



**Steps for assembly of a Bukito version (Stickers on baseplate dated April 27, 2014 or later.)**

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## Definitions and conventions.

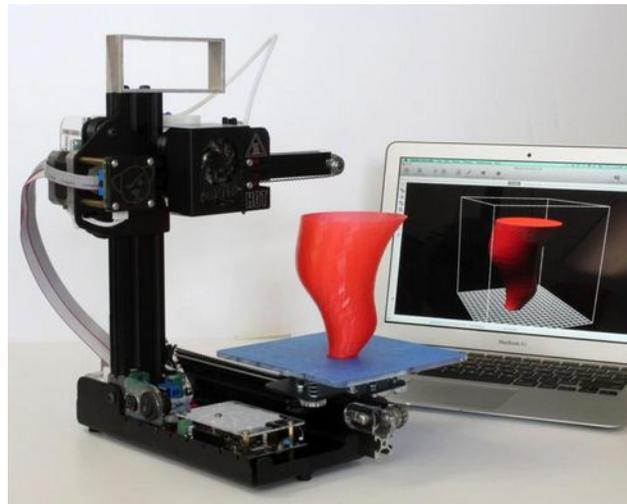
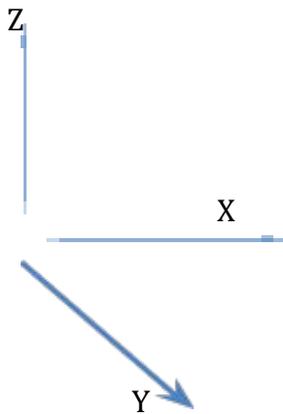
The parts are collected into **kits** (individual plastic bags.) Where possible, we will walk you through all the parts in a kit and highlight the **kit name** in yellow.

The **X axis** runs along the horizontal rail that runs from right to left in this photo. The extruder is carried on the X carriage..

The **Y axis** is the rail that runs underneath the platform. Y direction movement is done by the platform, which moves forward and backward.

The **Z axis** is the vertical axis. The Bukito's up and down movement happens along this rail.

The "**front**" of the Bukito is defined here as the end of of the Y axis closest from the controller board mount. (Or to put it another way, the controller board will be in the front, and the power switch will be on the left (See image below of assembled Bukitos- refer back to this if you get lost.) When we say "**left**" or "**right**" we mean from the point of view of an observer looking at the machine from the front.



## Tools you will need, not included in kit

Phillips-head screwdriver

A roll of 3M blue painter's tape ("ScotchBlue") for the platform, if you will be printing in PLA.

Metric allen wrenches (1.5, 2 and 3 mm)

A pair of pliers or 5 mm internal hex driver to tighten standoffs.

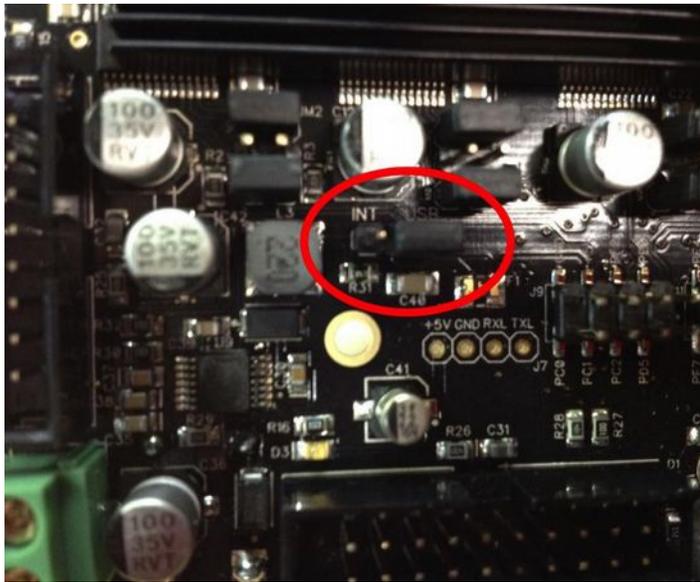
## General observations

If you are an experienced assembler of electronics, you may find the following obvious. If not, some notes about assembly in general:

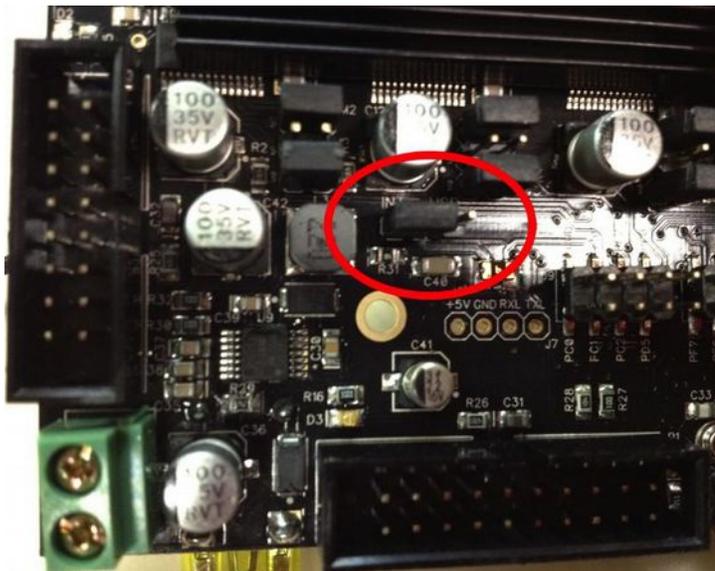
- Kit list colors, **Red**= Acrylic piece, **Green**= Electronics, **Purple**= 3D Printed part, **Black**= Hardware.
- Many pieces have rectangular and slide nuts. These nuts are designed to lock in the slots in the sides of the aluminum bars. You just need to get them started and they will self-align. The slide nuts should be installed with the protrusion toward the inside of the slot, with the exception of the ones connecting the idlers.
- By and large, it's a bad idea to cinch down nuts on the first pass around a particular assembly. We will discuss this as we go and note exceptions.
- Each end stop and the extruder all get a ribbon cable connection. The ribbon cables are pre-installed in the correct sockets on the controller board which are labeled on the acrylic cover over the controller board. If a ribbon cable has significant slack, it probably isn't the right one! Look at these carefully before beginning.
- Each motor is paired to a breakout board, a small circuit board. Each breakout board uses at least one ribbon cable and motor cable.
- **DO NOT plug the printer-in-progress or any part of it into your computer or a wall outlet until instructed to do so.**

## Checking board jumper settings

In some cases a jumper on the main electronics board may have been set to USB power which means you will not be able to run your Bukito from code on an SD card. If your Azteeg X2 controller board looks like this (You may have to remove the acrylic cover to view the top of the controller board):



Remove the acrylic cover over the board and then take off the little jumper and move it so that it looks like this:



Replace the jumper and the acrylic board cover if you had to remove them.

## Initial unpacking; remove parts that are stored for shipping.

Here are the parts not in kits you should examine initially:

- Z Threaded rod with coupler and 5mm Ball Bearing
- Platform (Acrylic)
- Bowden tube 300mm
- Bukito power supply
- Bukito power supply cord
- Y - 2 row V-slot rails
- Z - 2 row V-slot (tapped holes both ends)
- Baseplate with X2/cables/extruder assembly/extruder breakout kit
- X - 1 row V-slot with mount-attached to base
- Y carriage
- Filament sample (nylon and PLA)
- Motors (4)
- Color strip set
- USB cable

Z Threaded Rod with  
Coupler and 5mm ball  
bearing



Bowden Tube and  
Acrylic Platform



Power Supply (4-pin)



Power Supply Cord



Y - 2 row V-slot rails

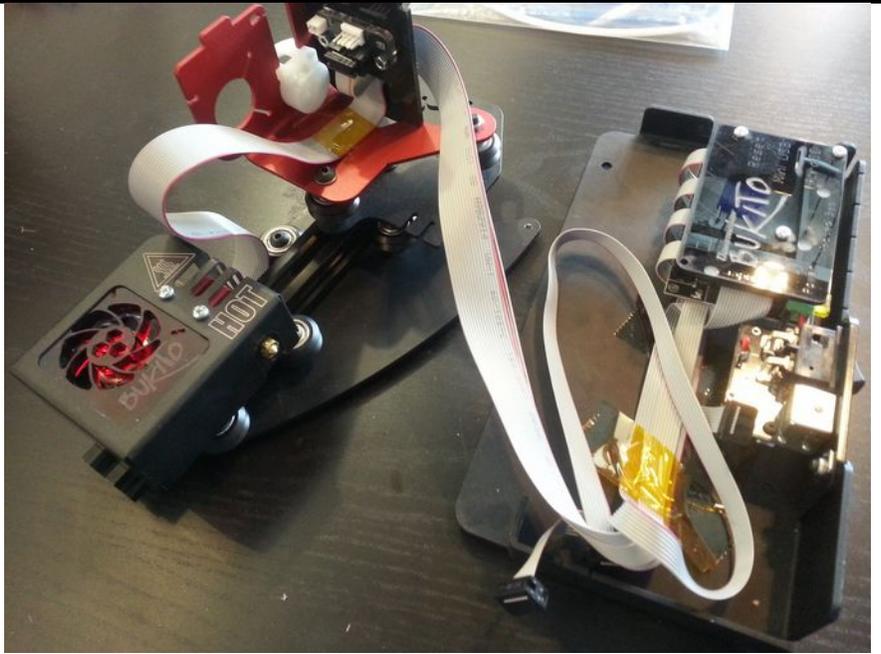
Z - 2 row V-slot  
(tapped both sides)



Baseplate with  
(X2/cables/extruder  
assembly/ Extruder  
Breakout Kit),

X- 1row V-slot with  
Mount attached to  
base

Y Carriage



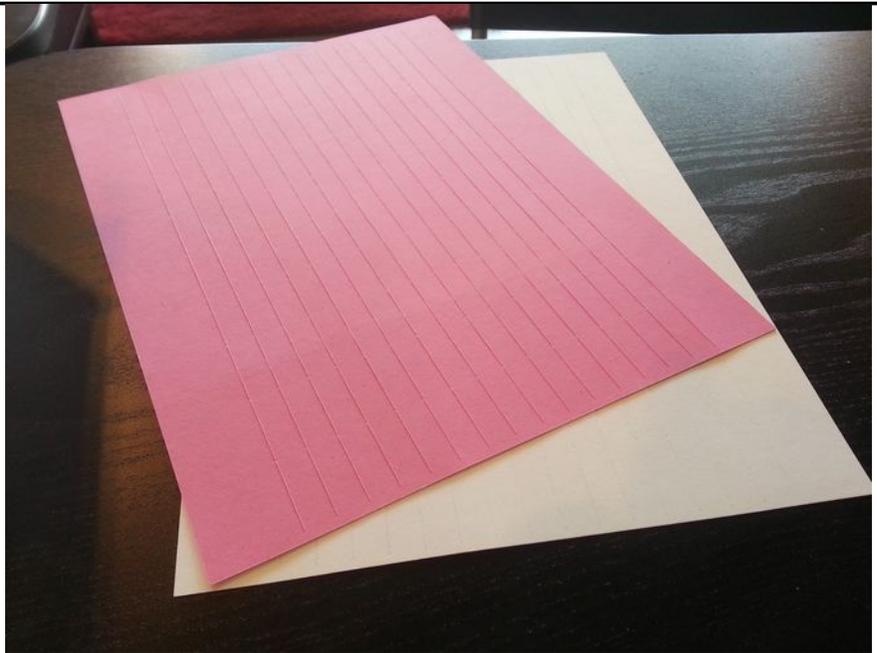
Filament Sample  
(Nylon and PLA)



Motors (4)



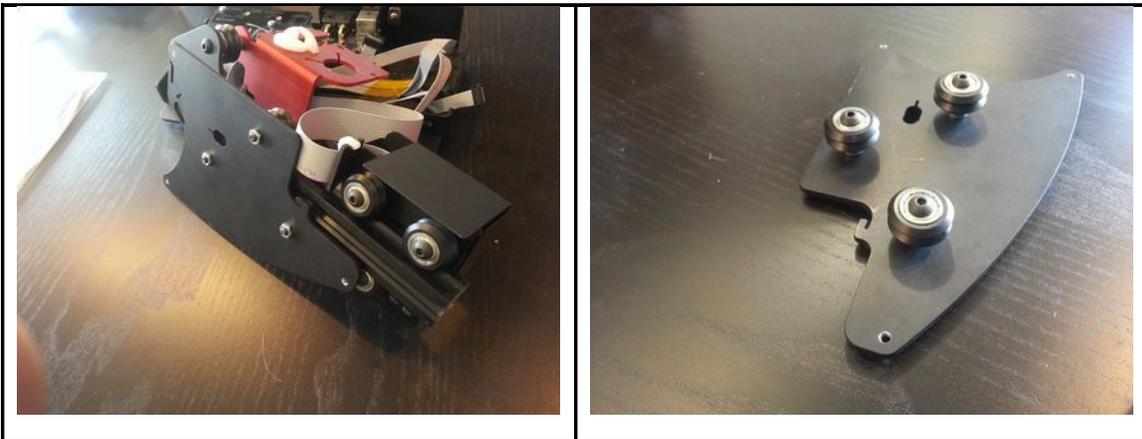
Color Strip Set



USB Cable



For safety while shipping the Y-carriage and X-carriage are tucked onto rails that are not their final destination. You should disassemble them like this- slide the Y carriage and X-carriage (Box that says "Bukito" on it) off their rails, but don't disconnect any cables going to the X carriage.

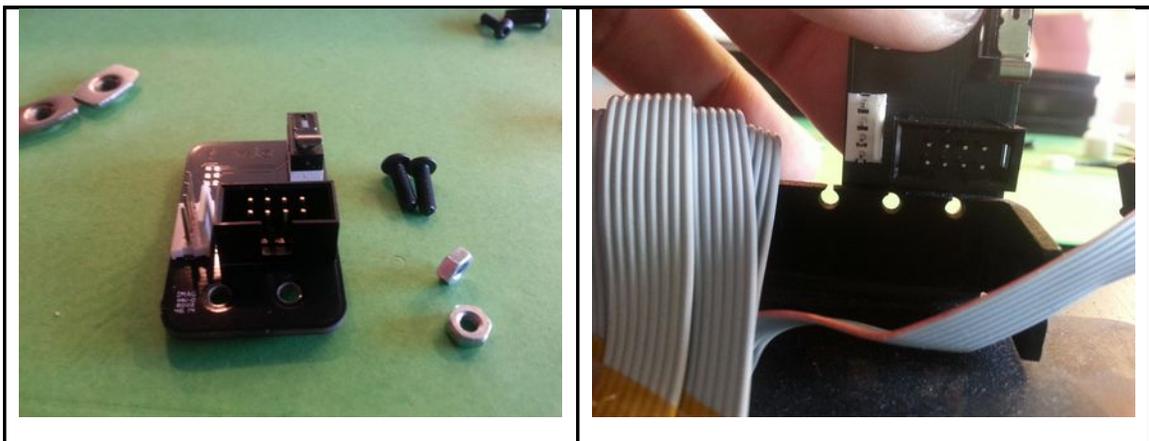


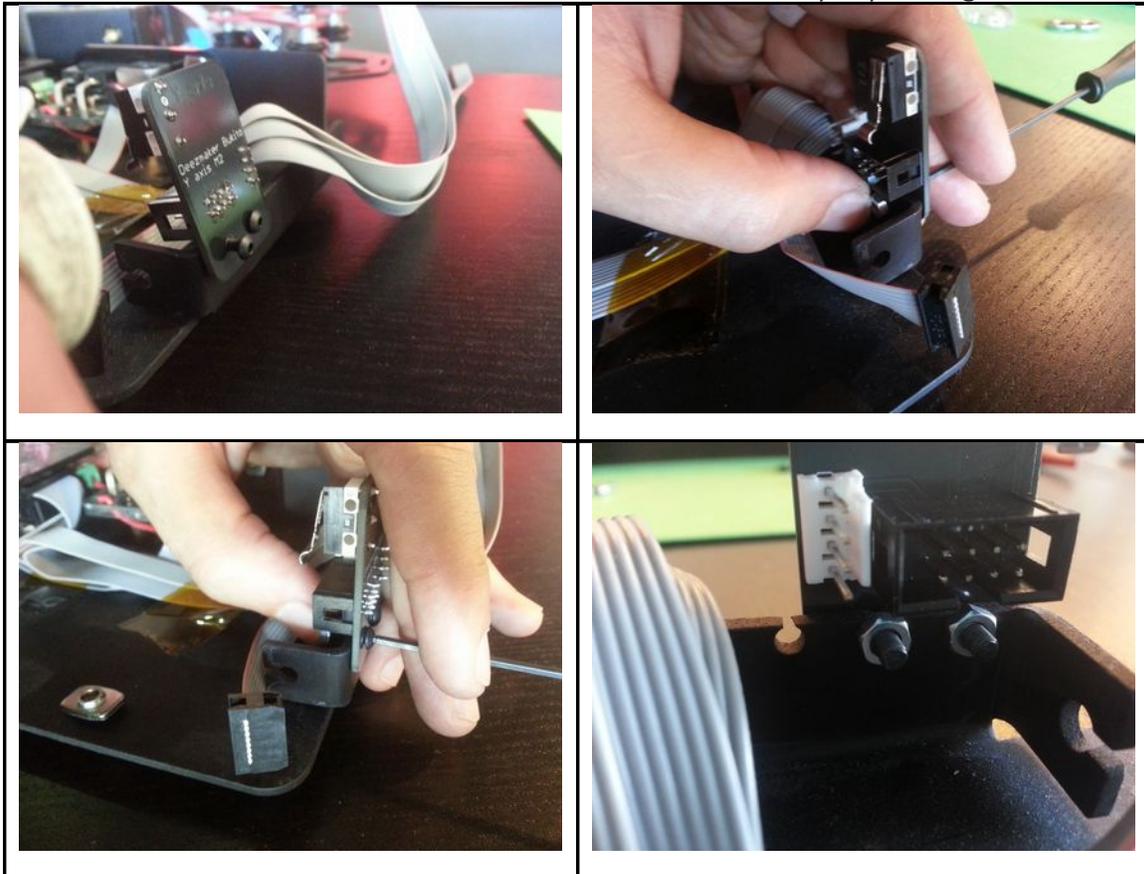
### Y Breakout kit.

