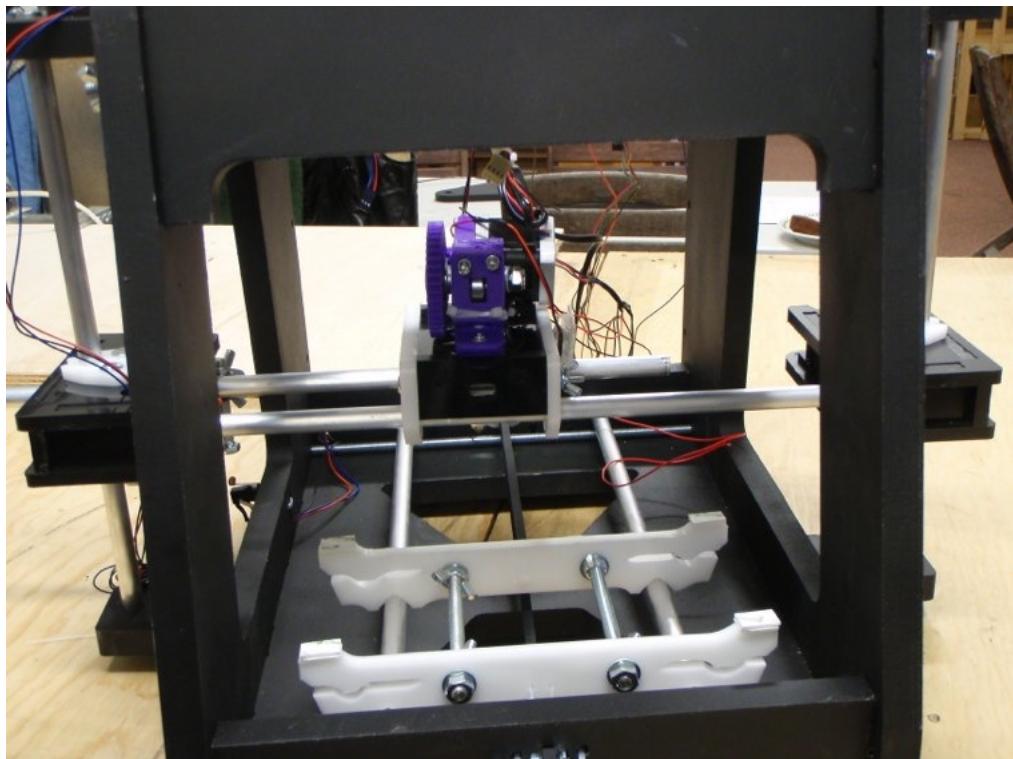
Repeat the process for the other side – you should now have two vertical rods secured in place and the two X boxes in position.

Spin the two threaded rods so that the two X-boxes are about the same height.

Push the two longest (remaining) aluminium tubes and push them through the side of the x-box, the white bearings on the carriage and finally the x-box on the other side.

Ensure the motor on the extruder is toward the rear of the frame. If you have this correct, then the fan will be on the right side of the carriage.

Secure both rods in place with wood screws at each end just like we did with the Z rods.

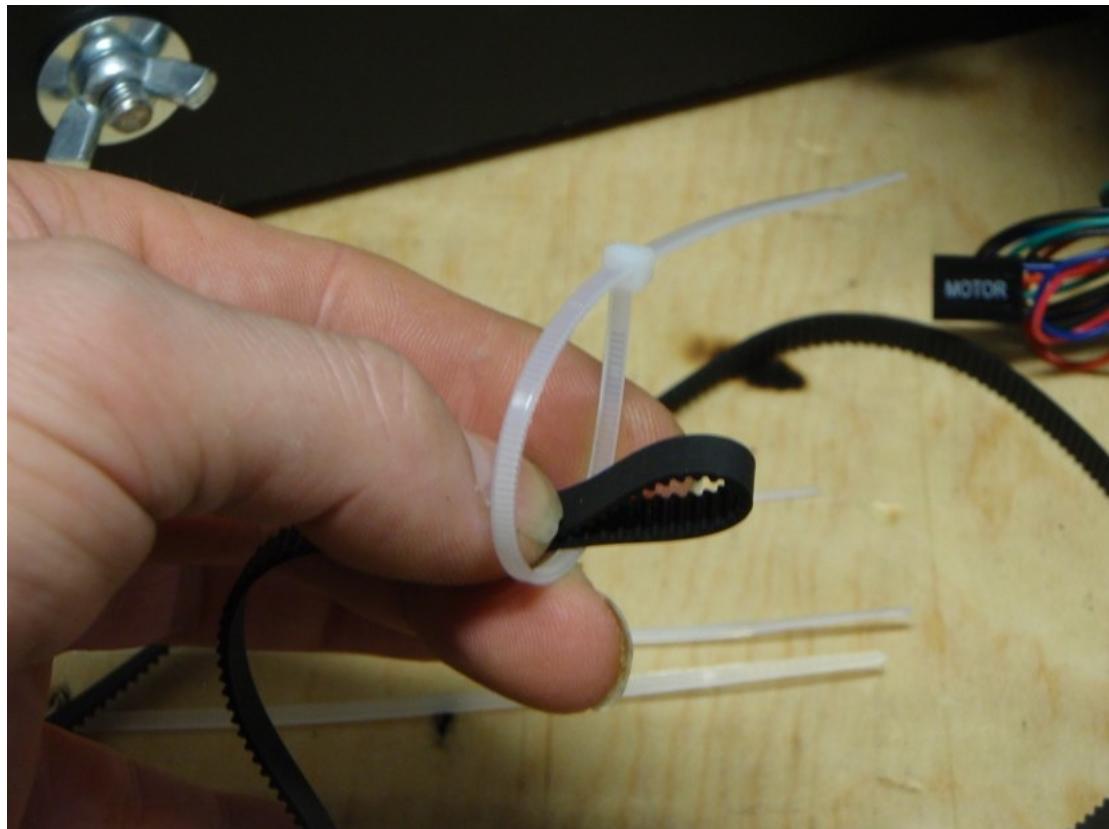


Make sure the carriage slides back and forward smoothly.

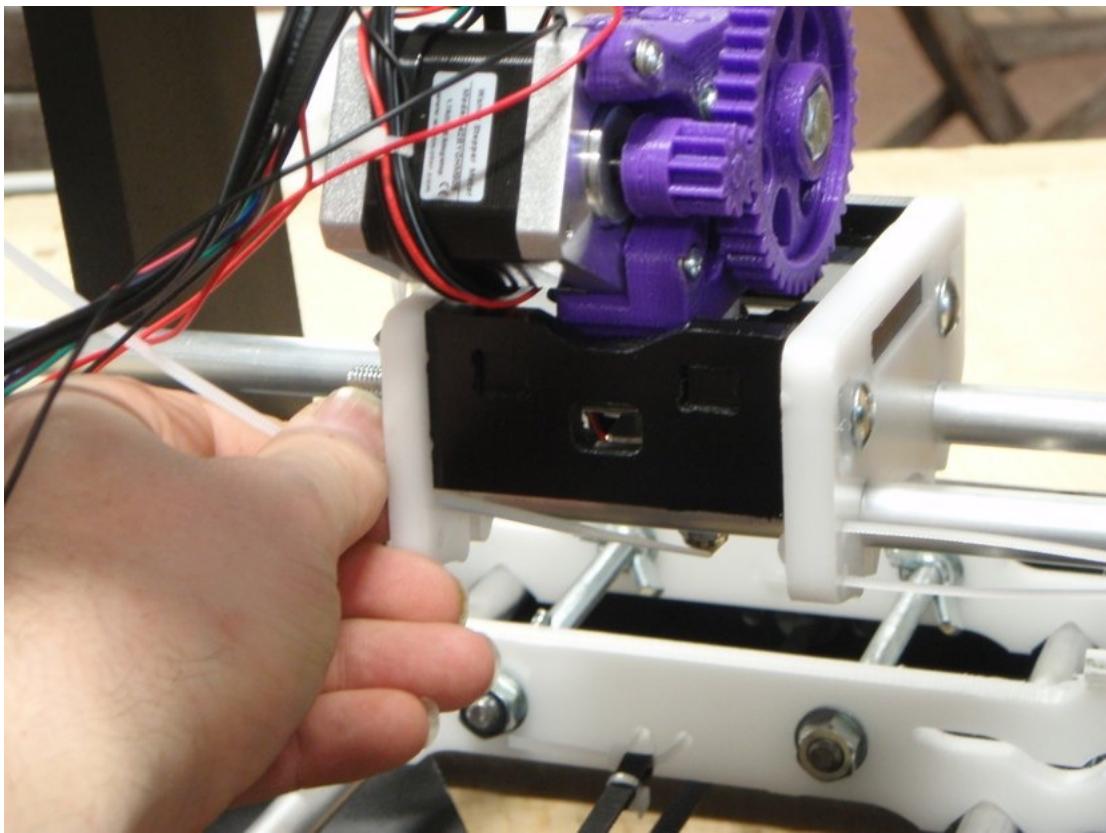
If you notice any nicks or dings in the rod that cause the carriage not move smoothly, remove the wood screws, rotate the rods until it moves smoothly.

Fitting the X Belt

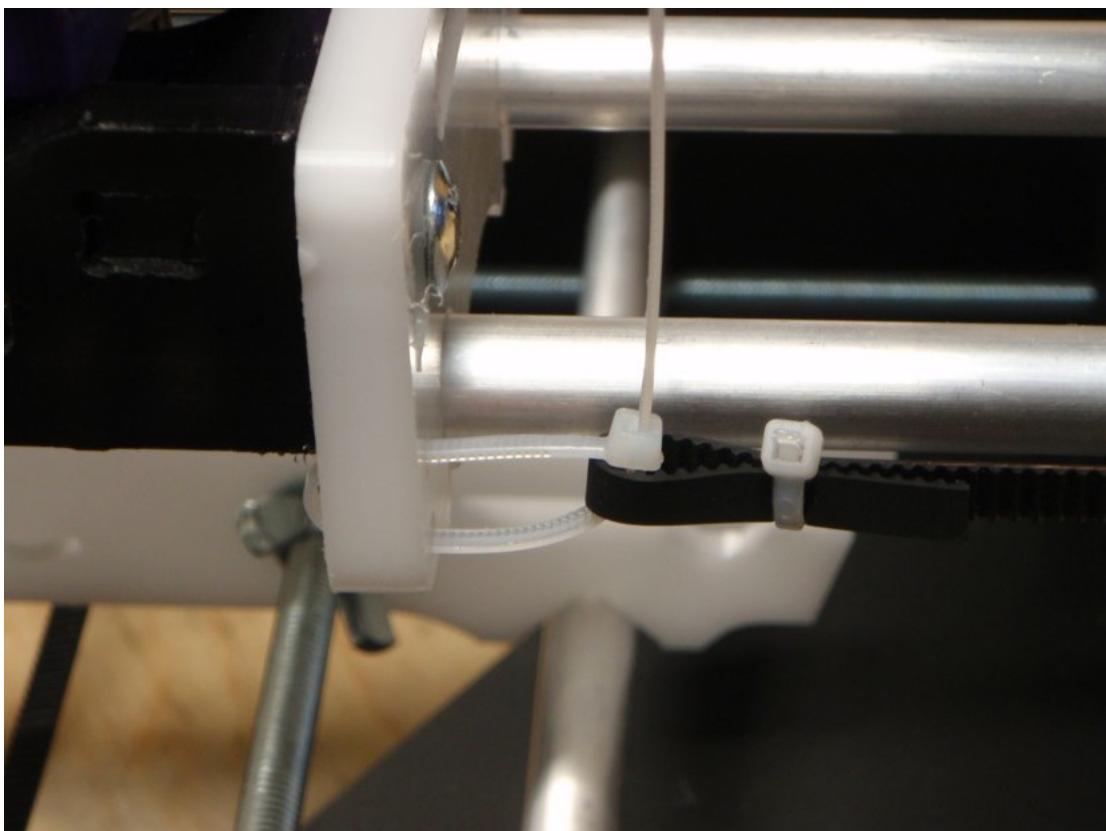
Make a zip tied loop in the end of the x belt just like you did with the Y belt. It should be around a 30mm in height.



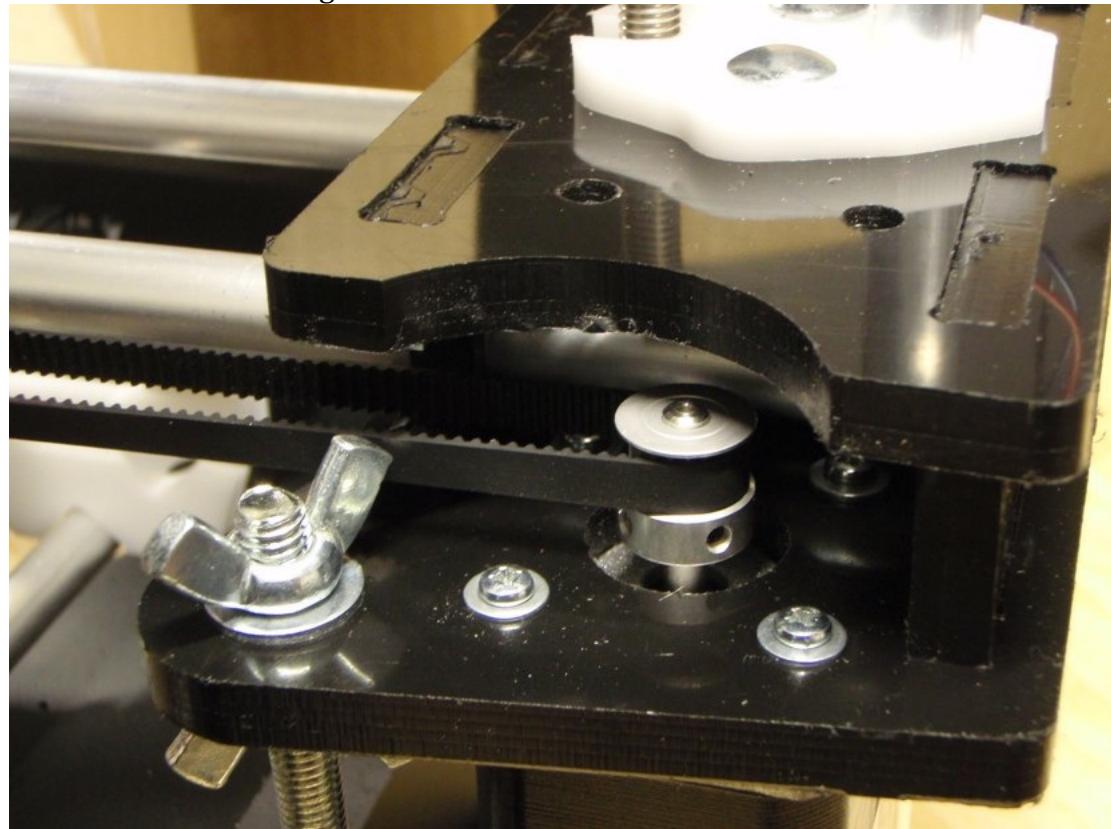
Loop a zip tie through the two small holes on the carriage so the leads are pointing away from the carriage.



