Steps for assembly of a Bukobot. (Beta version 1.0, Dec. 28, 2013).

Deezmaker

1. Table of Contents

2. Definitions and introduction.

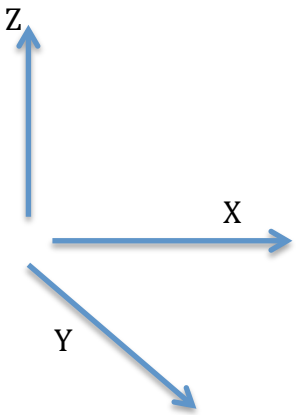
The parts are collected into kits (labeled plastic bags.) Where possible, we will walk you through all the parts in a kit and highlight the kit name (which should be written on the bag) in yellow. In some cases we will have you use a few parts from different kits- we will point out where you open a kit for the first time.

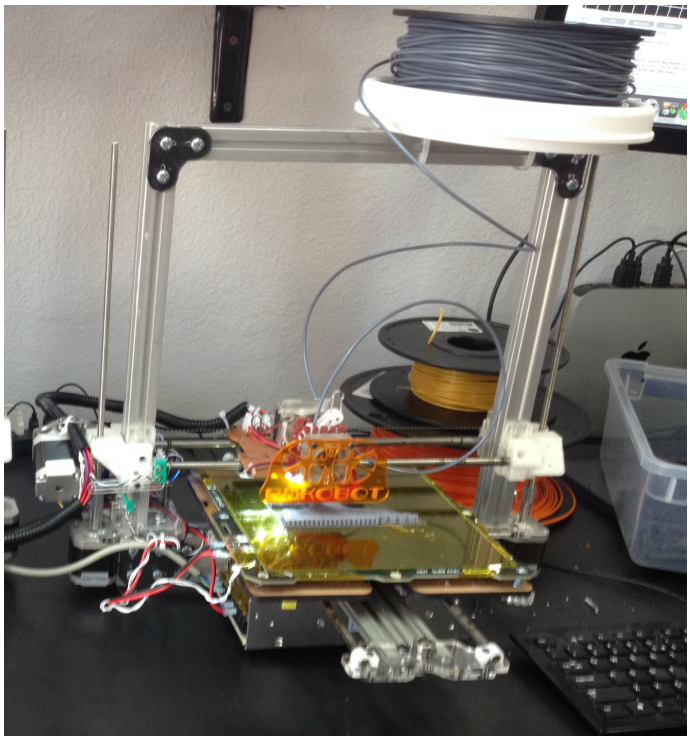
The X axis runs along the bottom of the square frame you build initially.

The Y axis is the bar that runs underneath the platform (Y direction movement is done by the platform).

The Z axis is the vertical axis.

The "front" of the Bukobot is the defined here as the end of the Y axis farther from the Azteeg board mount. (Or to put it another way, the Azteeg and other electronics will be in the back, and the power supply will be in the front. (See image below of assembled Bukobots – 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 – the spool of filament is on the right side of the machine shown with this definition.





3. Main Bukobot Frame.

First, assemble the U-shaped lower part of the main frame of the Bukobot using the four corner pieces.

Open the Bottom Bracket Kit (bottom bracket and aluminum frame beams).

Take the bottom frame guide (black plastic) and bottom frame plate (clear acrylic) and assemble using the nuts and washer provided. Repeat for the four brackets. Protruding feet should point down (away from the single-slotted part of the bottom frame.) The bottom of the center aluminum rails should be flush with the bottom of the side rails.

Attach the first of the four brackets to the ends of the frame bottom. (Widest aluminum strip.) Slots should be on top.

Put in the T nuts on top of the bottom bracket.

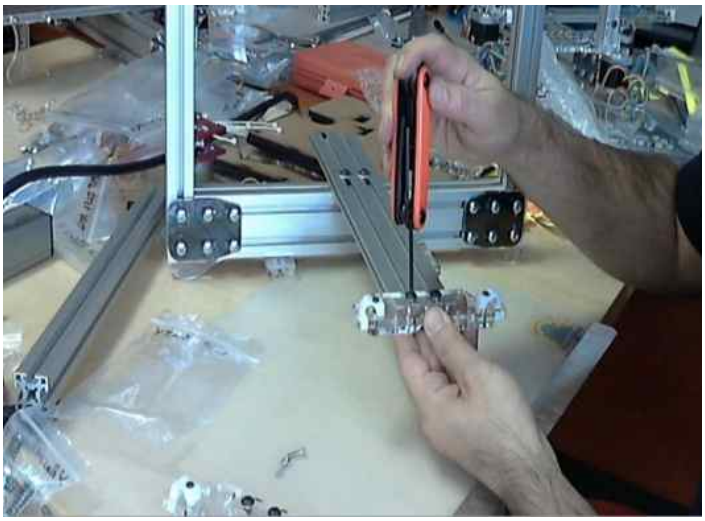
Attach the frame Y center beam.

Attach the Power Supply mount to the Y center beam.

Open the Y ends kit.

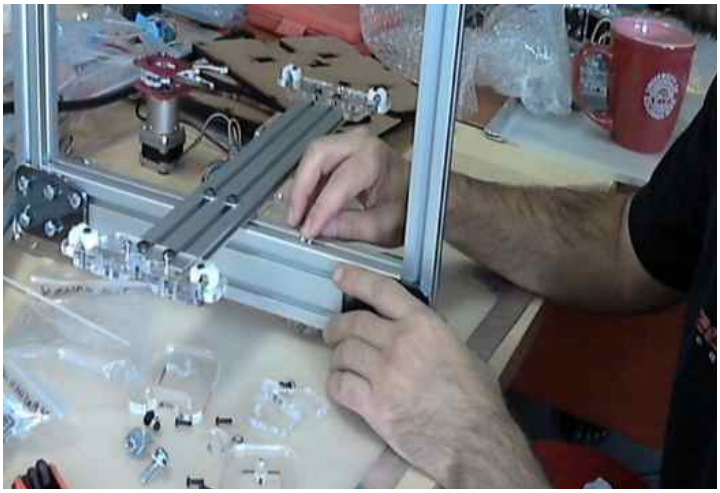
Assemble the Y ends (acrylic, says "Y" on the part) together with the white clips and screw. Repeat for the second assembly.

Attach the assembled ends to either side of the Y center beam.



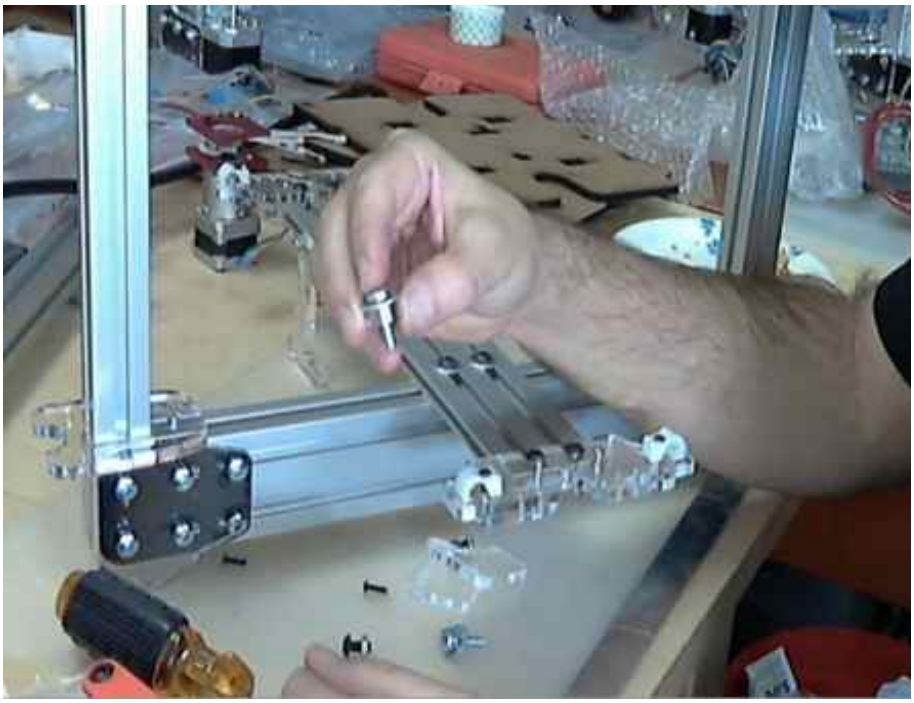
Open the Z motor kit.

Drop 2 nuts into each side of the bottom track (4 total).



There are three kinds of acrylic pieces in the kit. Take the two largest – these are the motor mounts. Put the Z motor mounts (says Z on the piece) on the bottom part of the frame on each side. They will slide down the Z rails on each side.

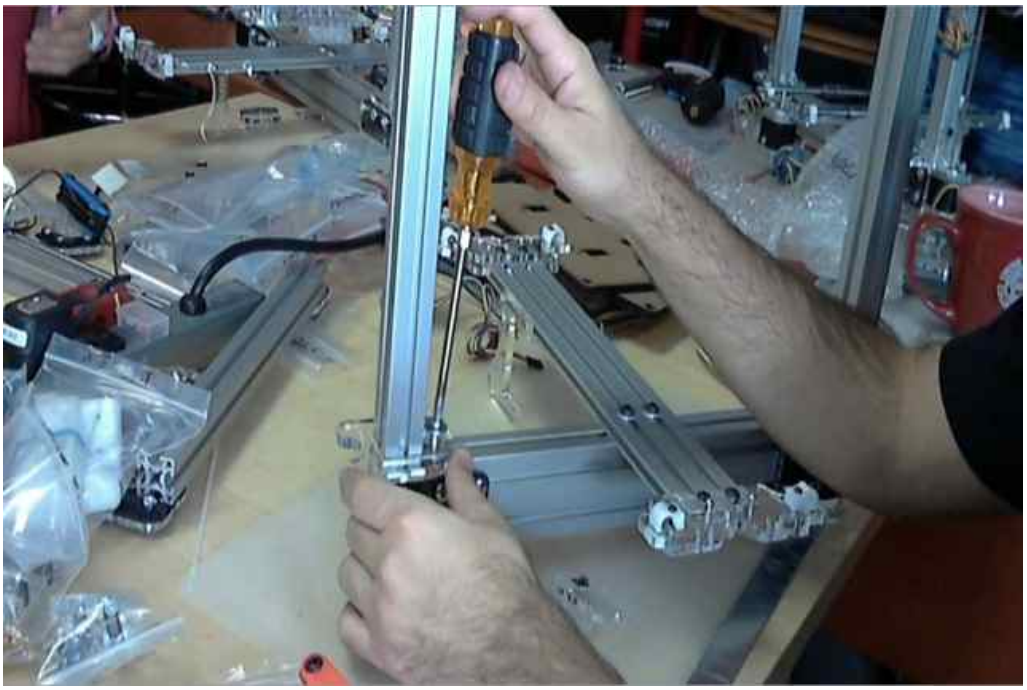
Attach the horizontal portion to the bottom track with a screw and acrylic spacer on the inside of the Z bar.



Attach the motor (wires down) to the motor mount.

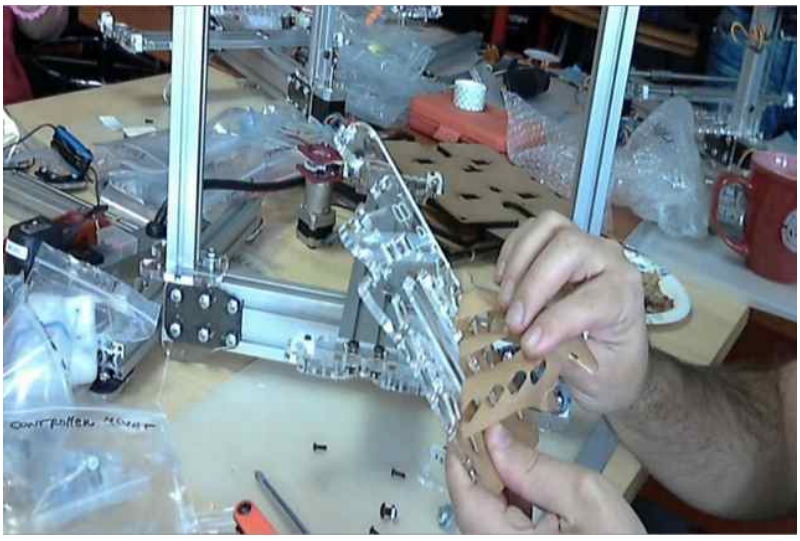
Push motor against the Z vertical frame and tighten the inner screw.

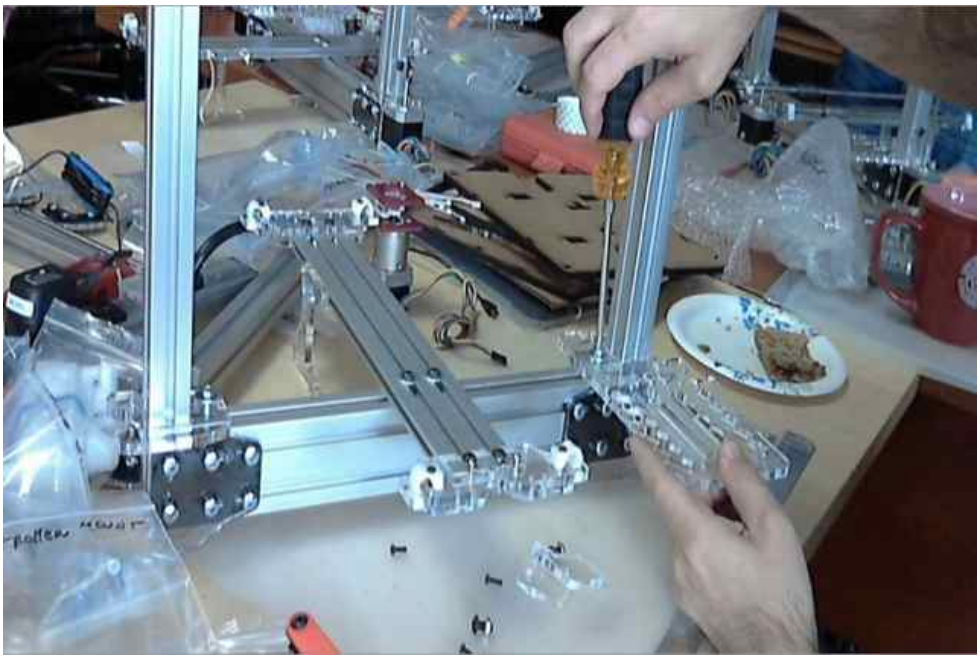
Attach the vertical portion (smaller acrylic piece) on the outside of the “U” of the frame (see image). Push it down firmly against the horizontal motor mount. Note that the pointed part of the vertical piece should point toward the back of the machine for the one on the right side and the front of the machine for the one on the left side.