Open the **Y breakout kit** and get the Y-rail and one motor.



Attach the **Y breakout Board** on the outside of the base plate, using the two right-most holes. (see below.)



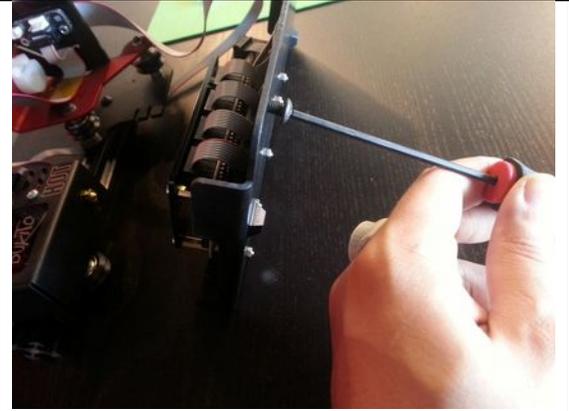


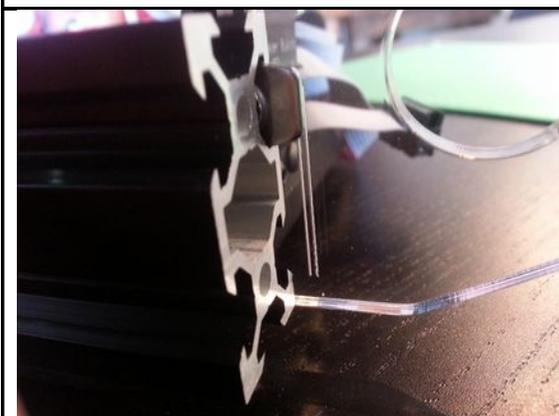
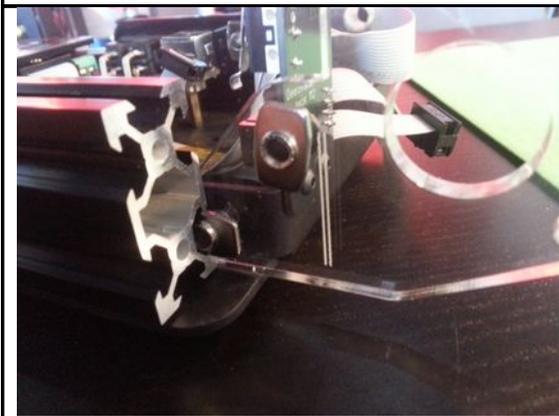
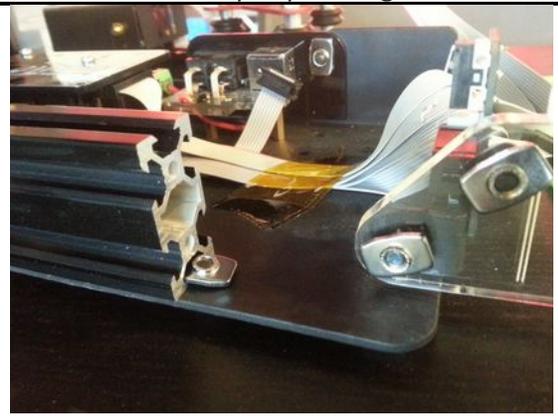
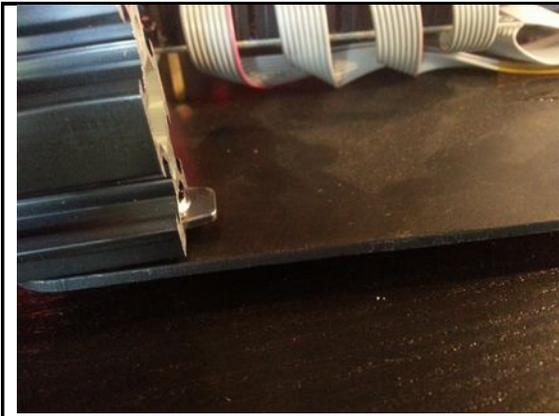
Note that the board goes OUTSIDE the black metal baseplate, not inside.

Attach the acrylic piece to the baseplate using the two longest (10 and 12mm) M5 screws and two T-nuts. The 10 mm will go through the upper hole of the **Acrylic**. The 12 mm will go through the metal baseplate AND **acrylic**. (Note: T-nuts have the flat side toward the screw head.) Put the two shorter M5 (8 mm) screws through the holes in the Bukito baseplate and put a rectangular T-nut loosely on each.



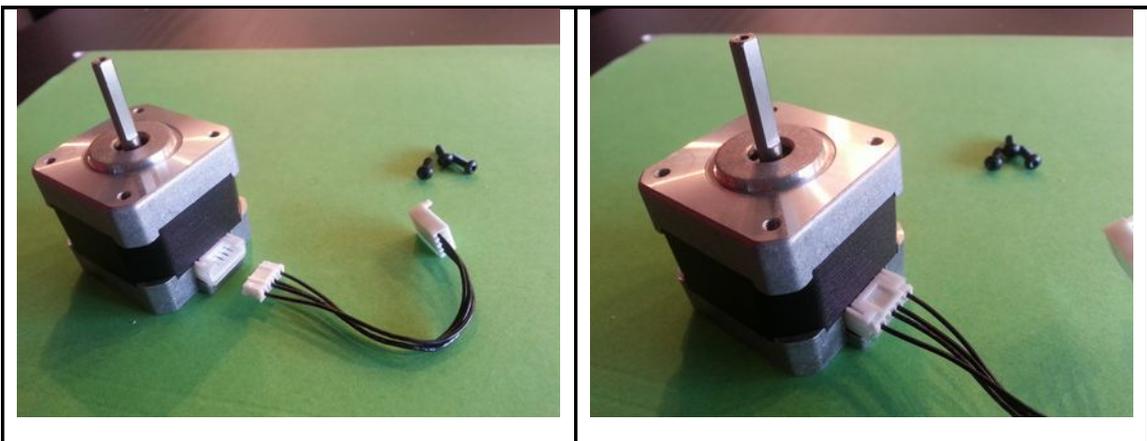
The T-nuts need to be fairly loose for the next step to work. Take the large aluminum rail (which is the Y axis- the one NOT labeled Z) and slide it over the nuts (two on the bottom of the baseplate and two on the acrylic piece.) Slide until the edge is between the two etched lines on the **Acrylic**. Tighten down.





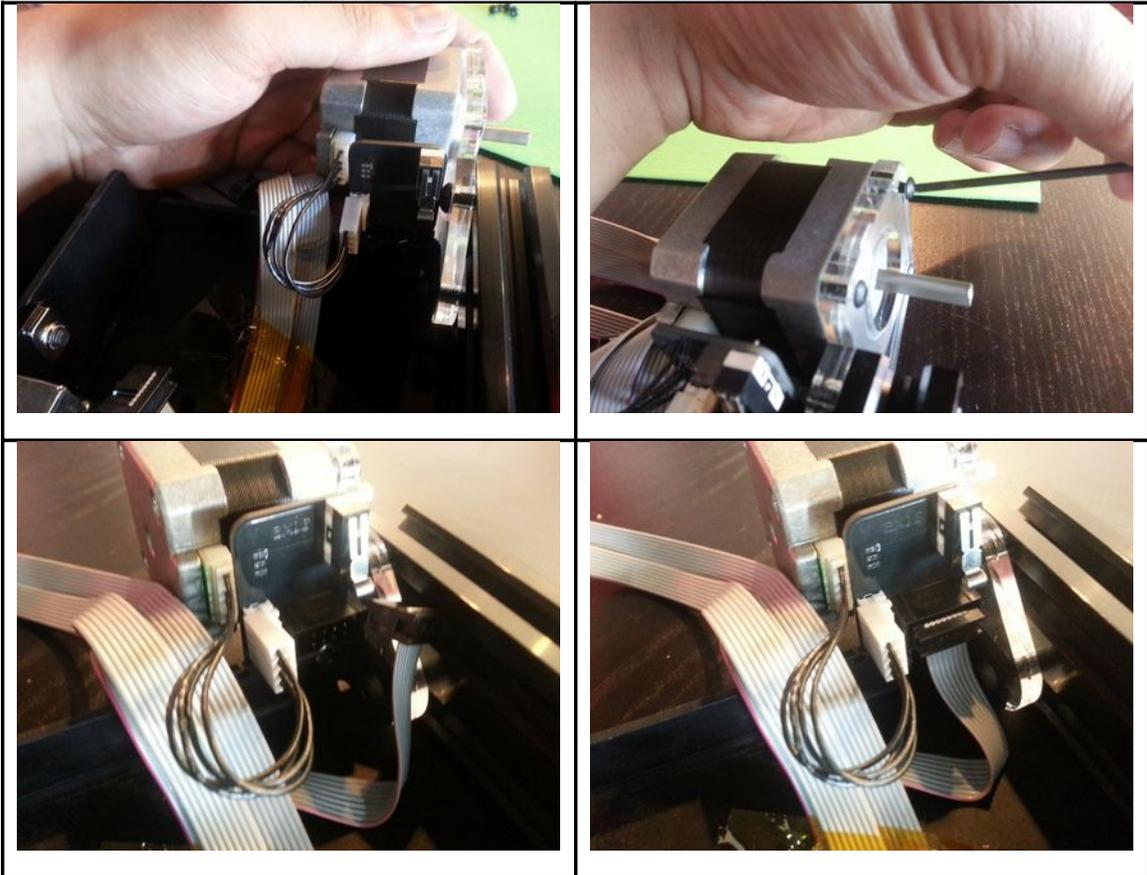


Attach the **Motor Cable** from the **Y Breakout Board** to the Y motor.





Attach the motor to the **Acrylic** with the three M3 10 mm screws provided. The motor connector should face the front of the machine. Then attach the Y-motor cable to the Y-breakout board, and then the Y-ribbon cable which should be conveniently adjacent.

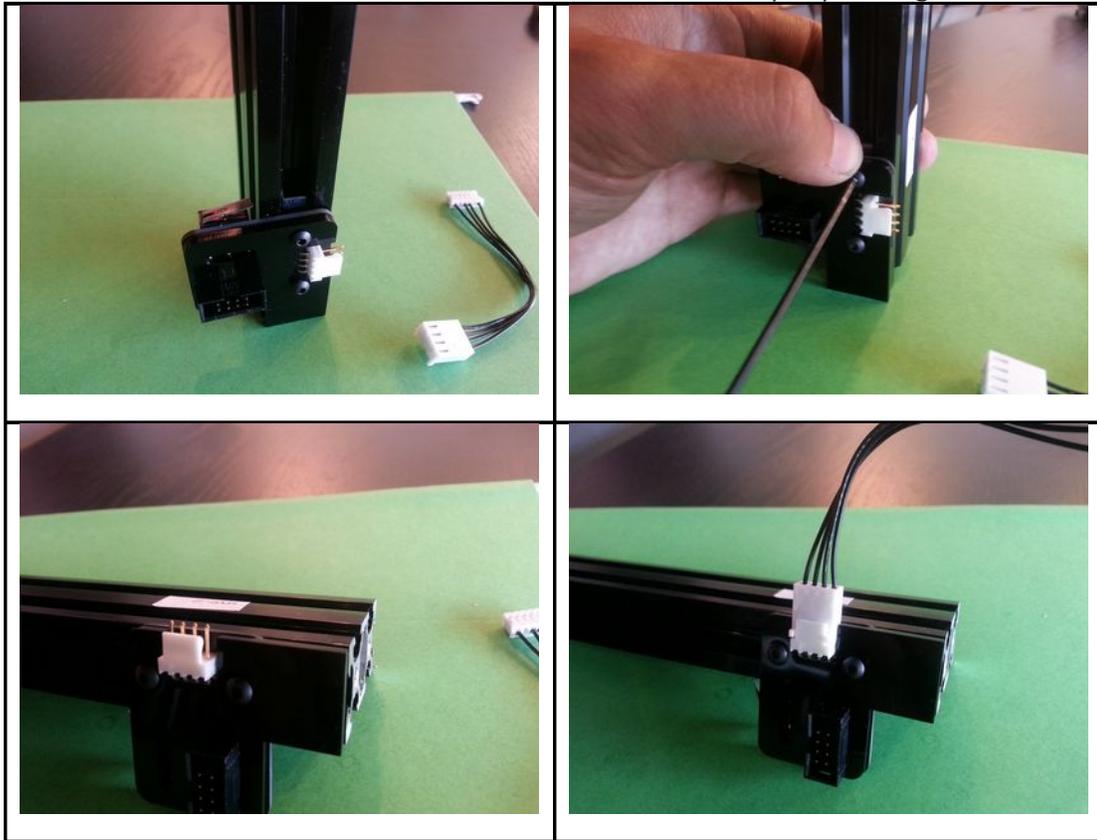


### Z breakout board.

Open the **Z-breakout kit** And get the Z-rail.

Assemble the parts in the kit as shown below.



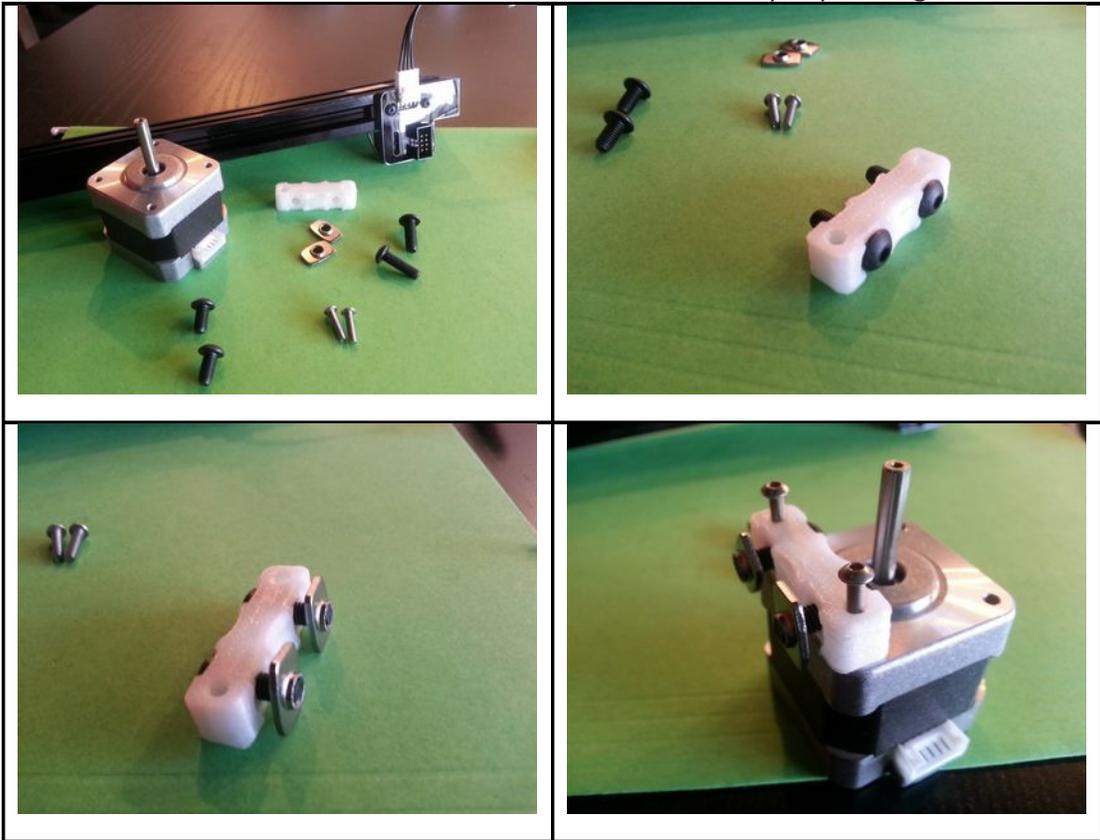


Then slide this assembly onto the narrow side of the Z axis using the T-nut's. Tighten it down so the bottom of the **Z-Acrylic Spacer** is flush with the bottom of the Z axis. Make sure it's tight (this is an exception to the "leave the T-nuts loose" rule.) Then attach the Z-motor cable to the Z-breakout board.

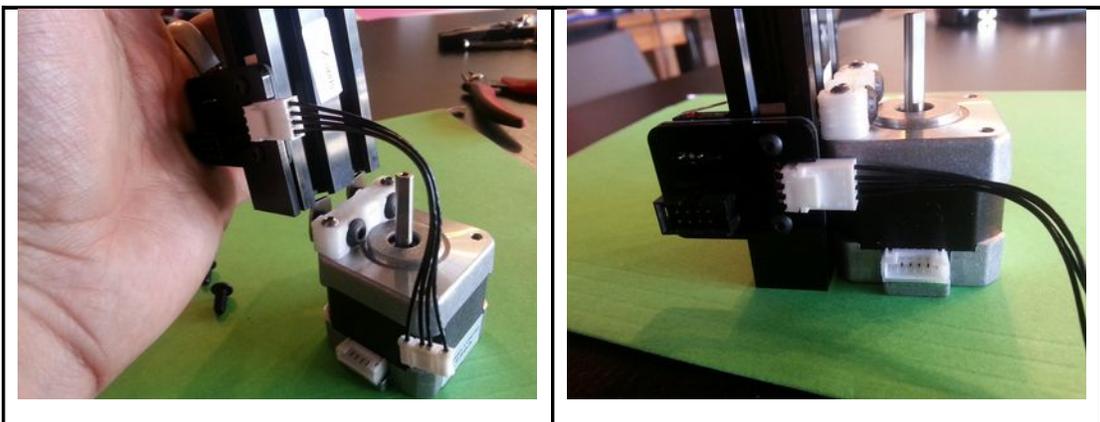
## Z motor mount

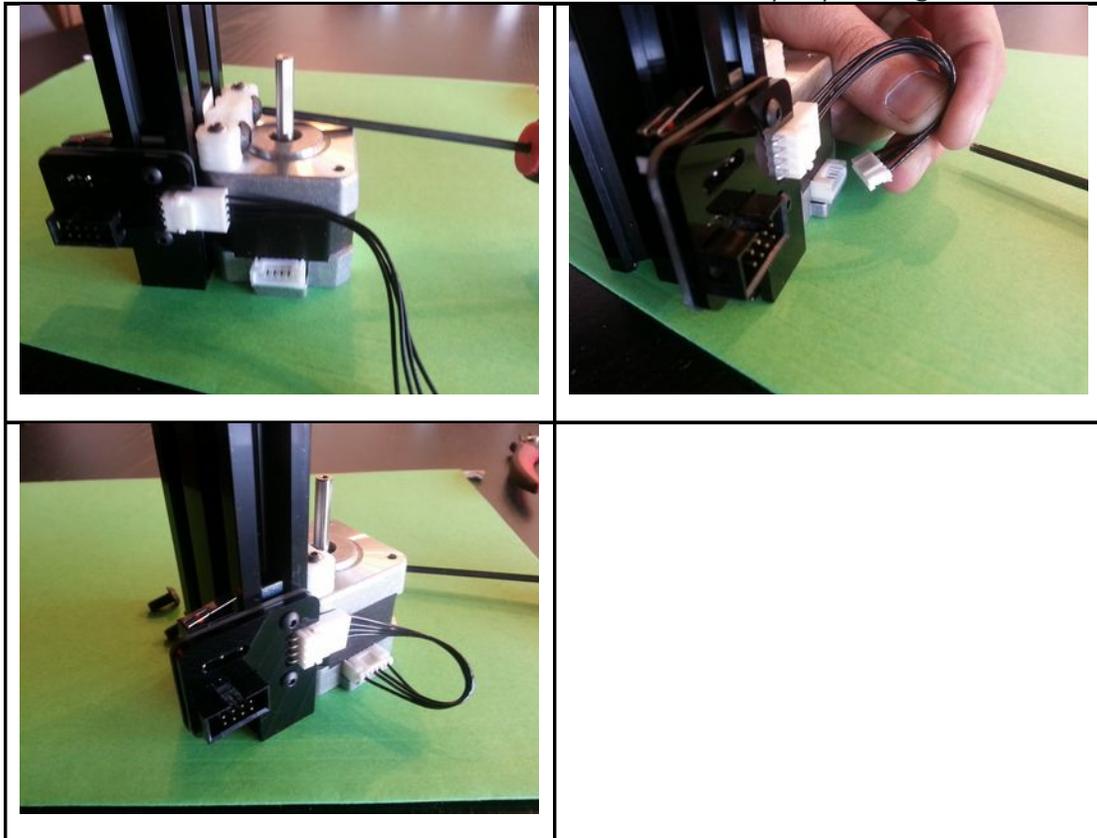
Open the **Z-motor mount kit**.