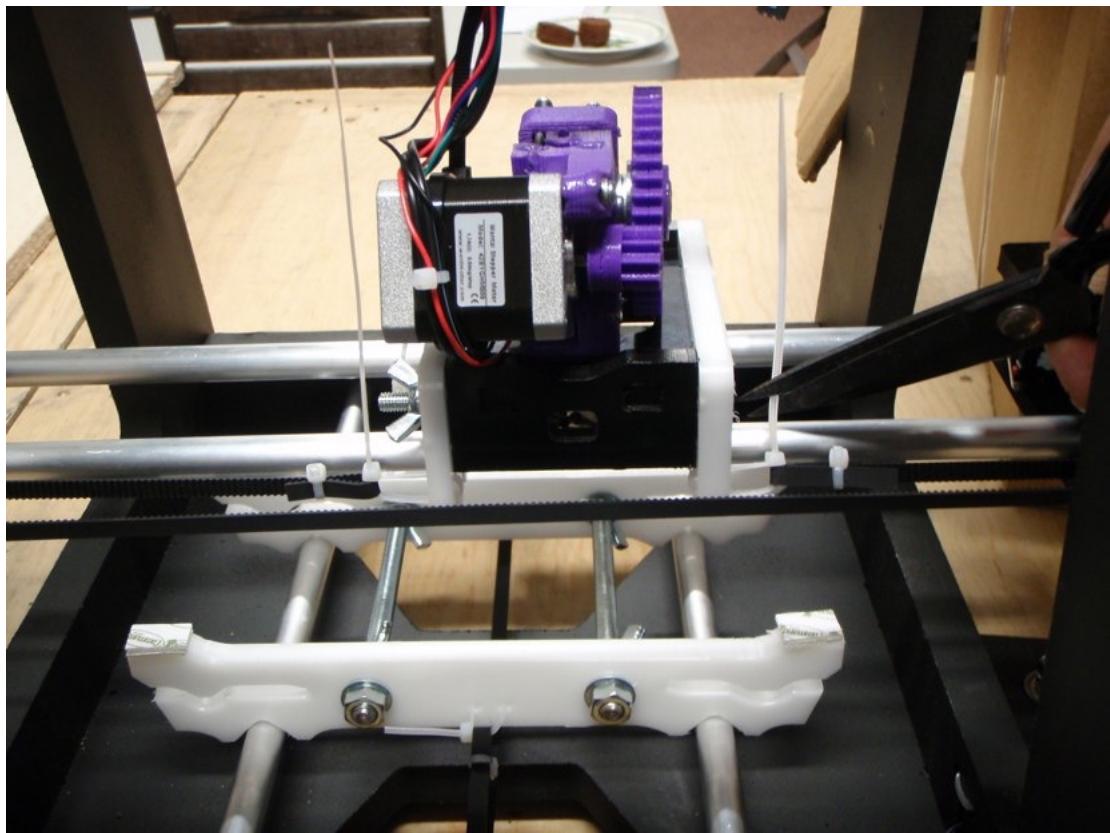
Connect the belt loop to the carriage and fasten the zip tie. Make sure the teeth of the belt are pointing away from the X rod.



Loop the belt around the X motor pulley and back to the carriage. You should now be able to make an appropriately sized loop in the belt and attach it to the other side of the carriage.



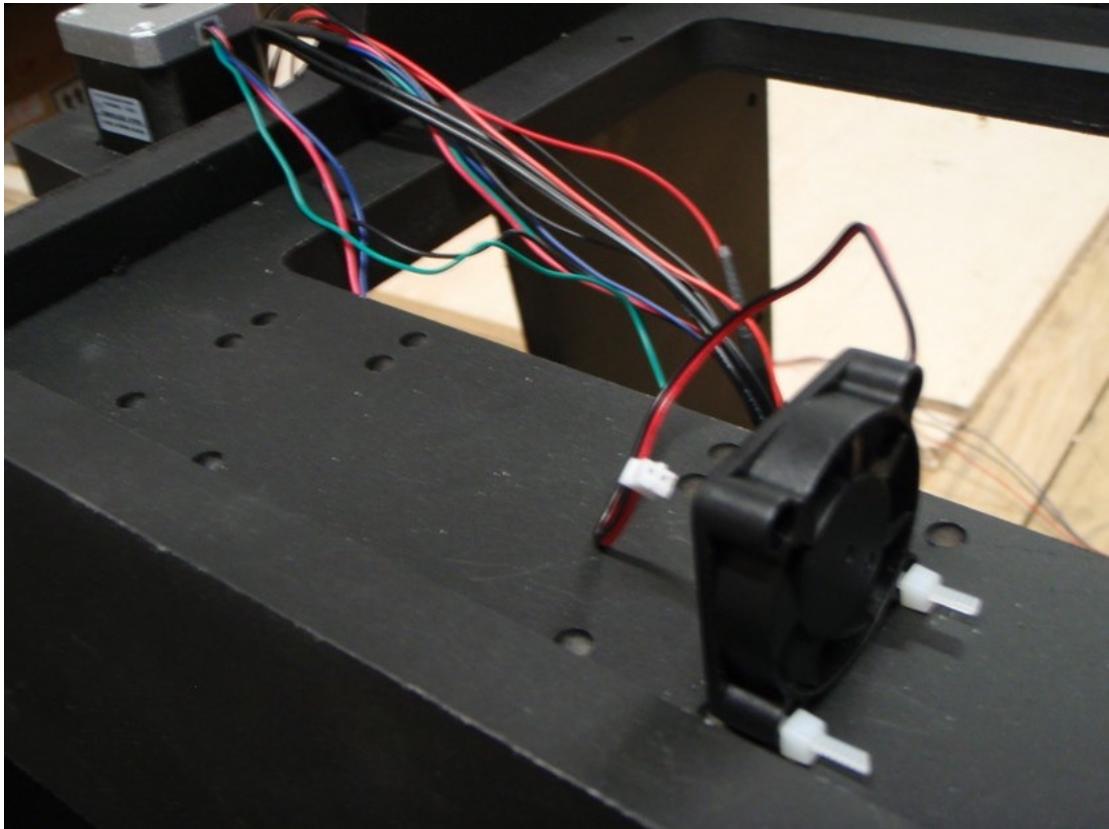
Gradually tighten the zip ties until the belt is tight enough to be plucked. Not so tight as to make a twang – yes, these are technical terms....we should know, we invented them.



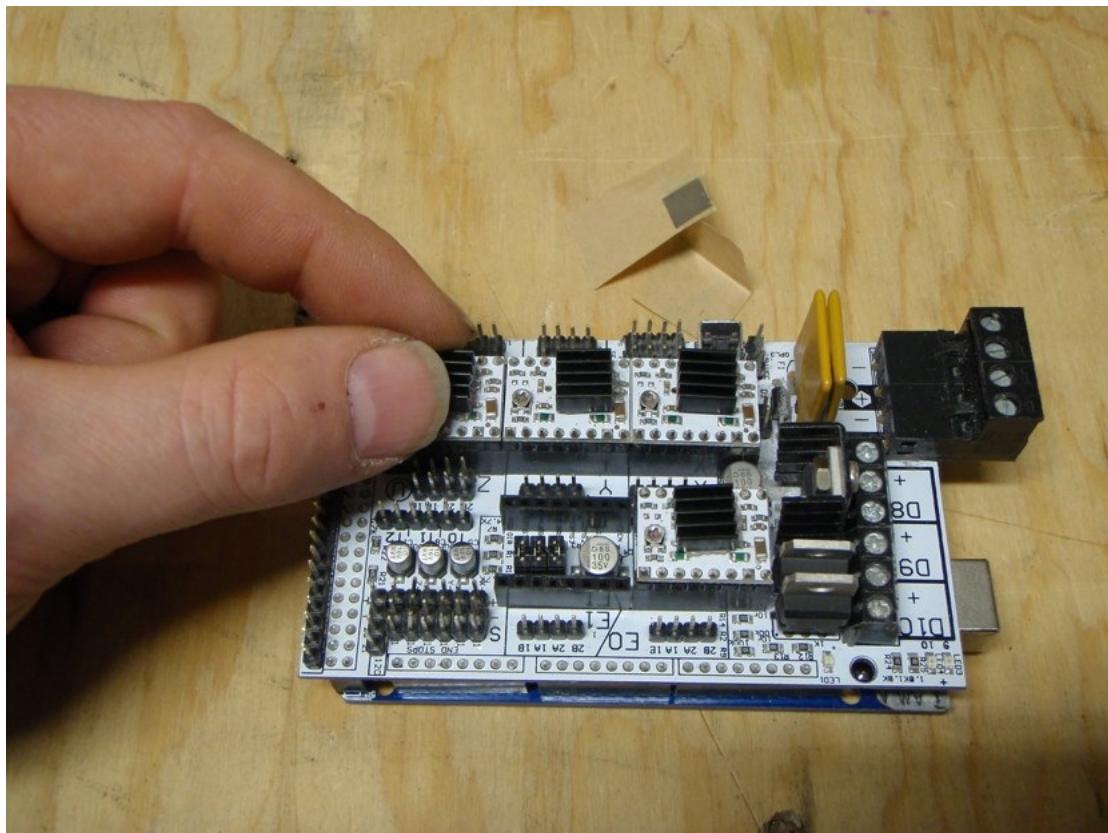
Snip the zip tie leads but leave enough to grab hold of as part of the tuning process – note that the belt will wear in over time so you'll use these ties to adjust for this.

Fitting the Electronics

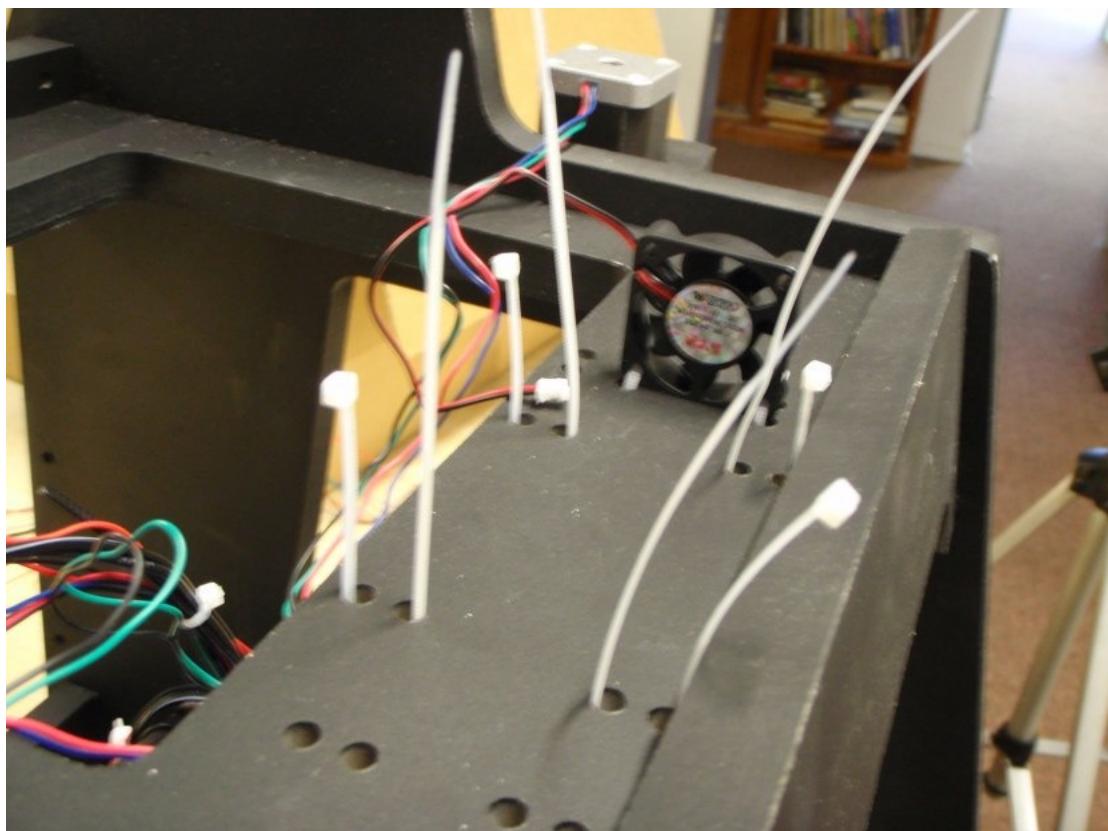
Fit a fan as shown in the picture below so that the label on the fan points to the left.