Open the Controller Mount kit.

Attach the other horizontal acrylic motor mount and its vertical acrylic piece. The point of this vertical piece should point toward the front of the machine and should be on the left side of the machine (as seen from the front.) The controller will be on the back left of the machine (out of the way.)

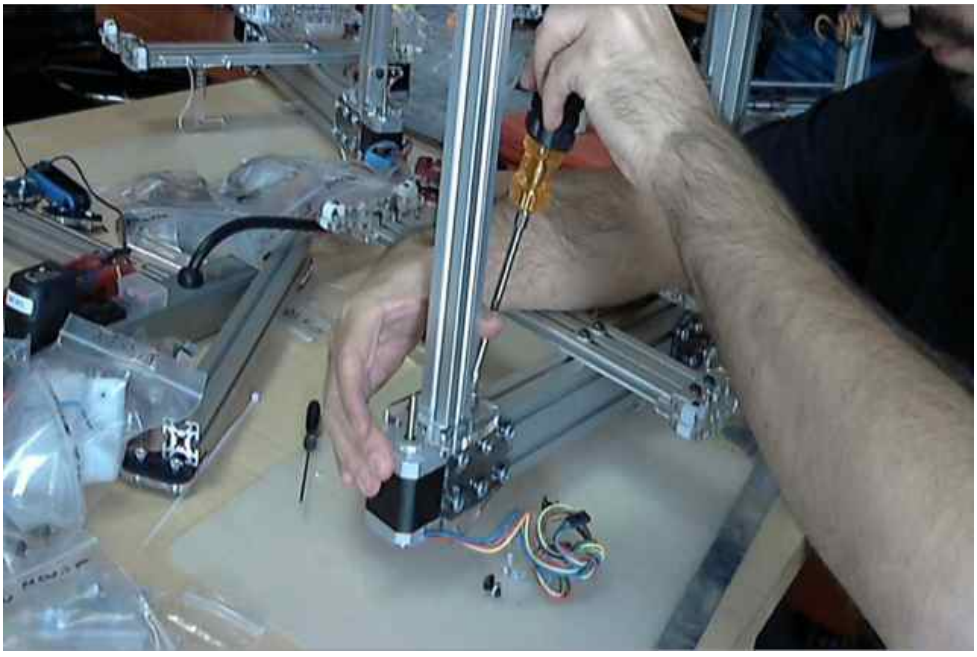




Attach the Z motor, but instead of a spacer you will insert the Azteeg board mount (facing toward the back of the machine.) The wires on the Z motor should be facing toward the back for cable management. The end stop holders need to be square so that the end stops can be put on later with adequate clearance.

4. Azteeg Board Mount

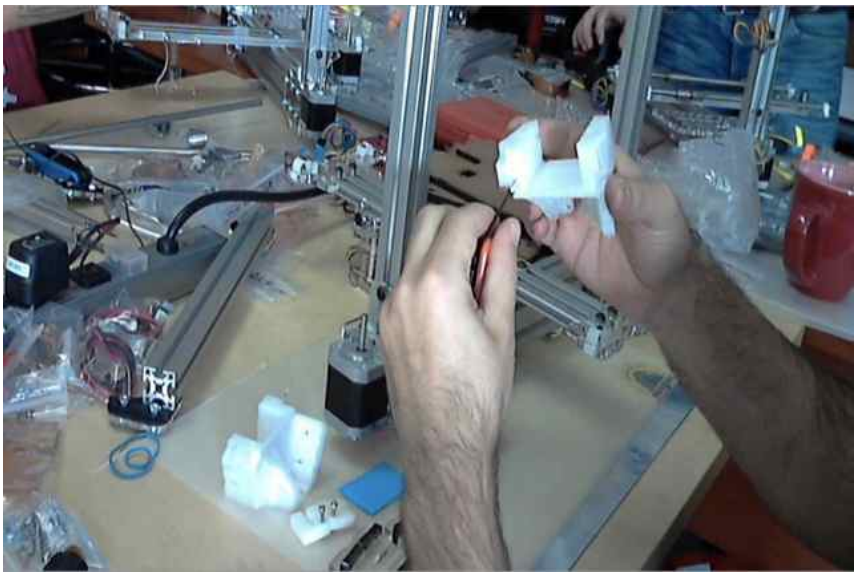
Attach the Azteeg board mount to the horizontal Z support and tighten while holding the motor against the frame to be sure that it is square and tight. The controller mount will push against the acrylic pieces we just put on tightly.



5. X End assembly.

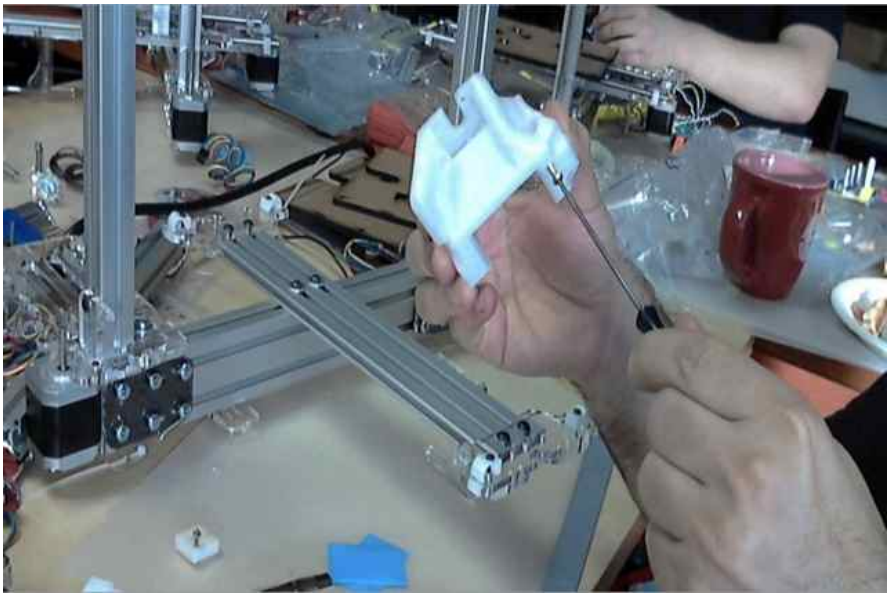
Open the X end kits.

Pick up one of the X ends (white 3D printed part).

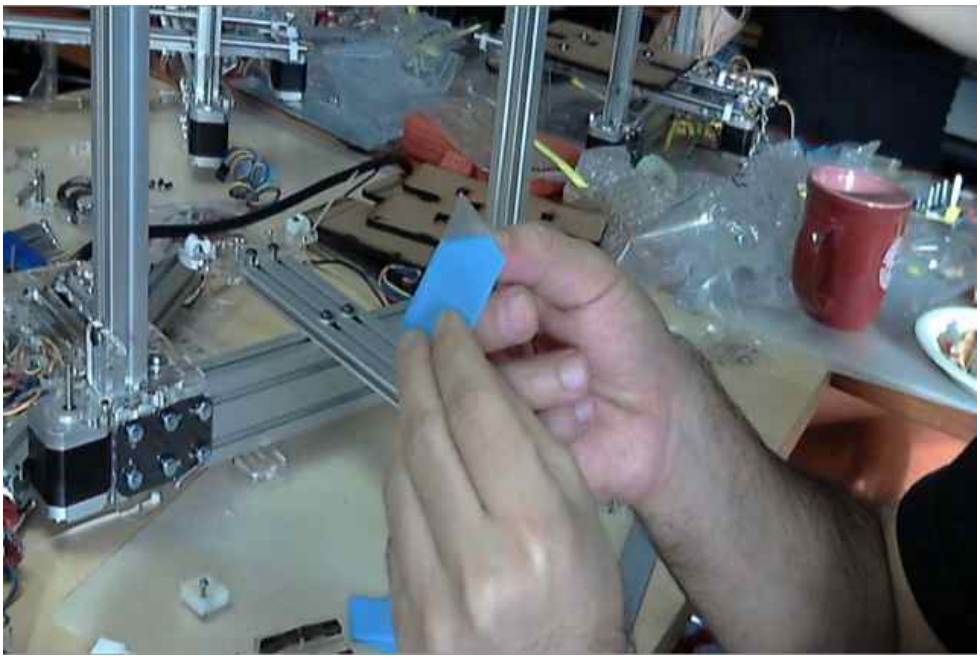


Put in screw as shown (this screw is the z end stop trigger).

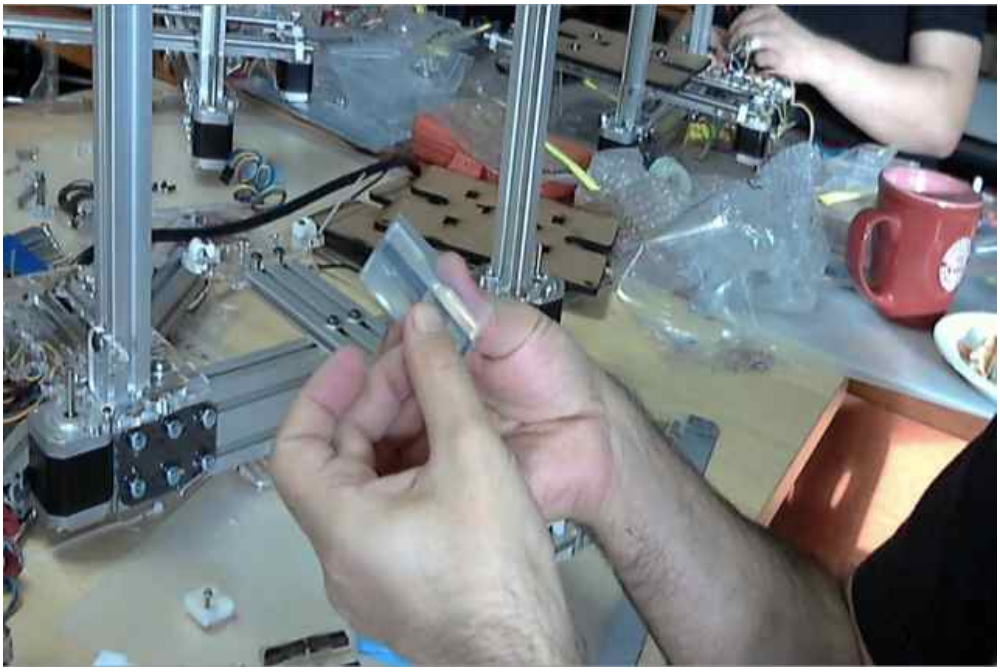
Put the piece on the vertical Z aluminum rail with the screw toward the front of the machine on the azteeg board side. (You are screwing into the wider flat surface.) This is the set screw for hitting the end stop.

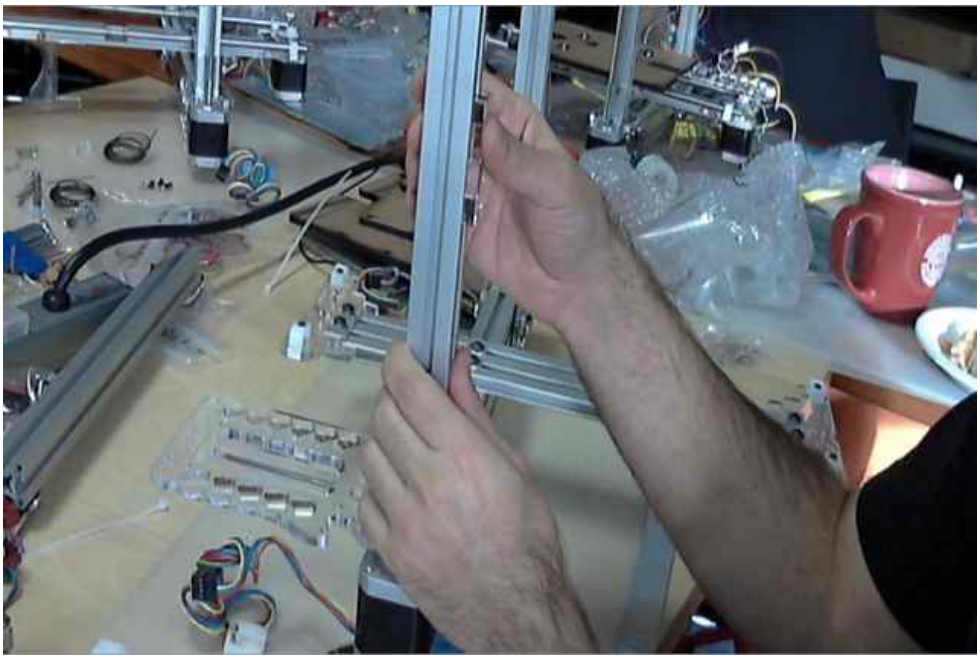


Take UHMW tape and take off the blue backing.



Take the rail slider and center the tape on the protruding central rail (that will fit into the slide.) Push it into the slot to form the tape around the slider rail.





Remove the piece from the rail and set it aside.

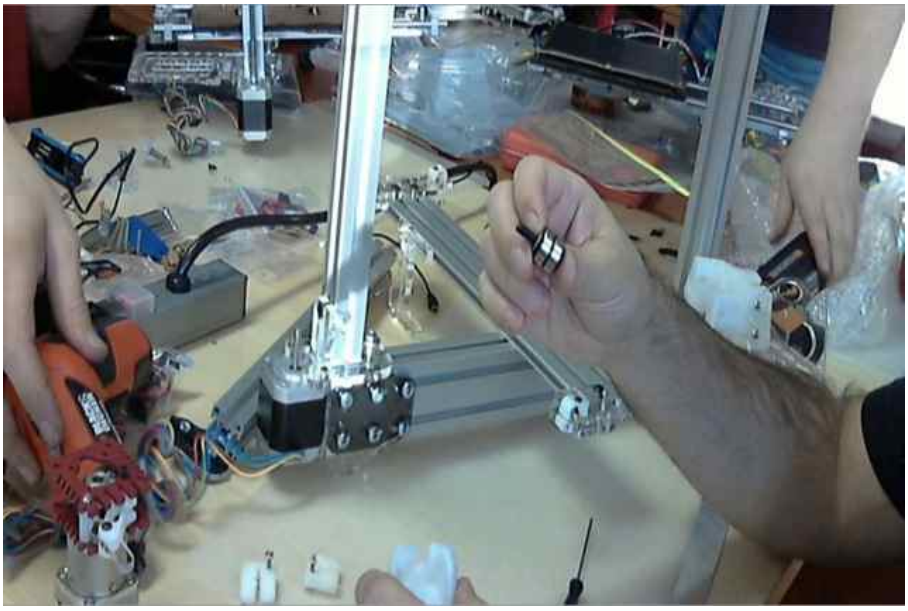
Open the X End Motor Mount kit.