Take the 2 M5 16 mm button heads and put them through the larger holes in the **Z Motor Block** (The white **3D Printed Nylon** piece.), attach the M5 T-nuts to the M5 16mm screws.



Attach the **Z motor block** on top of the Z motor perpendicular to the motor connector with the M3 12mm screws, as shown.





Slide the Z motor onto the Z axis perpendicular to the **Z Breakout Board** (The **Z Breakout Board** will be attached to the right side of the Z axis and the Z motor will be behind the Z Axis. See photo above.) Tighten down the Z motor on the Z axis, making sure the motor is flush with the bottom of the **Z Breakout Board** and Z axis.

Attach the **Z Motor Cable** from the **Z Breakout Board** to the Z motor.

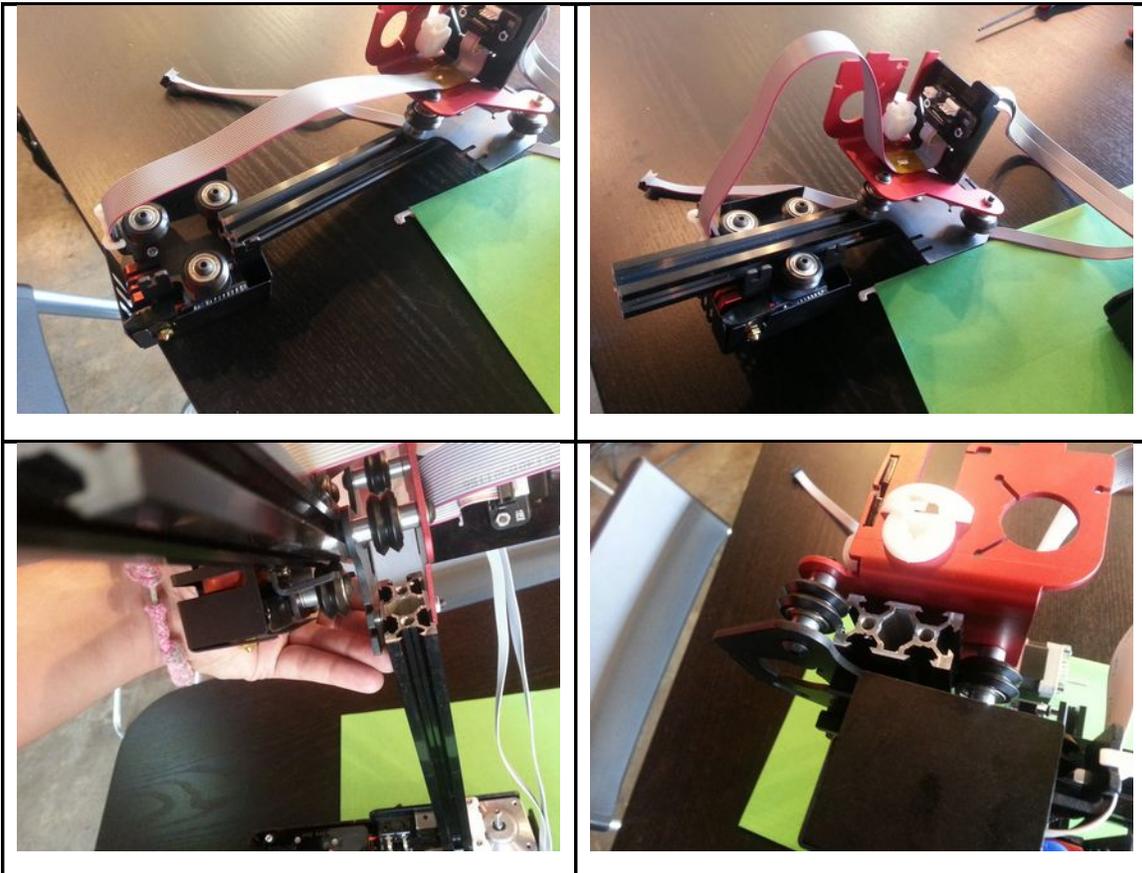
Then slide the whole Z axis over the T-nut next to the power switch (on the main baseplate assembly). This T-nut will need to be loosened to do this.

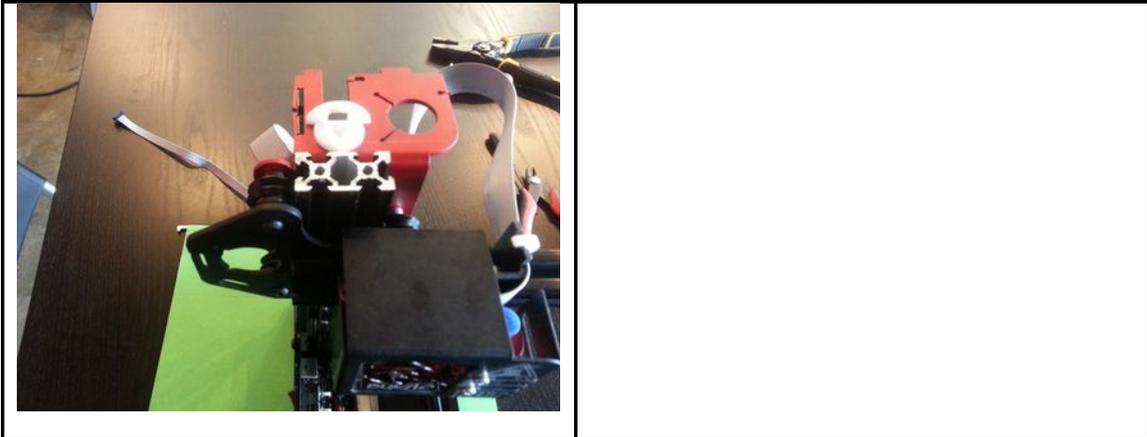


Attach the Z axis to the baseplate with the M5 10mm screws. Tighten all screws.  
Attach the Z ribbon cable to the Z Breakout Board.

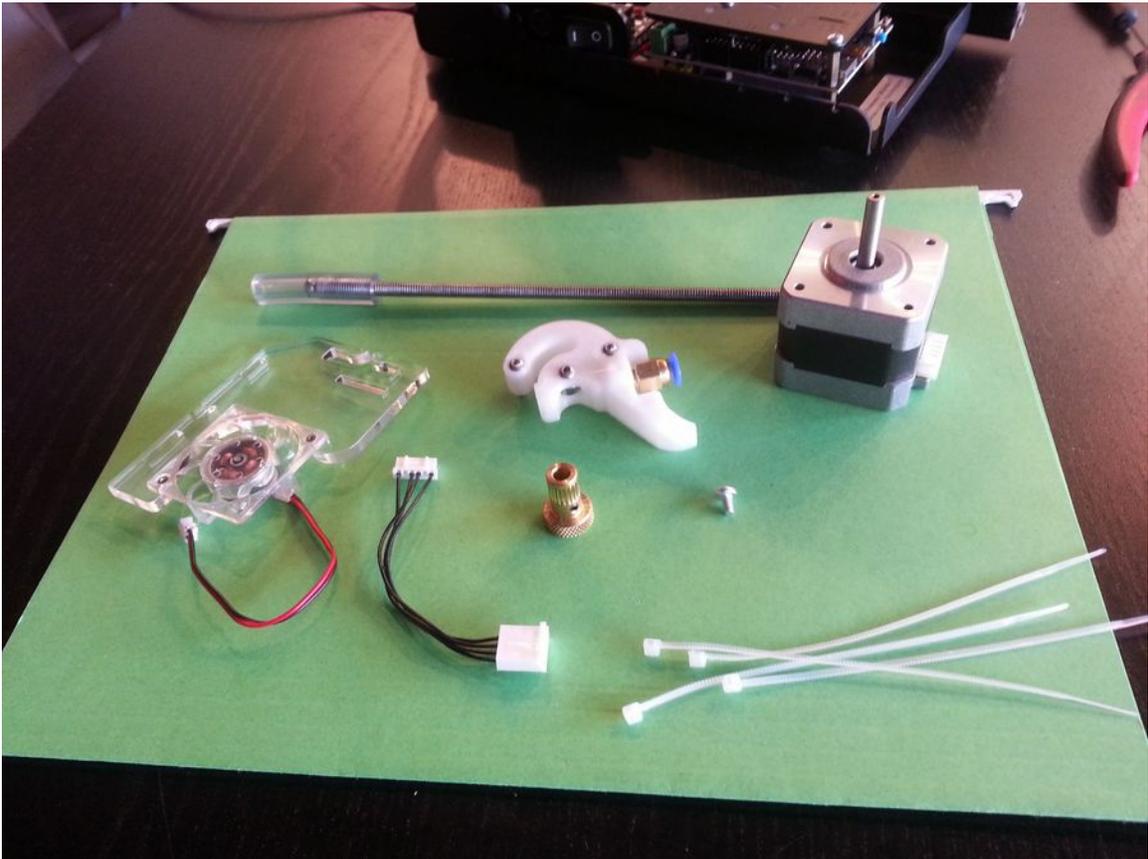
### Extruder Drive Mechanism

In prep for this kit we will go ahead and move the X carriage to the other side of the X-rail, followed by moving the Z carriage onto the Z-axis rail that we had just attached to the base. Wheels should go into the single slots on the left and right sides of the Z Rail.



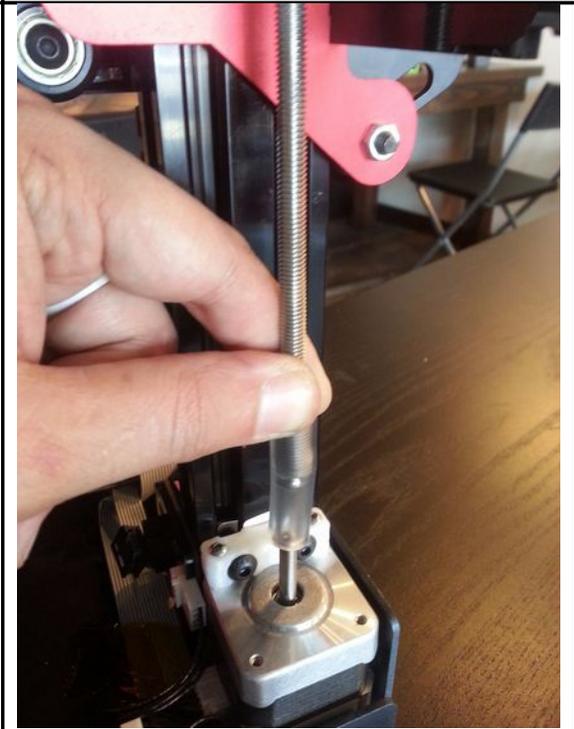
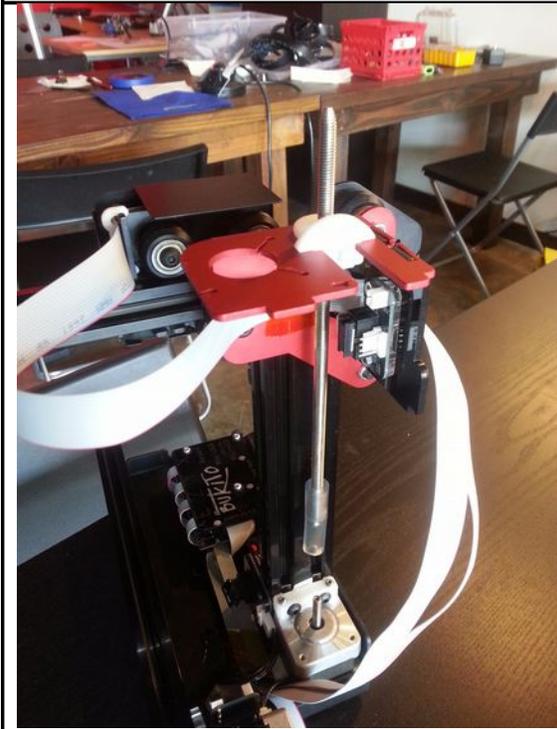
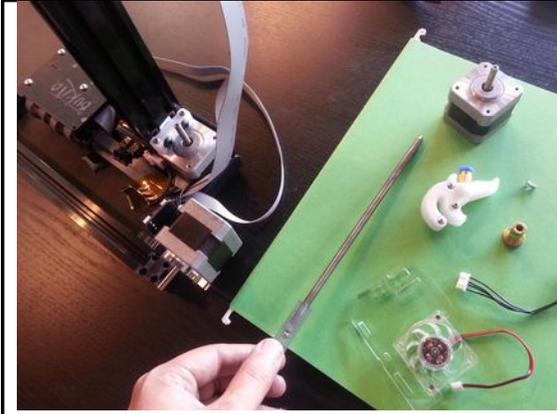


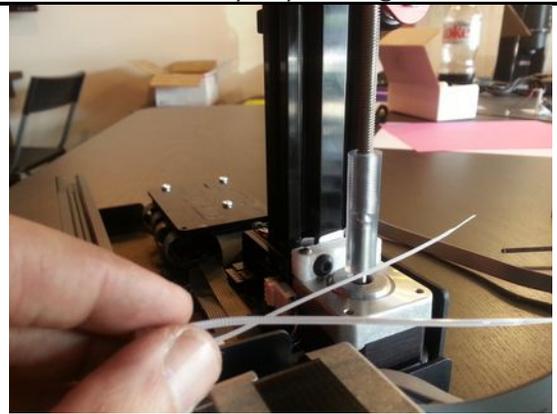
Open the **Extruder Drive Kit** and get the threaded rod with coupler as well as one motor.



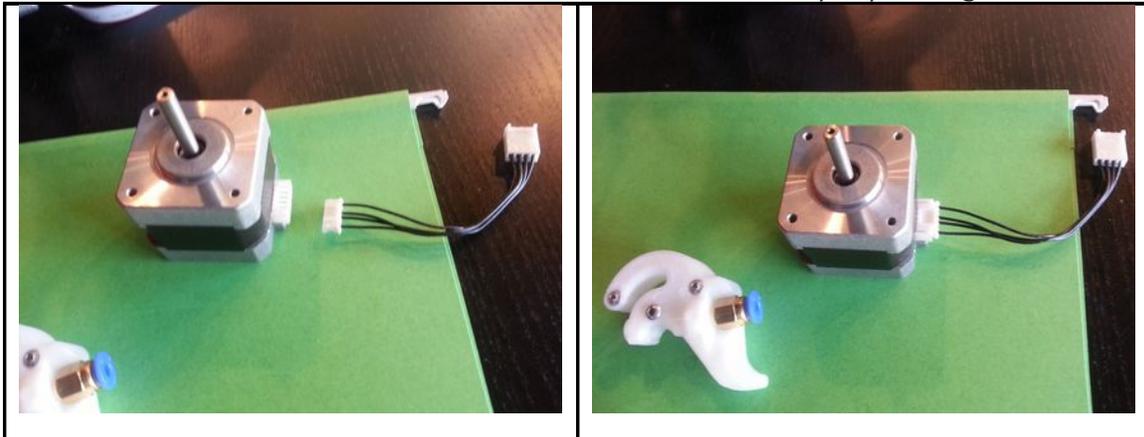
Insert the Z Threaded Rod from the bottom of the Z Carriage through the **3D printed Nylon piece** as shown. Turn it until it pokes up a few turns above the top of the **3D printed Nylon piece**. Then we will slide the coupler over the Z-motor shaft and make sure there is no space between the ball bearing and the motor shaft. There should only be a couple of mm clearance between the bottom of the coupler and top

of the motor. Then we will add a zip tie above and below the ball bearing and cut away the excess.