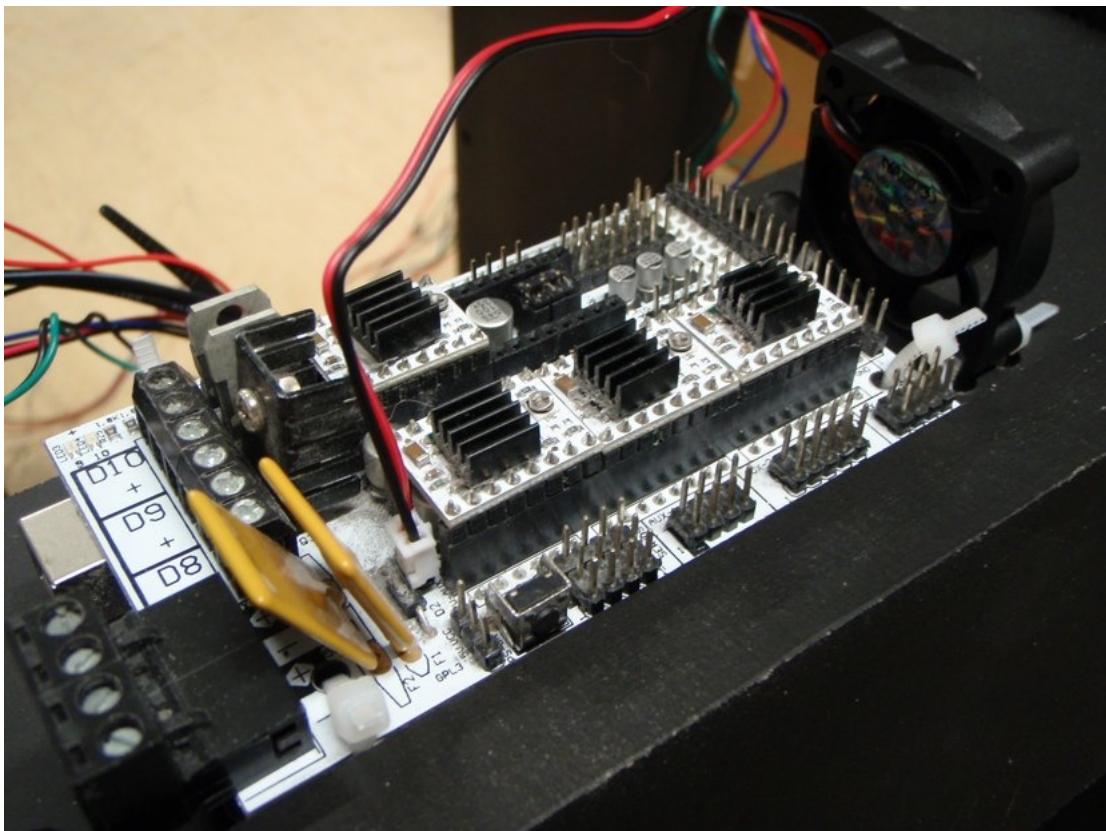


Fit a heat-sink to each little silver square and fit them to each of the driver boards on the main electronics.



Secure the electronics in place with zip ties as shown. Tighten gradually to ensure it stays level.

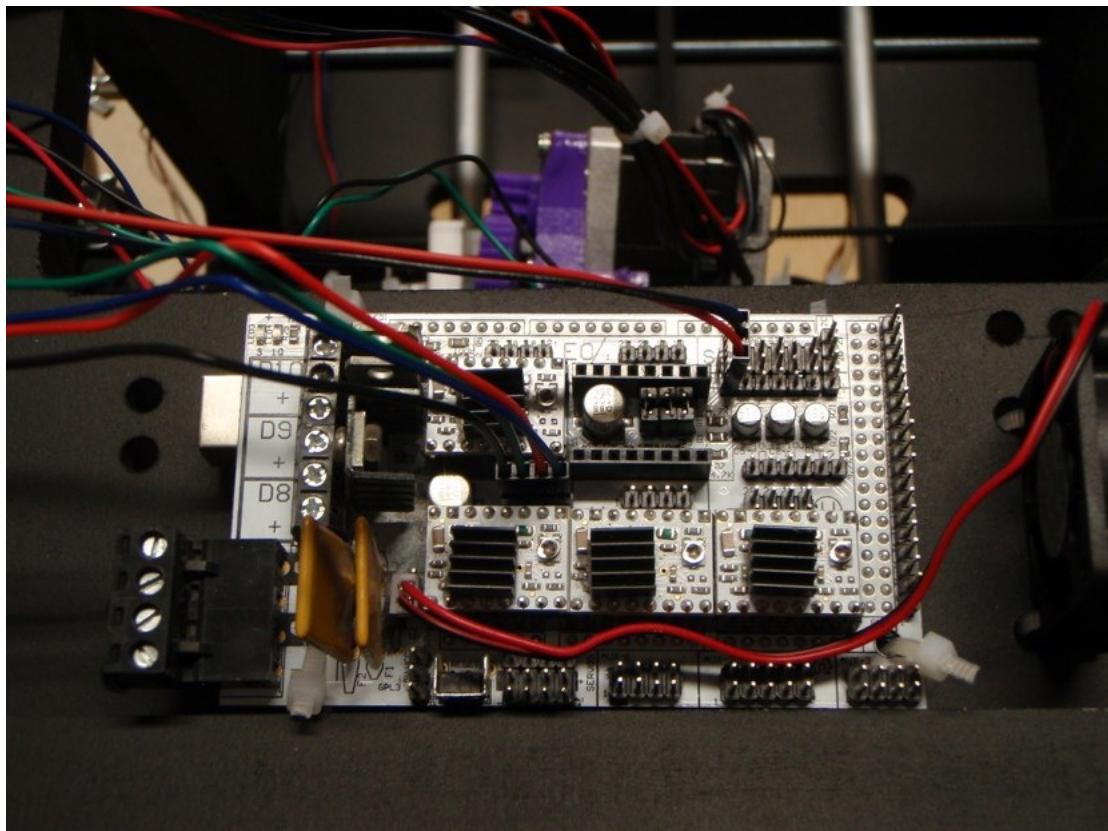




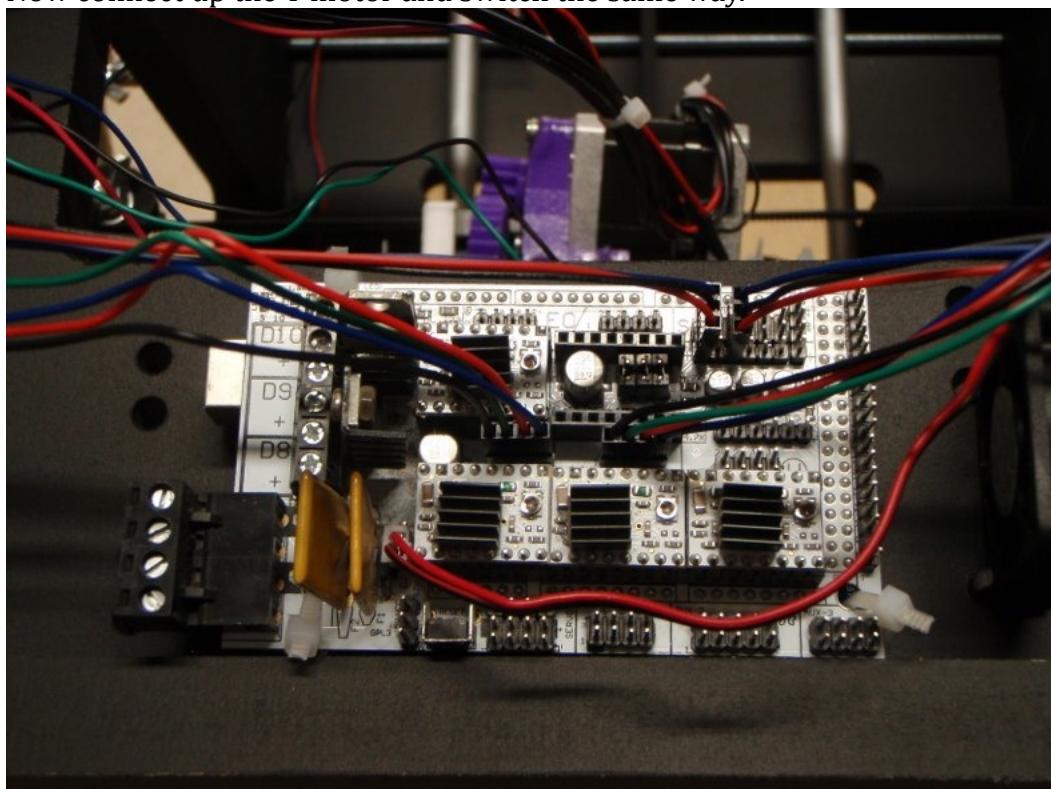
Your electronics should now look like this and be secured in place.
You can now plug in the fan as shown in the picture. Black wire toward the front.

Now we connect up the X motor and X end-stop (microswitch) wires to the locations shown in the picture below – they're also labeled on the board if you have good eyes. The motor is nearest the motor driver (with the heat-sink).

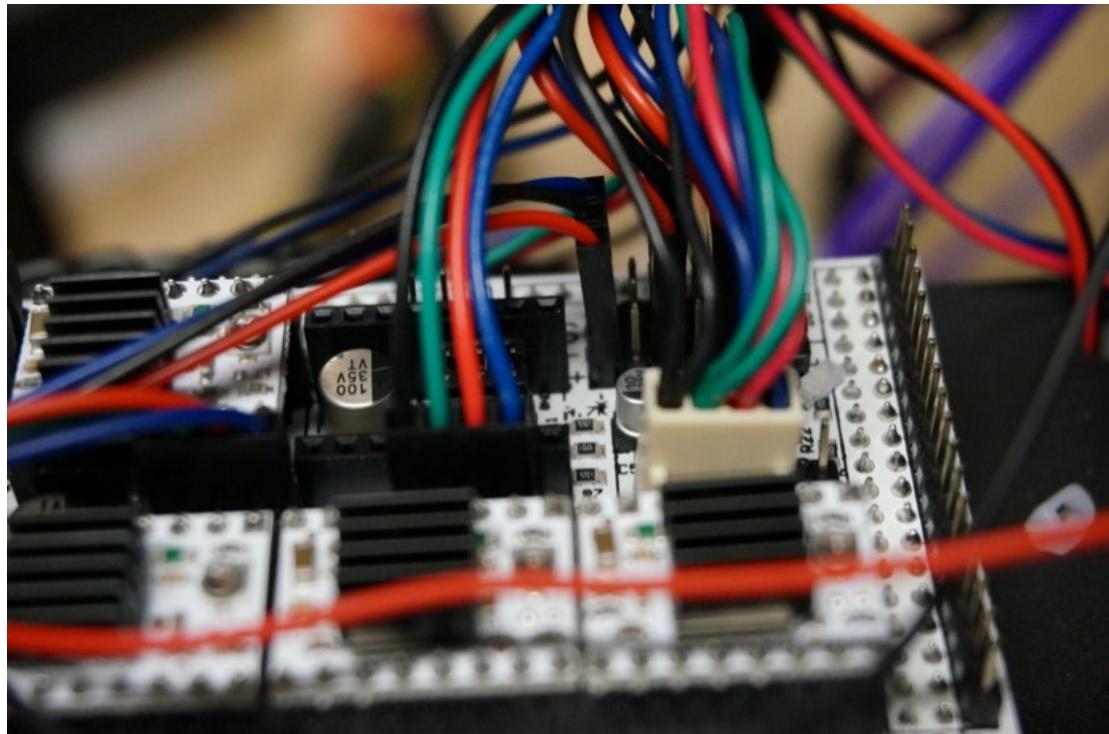
Note that if your stepper motor runs backward, then you need to turn the plug around.



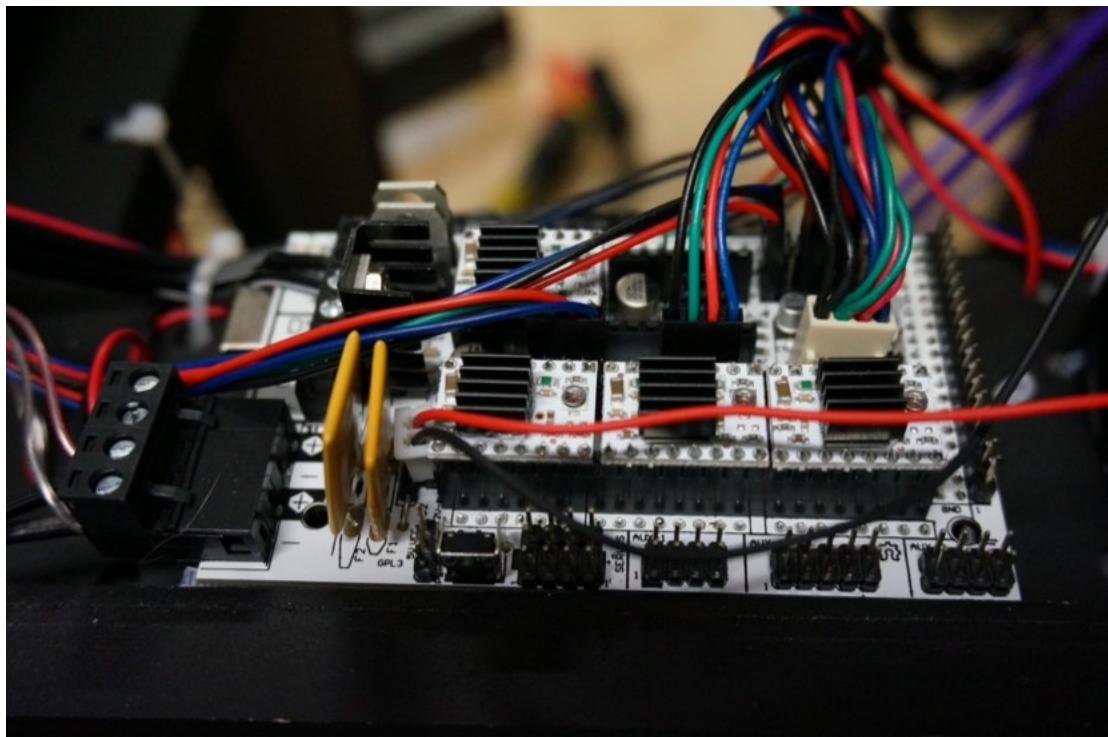
Now connect up the Y motor and switch the same way.