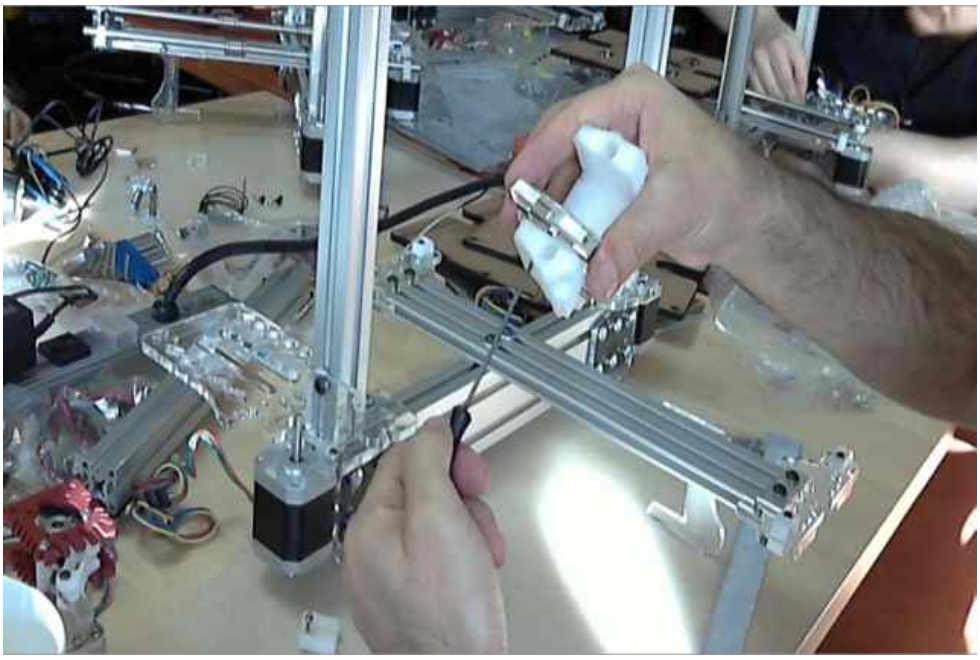
Take acrylic piece and use screws to attach it loosely to the X end. Set it aside.

Open syncromesh kit.

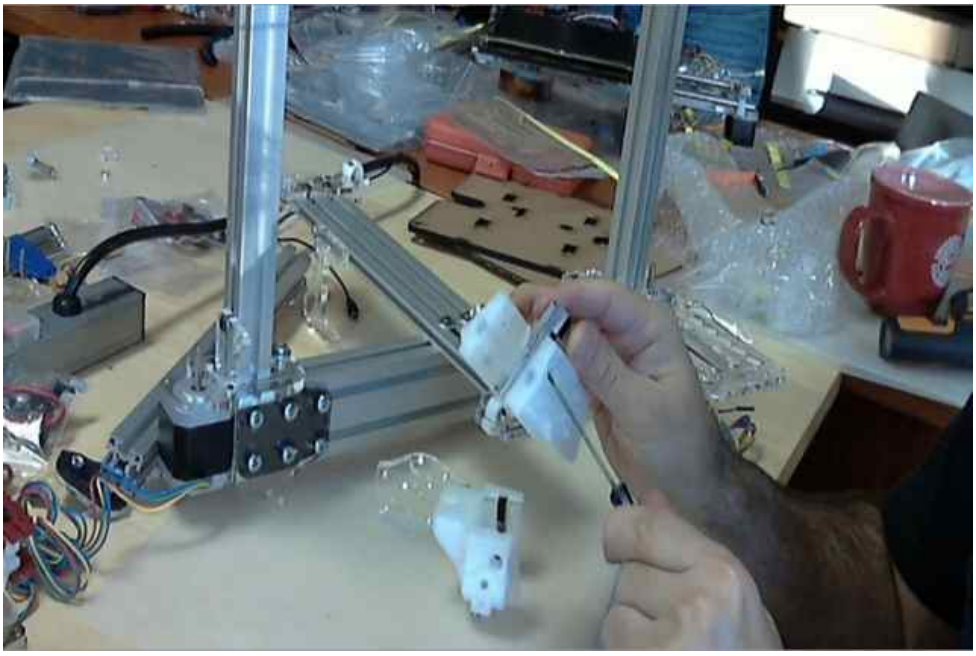
Take 2 bearings and 2 washers and M 520 screw (black screw) from kit.

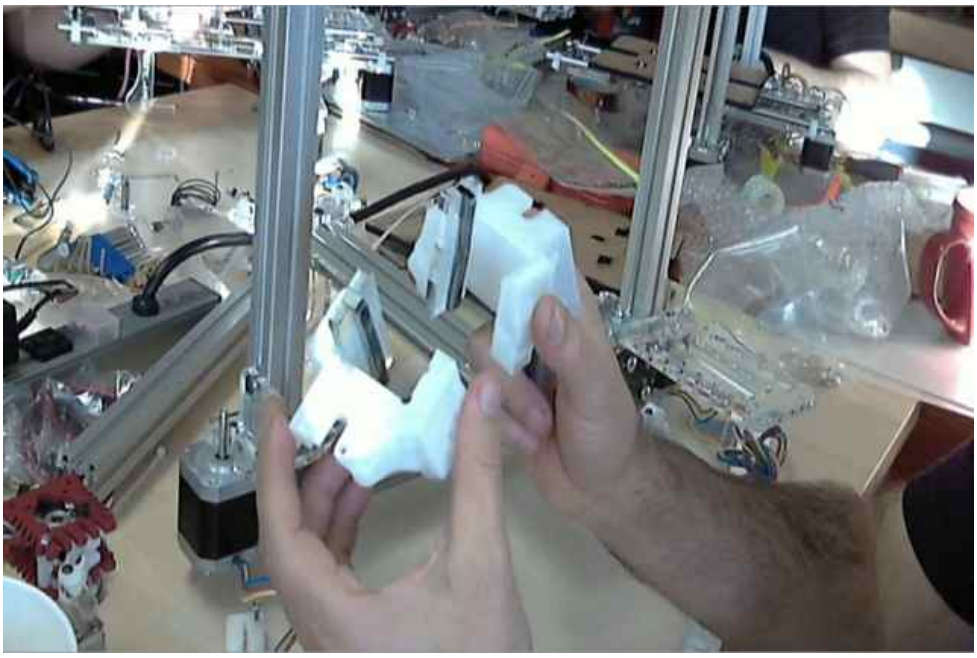
Load screw with bearing, then washer, then bearing, then other washer. Screw it into the X end on the back right of the machine.





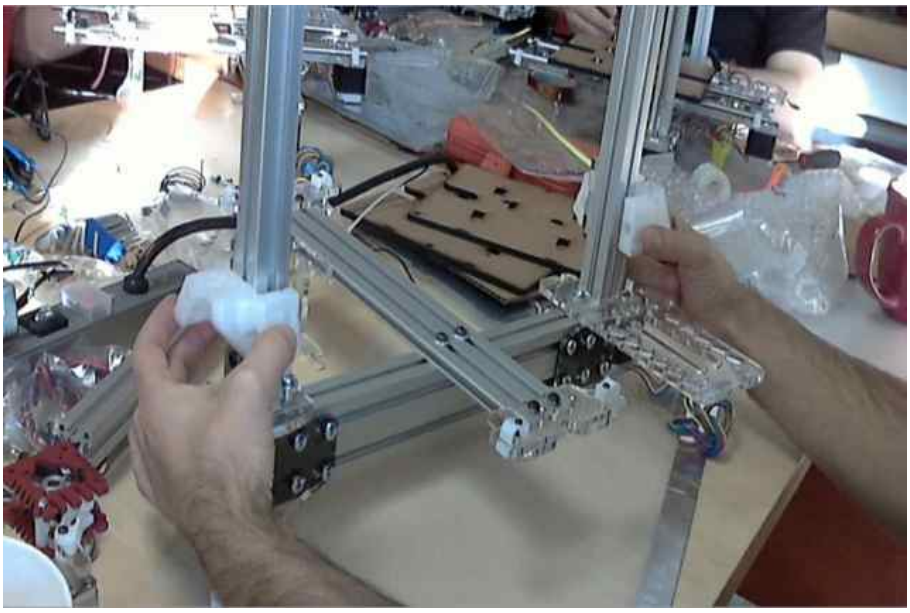
Now attach one rail slider assembly to the X end that does not have bearings attached.

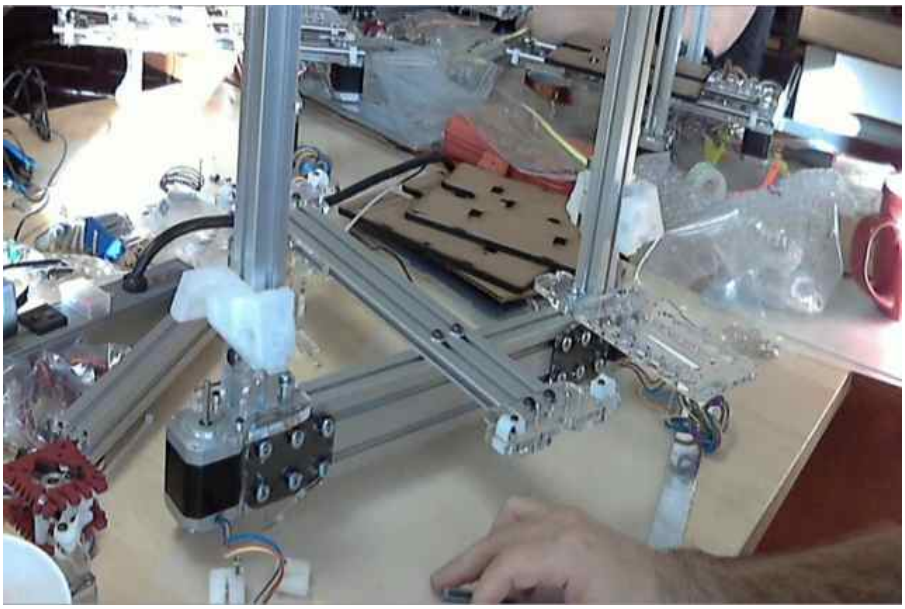


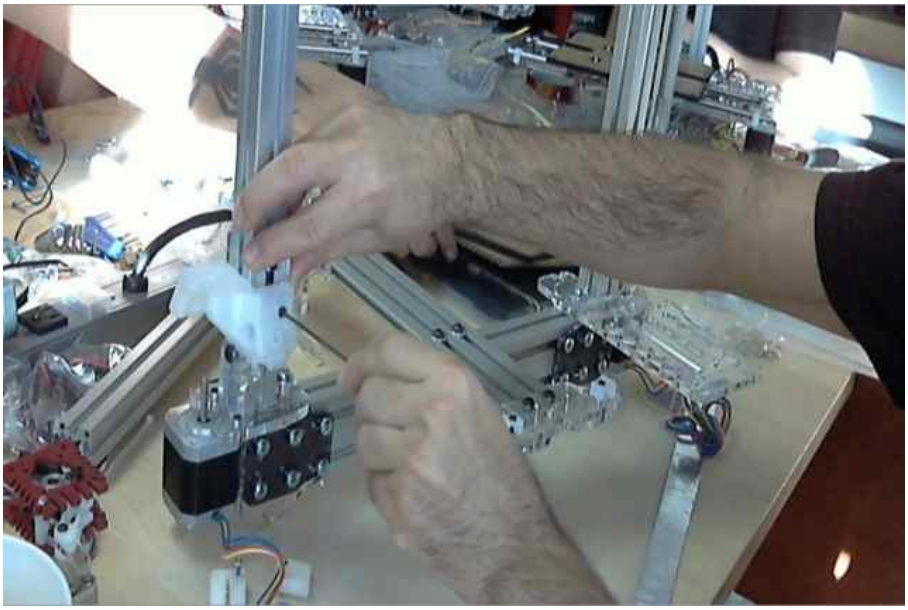


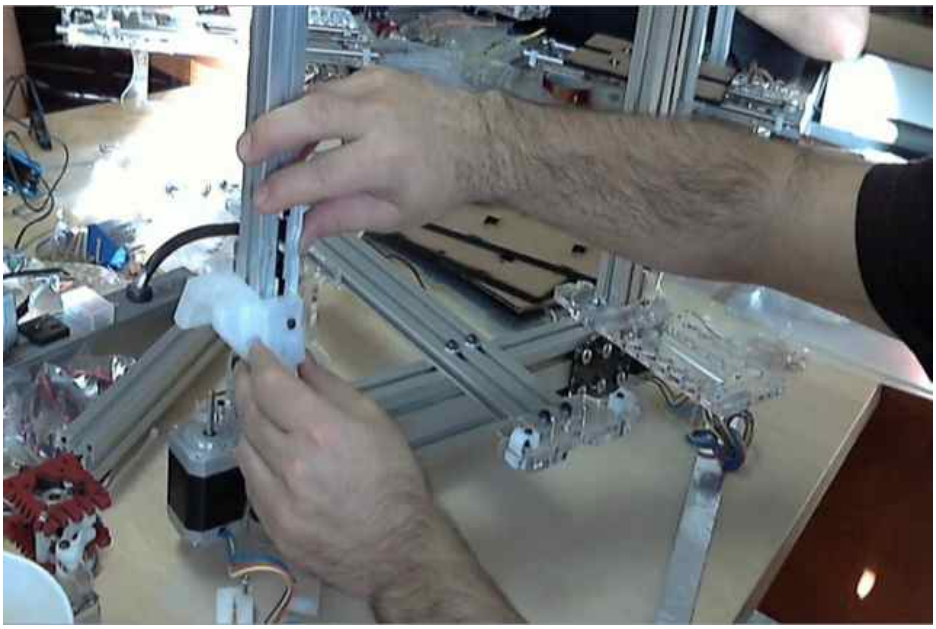
Put the X end on the Z vertical rail on the side away from the azteeg motor mount.