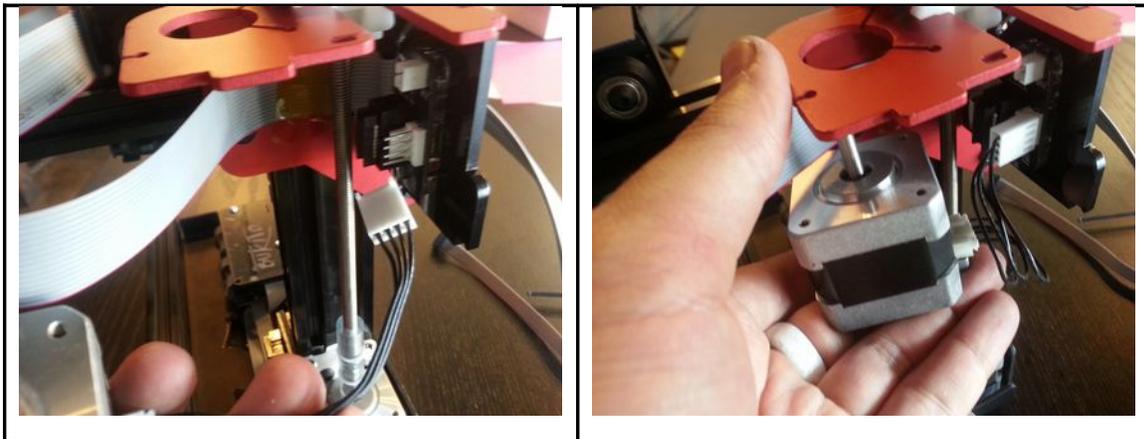


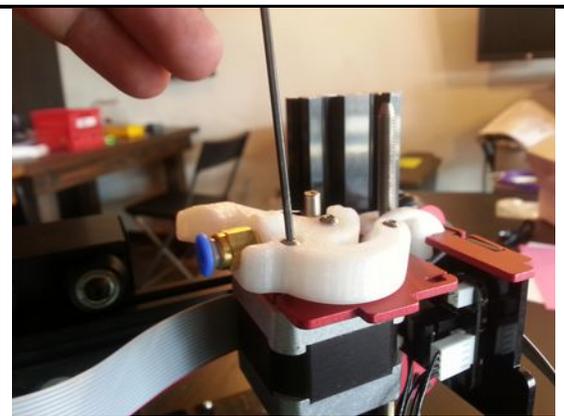
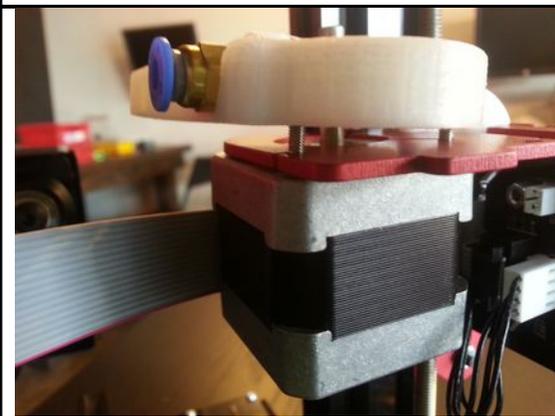
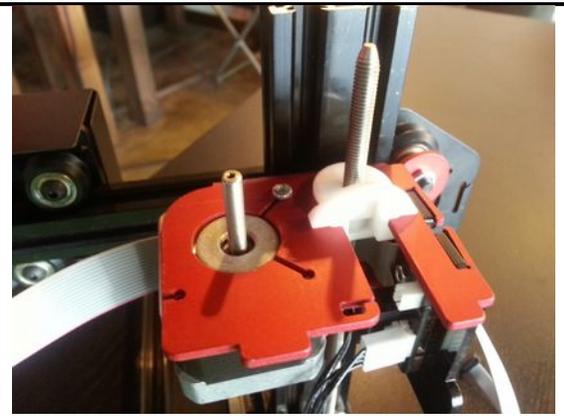
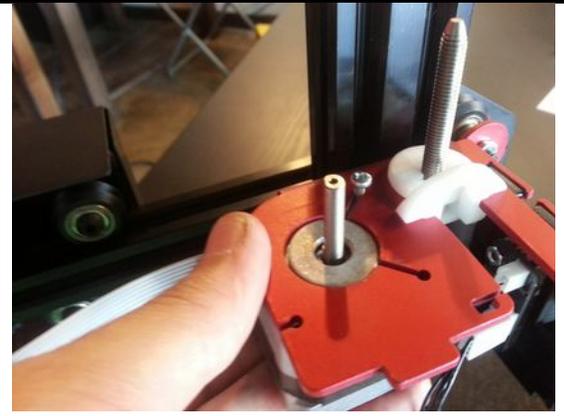
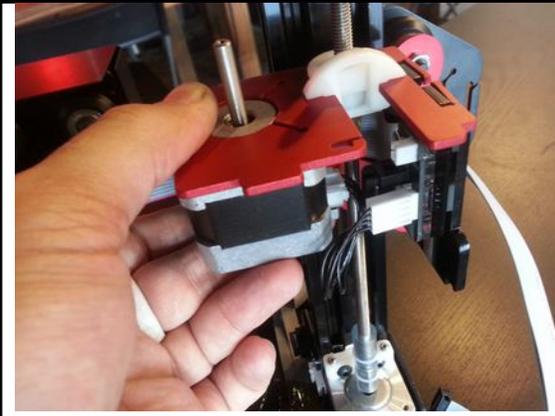


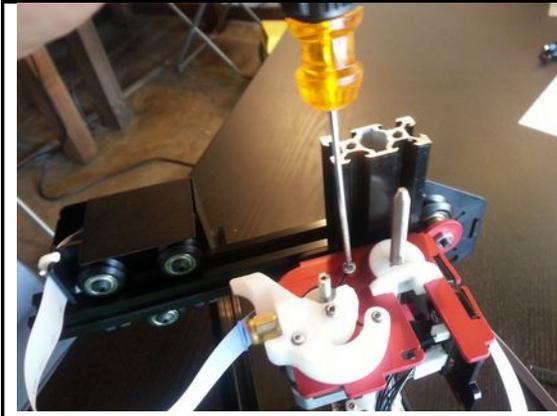
Attach the **motor cable** to the extruder motor.



Attach the other end of the **motor cable** to the **extruder breakout board** (already mounted on the clear **acrylic** next to the red metal.) The motor connector should be toward the **extruder breakout board**. Then put the motor shaft through the hole in the red metal piece and screw in using the M3 6mm screw, Keep the next screws relatively loose.



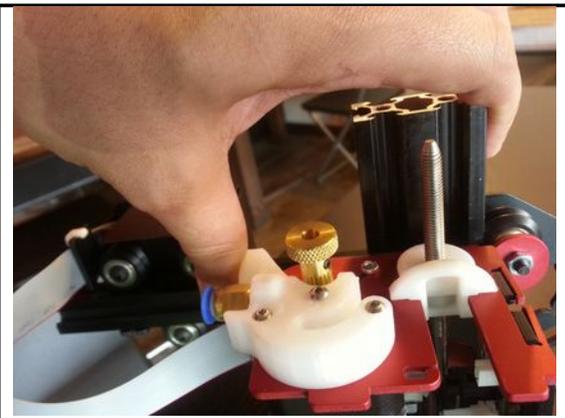
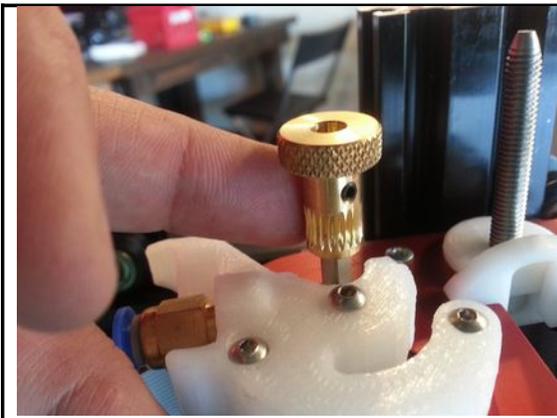


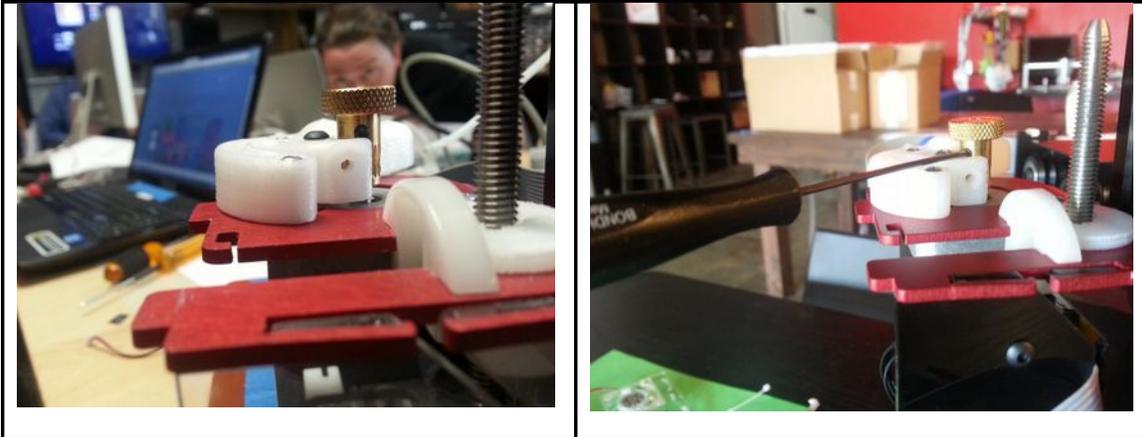


Next you will attach the extruder idler lever. Tighten down two screws that are poking out of the bottom of the idler.

Tighten all three screws once you have them all started.

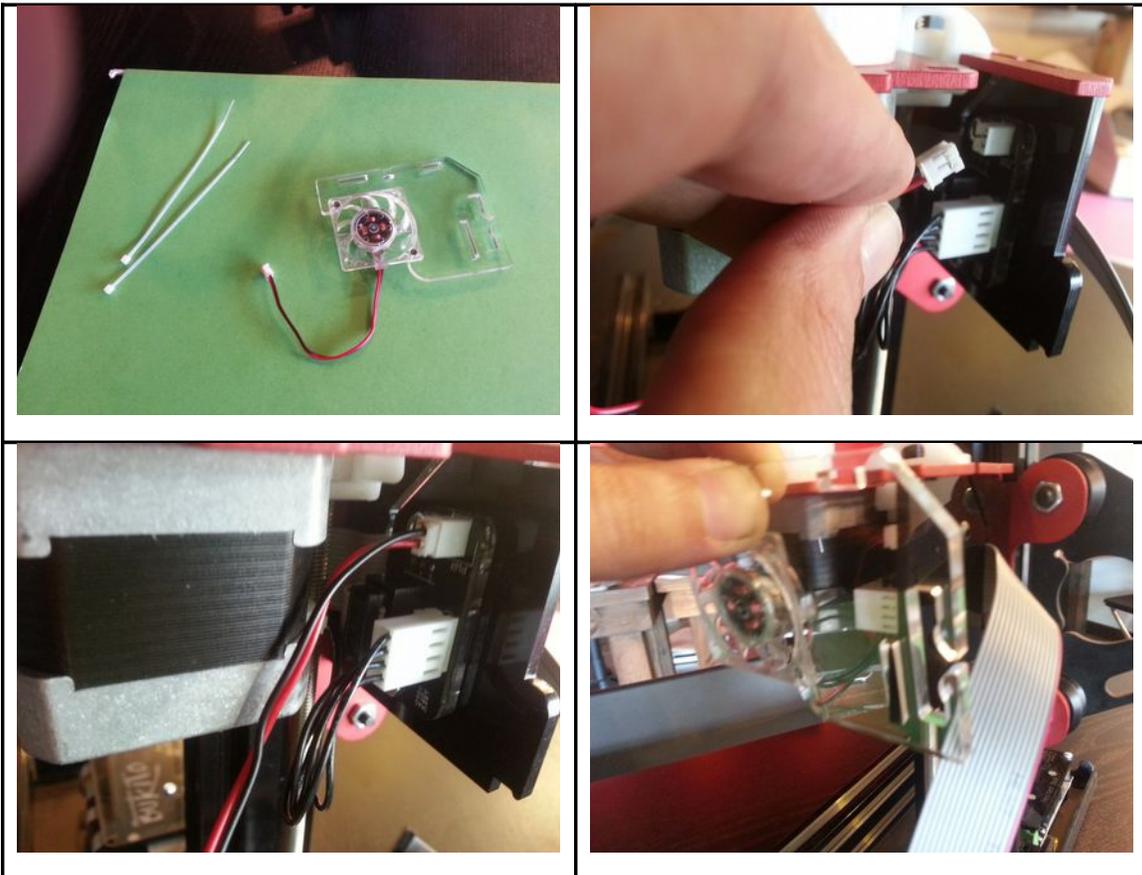
Next attach the drive gear. You may have to loosen the set screw (small black screw) to get it on. Align the set screw with the flat part of the drive shaft and tighten it down.

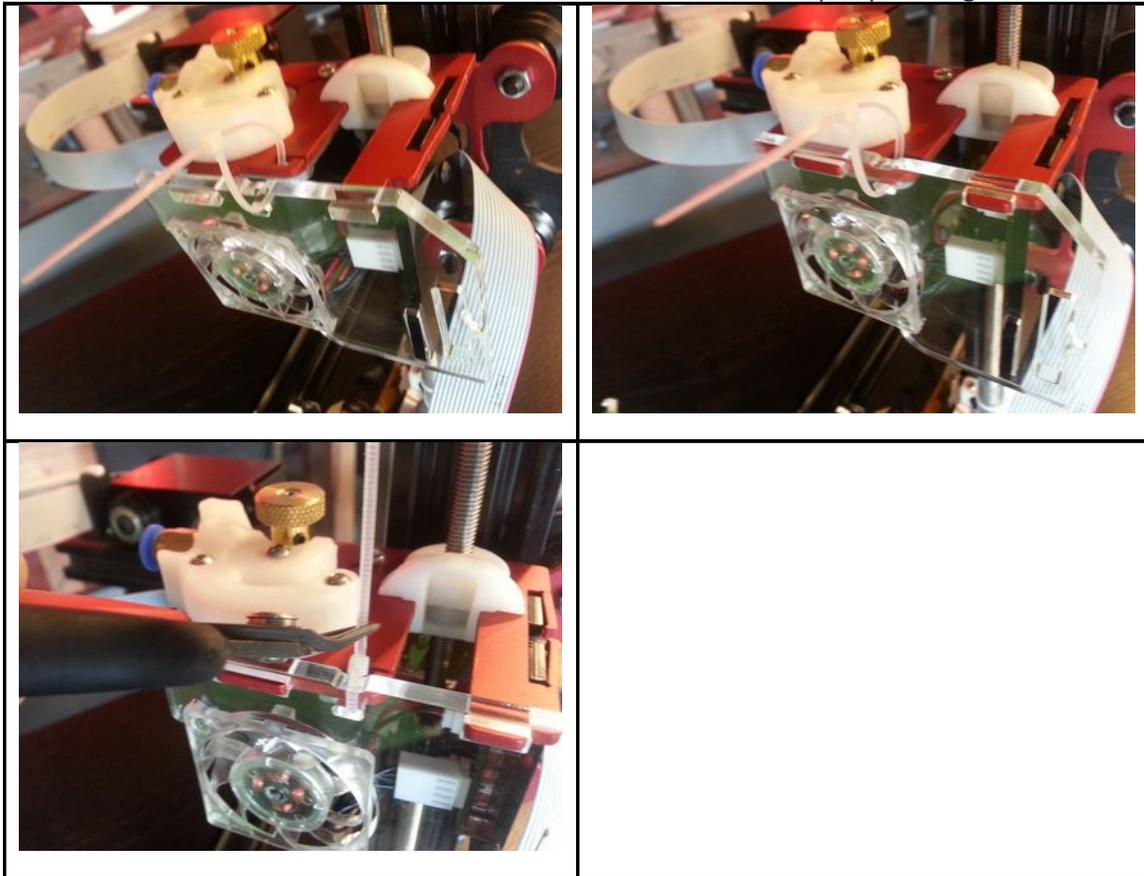




\*For best alignment, make sure that the middle of the drive gear grooves lines up with the hole for the filament in the idler.

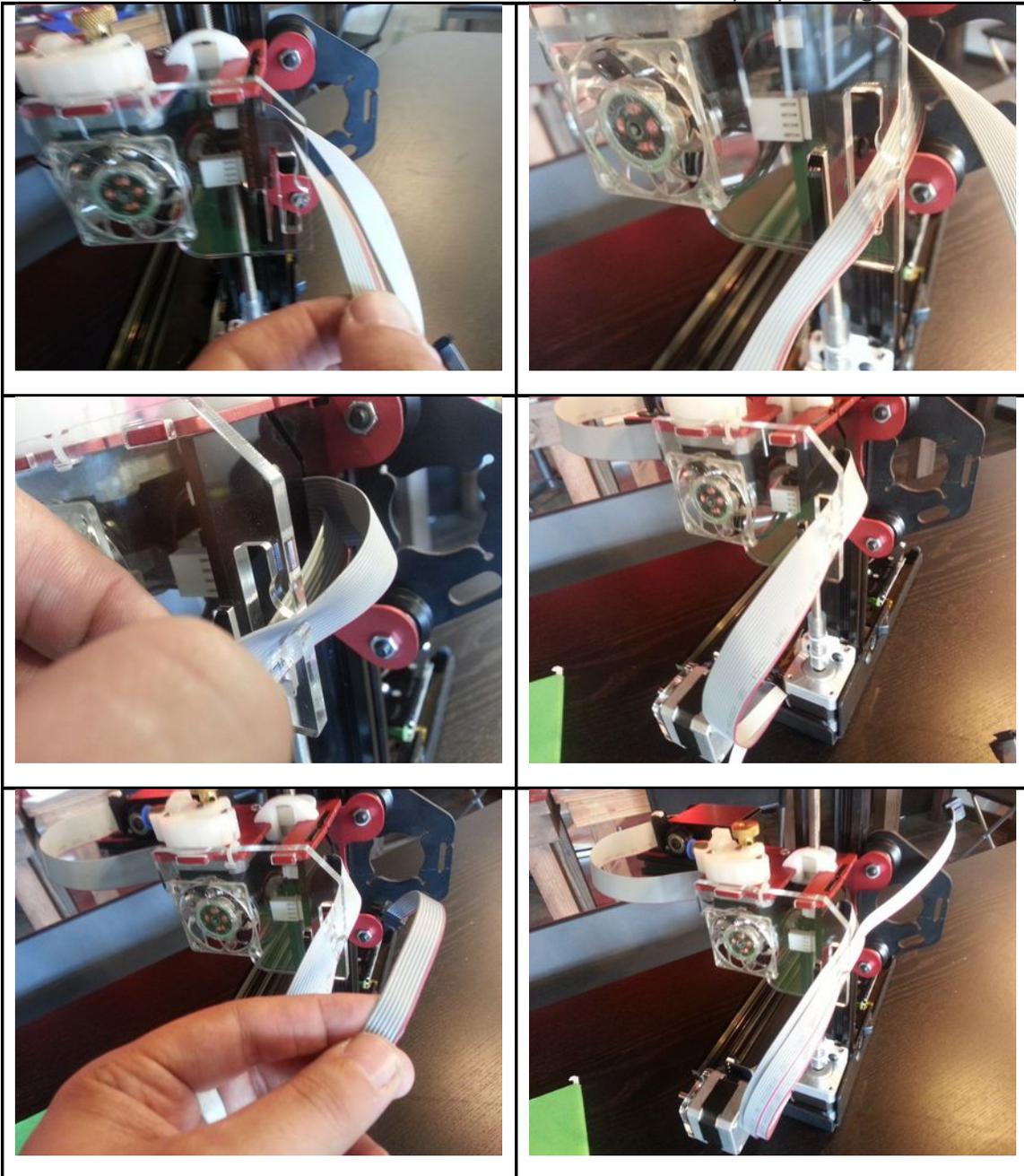
First attach the fan power wires (Red and black wires with white connector) to the Connection labeled PWR on **breakout board** that is already attached to the extruder assembly.