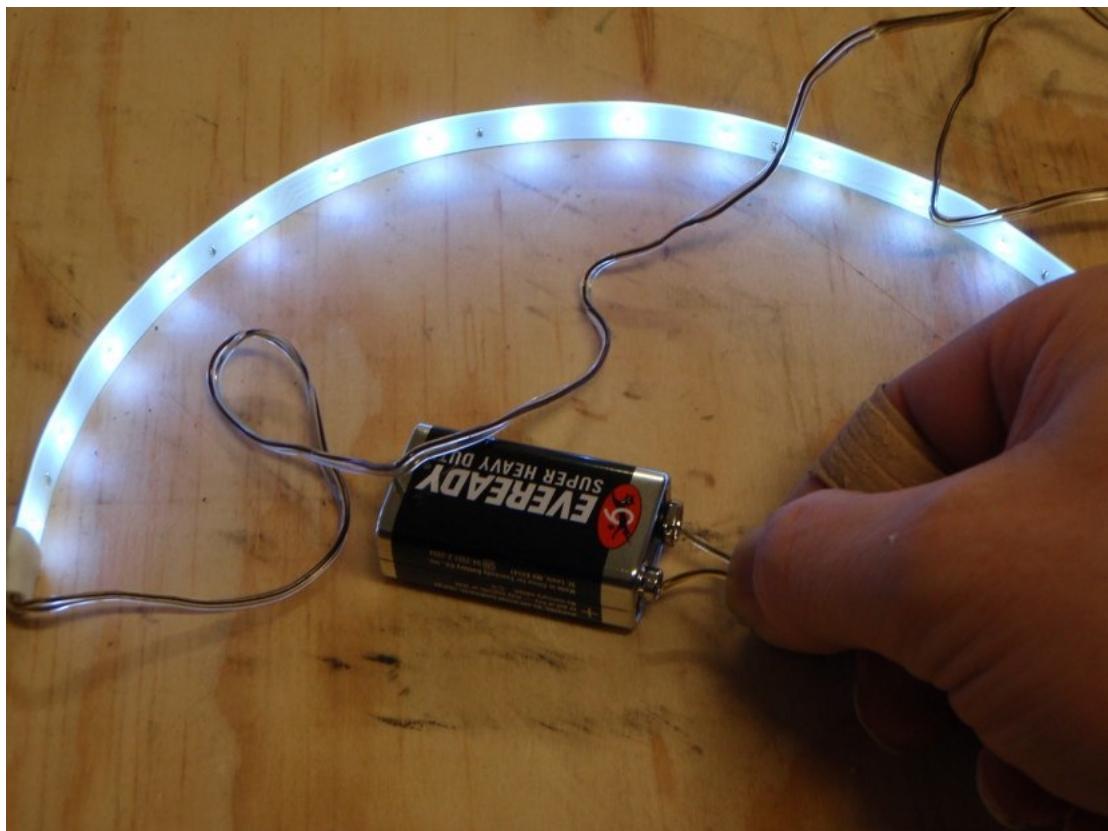
Now connect up the Z motors and switch. You will see two rows of pins for the Z motor connector on the board, it does not matter which set you use.



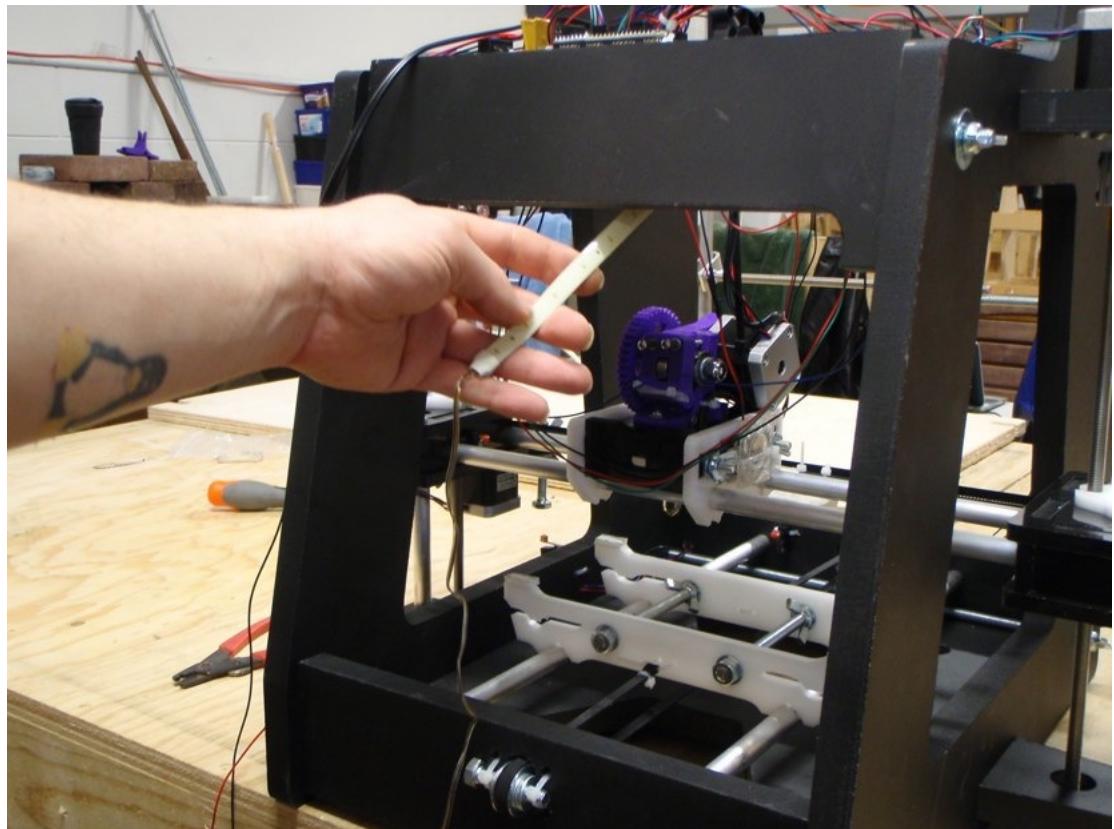
Now we connect up the extruder motor to the E0 pins and the extruder thermistor (black and red wires) to the T0 pins on the board (top left cables in the picture). These can be tricky to locate and are right by the Z motor pins. It doesn't matter which way around the thermistor is connected.



Test the polarity of your light strip by connecting it to a 9v battery. Connecting it the wrong way around will not hurt it but you'll know the polarity of each wire. Make a note of the positive wire.

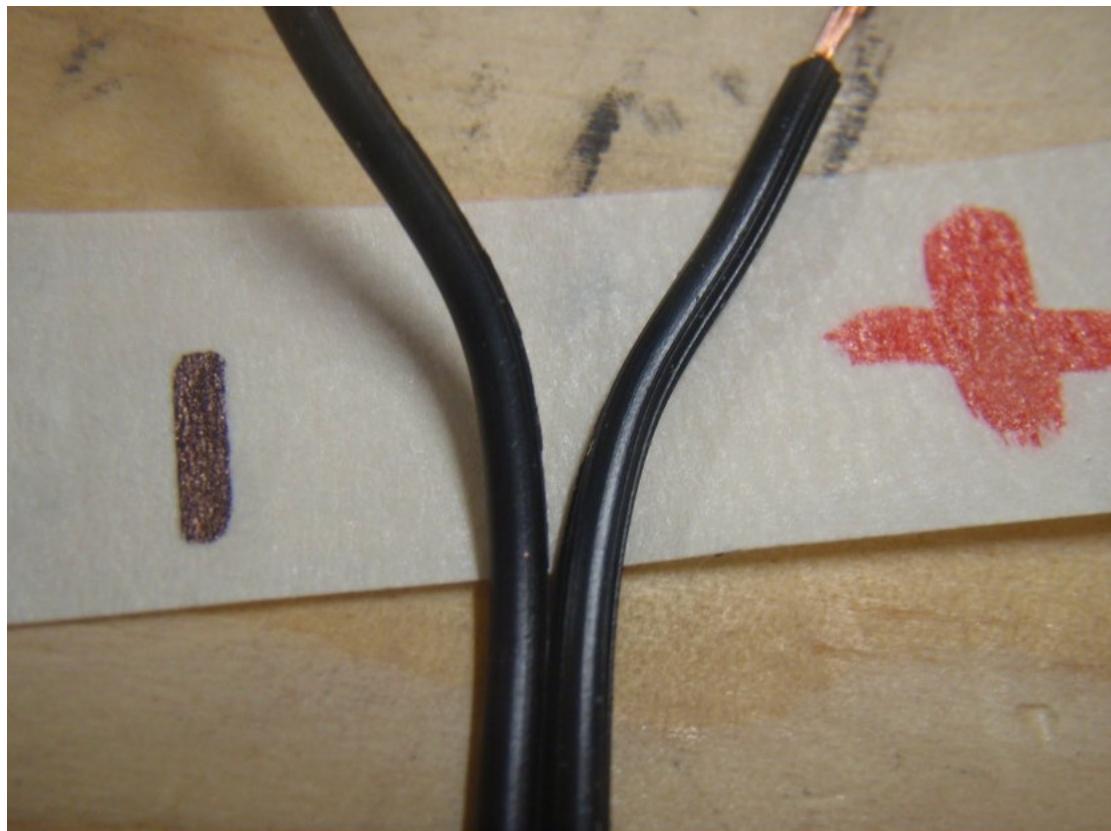


Stick the light strip anywhere you please but we suggest putting it under the top front panel. Do not trim it to size or you will let the magic smoke out of it. It's self adhesive once you peel the backing strip off.

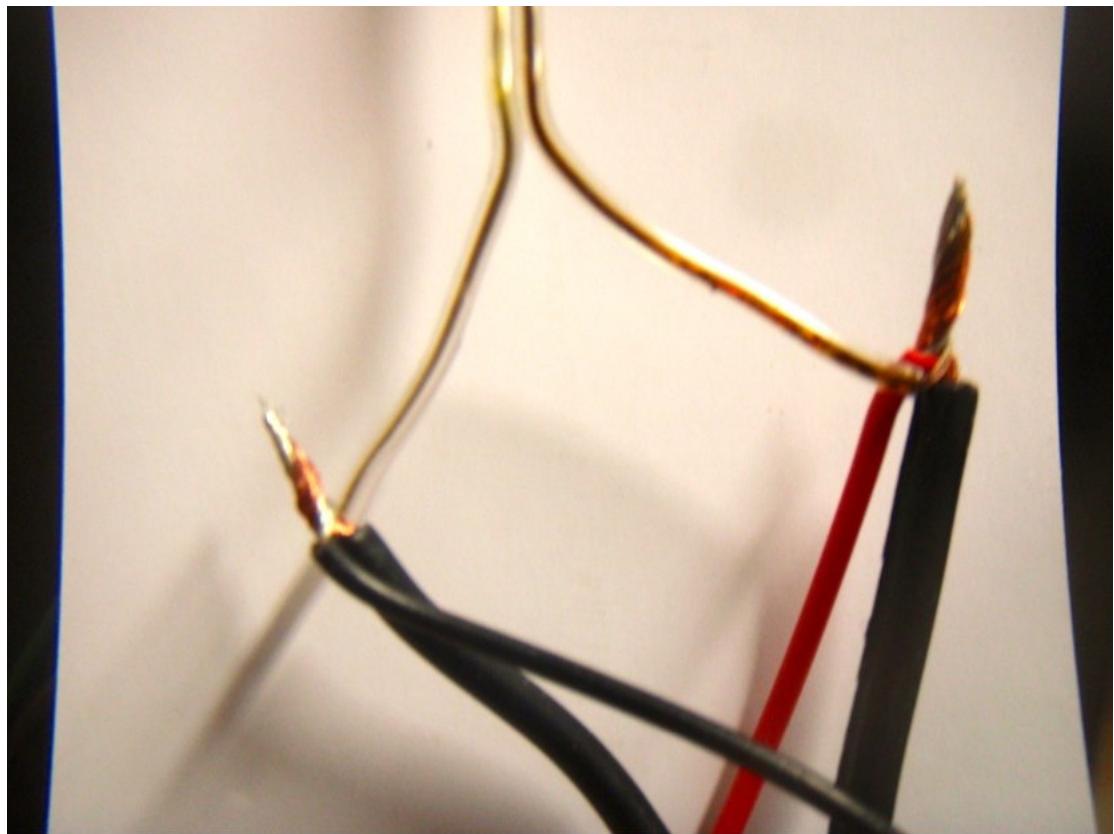


Connecting the power

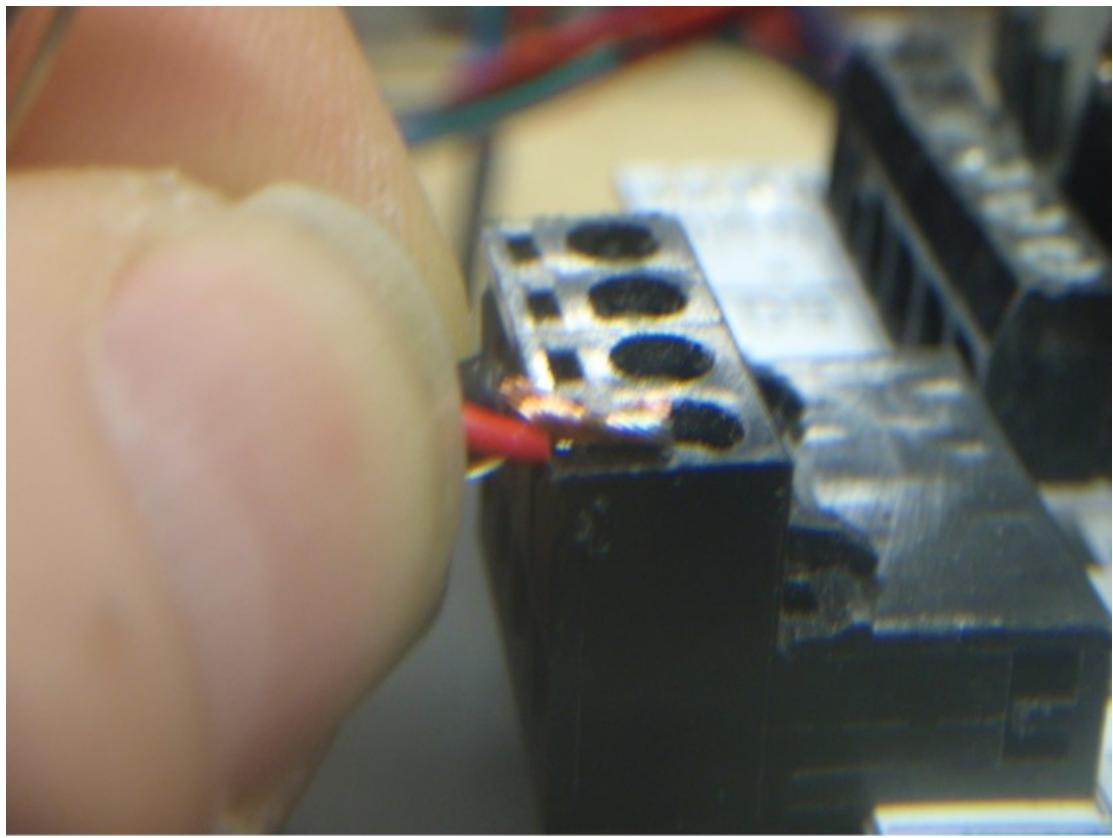
Take the cigarette lighter plus and look very closely at the ends of the wires. You'll find one with a ridge running down the outside – that is the positive lead. If you have a continuity meter or multimeter then it is the one that connects to the tip of the plug.