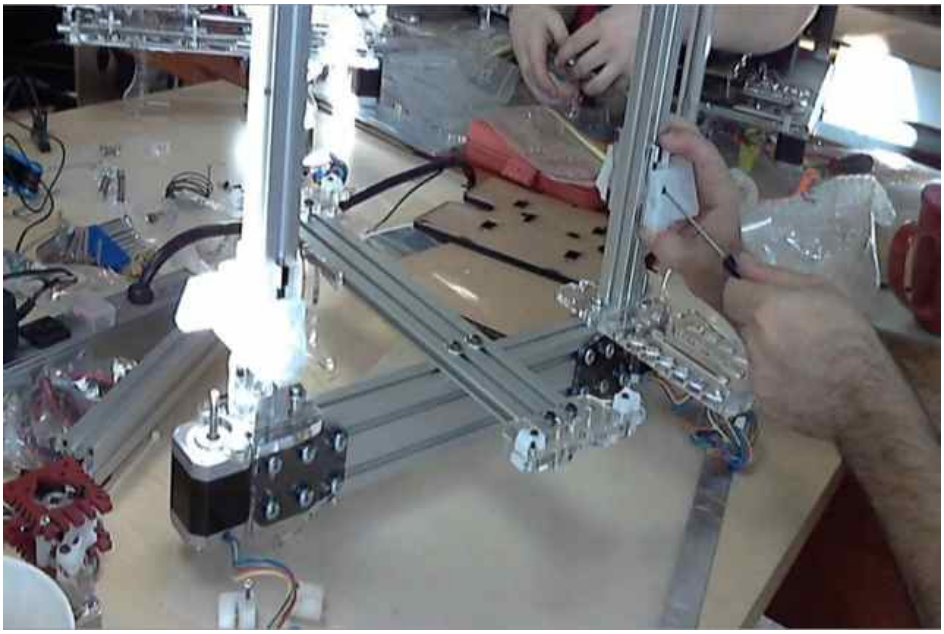
Take the second slide (there are two per vertical rail, one on the front and the other on the back) and slide it in (see photo sequence.)











Place front screw to hold the assembly together.

Add the other slider to the other side.

Two screws left over from the Y ends kit should be used to put on the Y motor. Check that the screws are tight. Put the wires facing inward.

Take Y rods and wipe them off.

6. Assemble XY Bearings.

Open XY Bearings Kit

Pull out 4 bearings. Put two bearings on each of the two Y rods.

Insert the rods into the housing loosely on either end of the Y nylon end clamps. Be sure the clamps are loose so the rail will go in. Once the rods are in tighten the screws. The nylon should touch the acrylic once the screws are fully tightened.

Next clean two more rods. Put two bearings on each. Make sure the X ends are seated on the bottom of their Z travel so that the holes line up.

Run the rod through the holes in the X ends (these rods will be horizontal and perpendicular to the ones you just put in on the Y axis.) This will be the X axis rods for carrying the extruder. Be sure the rods extend well into both ends.

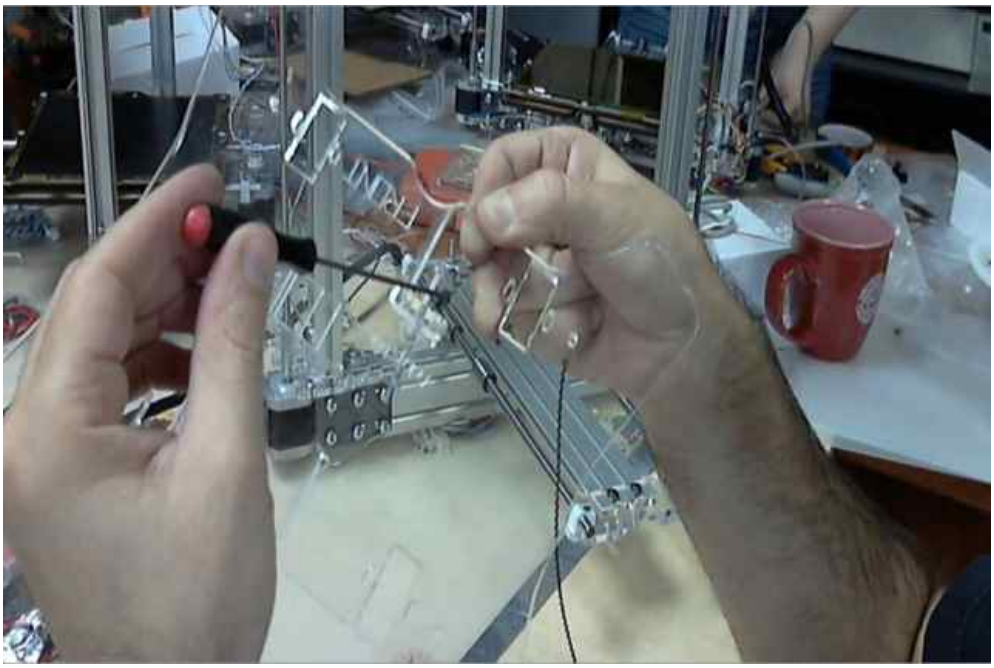
Take the threaded long rods. Clean them by turning them in a paper towel.

Take the small square pieces (Z delrin nuts) from the x end kit and screw one onto the end of each rod. If they have a screw inserted already, remove it.

Insert the rod into the Z coupler tube and seat it on the shaft of the motor. Attach the top of the rod into the 3D printed end stop. Add screws on top plastic part. Repeat on the other side. Notice that the X carriage is lifted.

7. Place synchromesh.

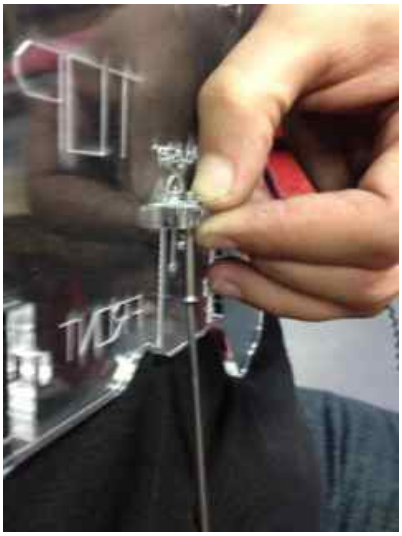
Open the Y platform kit, and find the Y carriage large acrylic piece.

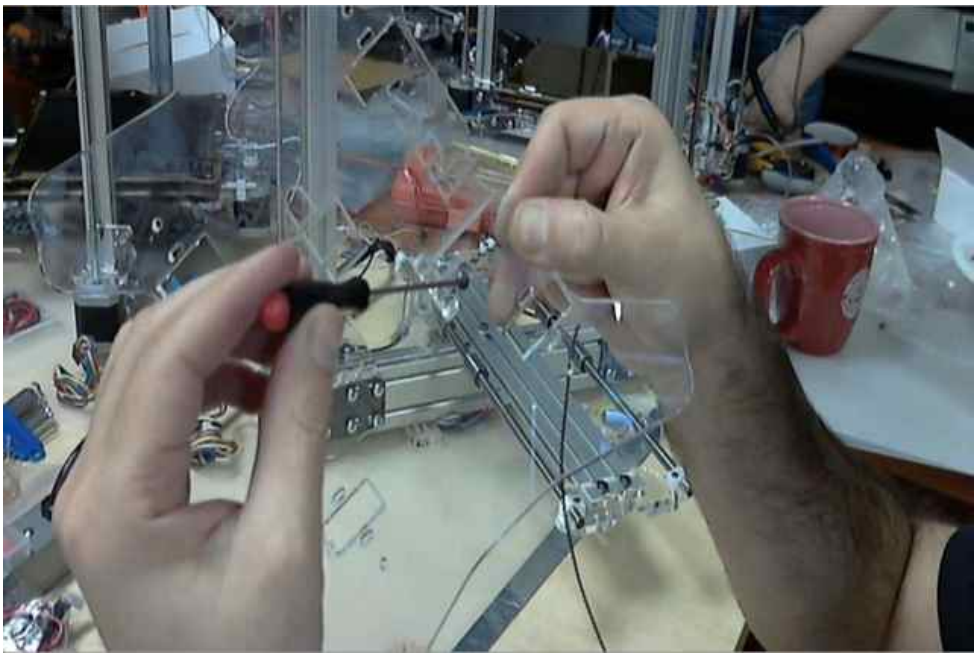


Take the part engraved for the nut, and insert it into the Y carriage so that the protruding part is to the front of the Y carriage.

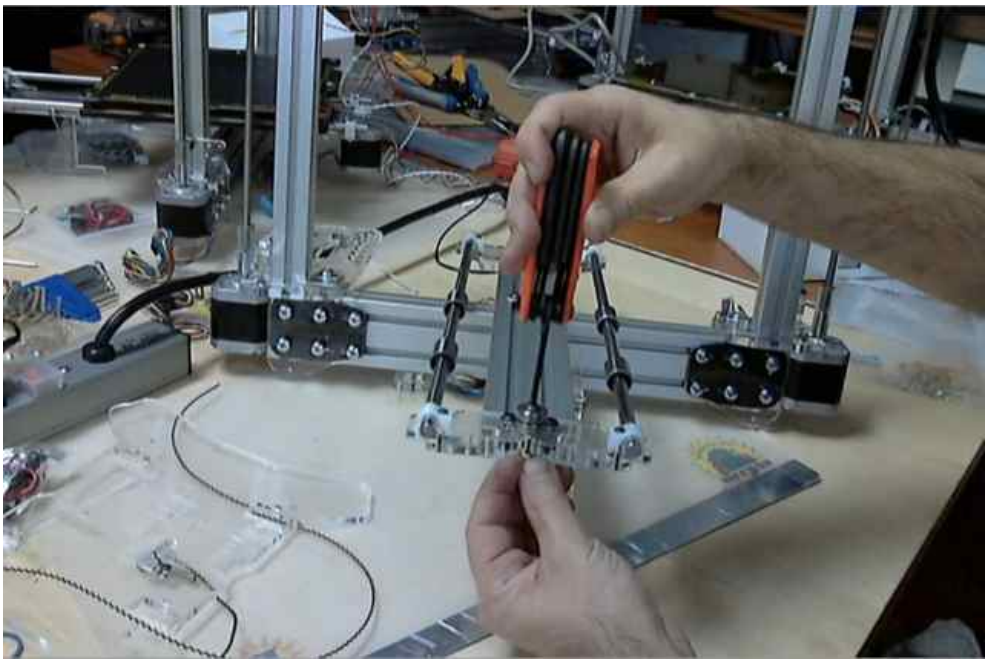
Pull out a piece of synchromesh. Thread it through the hole and tighten the end with a screw. Then thread the mesh through the Y adjuster guide holes, over the rounded 3d printed piece, and back.

Then anchor the synchromesh to the front of the acrylic piece. The synchromesh has to protrude from the top front about a centimeter. Follow the diagram on the Y carriage to add the screw and nut. After the nut, add Y adjuster guide from the Y platform kit (small plastic part.)

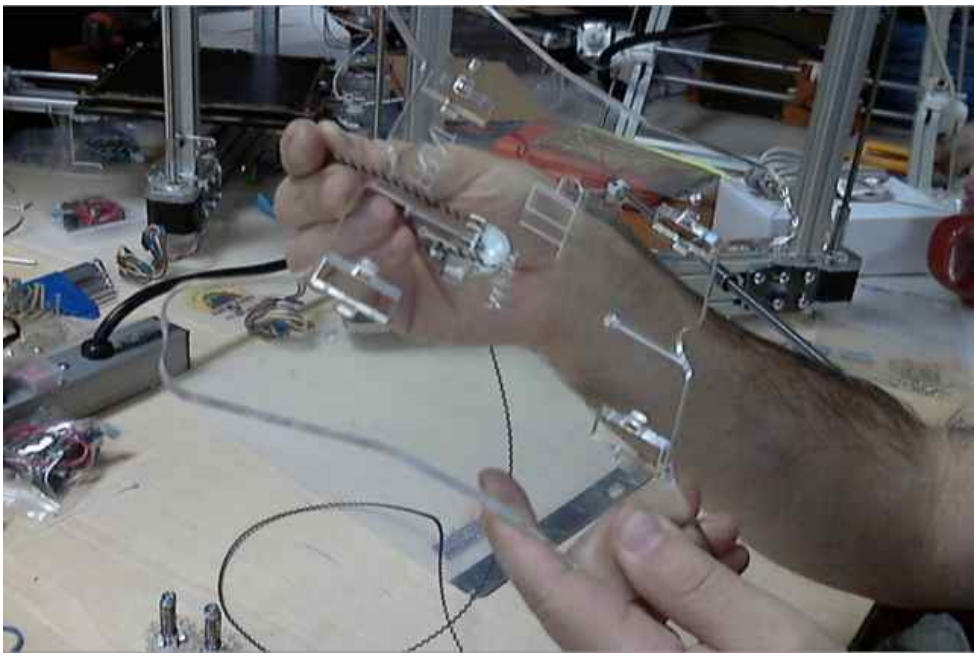




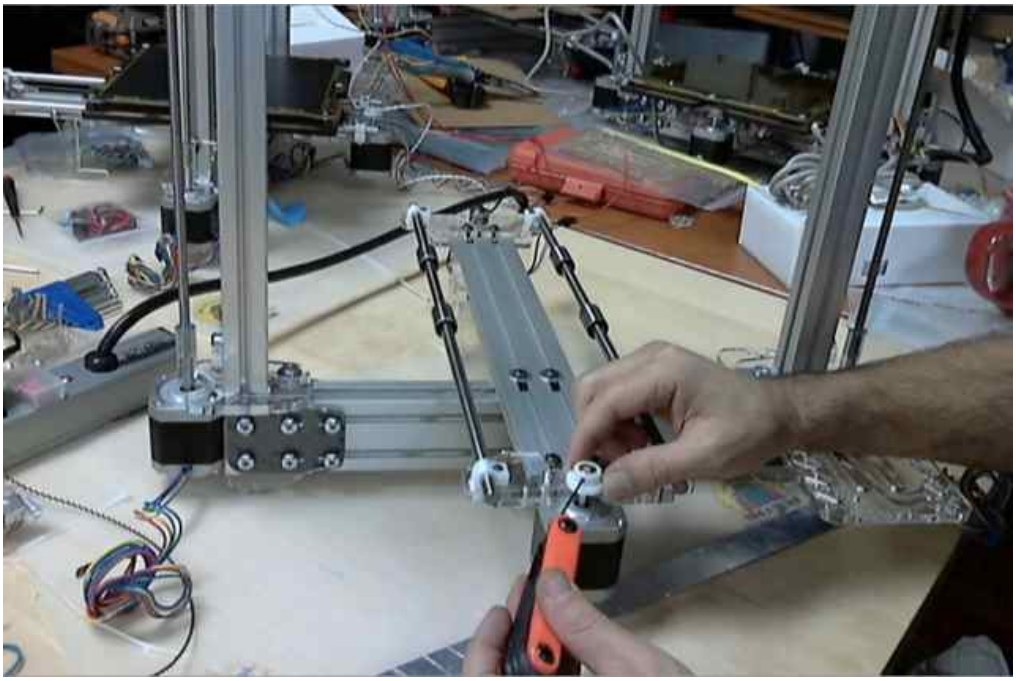
Put together another screw assembly with washer/bearing/washer/ bearing and attach it to the end of the Y carriage away from the azteeg board carrier. It should be tight, but not enough to break anything.