Now attach the fan. First hook the lower part on. Then pull through a zip tie on the top and click the last part into place. Cut the zip tie excess.

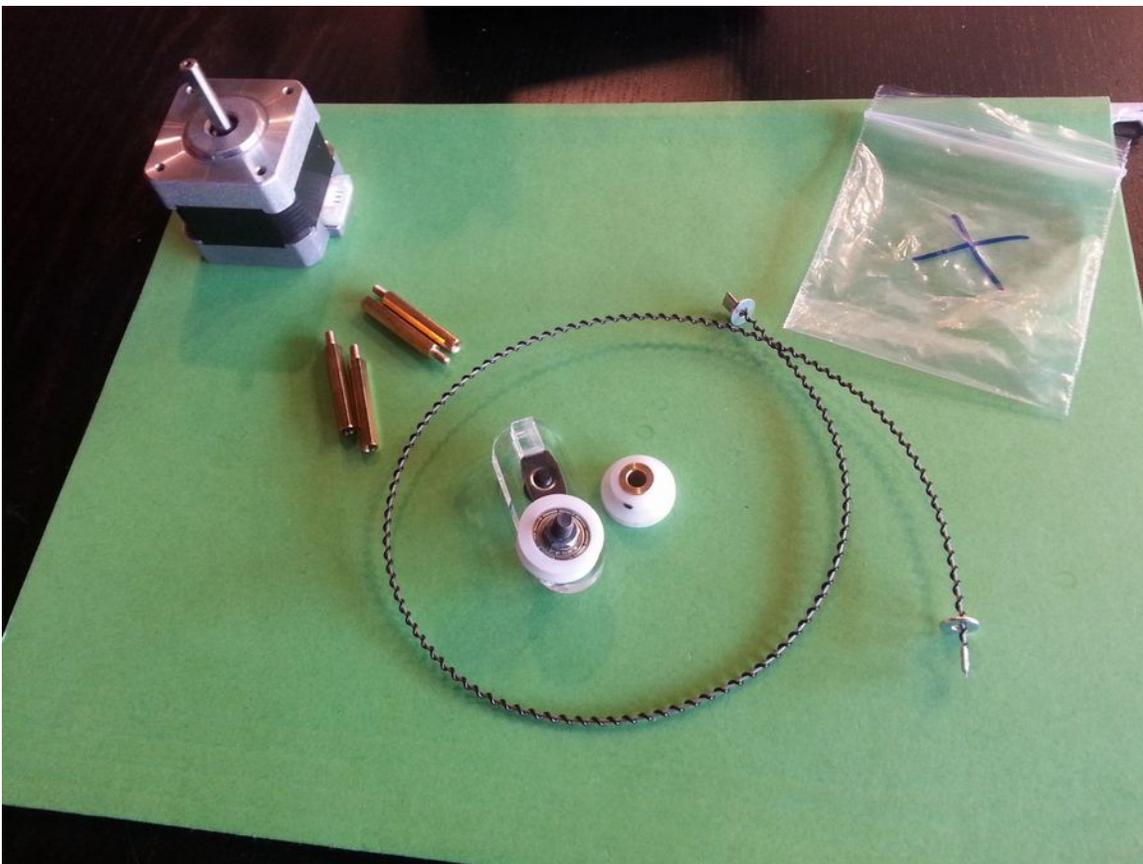
Take the **Ribbon Cables** one at a time and tuck them into the slot on the part of the **Extruder motor fan acrylic** farthest from the fan. Start with the **X Ribbon Cable** (narrowest) then tuck in all three. Turn the assembly to get rid of any twists relative to the base.



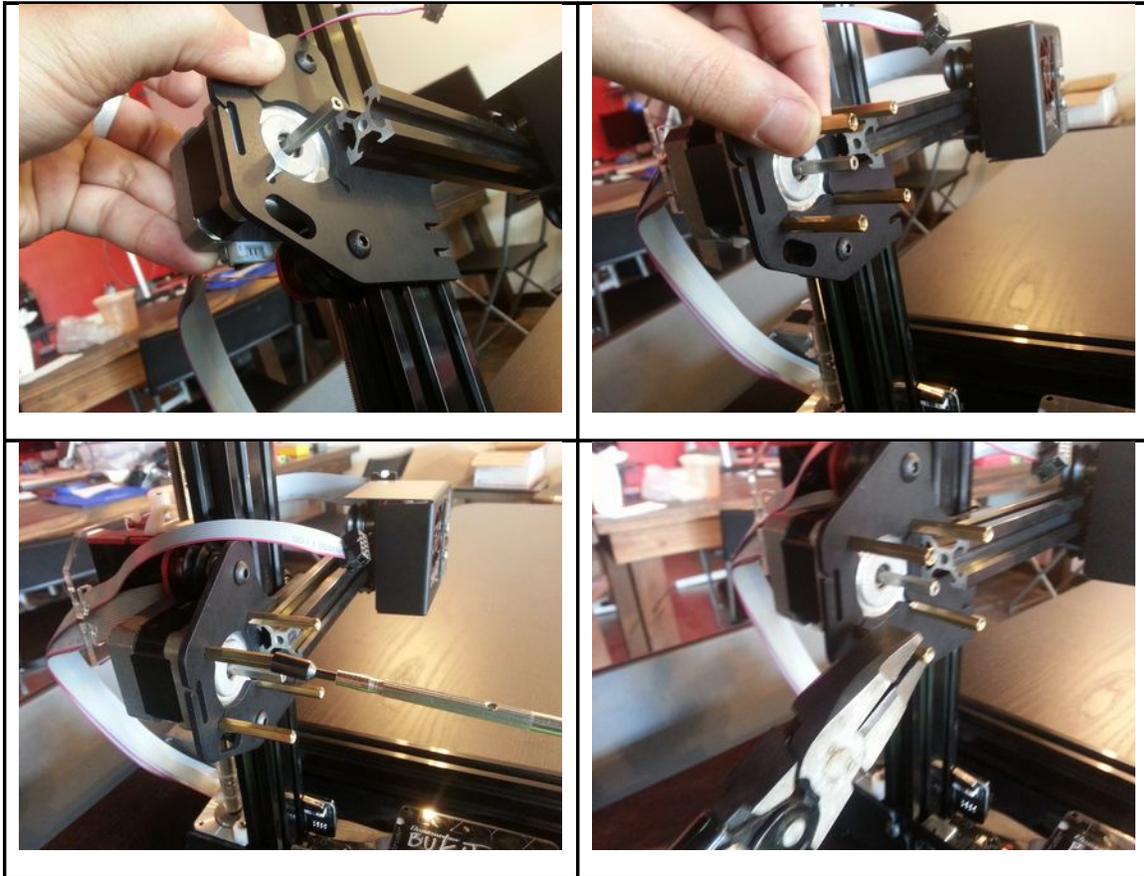
Finally, put one cable tie on the coupler, just above the **Z motor mount**, and another at the top of the coupler. Make them both very tight. Trim the zip ties.

If the 5mm Ball Bearing doesn't touch both Z Threaded Rod and the Z motor shaft when the coupler is all the way down on the motor shaft, you will need to trim the coupler a bit with a knife or razor blade.

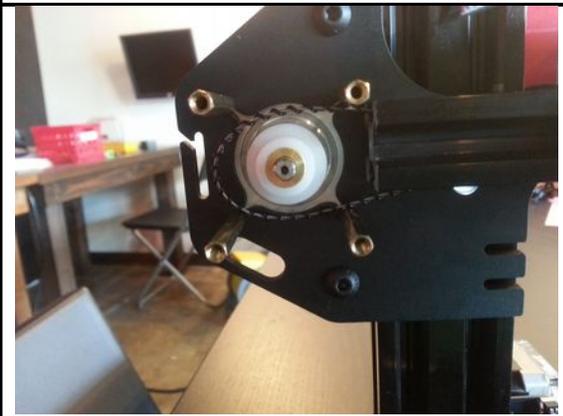
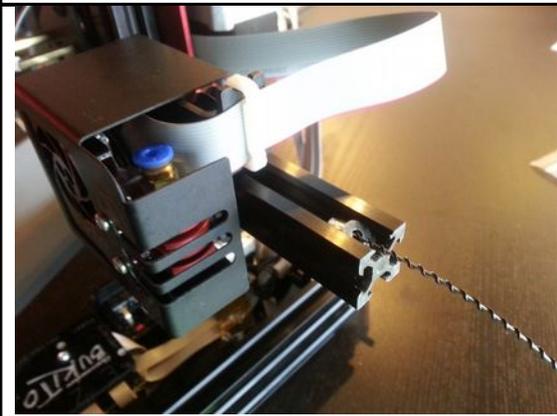
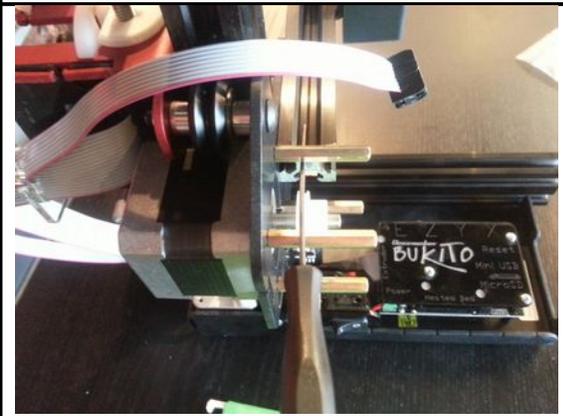
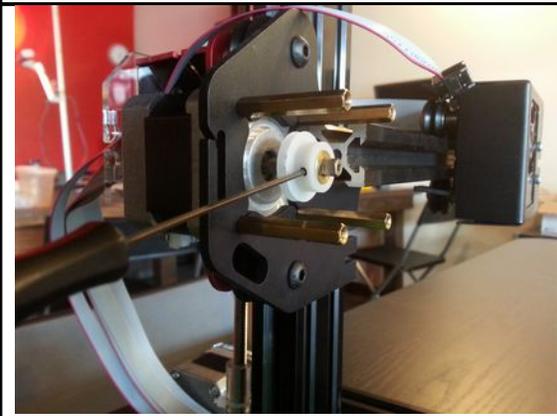
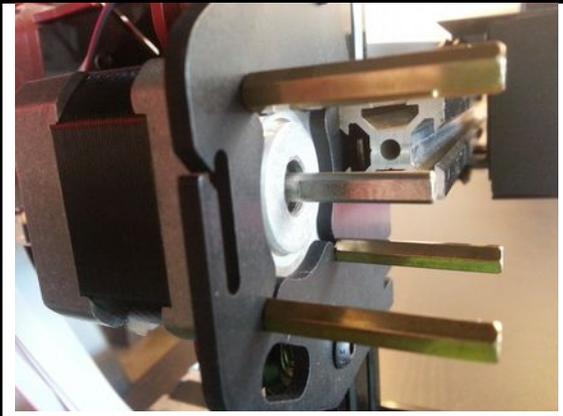
## Synchromesh- X axis

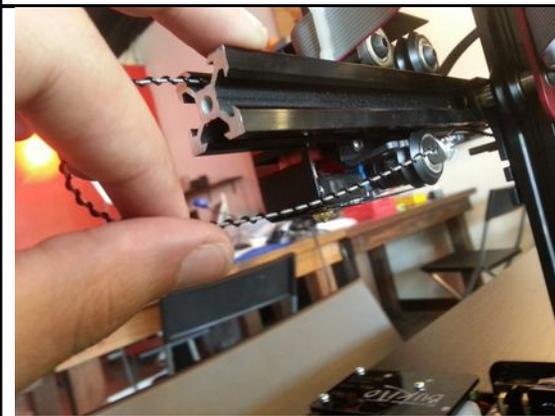


Open the Synchromesh kit. Only open the bag marked X for now so you can keep straight which synchromesh is which.



Pull the **X axis ribbon cable** through the slot in the Z Carriage and then attach the motor with the four standoffs, with the motor oriented with its connector pointed downward. Make sure the standoffs are tight (you may need to use pliers, or, if you have one, a 5 mm internal hex driver.)







Attach the synchro mesh pulley to the motor shaft with the wider “brim” part nearer the motor. Align the black adjustment screw on the pulley with the flat part of the motor shaft. Align the grooves of the pulley for the synchro mesh with the center of the X Rail. Tighten down the pulley and the four standoffs for the X motor.

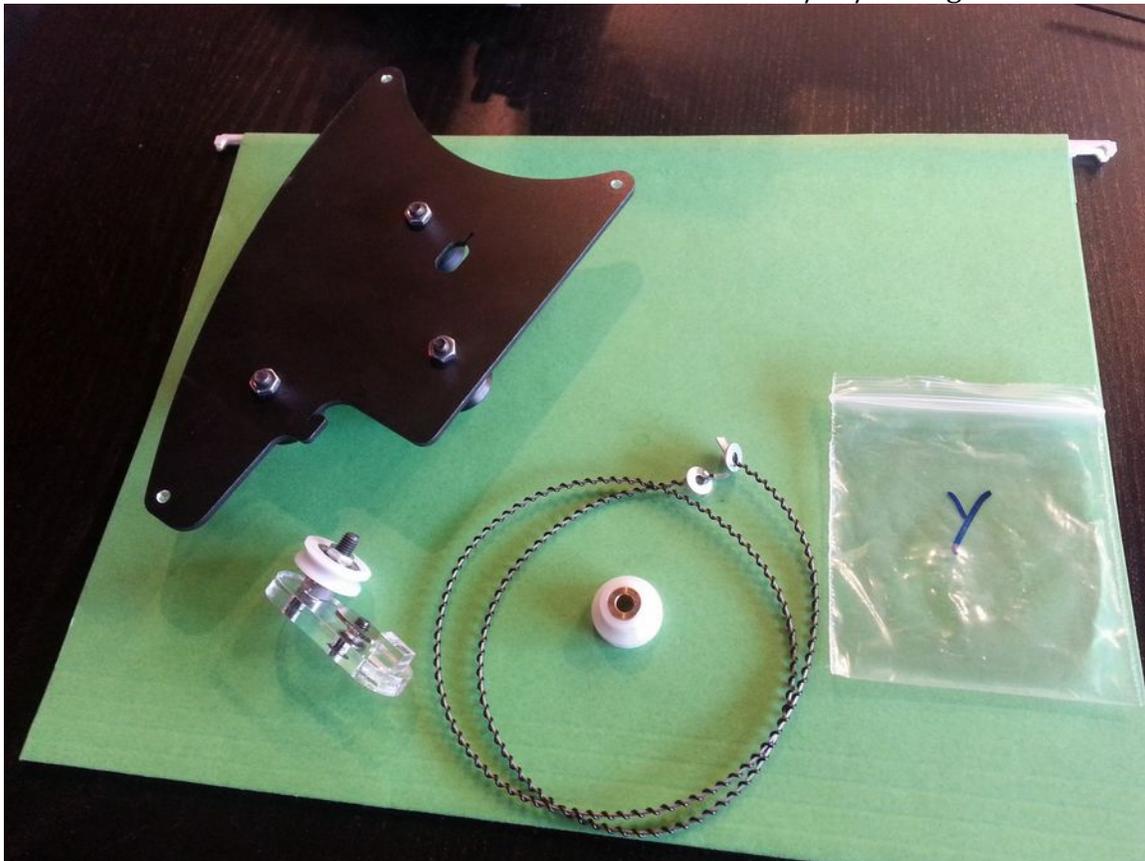
Take the X synchro mesh cable and attach it to the slot on the underside of the X carriage on the left side with the synchro mesh tab and washer below the carriage, pointed down. Run the synchro mesh around the X rail, in the X-rail slot on top and

bottom. Work the wheels of the extruder carriage onto the X axis, and then hook the second side of the synchromesh to the bottom of the carriage. On both sides, the synchromesh should poke through from top to bottom and be snug in the slot for it on the bottom of the extruder assembly. Be sure the synchromesh is INSIDE the motor standoffs and not snagged on them.