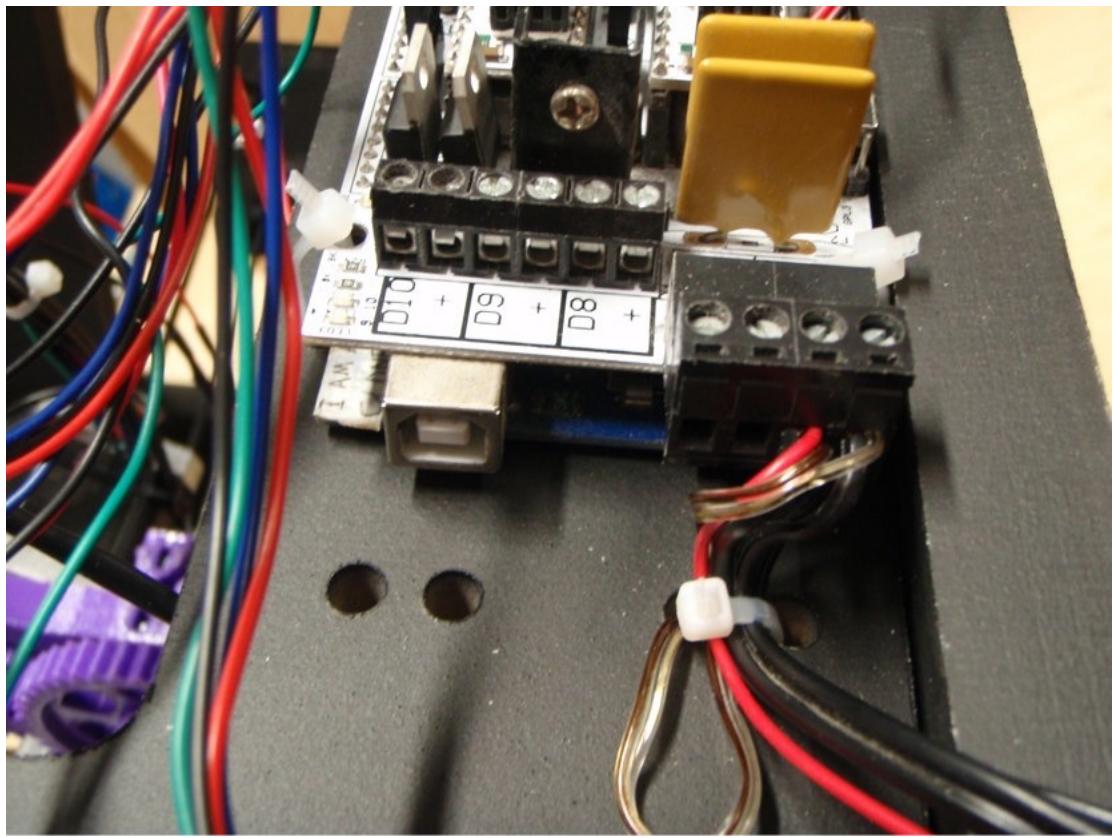
Strip the ends of the wires so that they're long enough to twist. Connect them up to the light strip leads and the carriage fan leads as shown below. Make sure you twist them together firmly with no stray strands.



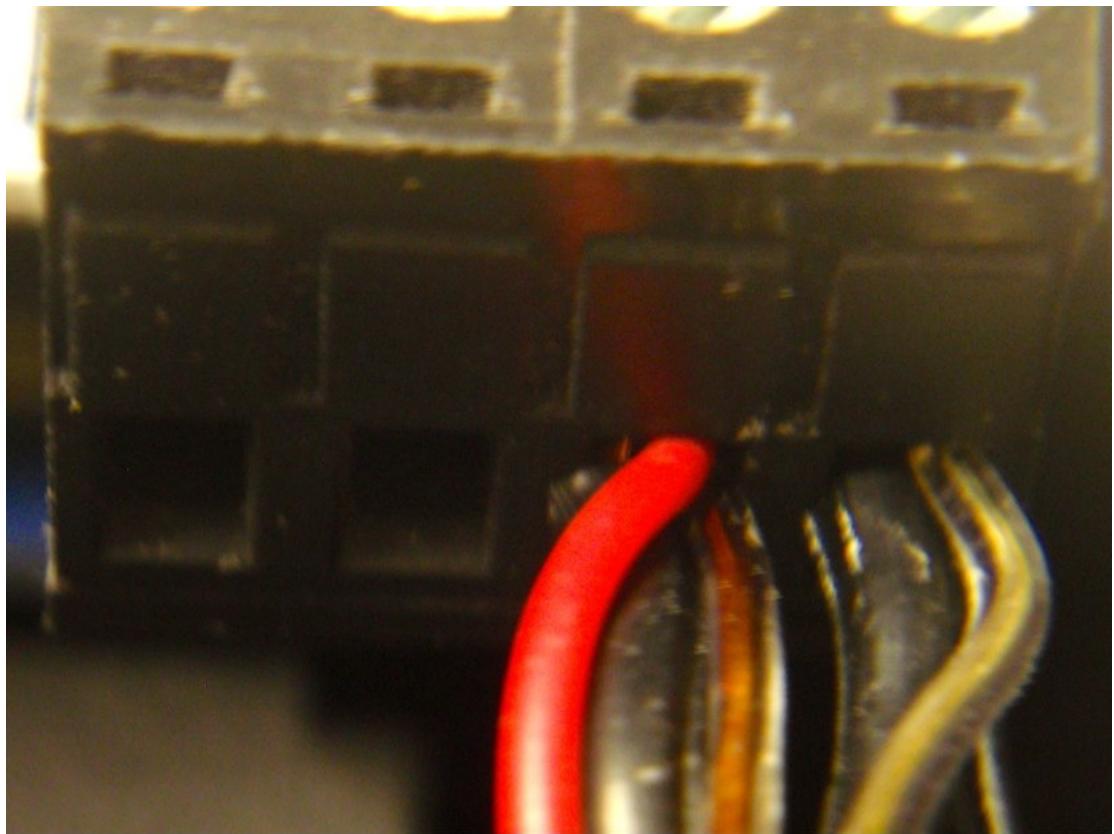
Trim the twisted ends so they meet the screw in the middle of the terminal block on the electronics. We need to do this to ensure no metal is exposed once it's screwed down. This is important for safety.



Screw the wire bundles in place on the 5A (5 Amp) connectors on the terminal block. The 11A is reserved connectors are reserved for the heated bed.



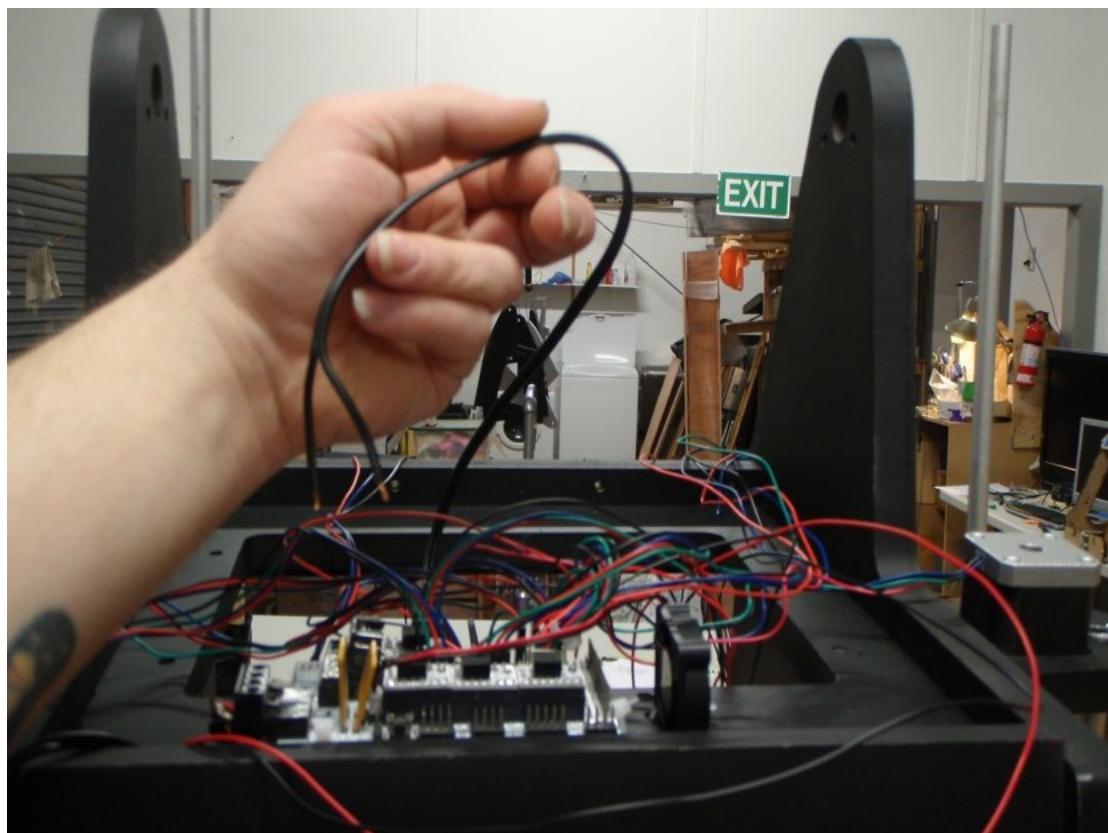
Tie the wires in place with zip ties to ensure they wont come free – again this is for safety.



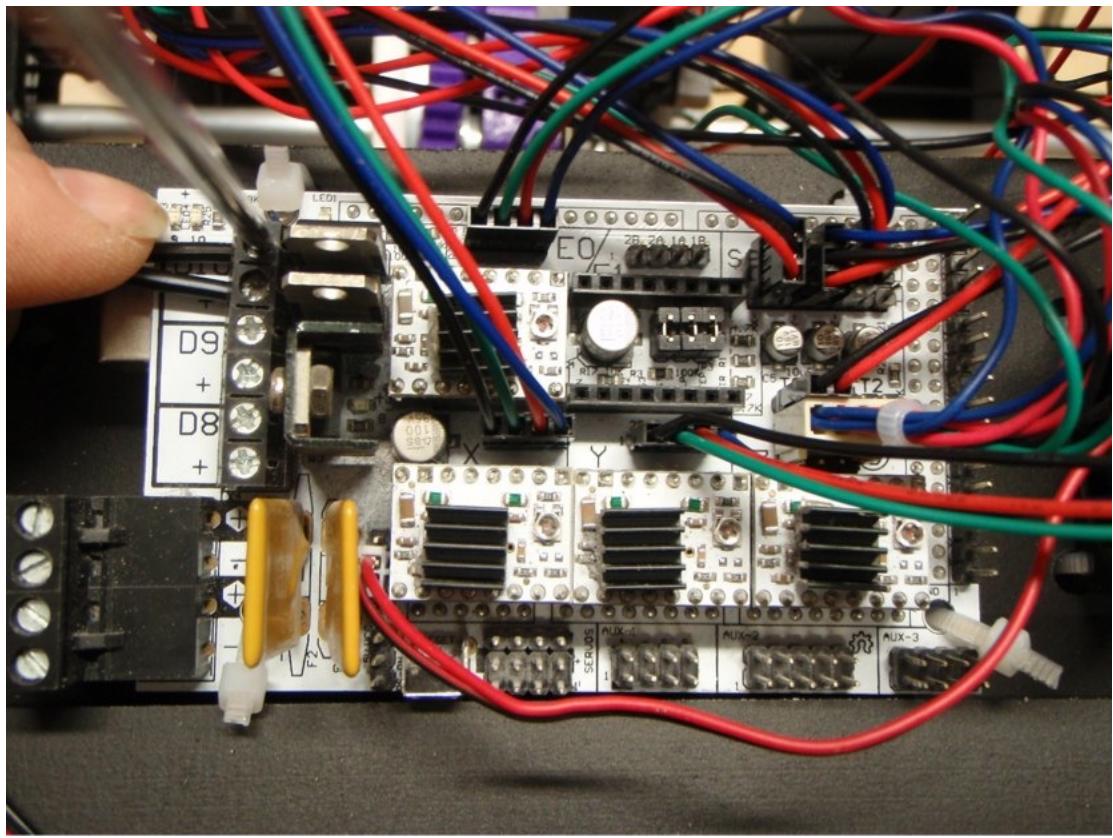
Notice how there is no metal exposed.