Place the synchromesh pulley on top of the motor on the opposite side of the y carriage. Make sure the set screw is matched up with the flat side of the shaft.

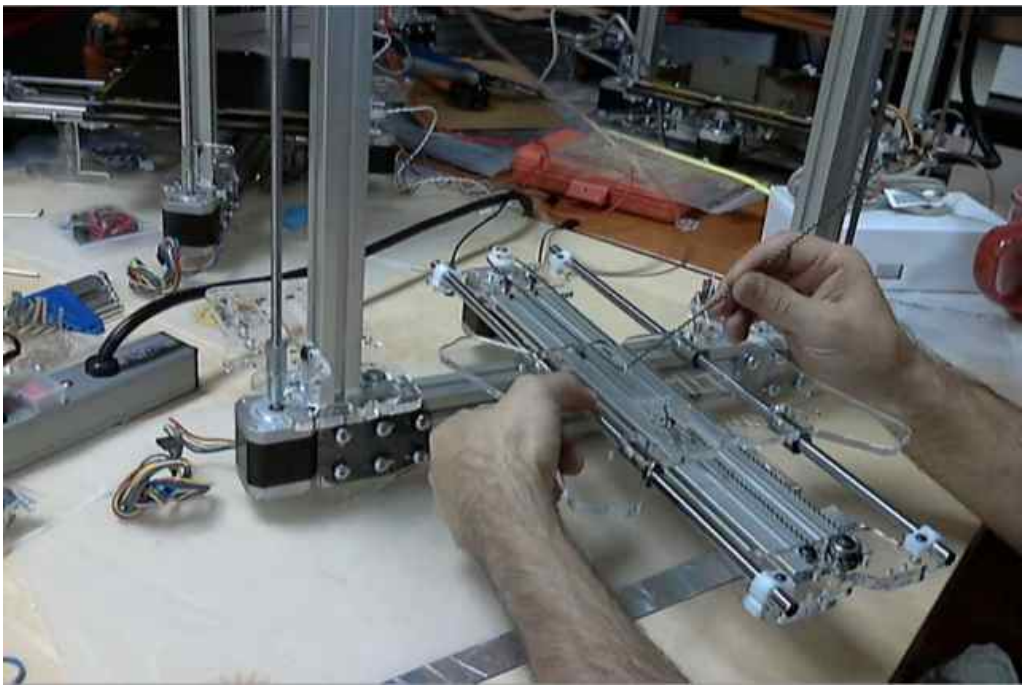


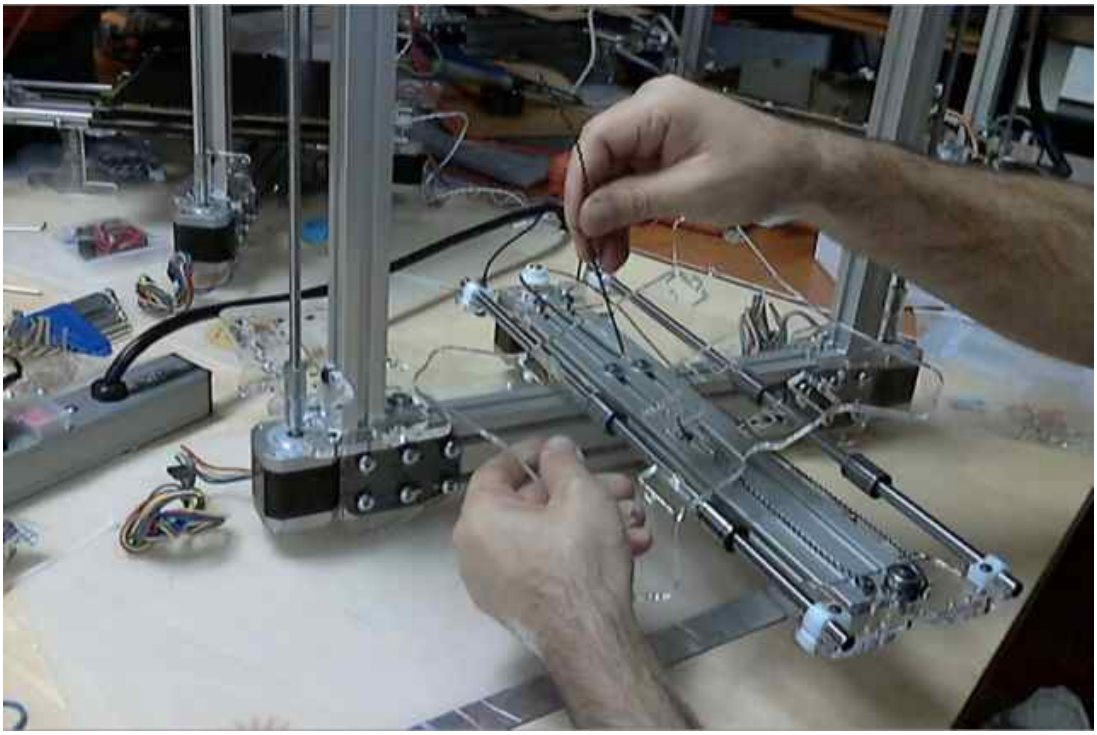
Take the Y-carriage acrylic piece and have the front side away from the azteeg board. Run the synchromesh cable through the back and through the pulley and guide. Tighten with screw. Pull mesh to make it tensioned but not extremely tight. There can be a little play in the synchromesh, but only a little.

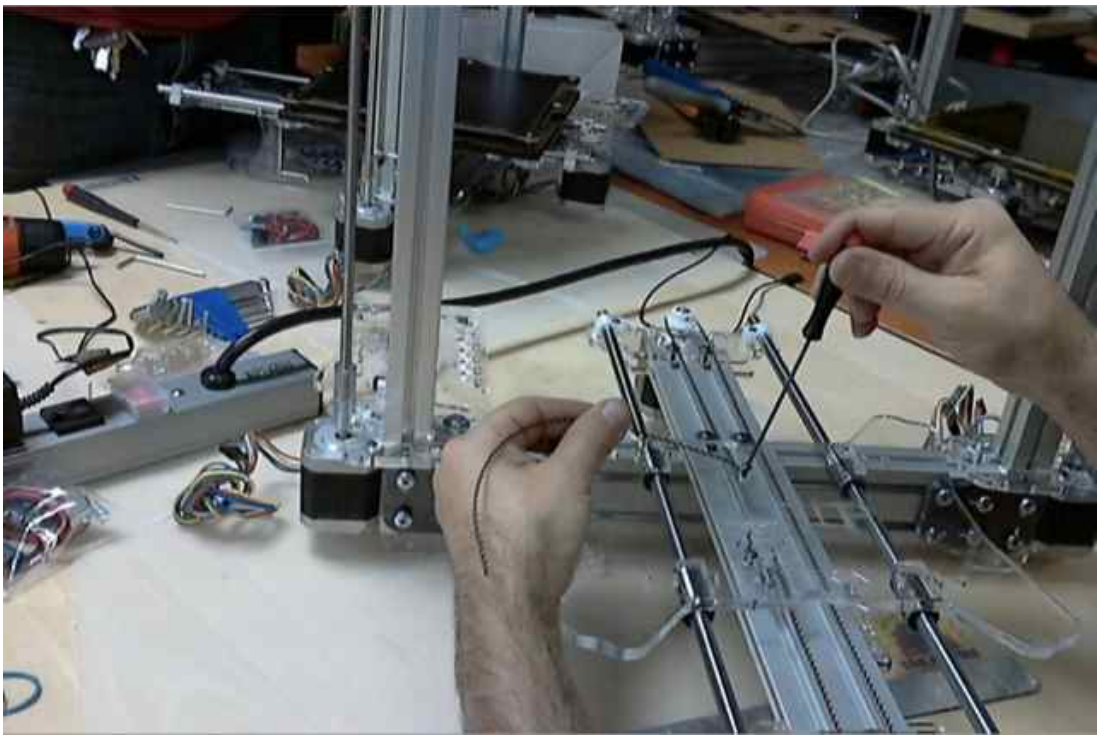


Tighten down the platform by pulling on the zip ties and make it tight. Once they are all tight trim off the excess. Trim the syncrhromesh too, but leave one or two inches.

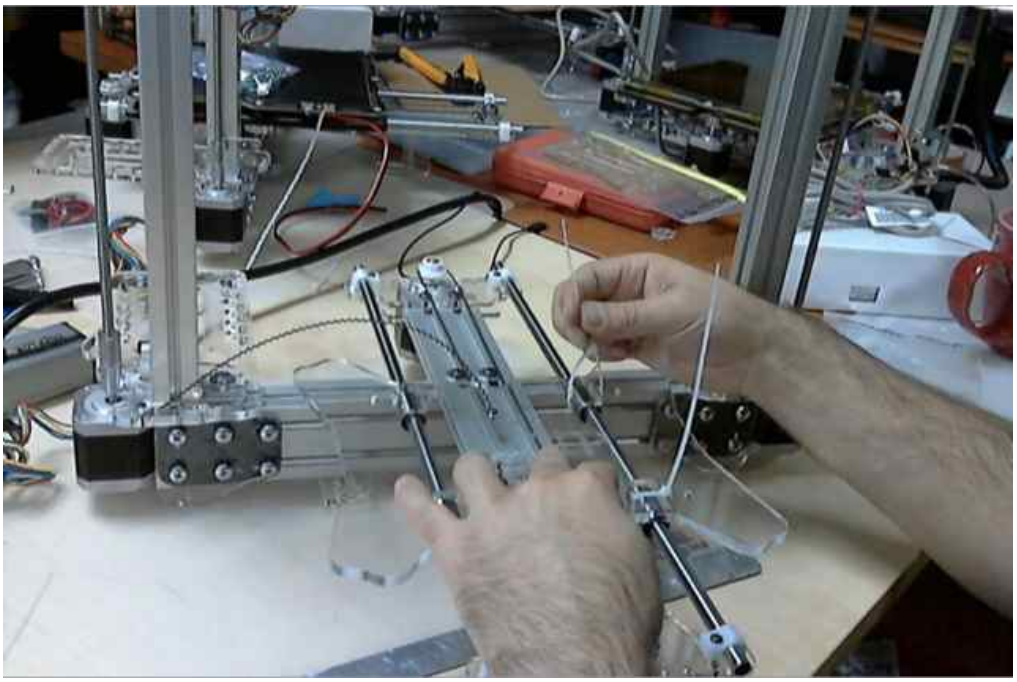
Tighten the sychromesh with the adjustment screw under the platform. Make sure that the cable is not touching the acrylic platform. If it is, adjust the pulley downward until it is clear.