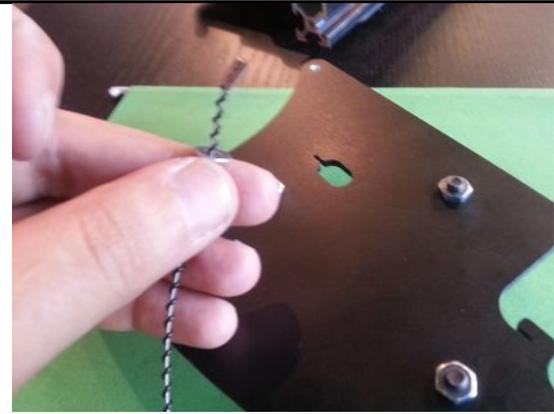
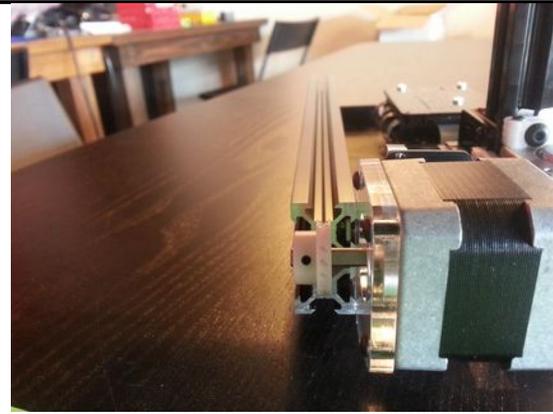
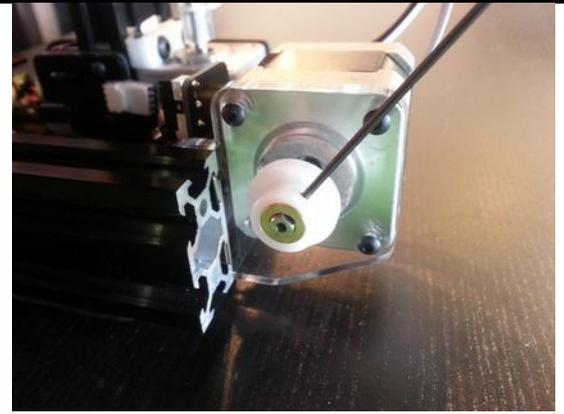
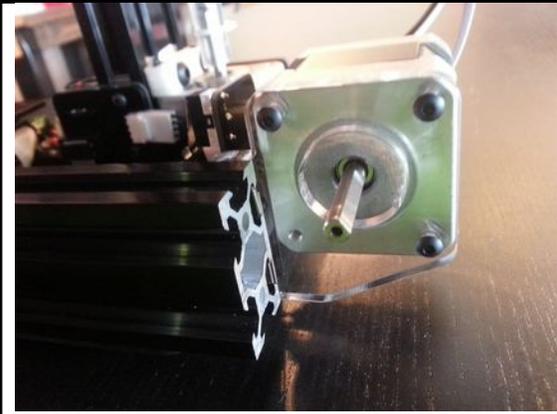
Pull the synchromesh around the pulley, and then get a bit of slack on the other end. Insert the idler into the slot on the back of the X Rail and slide the synchromesh over it. Then pull the idler toward you with one hand to create some tension, and with the other hand tighten the screw that will hold it in place.

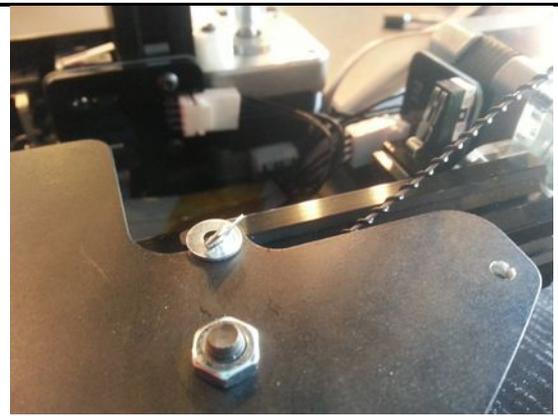
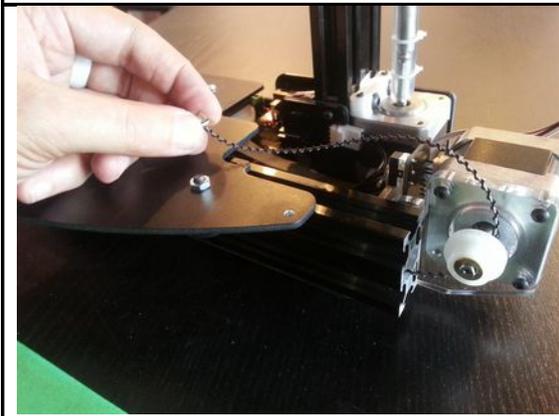
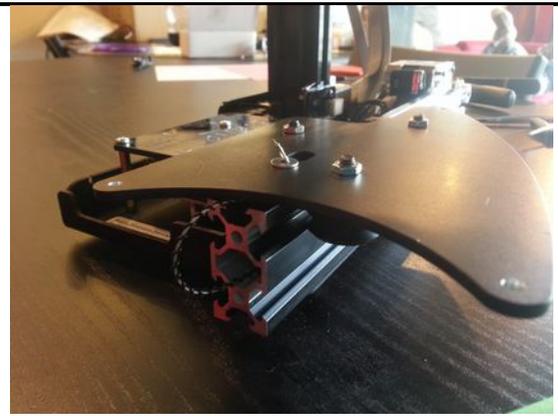
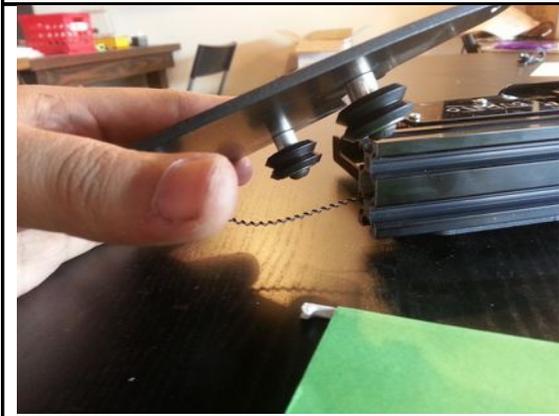
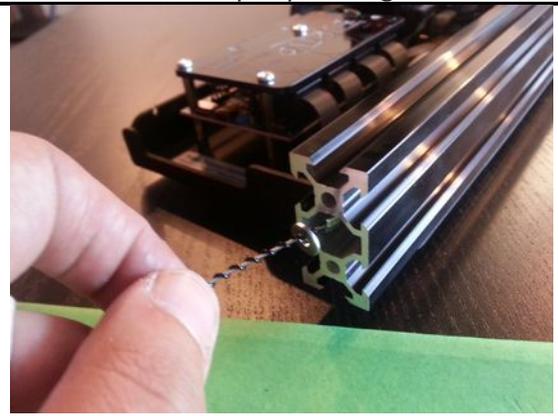
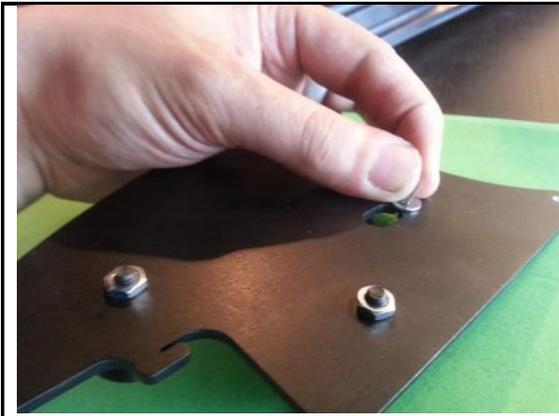
## Synchromesh- Y axis

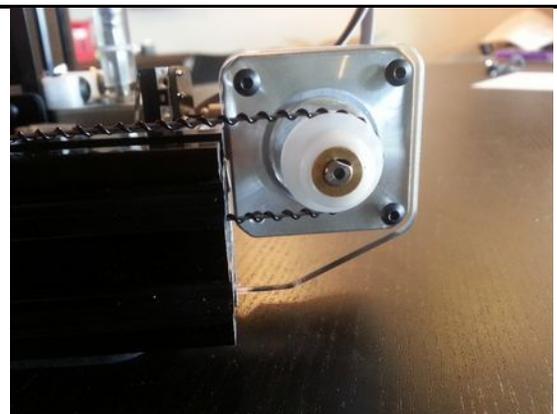
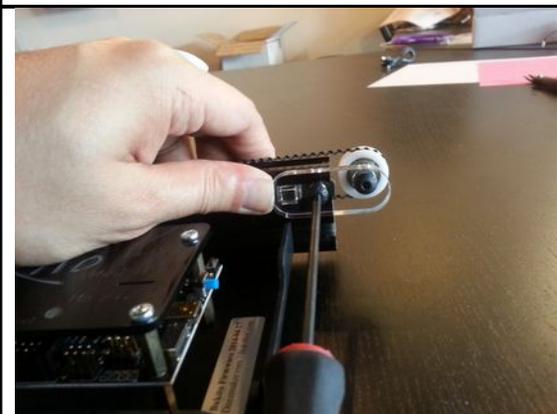
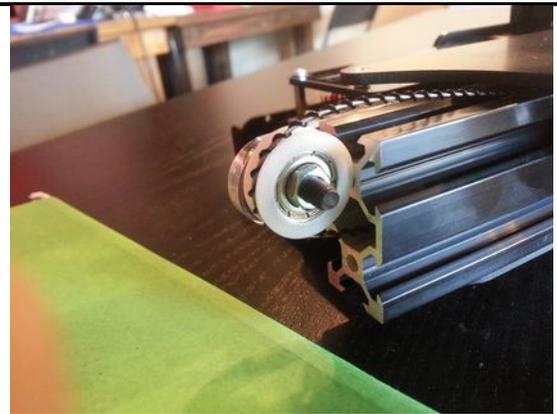
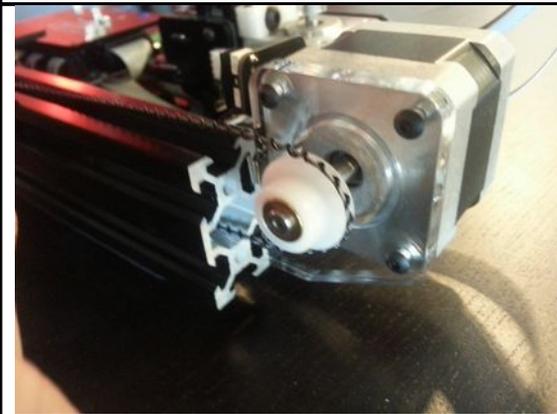
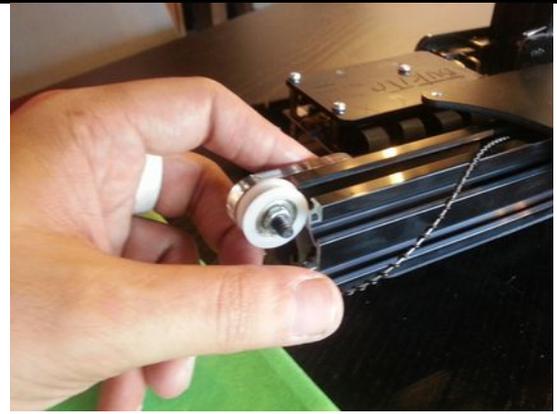
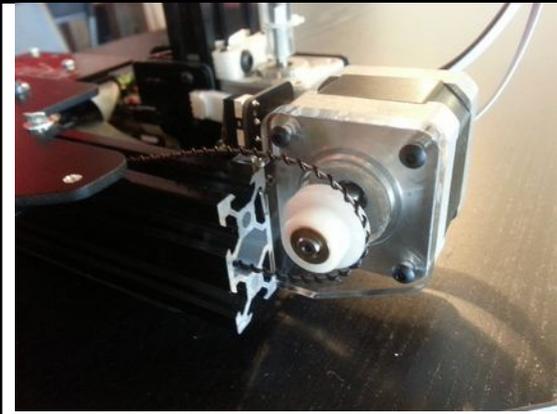
Take the Y carriage and hook the synchromesh from the “Y” bag into a slot at one end, with the synchromesh tab and washer pointed up from the Y carriage (see photo below). Be sure it is snug into the slot. Run the synchromesh through the center of the y axis (NOT along the top or bottom) and out the other end. Then hook it into the slot on the other end of the Y carriage as you slide the Y carriage onto the Y Rail (the wheels should slide onto the left and right the sides of the y axis rail.)

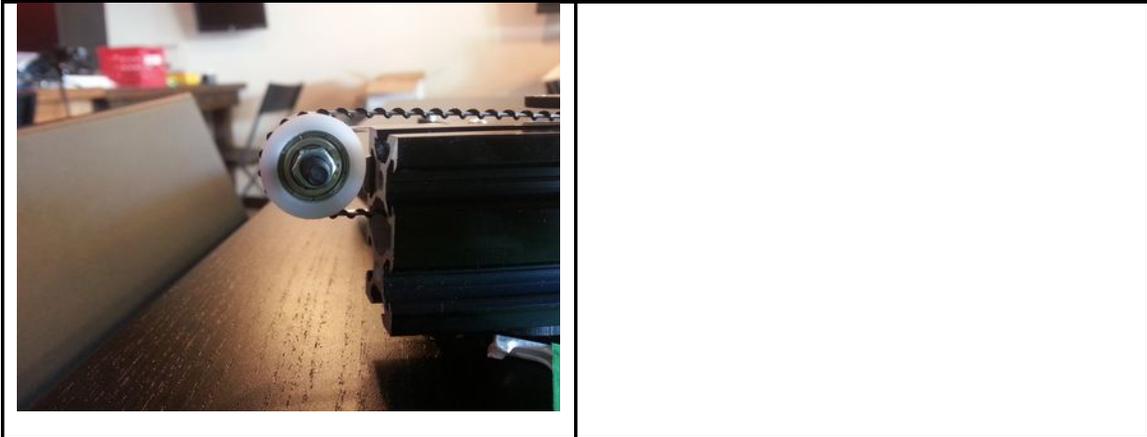


Attach and tighten the pulley, then wrap the synchromesh around the pulley. Next attach idler and tighten like with the X synchromesh assembly. The synchromesh should be about as tight as a steel guitar string. Be sure the idler screw is tightened down. If the synchromesh isn't tight when this assembly is complete, loosen the T-nuts on the Y Rail and pull it forward a bit so that it is.



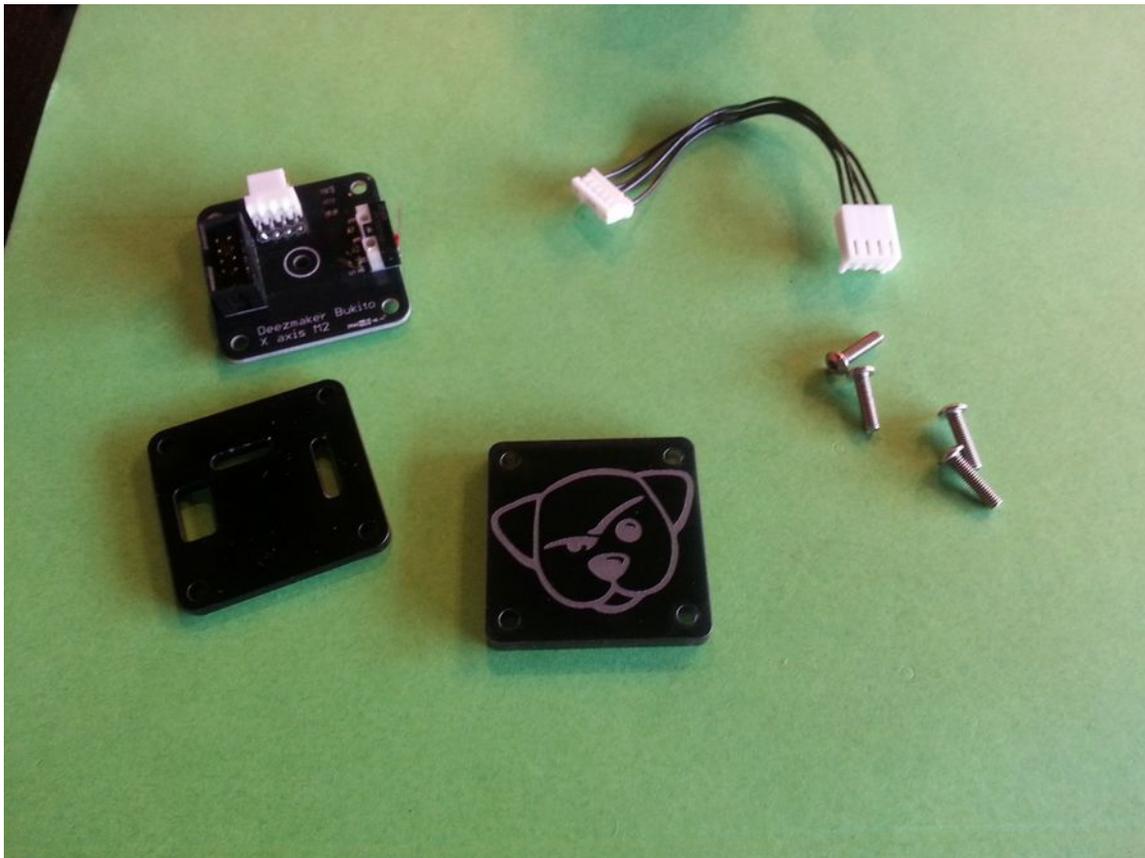


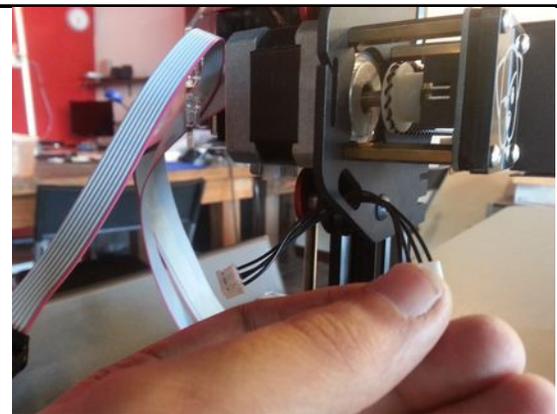
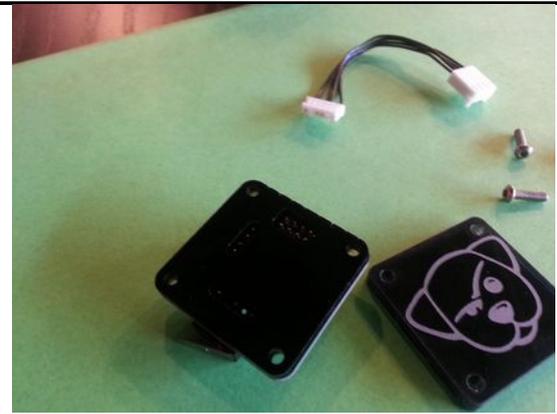
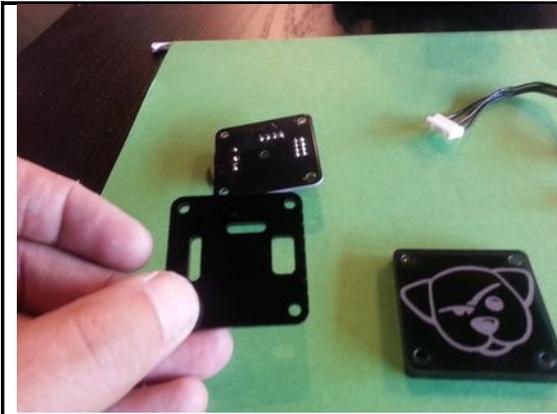