Wiring up the Extruder

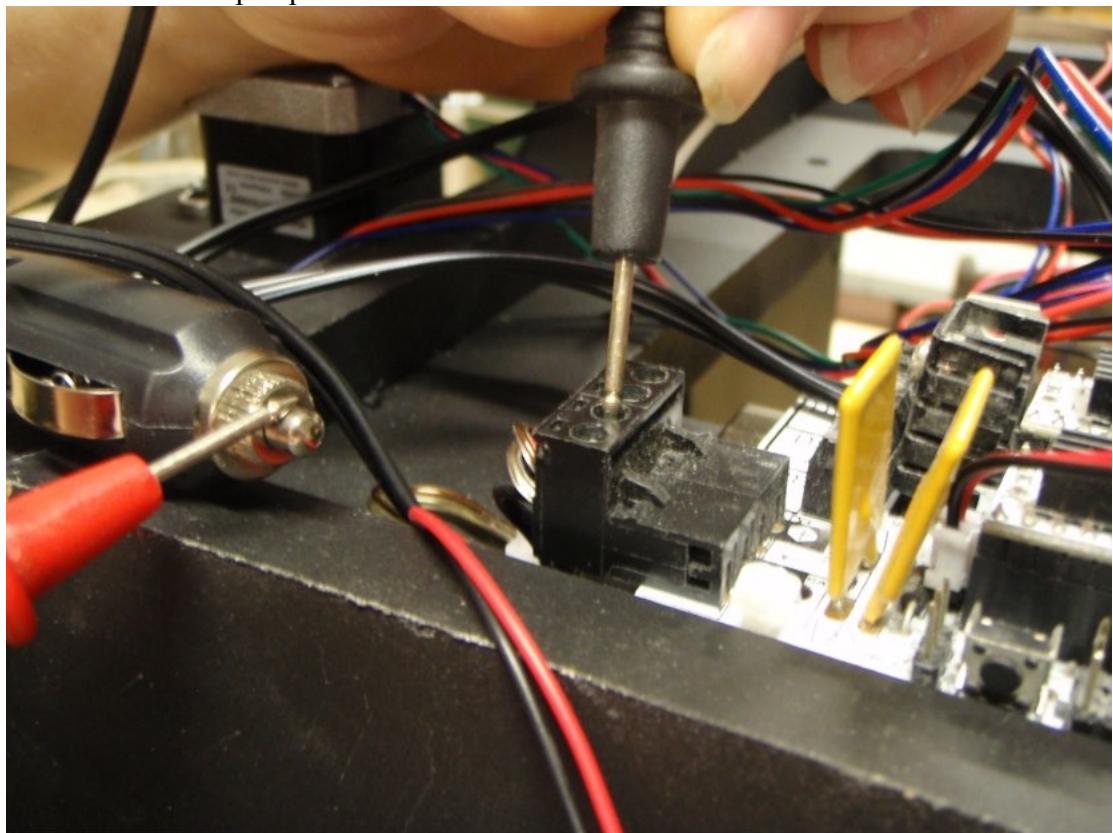
Take the thick twin core wire that comes from the extruder and cut it to around 65cm. This ensures it has enough length so that the head can reach the bed without pulling the cable.



Strip the ends of the wire so there's about 4mm of exposed metal and insert it into the screw terminals marked D10. The wire with a white stripe is positive but it doesn't really matter if you get this wrong.



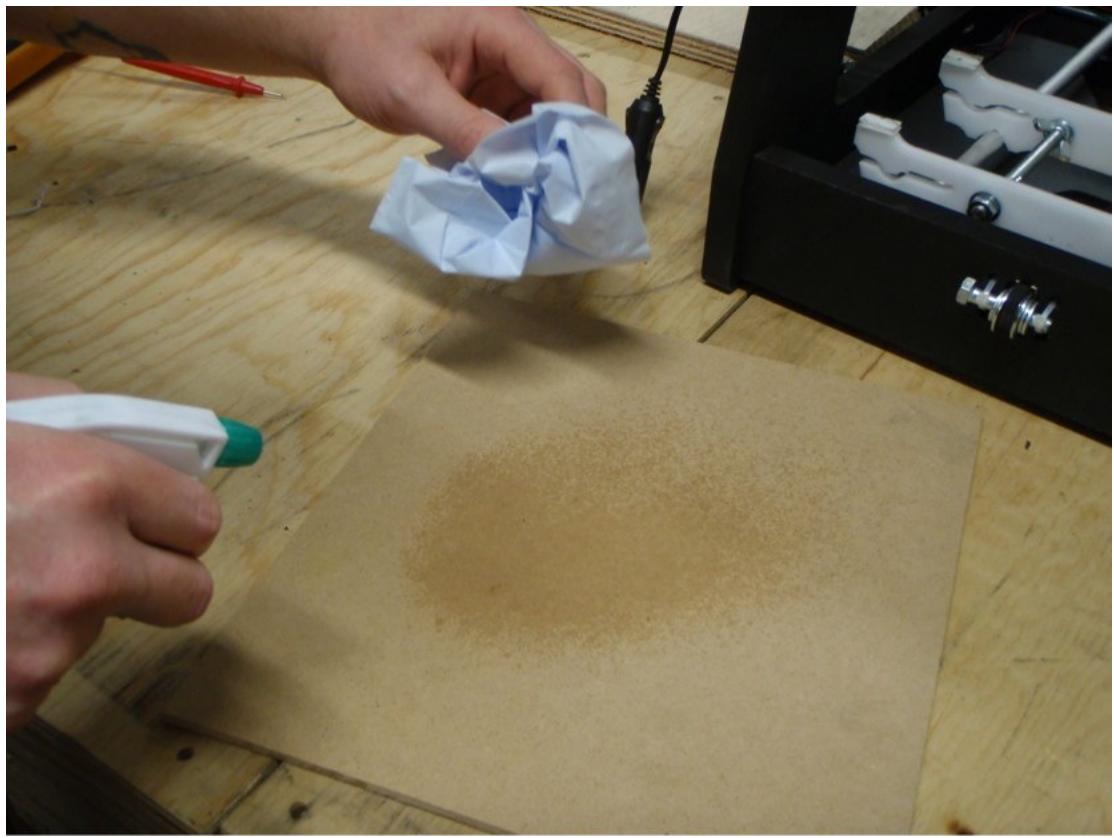
Now is a great time to double check the polarity of the cigarette lighter polarity with a multimeter. The tip is positive.



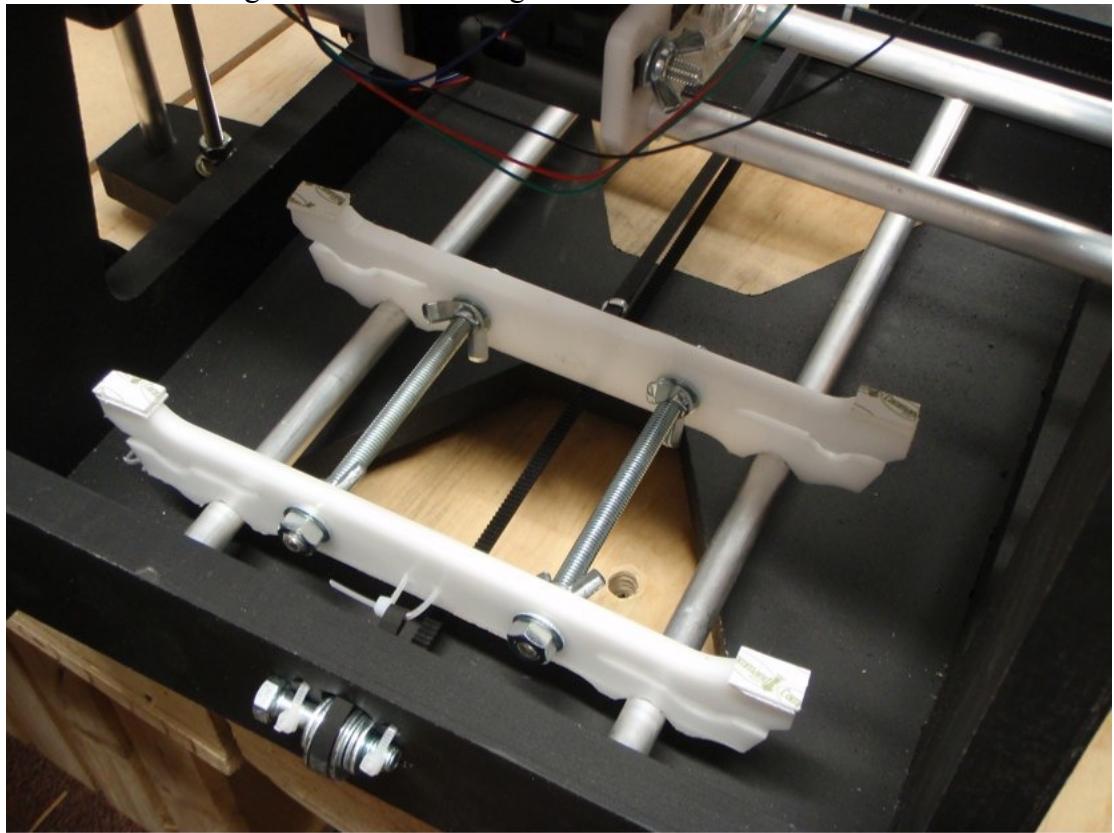
Preparing the Printer Bed

Take the 6mm MDF board and clean one side of dust and oils by spraying it with isopropyl alcohol, meths or vodka in a pinch. Removing the oil means we'll get good adhesion with the tape.

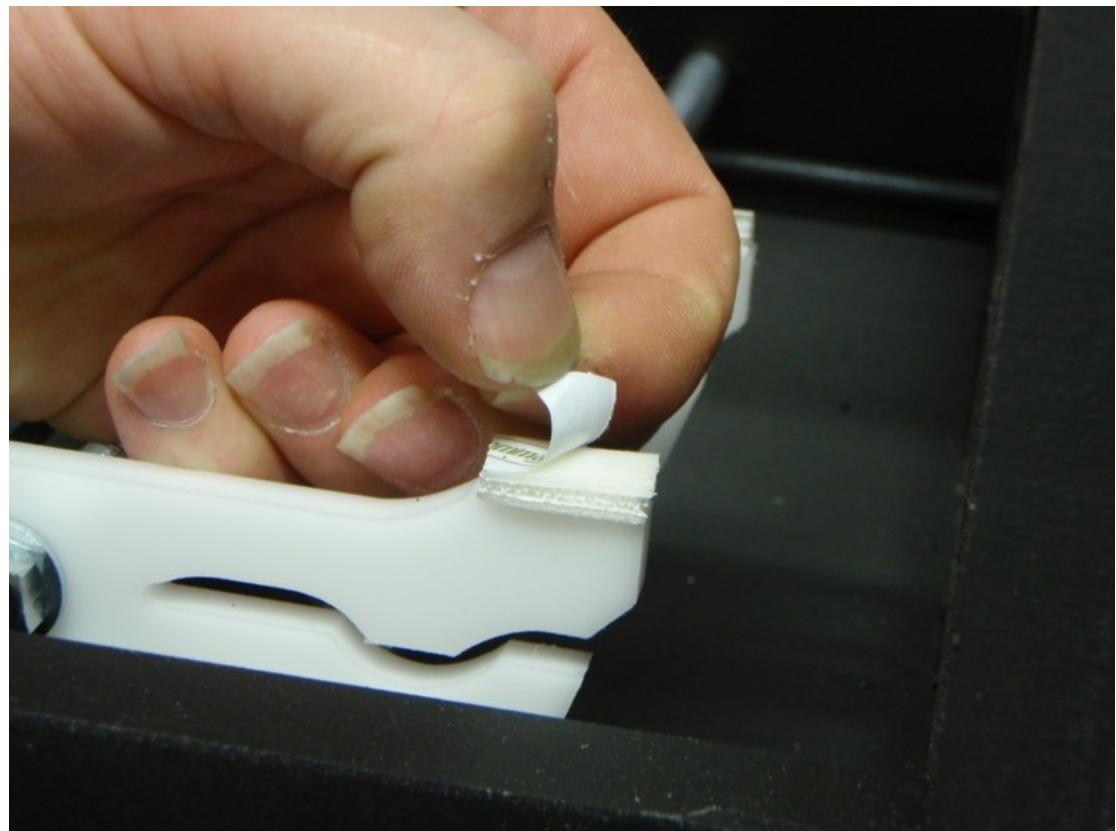




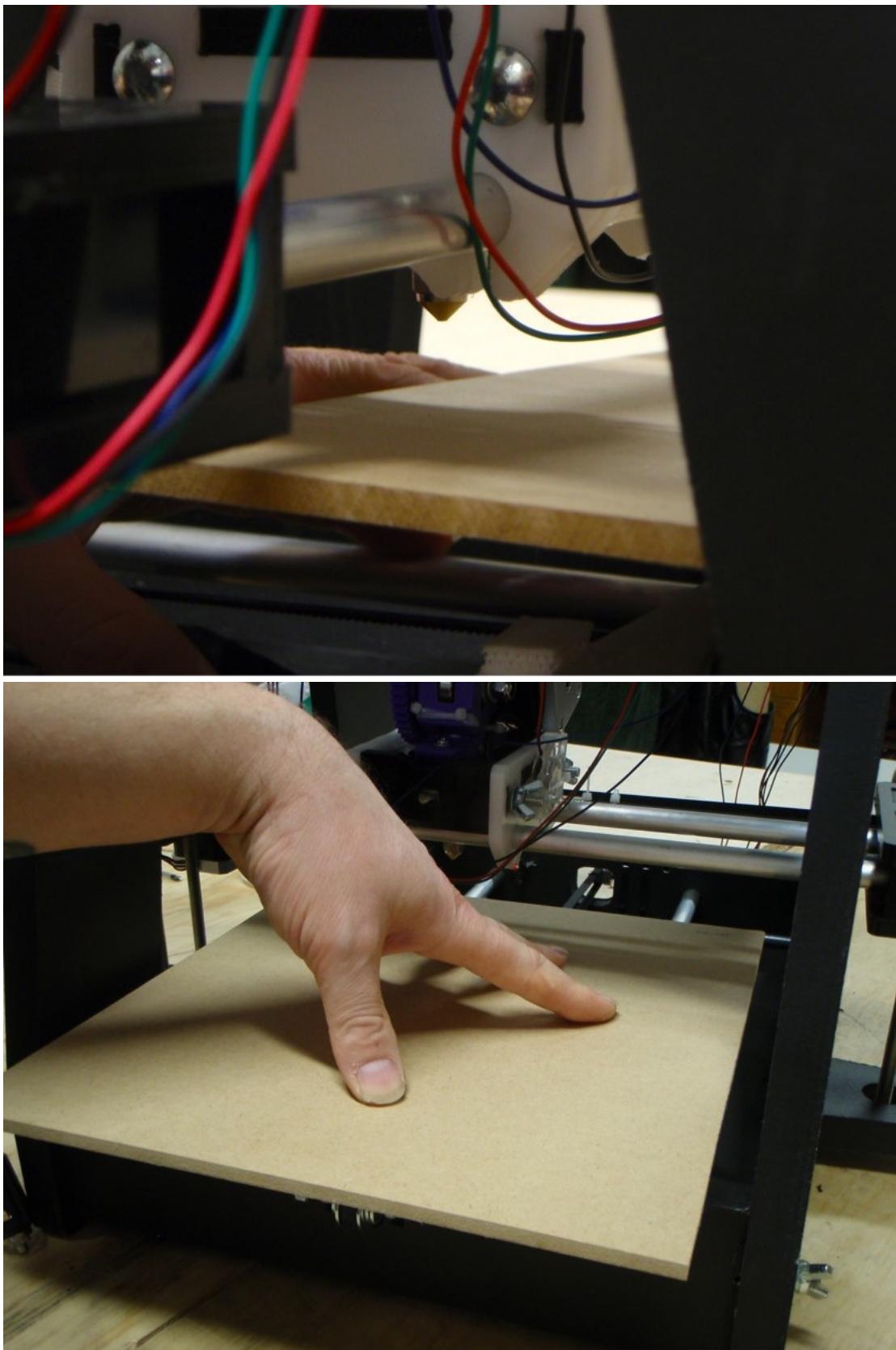
Move the Y-Carriage as close as it will go to the Y idler