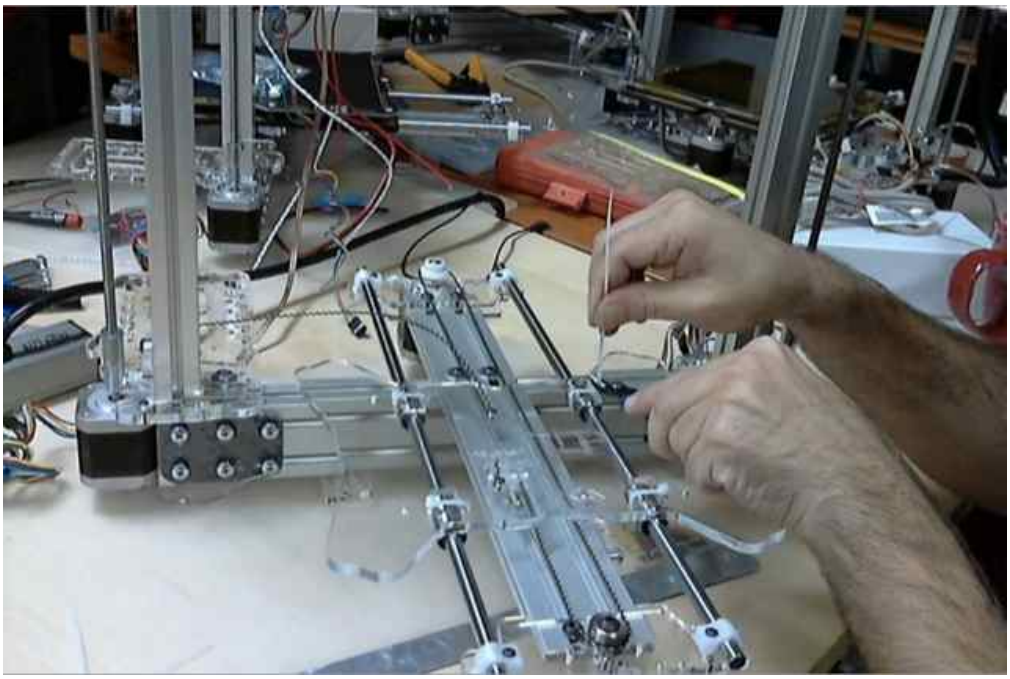


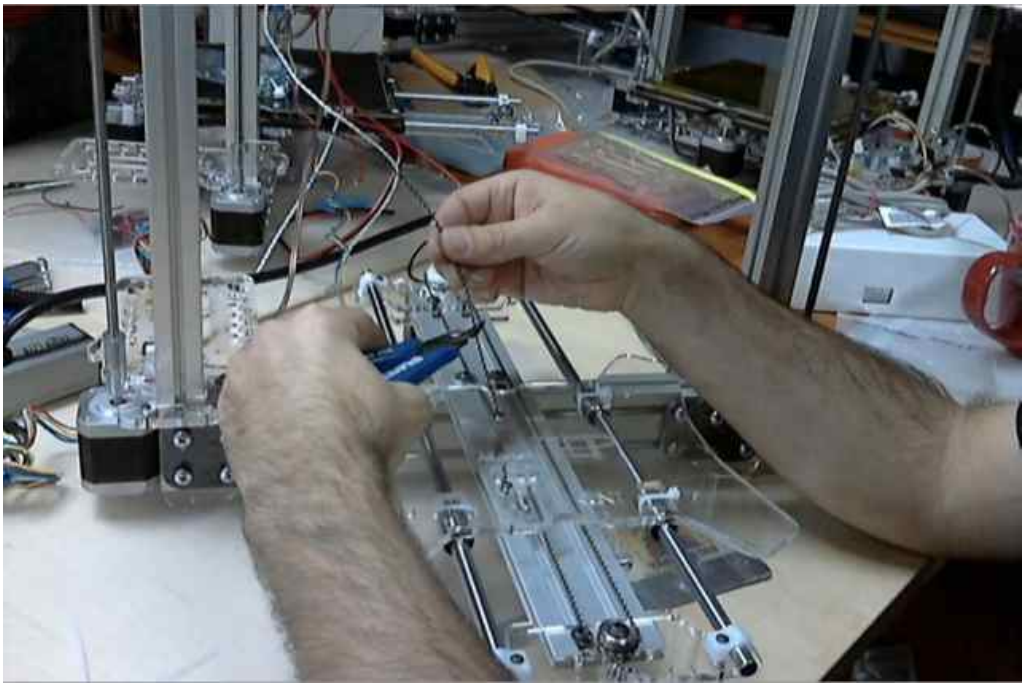




When you are done, run a zip tie through the slots around each bearing.

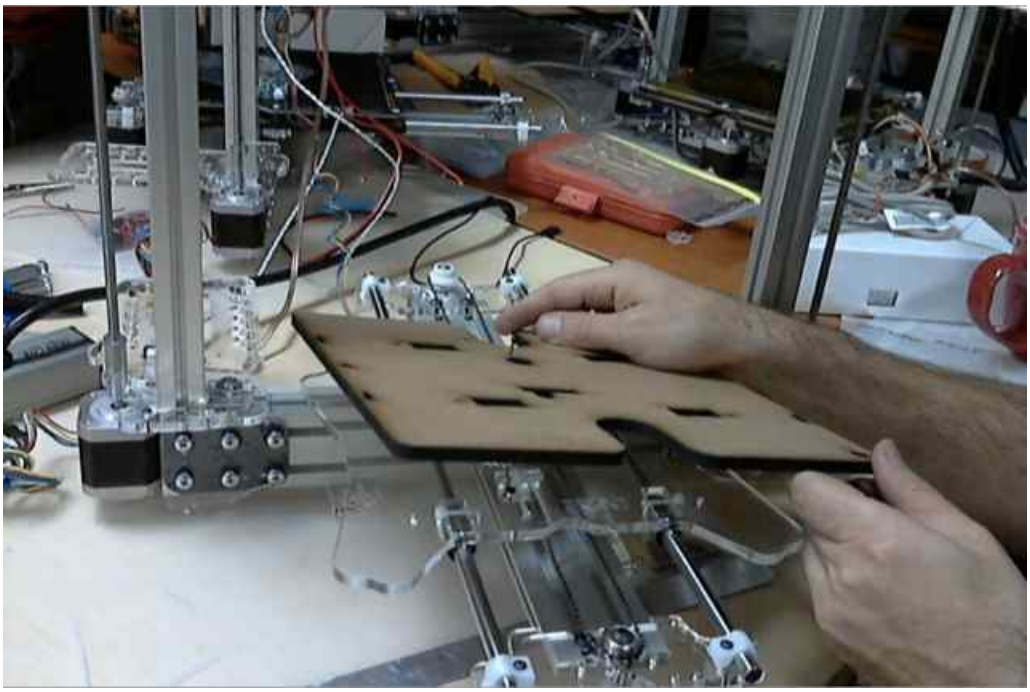




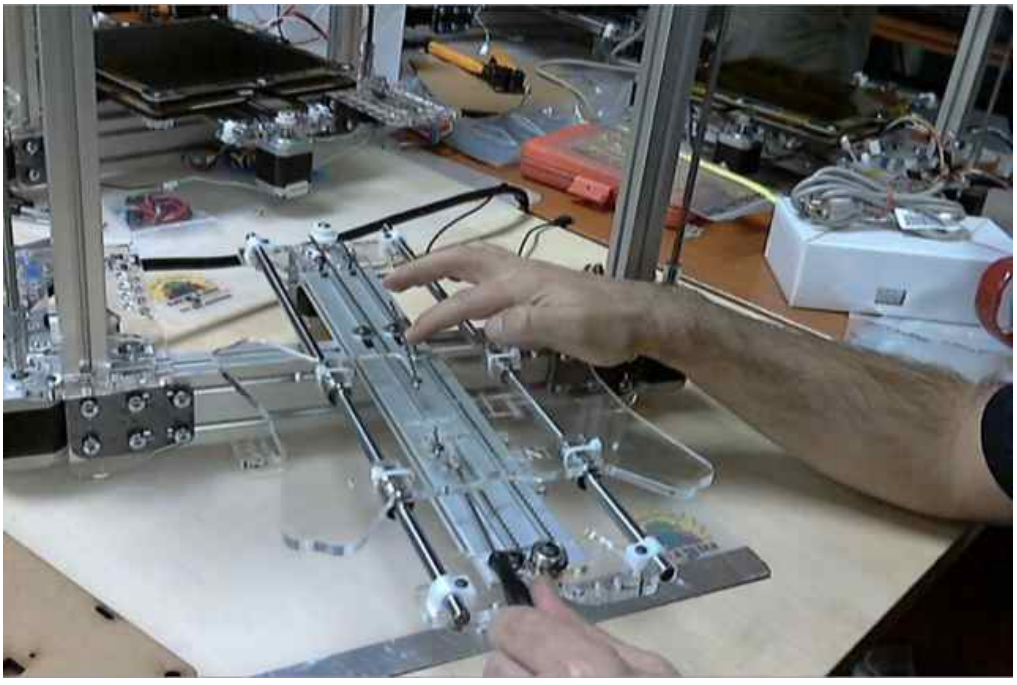


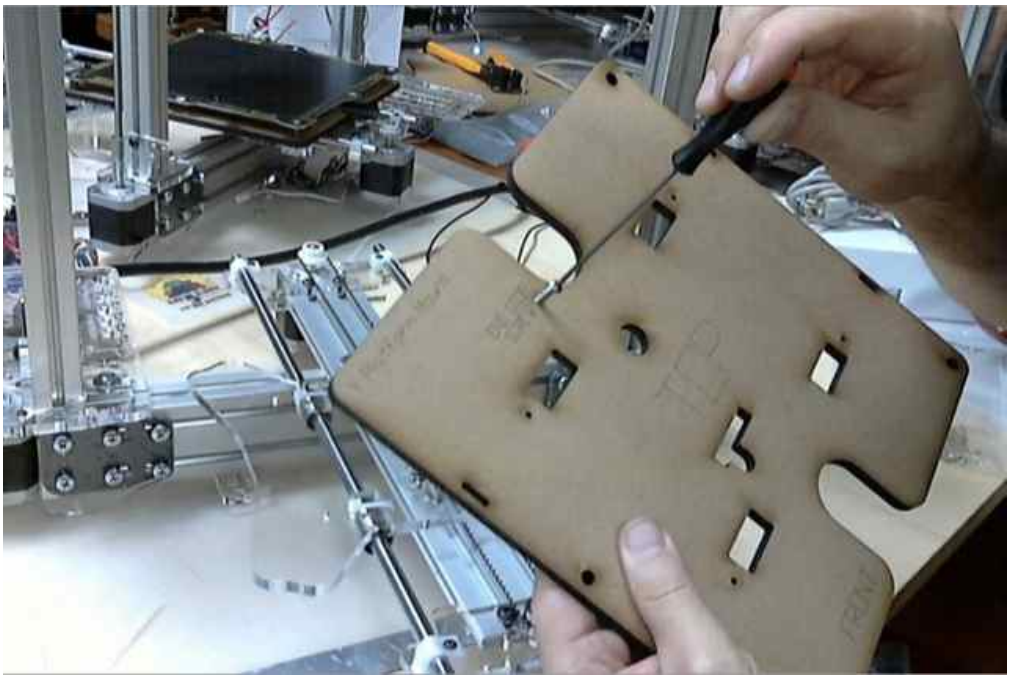
8. Attach wooden platform.

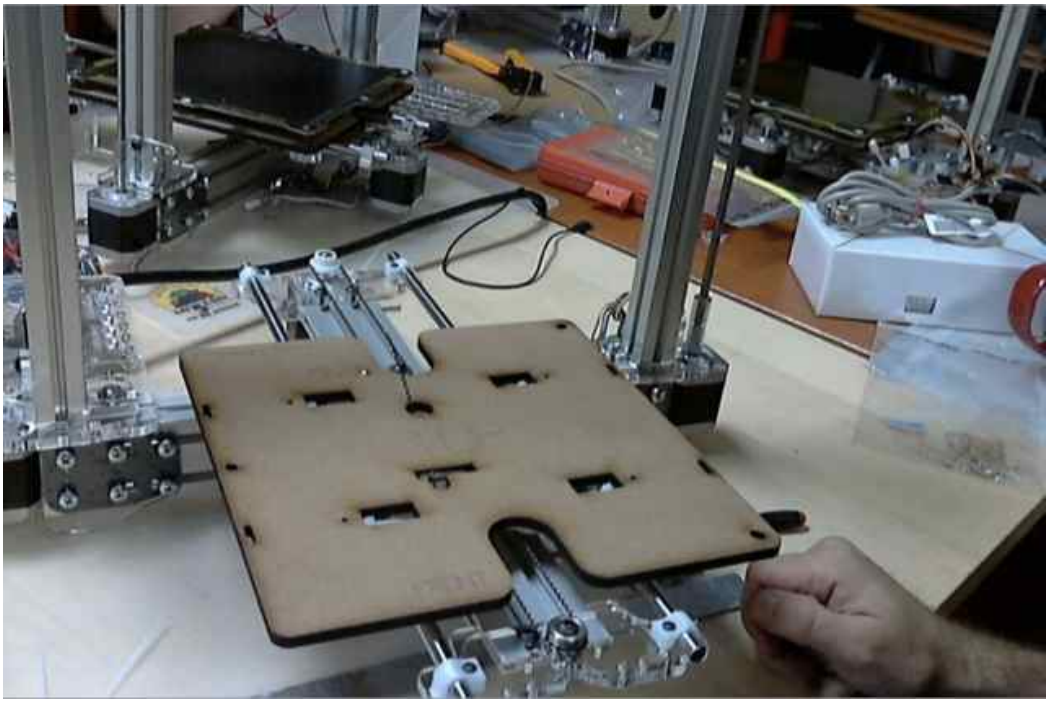
Take the wooden platform piece. Put in the endstop screw, which is in the Y platform kit package. This is the y endstop. Screw it in all the way.

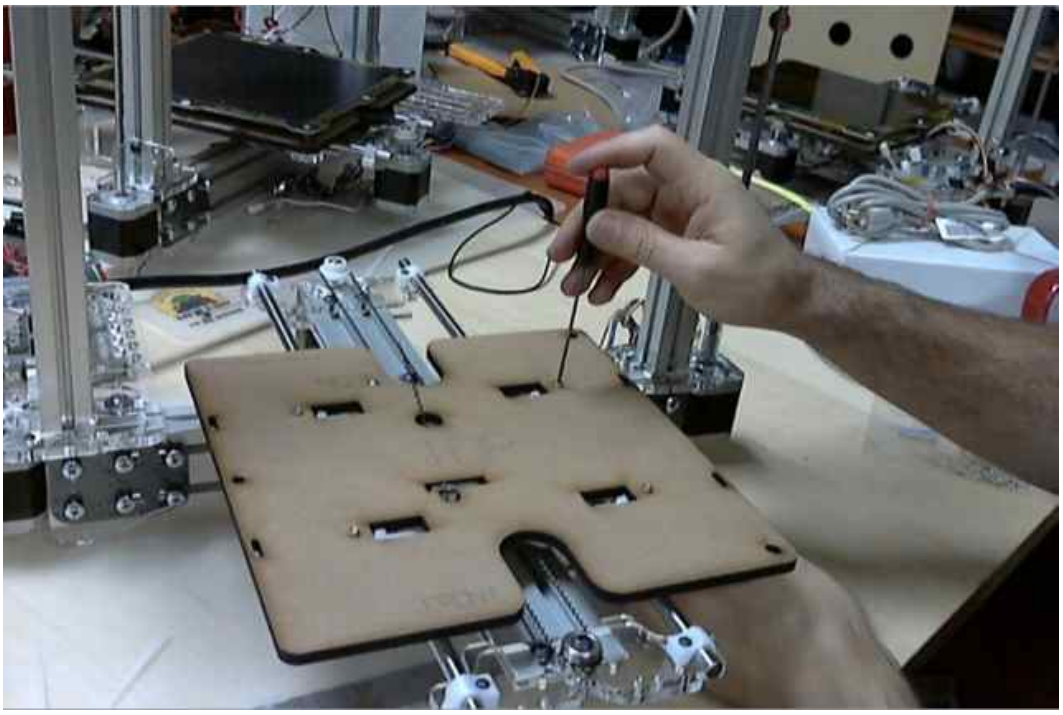


Lay the wood on top of the acrylic. Make sure there are no zipties or any synchromesh cable caught under the wood- all cabling should come through a hole in the wood. Screw down with 4 screws from the y platform kit. Be sure they are very tight. Be sure the “Front” label is on the side away from the azteeg board support.