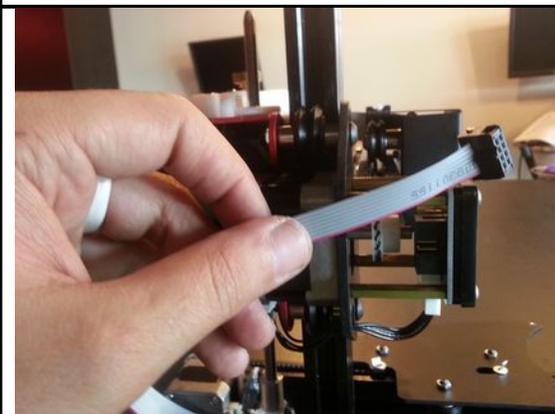
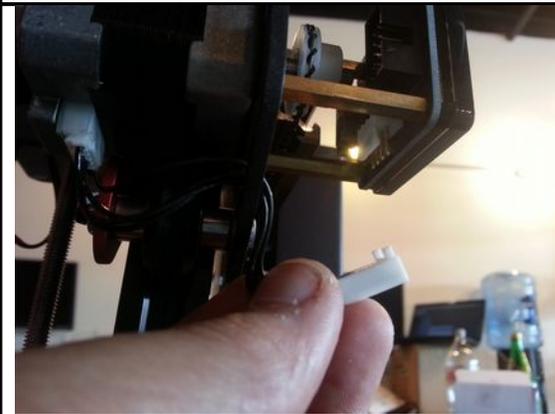
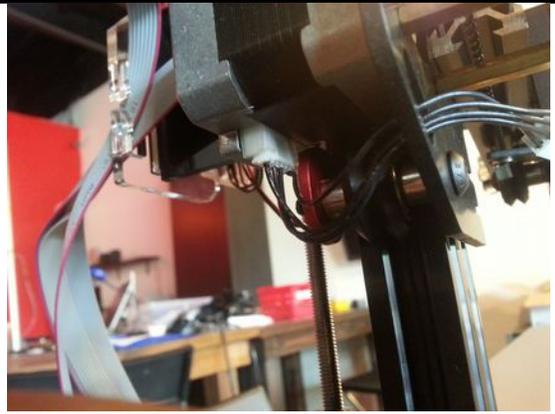
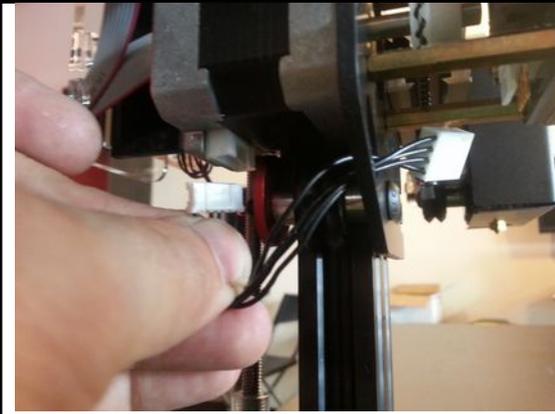


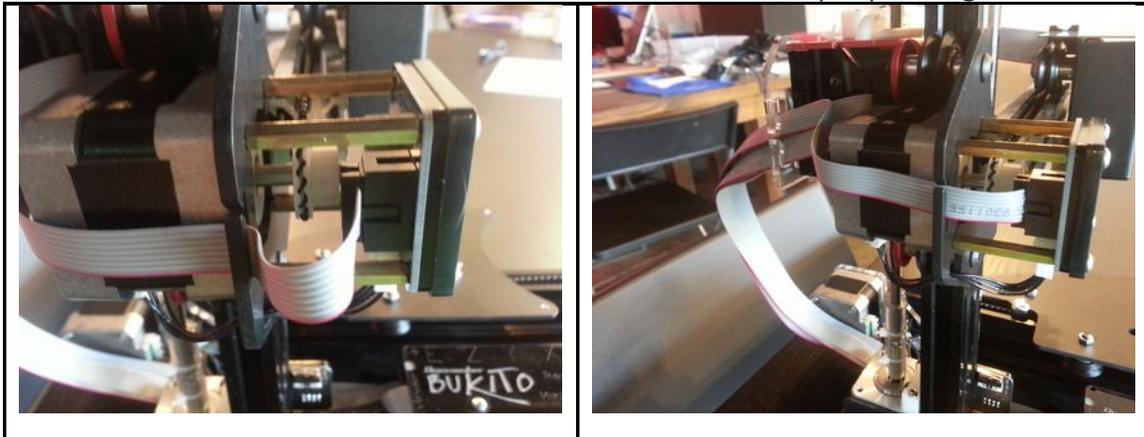
## X breakout board

Take the **X breakout board kit**.







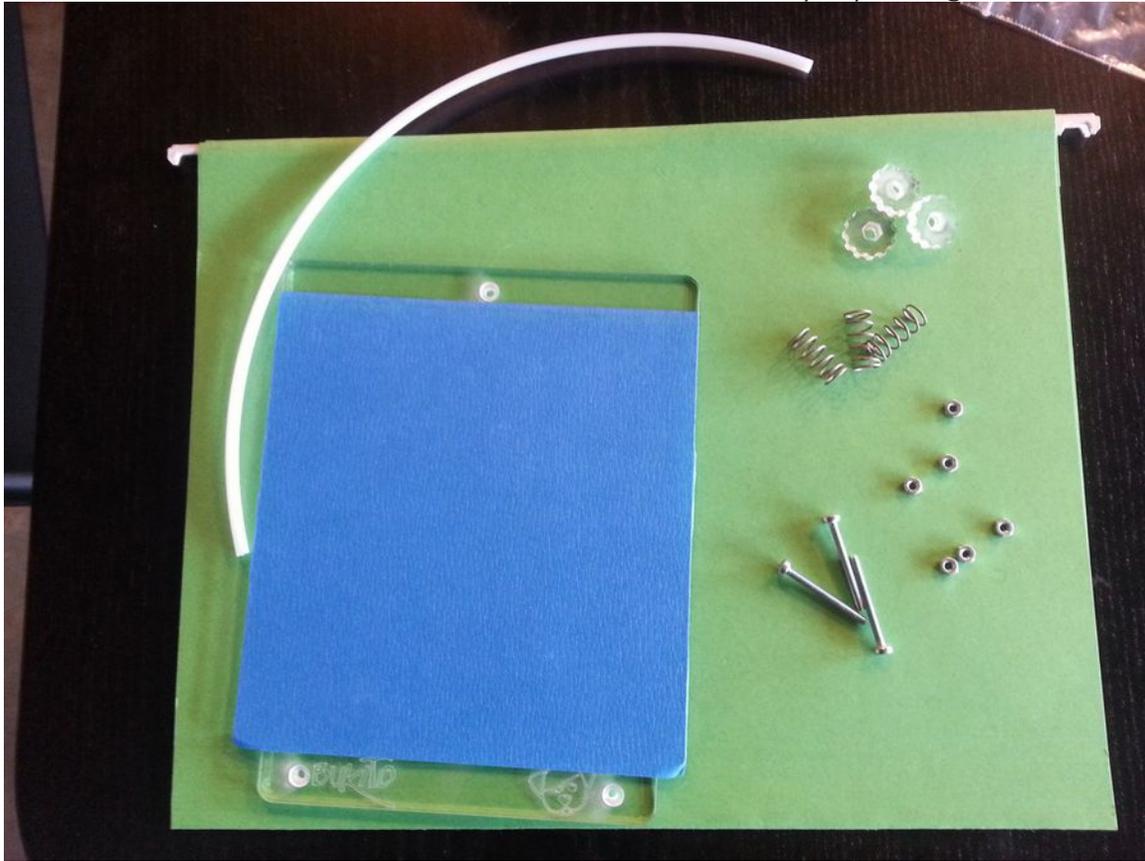


Then attach the **x axis ribbon cable** from the main controller to the **X breakout board**. There is a slot instead of a hole for this cable, located on the left side of the black anodized metal.

Attach the acrylic spacer...

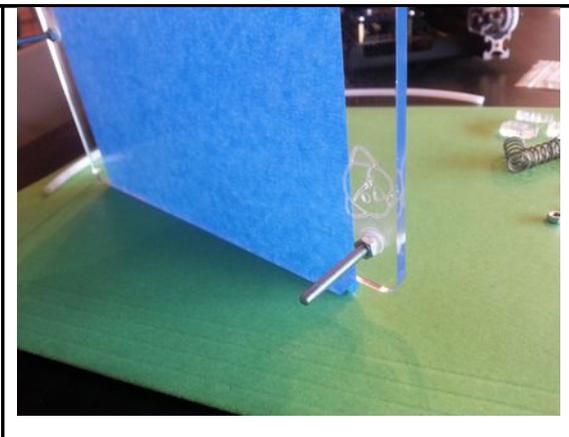
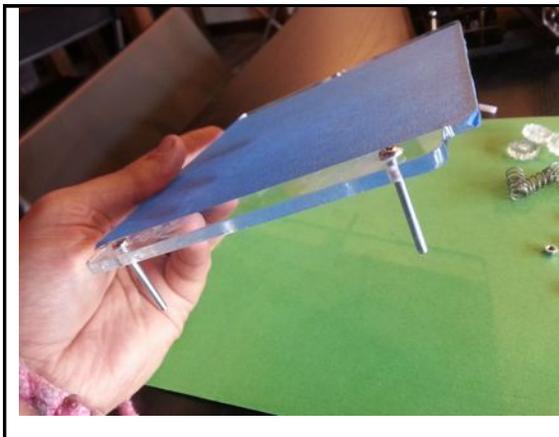
And finally the Bukito logo cover with the four M3 12mm screws.

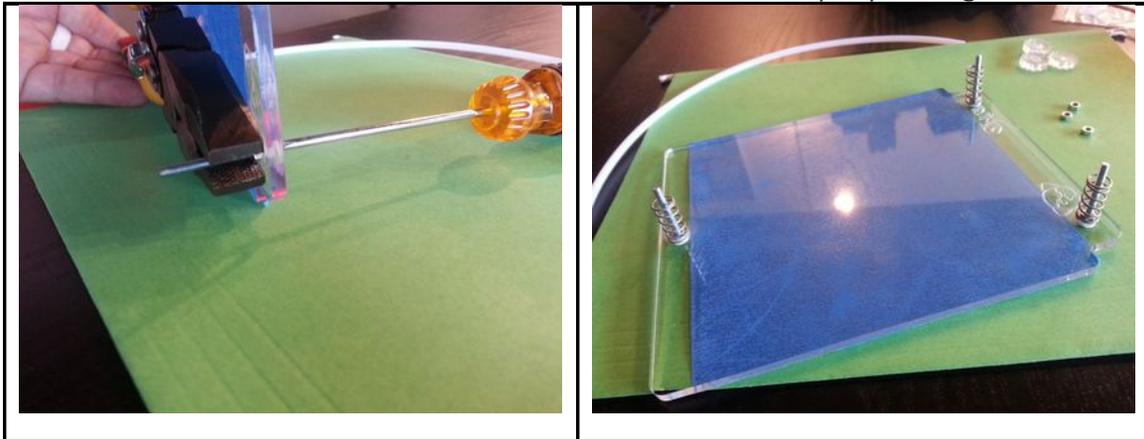
## Attaching the build platform



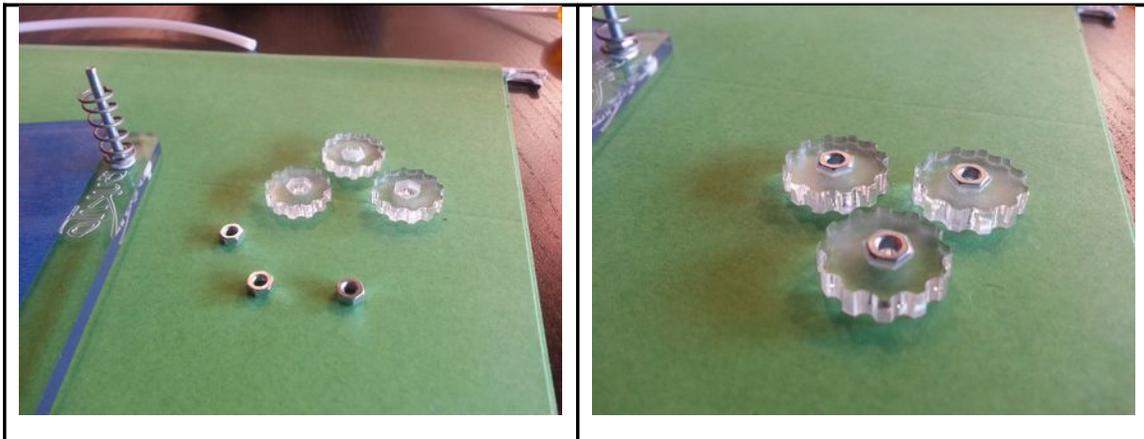
Open the **Y platform kit**

Take the platform. Put the three M3 25mm screws, then the M3 nuts, and then springs on as shown. Be sure the nuts are on tight so that the screws do not wiggle around. If you can still turn the screws with your tool they are too loose! This is a critical adjustment for print quality.



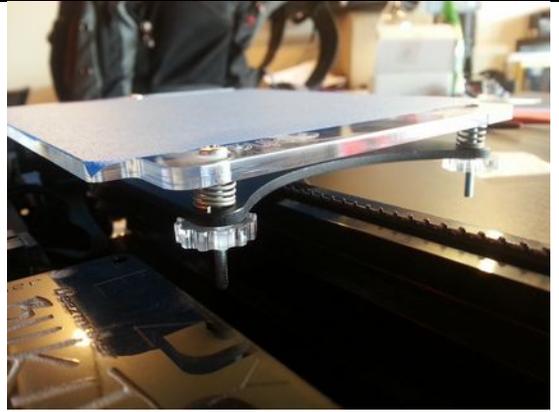
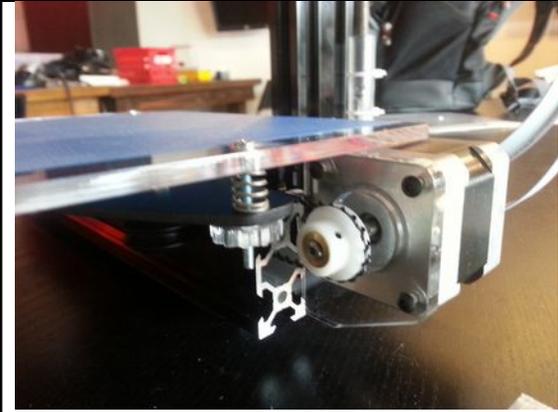
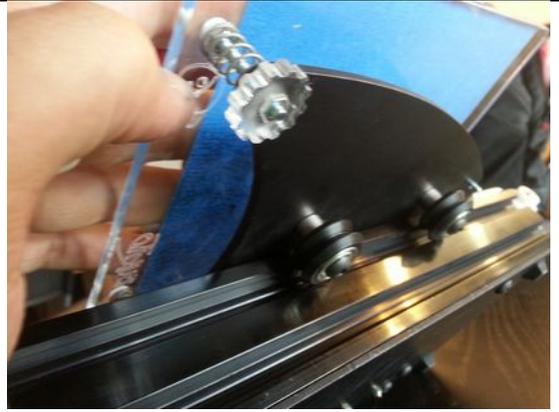
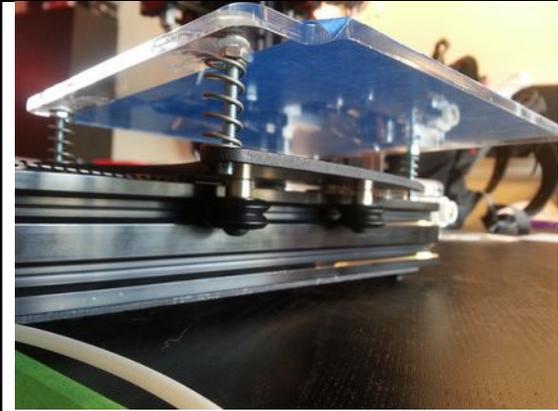


Take the **Bukito thumbwheels** and small nuts and drop a nut into the indentation in each wheel. Press into place.



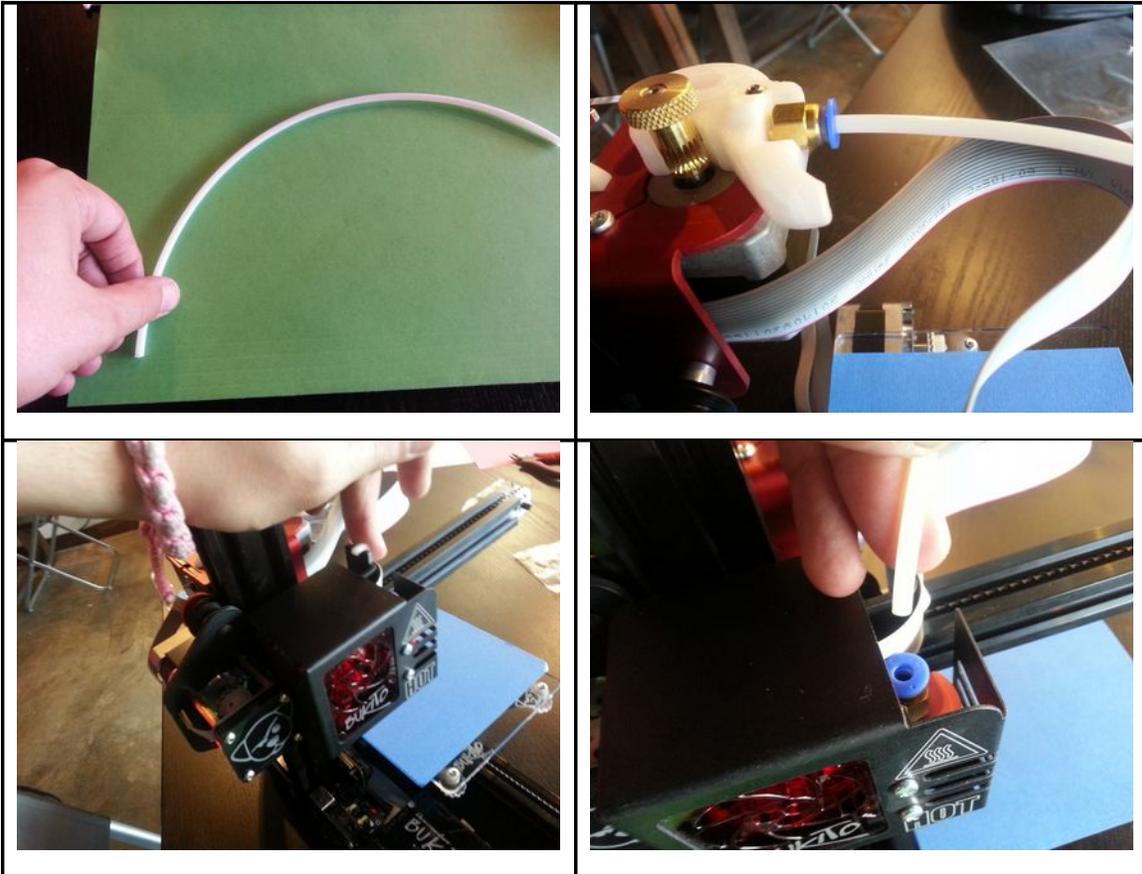
Take the platform and connect it to the carriage as shown. Hold the platform down with one hand and tighten the nuts (using the **thumbwheels**) as much as you can. You will back it off later to adjust it.