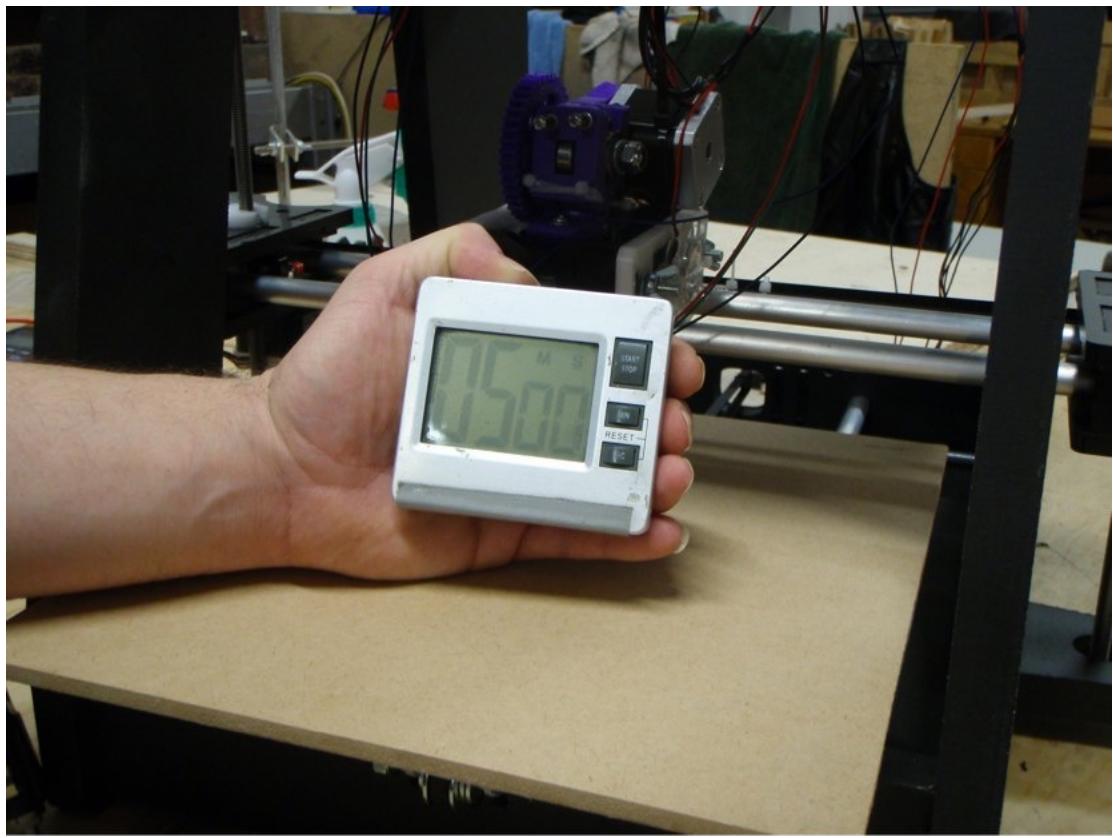
Peel the self adhesive tabs covers off the Y-carriage and place the board on top so that it is nice and central and square and MOST IMPORTANTLY the nozzle hangs over the bed by 20-30mm. This will ensure that the nozzle stays over the bed at both extremes of movement.



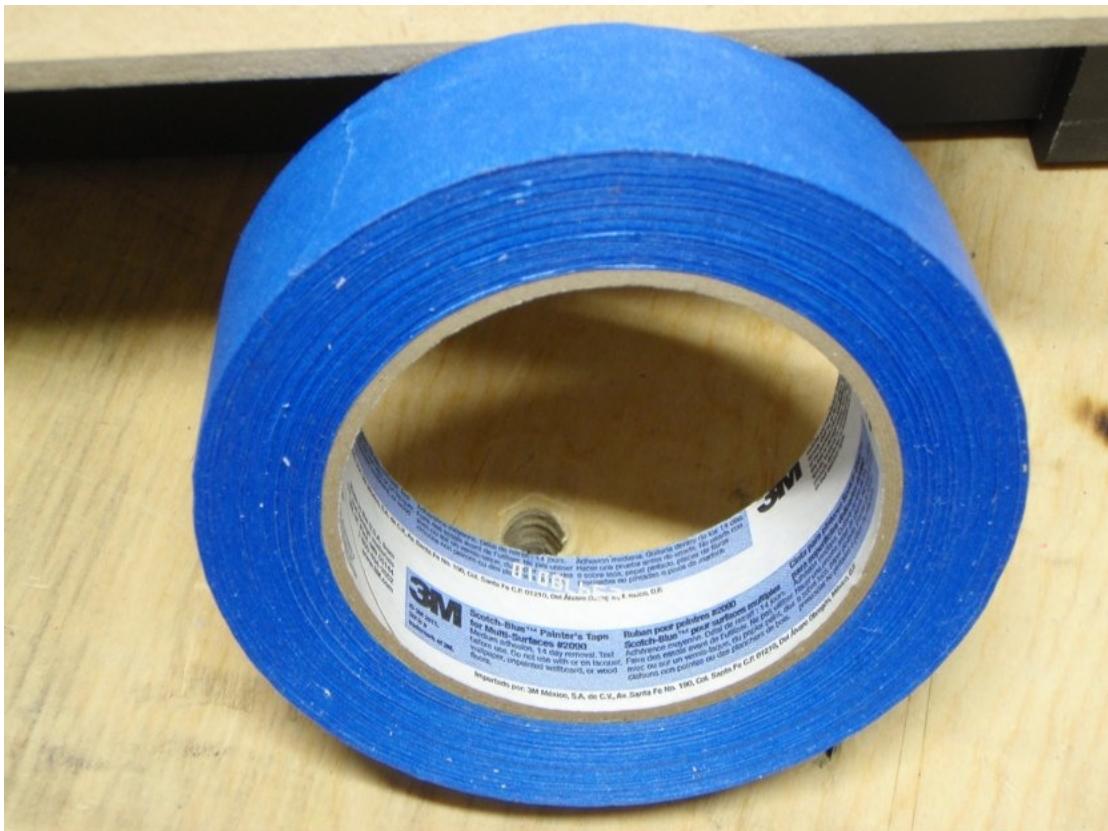
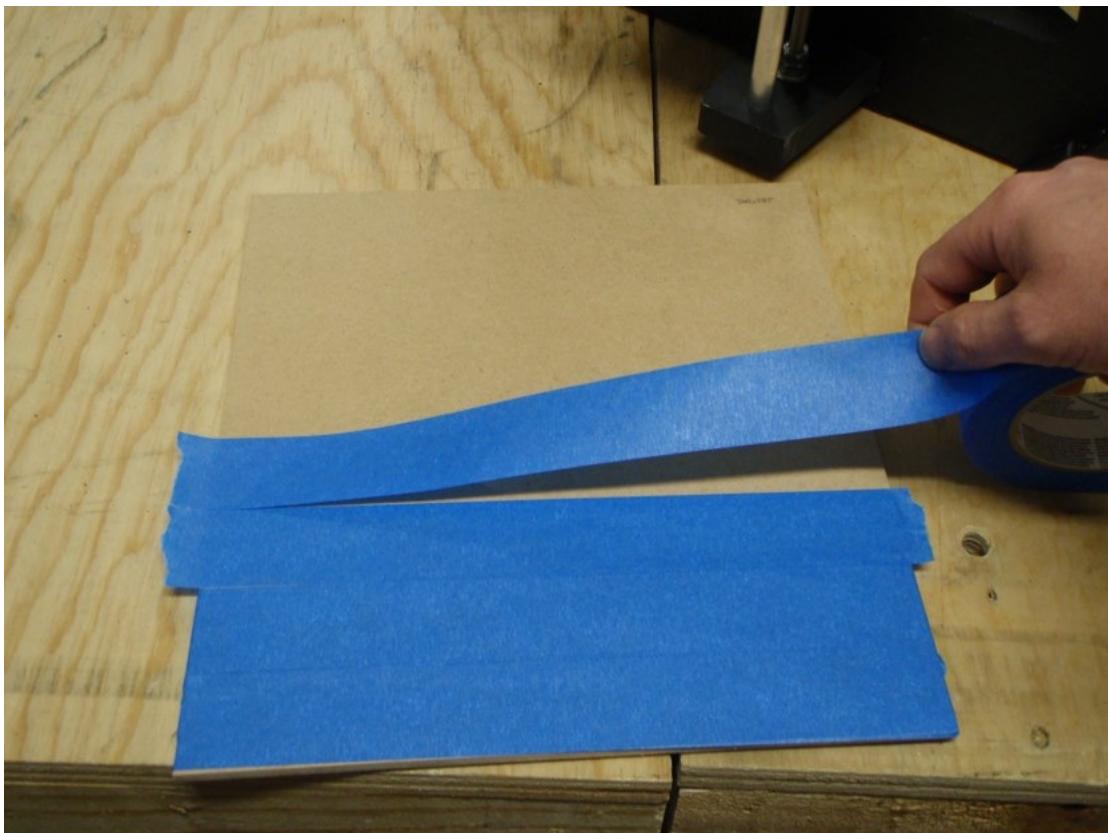
Notice how the nozzle is over the bed.



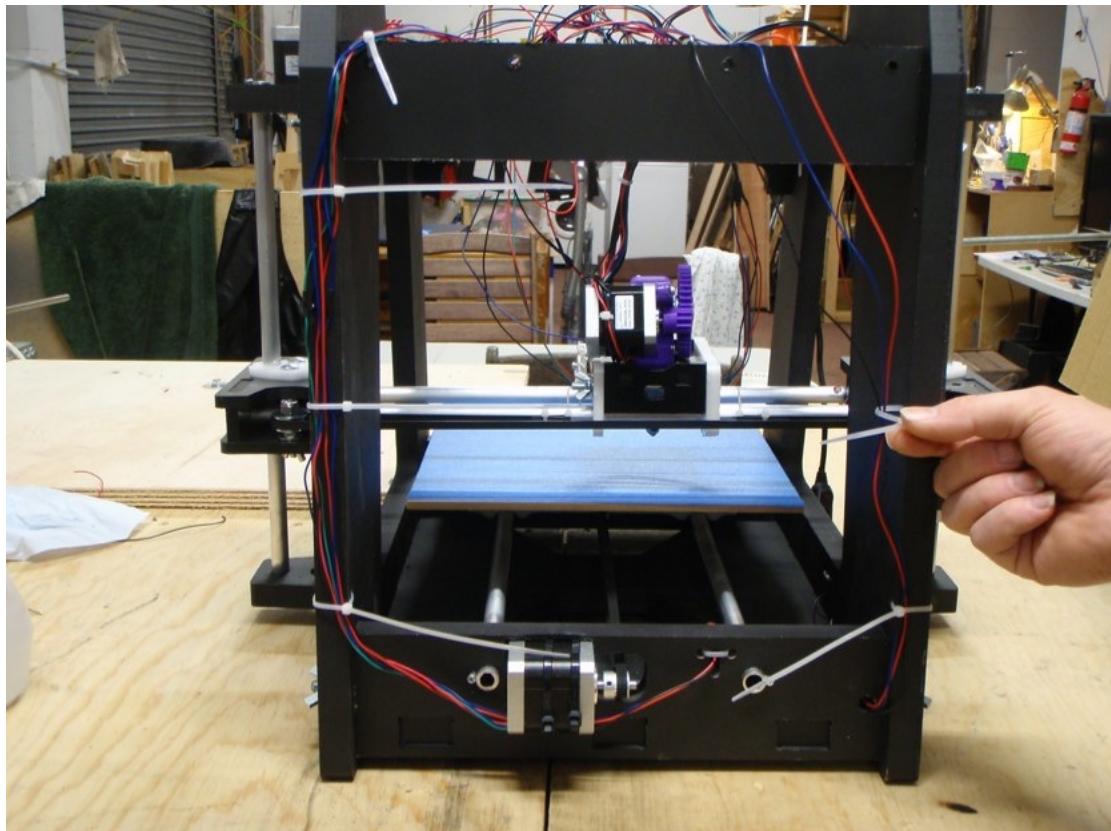
Take a break for five minutes for the glue to do its thing or else our bed will skew and move around and create lots of headaches and hair pulling.



Remove the bed from the Velcro and line the top surface with blue painters tape (medium tack) by 3M (not supplied). Butt the edges of the tape together but don't overlap the strips – we want to make a smooth and even surface to print on. It's ok to wrap the ends around the sides, but don't cover the Velcro you just added.



Put the bed back in place and tidy up the wires with zip ties.



Firing it Up

First up, triple check your wiring and especially that you have your power supply the right way around.

Take a deep sniff of your board and electronics so you know what it smells like and then plug in the power for one or two seconds while watching for fans, lights, smoke and escaping magic smoke. Unplug the power and take a good sniff of your circuit board. It should smell the same as it did before. If it doesn't, check your wiring.

Touch test the heat sinks and the tops of the heater drivers. They should not have warmed significantly.

If all is well, plug the power in and leave it in while giving it another sniff test. Check the power drivers and stepper drivers for excessive heat with your finger.

You should now be able to plug it into your computer via the supplied USB lead.

Software

Install the FTDI drivers so your computer will speak to the electronics on the printer. For Linux and OSX this is already done for you but for Windows you'll have to install them.

You'll find the windows drivers at the link below

<http://www.mindkits.co.nz/Documents/DiamondMind/Windows-FTDI-drivers.zip>

In Windows you should now be able to plug in the USB cable and in device manager see a new com port show up (something like COM38 – a higher number port anyway).

Download Repetier from the link below and install it for your specific OS

<http://www.repetier.com/download/>

You can learn how to use it from the excellent guides available on the Repetier site.