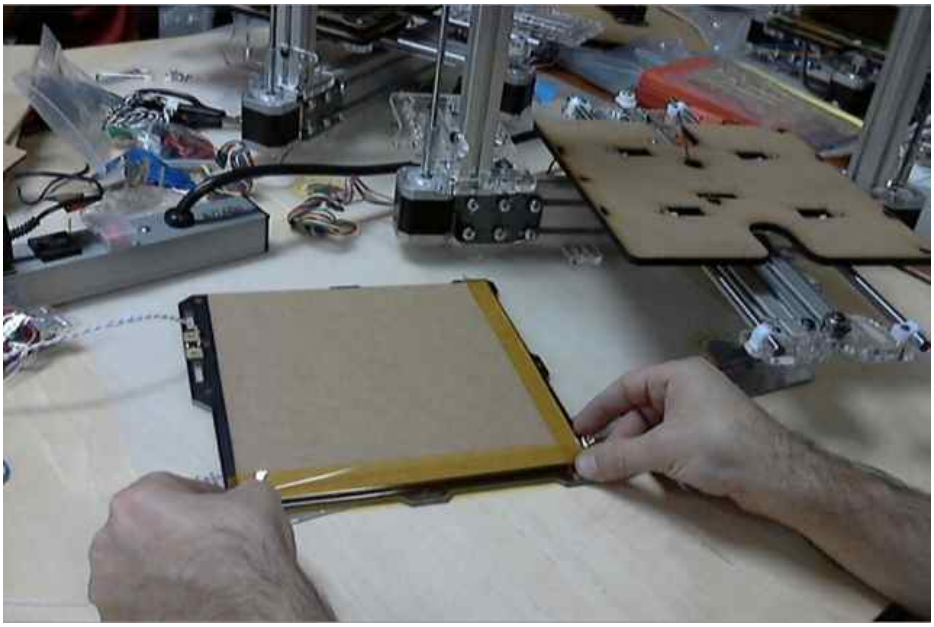


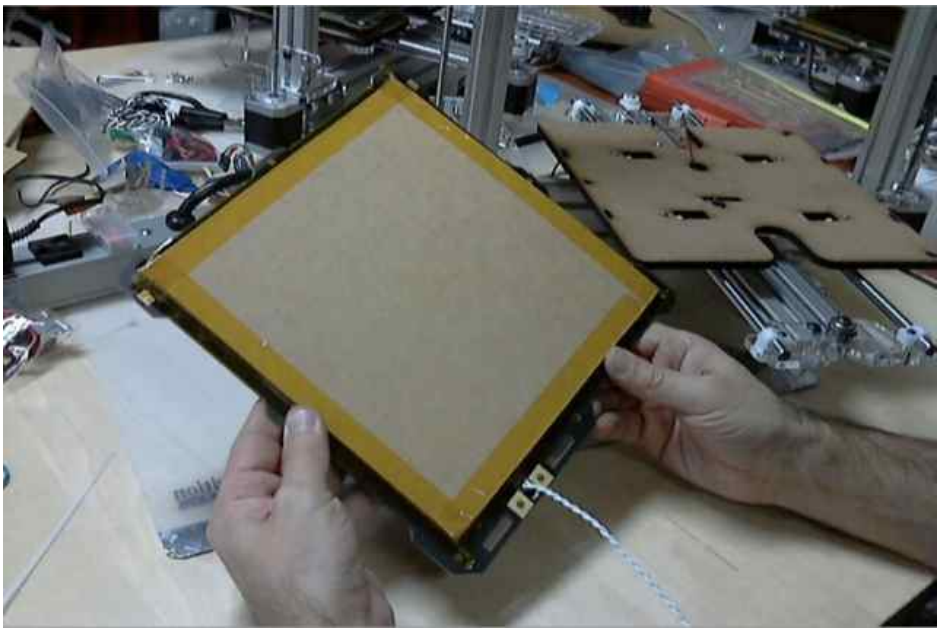


Check that the assembly slides smoothly.

9. Attach heated platform.

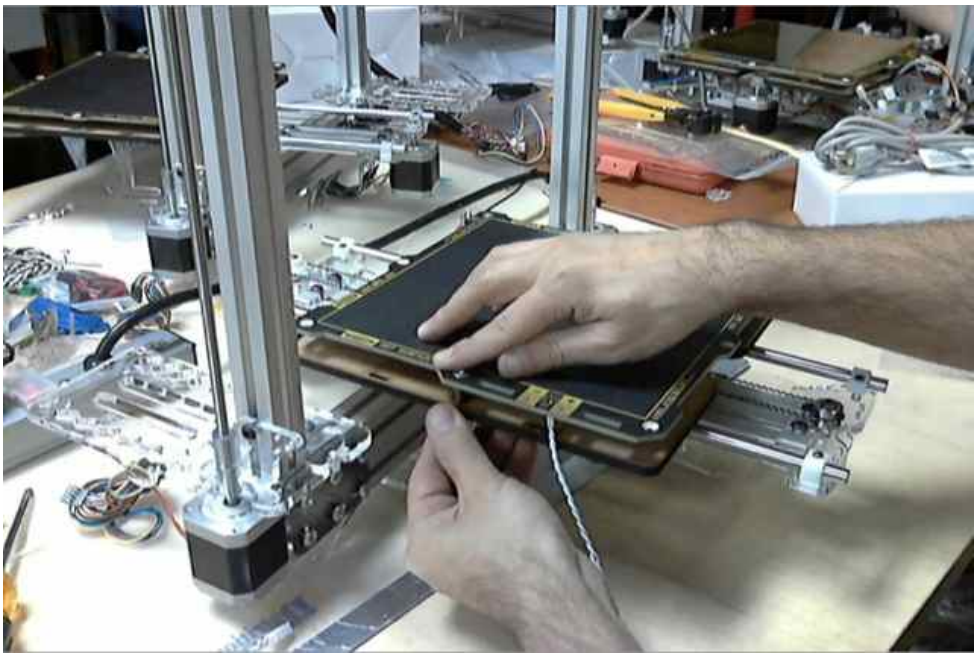
Pick up the heated platform assembly and piece of cardboard. Tape the two together with Kapton tape around the edges. It just needs to be secure enough to hold it in place. The cardboard is an insulator to make the platform more efficient in holding temperature.



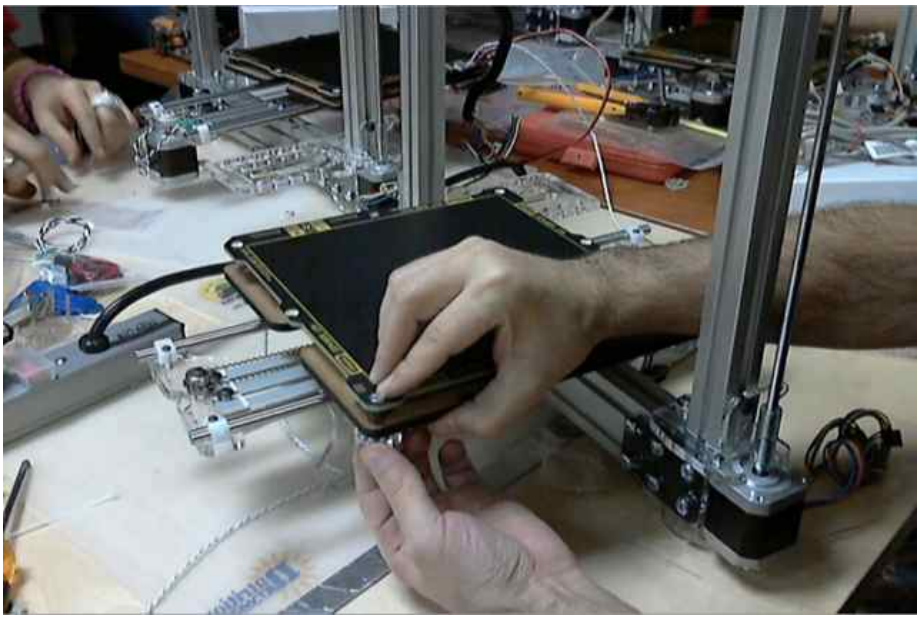


Get the platform adjuster wheels from the Y platform kit (looks like a flower on a screw with a spring.) If assembled take them apart.

Take the screws from the adjuster wheels and screw into the heated platform. Put the screws in the two corners away from the cable and the closest hole to the cable. Place on the platform with the cable on the side nearest the Azteeg board (on the left, looking at the machine from the front.)



Put a spring in between the heated platform and the wood board. Run the screw though and put the flower adjuster ends on the bottom. Tighten all around. Fully compress the springs for now (you will back these off to align the platform later.)

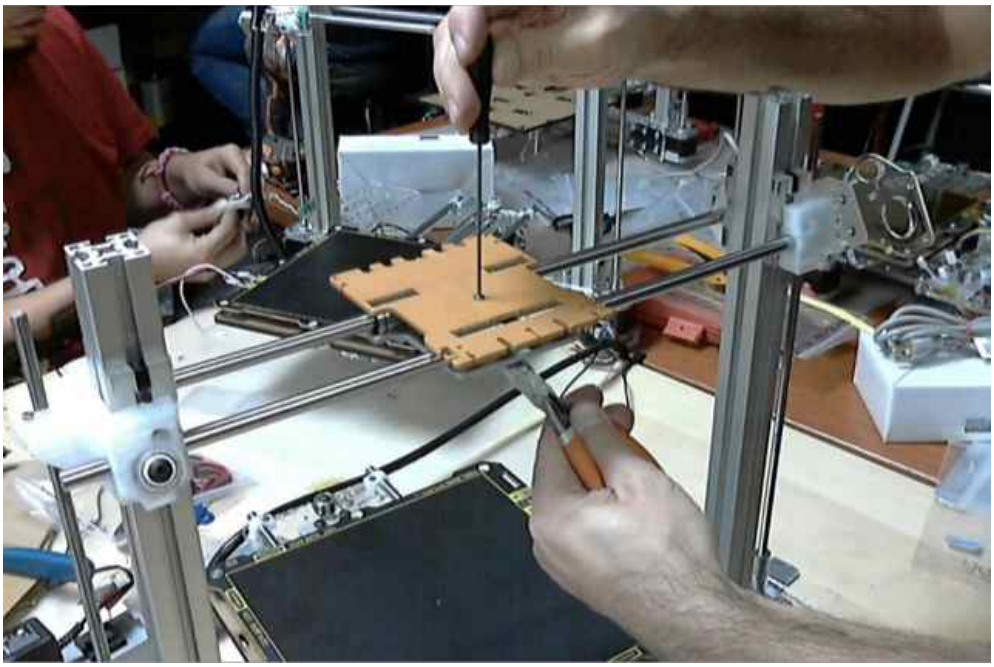


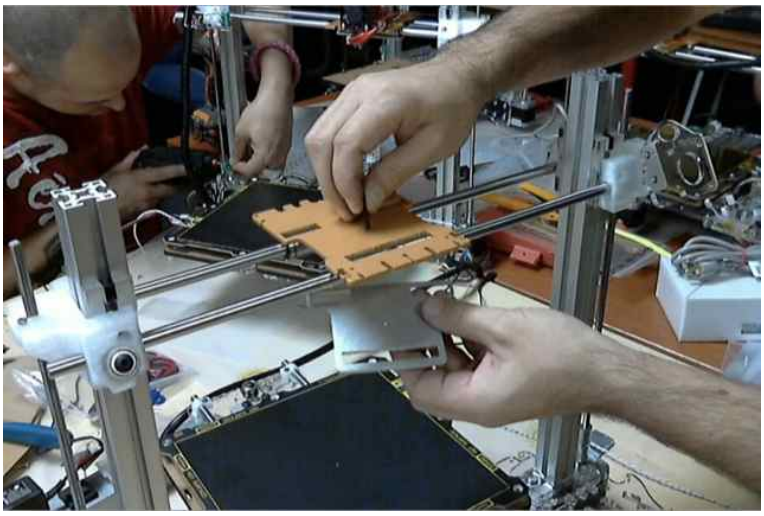
10.Assemble the X carriage.

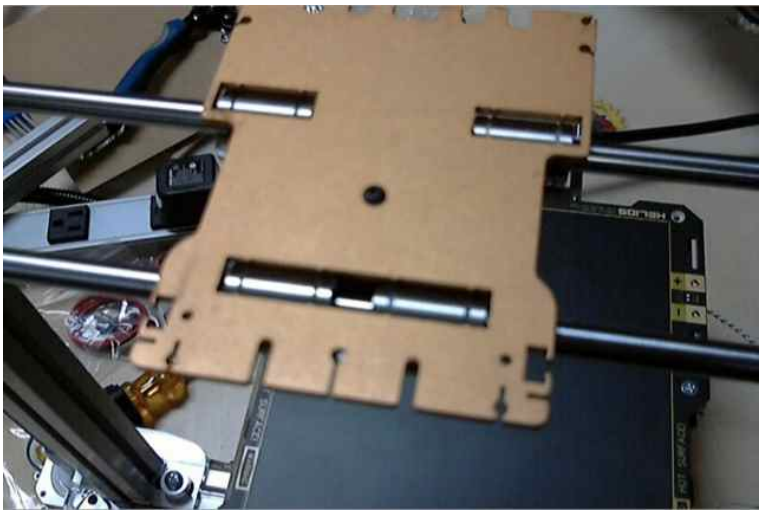
Open the X carriage kit.

You are now building the assembly that will carry and move the extruder in the x direction.

Attach the two plates one above and one below the rods. Attach with central screw. Tighten firmly but not excessively. Be sure the bearings dimples are in the grooves in the carriage.