You may want to just put on the screw and spring that will be on the back first loosely and then pivot the platform into place to do the two in the front. Otherwise the springs want to go everywhere as you push the platform down. Here is what it looks like finished, from below.



## Filament tube

Attach the filament tube to the push-to-connect fittings (the ones that end in blue flange release mechanisms) on the extruder drive assembly and on the extruder block. Be sure it seats securely on both ends- there should be a bit of resistance and a final slide into place.

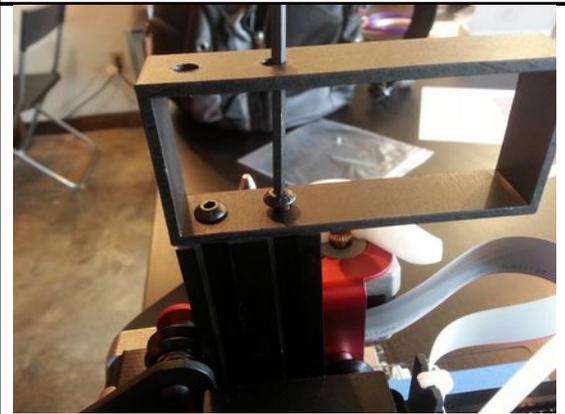
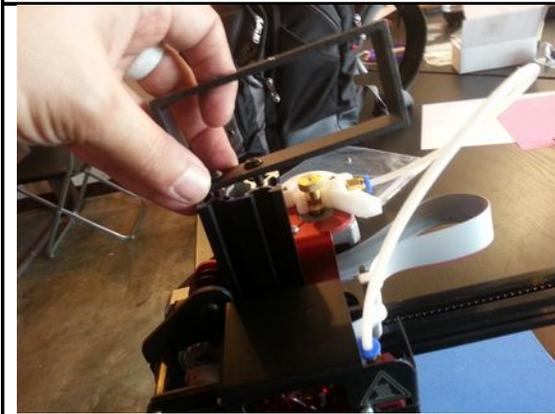


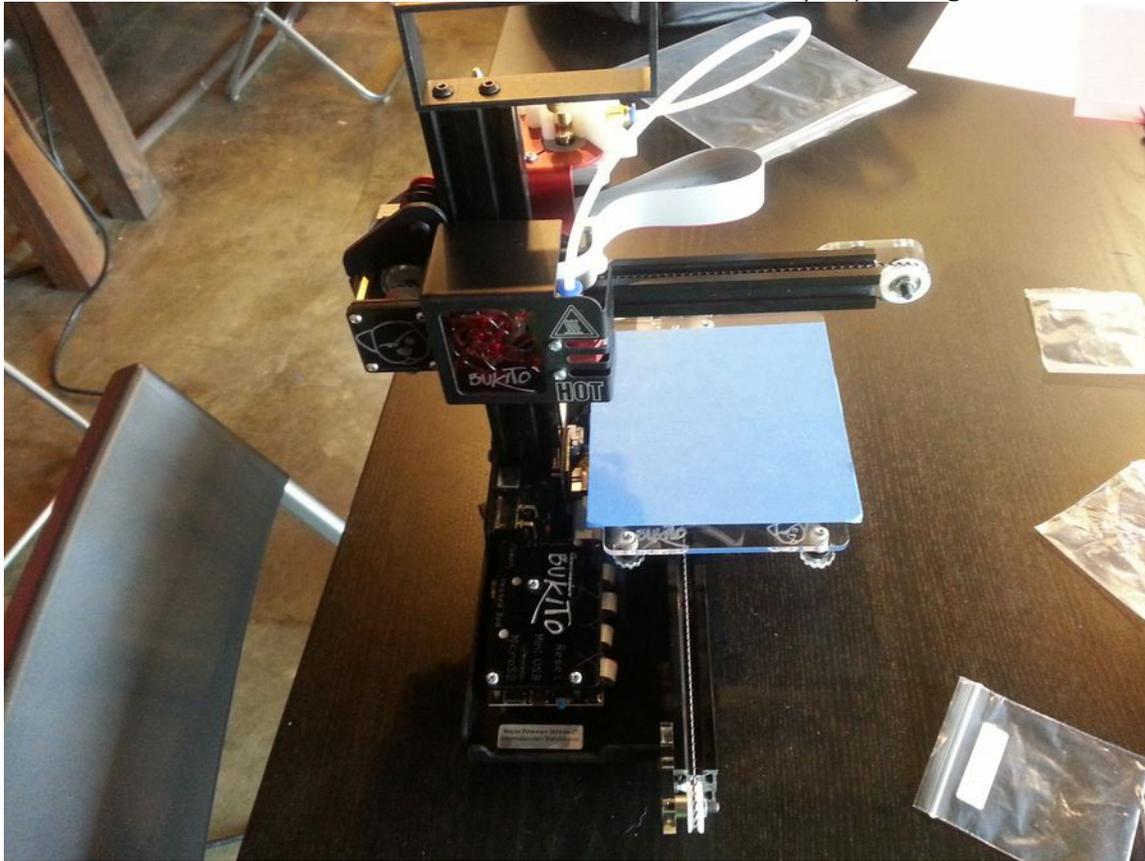
## Colored strips

If you want to you can insert the colored strips in the Z bars before you put on the handle.

## Handle

Put on the handle, using the two M5 10mm screws provided. The top holes are meant for clearance for the screwdriver and also for you to add your own 3D printed handle additions if you like (a 3D printed alternative is shown here.)





### Final cable clearance check

Be sure that the ribbon cables that run from the x carriage down to the main electronics board are clear of the Z Threaded Rod and Y platform. Pull them out the back to get them out of the way. Make sure that the platform clears the Y motor. If not back it off a bit. Check that all the end stops are placed correctly (so that they will stop the platform or carriage at the end of its travel.)

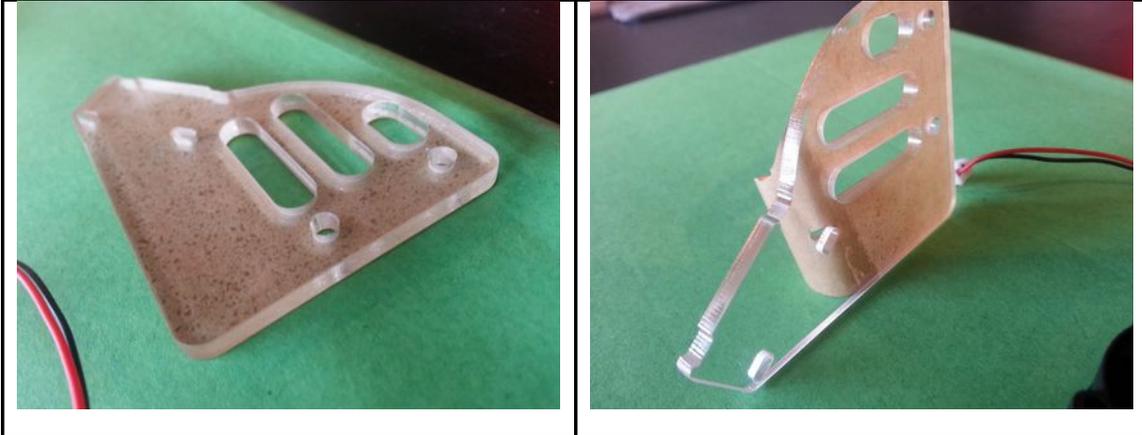
### Applying blue tape

Your printer comes with blue tape applied, ready to print PLA.

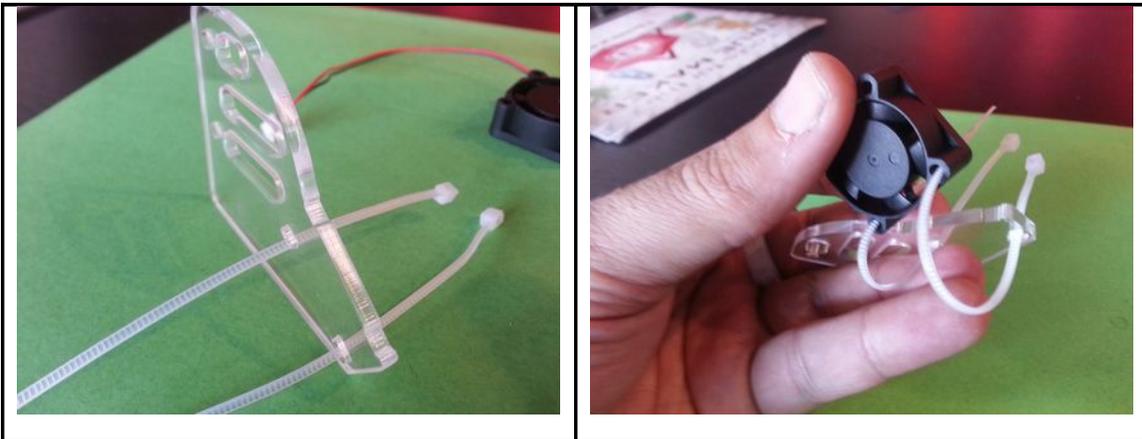
Purchase a roll of 3M "ScotchBlue" painter's tape to re-apply it in the future when it gets beat up, or after printing nylon. Other brands do not seem to work as well. This tape is used so that the PLA will stick to the platform. When you re-apply tape in the future, take the old tape off and apply it one layer thick, preferably without overlapping or bubbles.

## Add-on PLA cooling fan

Peel the backing off.

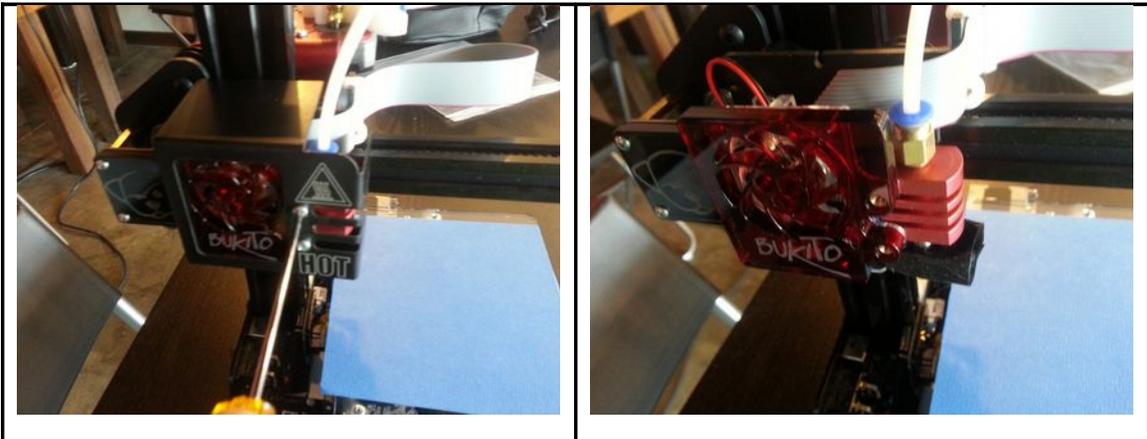


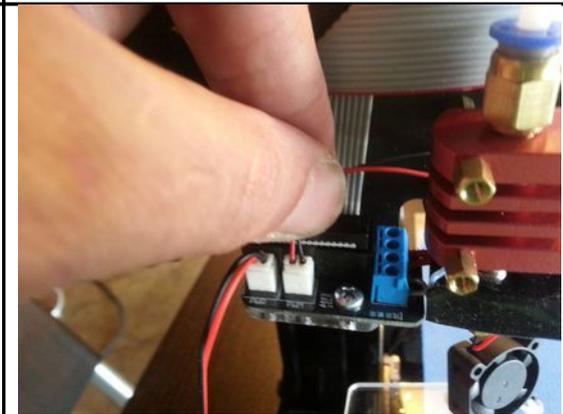
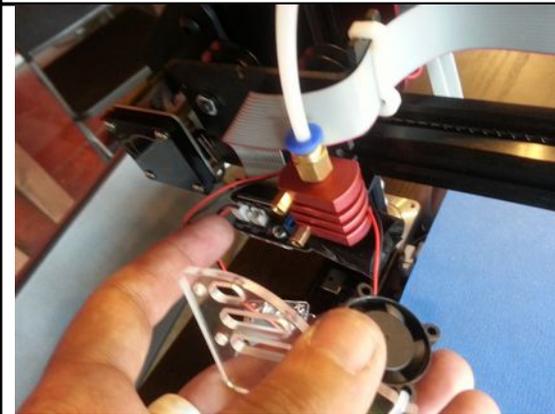
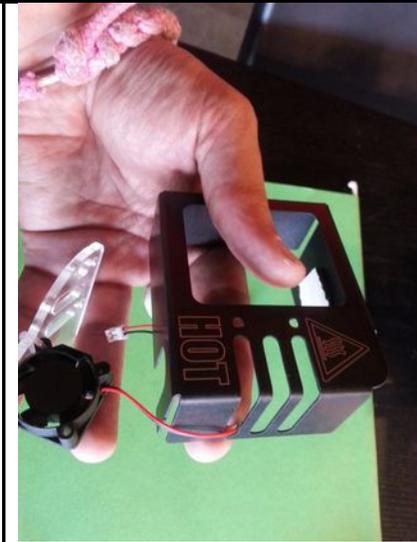
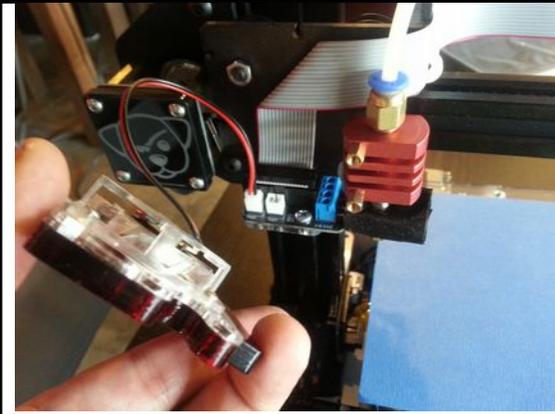
You will attach the small fan perpendicular to the end of the acrylic piece with two cable ties. The sticker on the fan should face down.





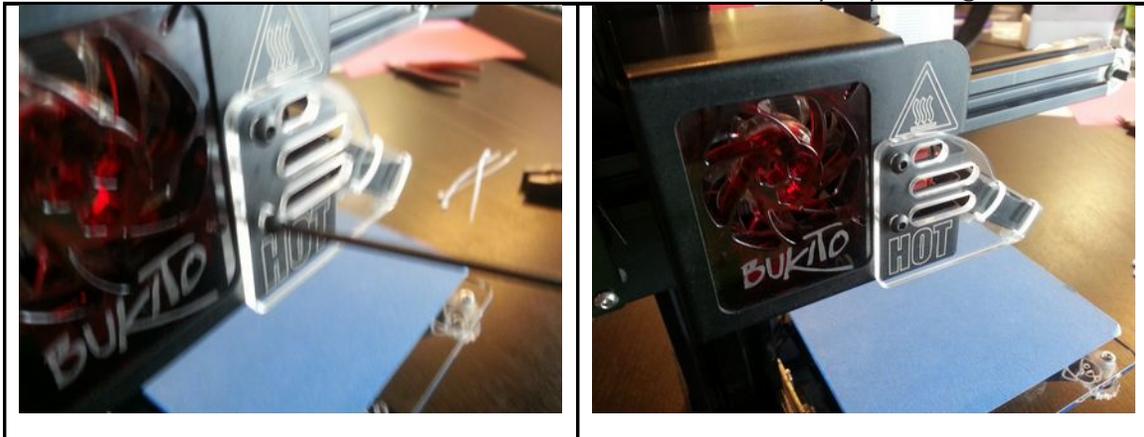
Remove the screws holding on the extruder head cover then pull off the other fan, and the fan holder acrylic. Run the power connector for the new fan through the heat vents on the extruder cover and then behind the red heat sink (between the two standoffs). Be careful not to run any wires where they will impact the fans. Be sure the wires for any fan do not touch the heater block (the square metal block right above the nozzle). It is all right for the wires to touch the red heat sink.





This and the next picture are shown without the extruder cover so it's easier to see how cable slide though.

Next, clip the original fan back into place over the extruder. Then put the metal cover back and finally the new acrylic. Use the new longer, M3 8mm screws included in the fan kit.



**Plug in the power supply.**

**NOTE THAT THIS IS AN EXPERIMENTAL MACHINE, MEANT FOR THOSE WITH EXPERIENCE ASSEMBLING ELECTRONICS. AS WITH ANY TOOL, THIS SHOULD BE KEPT AWAY FROM CHILDREN AND UNPLUGGED WHEN NOT IN USE.**

Congratulations- you are done! Next, read the “first print” Bukito directions and download the “Bukito tram G-code” at <http://bukobot.com/flight-check-bukito>.