<http://www.repetier.com/documentation/repetier-host/>

When you come to configuring slic3r (the program that turns a model into Gcode) you can import our configuration file which is available here.

<http://www.mindkits.co.nz/Documents/DiamondMind/slicer-DiamondMindv2-v1.ini>

You can load the config into slicer within Repetier by clicking the slic3r tab then configure. Once the slicer config loads, click file=>load config and open the config you downloaded.

It's important to save the config for each tab under 'print settings', 'Filament settings' and Printer settings. Otherwise it will drop your newly imported settings once you close the program.

There's an overview doc with pictures you can download here which shows how to load the config.

<http://www.mindkits.co.nz/Documents/DiamondMind/Repetier-Load-config.pdf>

Calibration

We now need to make sure the nozzle is the same height above the bed no matter where it travels around the print surface.

The X and Y axis movement is likely very close to perfect but we need to tune the leveling of the head.

By eyeball, (a Mark one eyecrometer) turn the couplings on the z motors until the X rails with the print head on look level with the bed.

Home the X and Y axis in repetier using the manual control tab.

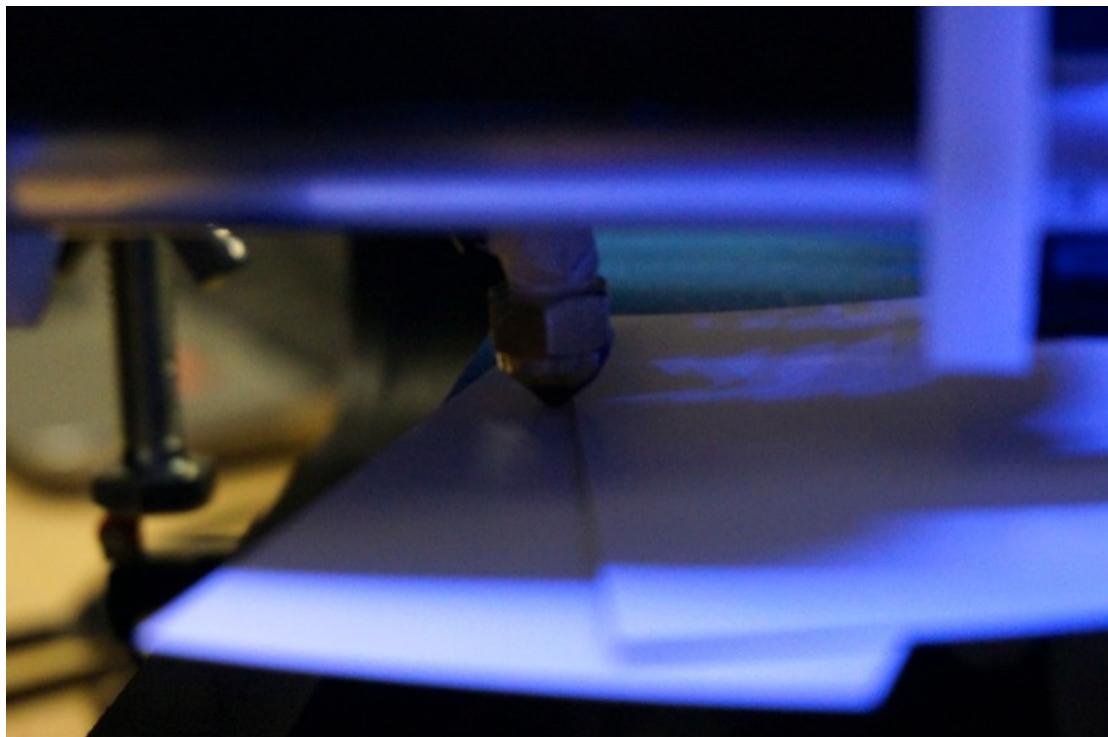
Extend the head of the Z actuator as far as it will go (the big bolt that hits the switch when the head reaches the bottom). This stops the extruder drilling into the bed.

Now home the Z axis.

Note:It's important from now on to realise the switch activates at a different point than it released. So you need to tune your Z height while the head is lowering toward the bed and not while you're moving the head up. Frustrating I know but it's the nature of the switches.

The head should be some distance above the bed. Release the butterfly nut on the Z actuator bolt and wind it up until it's just short of the height the head is above the bed. Err on the side of caution – we don't want to drive the extruder through the bed.

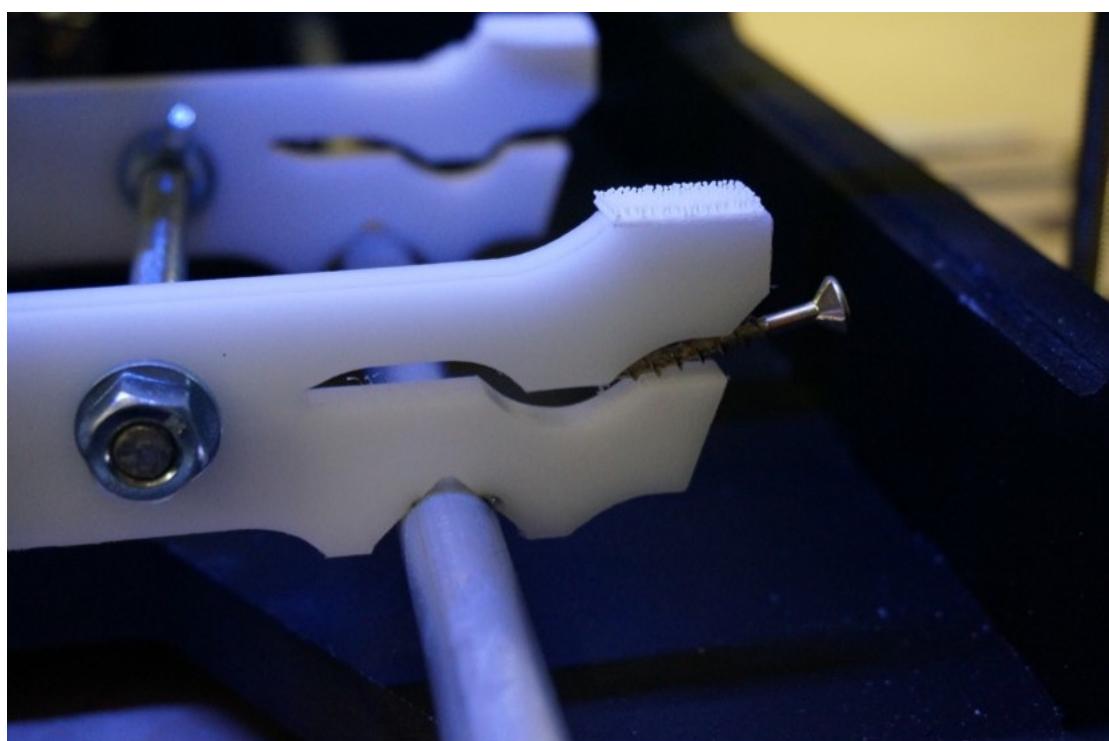
Take a business card and keep adjusting the length of the Z actuator until the extruder head rests on top of the business card. You should be able to slip one business card under it but not two. Tighten the butterfly nut and hit home in Repetier again. Fine adjustment may be needed.



Now send the X axis over to the other side of the bed – our aim is for it to be the same on both sides. Wind the couplings on the stepper motor until it is positioned correctly and you can put one card under it but not two.

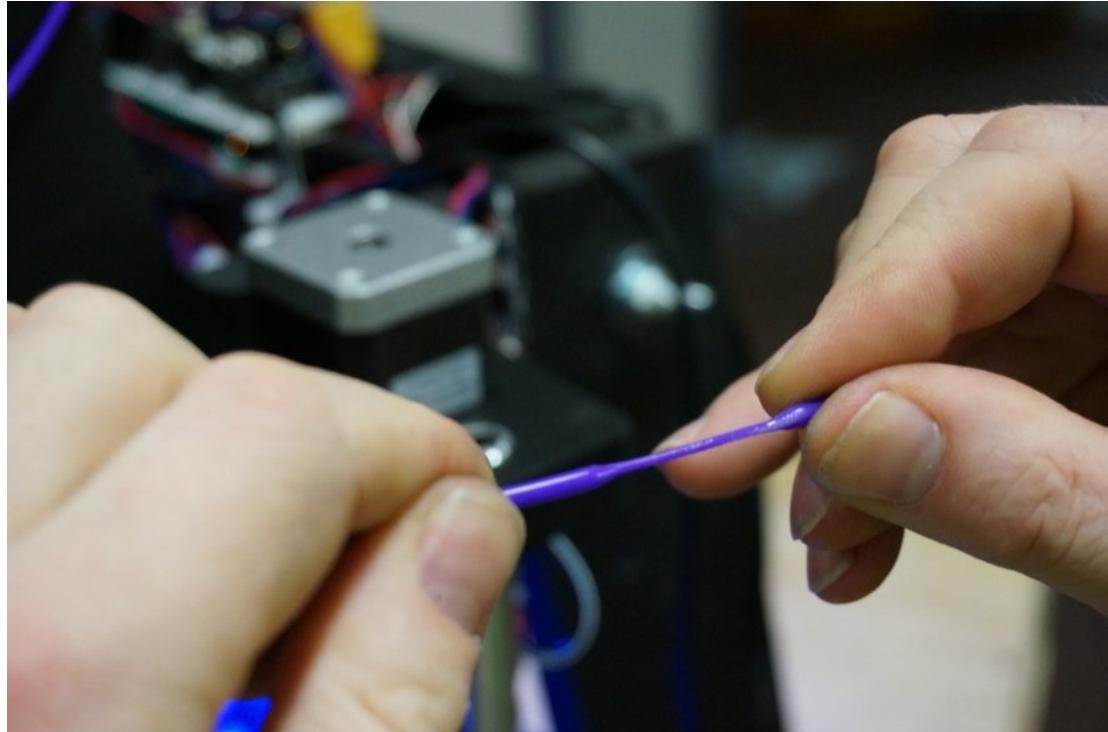
You should now have a level bed in the X direction.

If you're not able to get a level bed in each of the four corners you may need to screw a wood screw or two into the white carriage under the bed. This is unlikely though as the default setup is most likely accurate. This will jack up one or two sides.

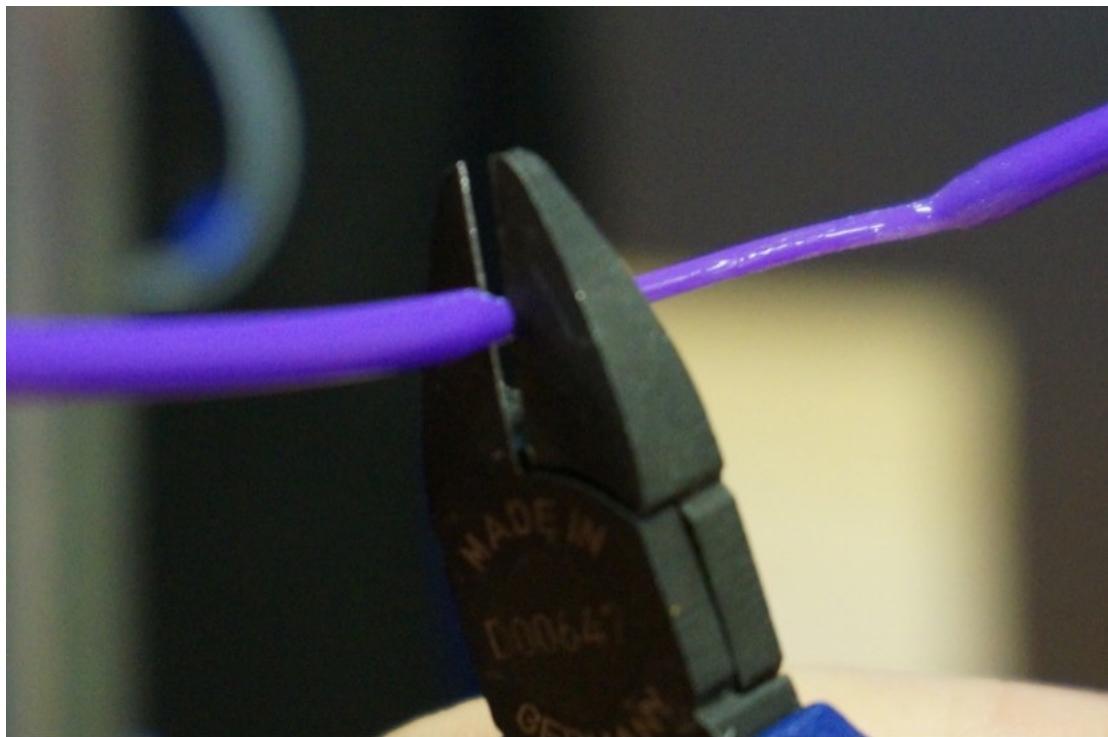


Feeding the Filament

Warm the extruder up to 225 degrees celcius and make sure the nozzle is at least 5mm off the build platform so the filament has somewhere to go. There will be the odour of hot plastic when fired up for the first time – there should not be anything resembling fire.



To ensure the filament goes in smoothly we'll taper the end of the filament. Do this by straightening out 150mm of filament at the end and then heating a section 30mm from the end and then pulling so it thins out. Cut the filament so you have a nice taper.



Poke the tapered end into the hole in the top of the extruder.

Now turn the motors off in Repetier on the manual control tab. You can now wind the filament into the extruder by turning the large cog towards you. Wind the filament down around 80mm and you should start to see melted filament coming out the nozzle. The hot end does need six minutes to warm up totally (despite reading that it's up to temp) so you may have to go and make a cup of tea and come back when it's properly hot.

If you still have no luck pushing filament out the nozzle, raise the temp 10 degrees and try again in a couple of minutes.

You can monitor the temperature in Repetier using the temperature tab. Still, be aware that it takes time for the entire extruder to come up to the temperature you read on the graph.

To test your filament you can now extrude 20mm or so in Repetier and you should see the results emerge from the nozzle.

Time to start printing

Load an object such as a calibration cube or shot glass which you can download from
<http://thingiverse.com>

Load it into repetier and slice it.

Make sure you're printer is up to temp before printing, extrude some filament to prime the nozzle and then start the print job.

Pro Tip: Don't be afraid to turn the Z axis couplers as your print is starting to do some fine adjustment on the height of the print head. Anti-clockwise to lower.