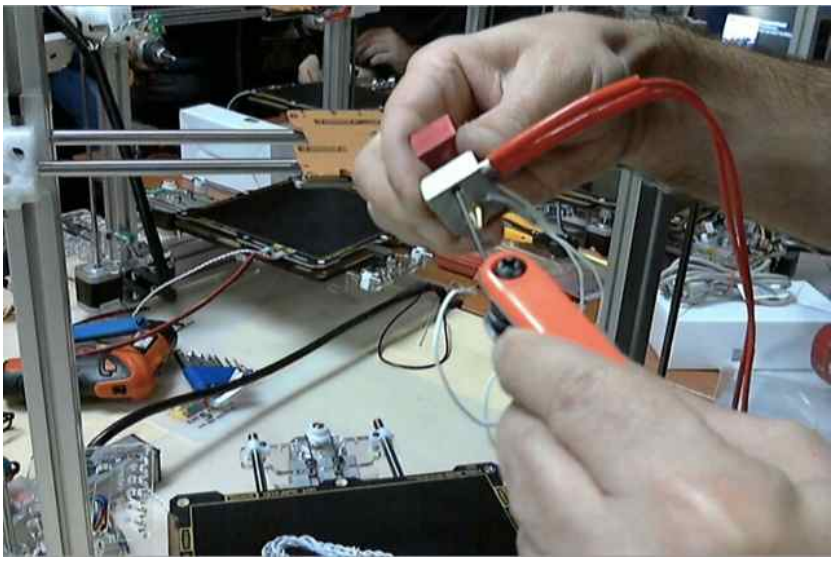




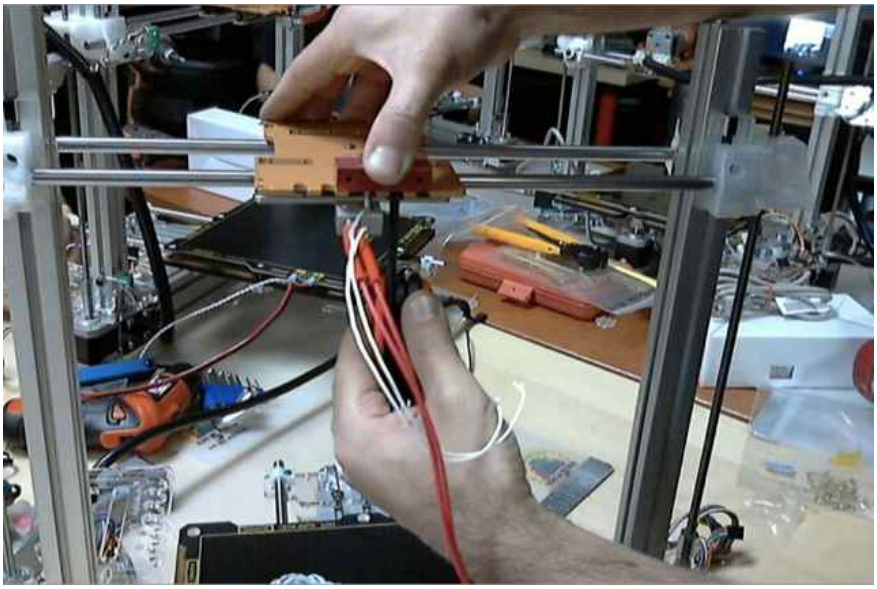


11.Assemble the extruder(s).

Open the nozzle kit. Take out the nozzle and the heater cartridge (thick wires with connector). Insert the cartridge into the nozzle assembly and then screw that onto the heater block to pin the heater into place. Screw down firmly.

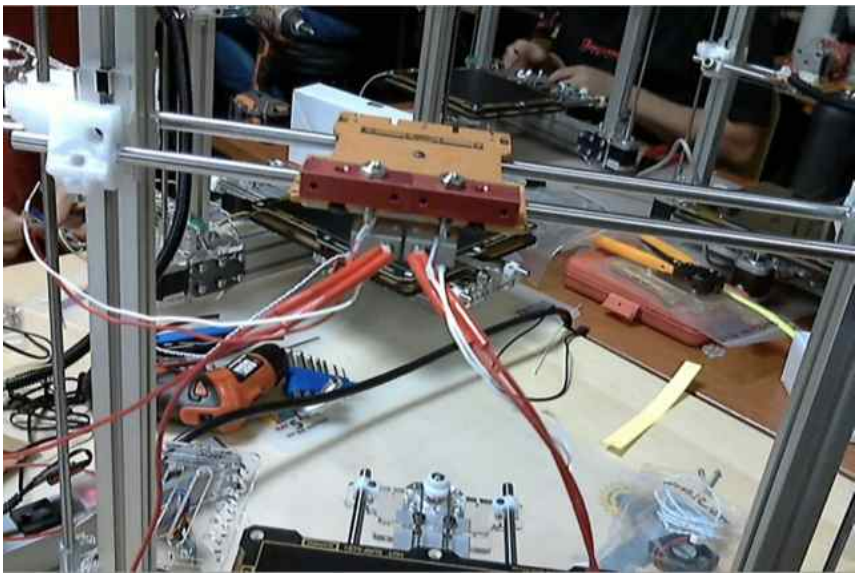


Note: for a single extruder, place the extruder centered in the x direction. If you have a dual extruder, one cartridge will be on either side of the centerline of the plate. In either case be sure the thermistor cables come out of the front and are not pinned under the carriage.

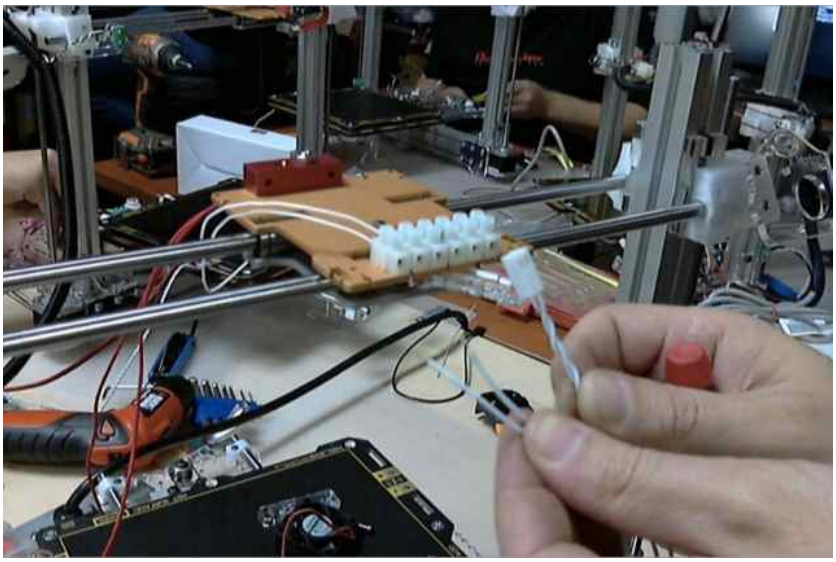


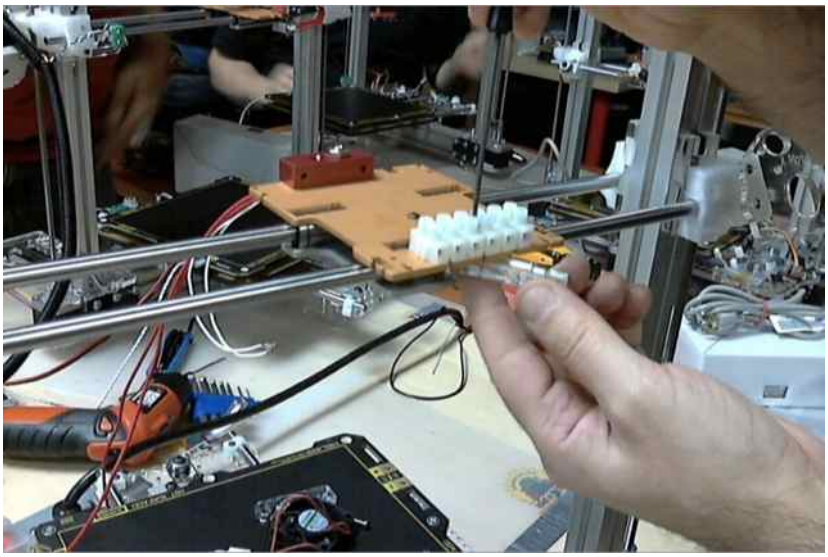
Open the extruder connection kit.

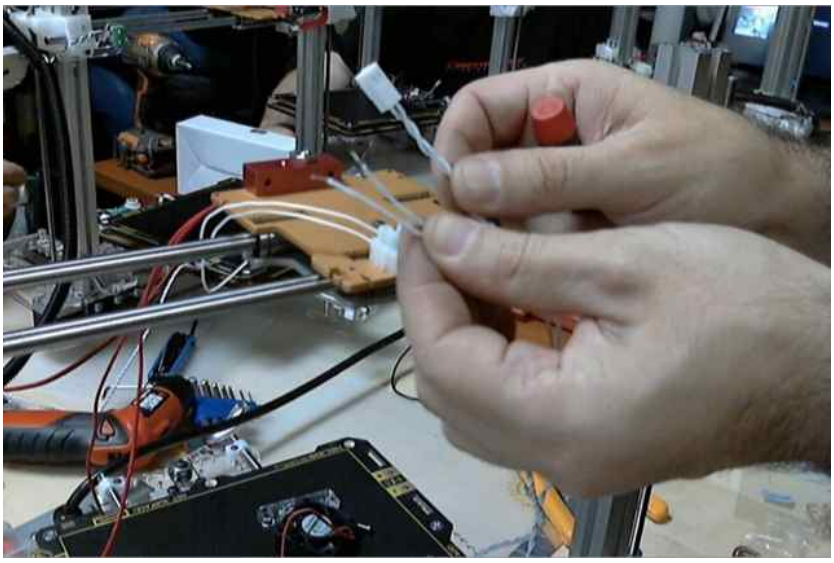
Take the terminal connection block (plastic piece) and screw it on the top plate on the side away from the extruder. Run the thermistor wires from the extruder into two slots and screw them down. The wires have no polarity and the order does not matter.

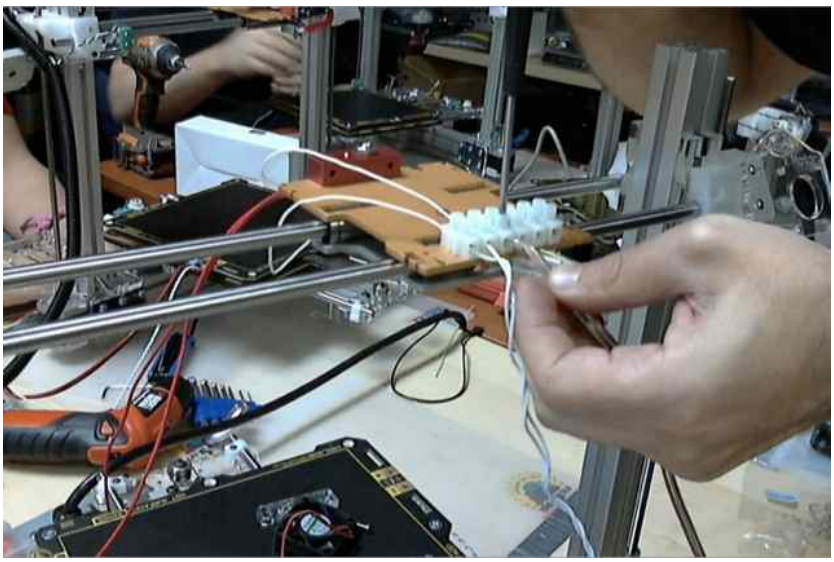


Take the wire with two pin connector (long thin wires) and strip the end away from the connector if they were not already stripped. Normally this wire is twisted. (Do NOT cut off the connector though!)





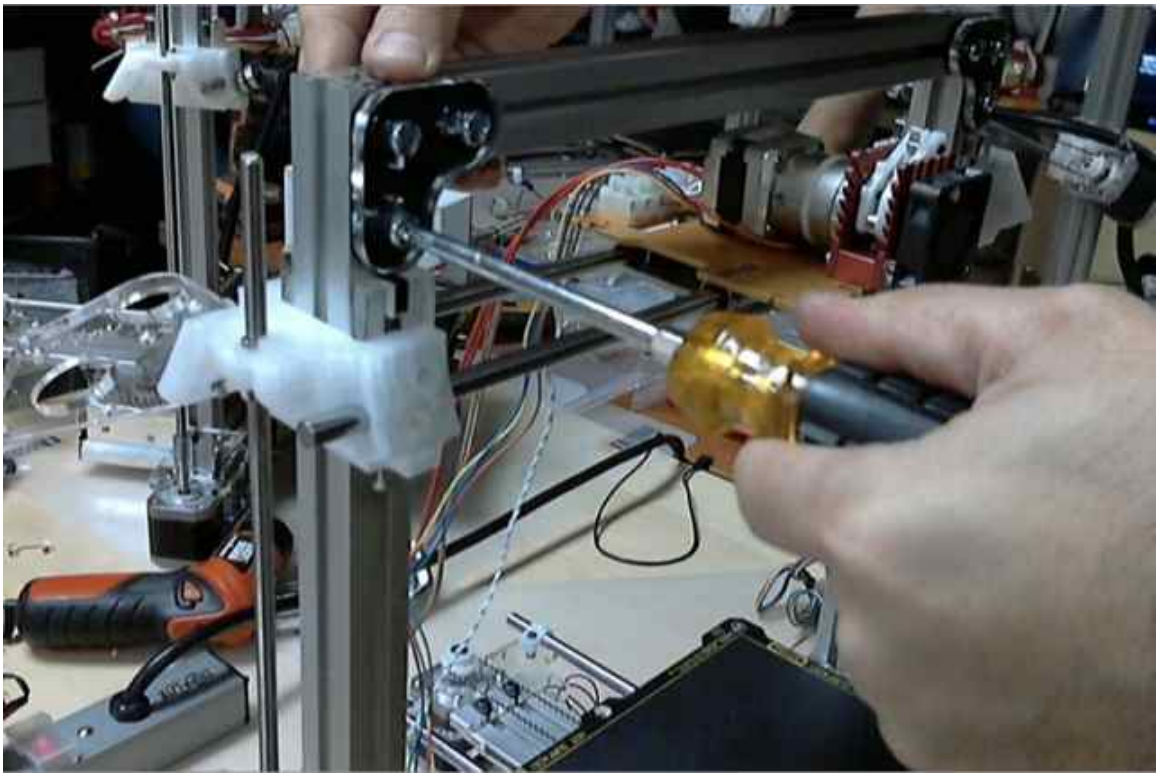




Take the 22 gauge wire from the extruder connection kit (for fan power.) Strip one end. Note that this wire has a polarity- red is positive, black is negative.

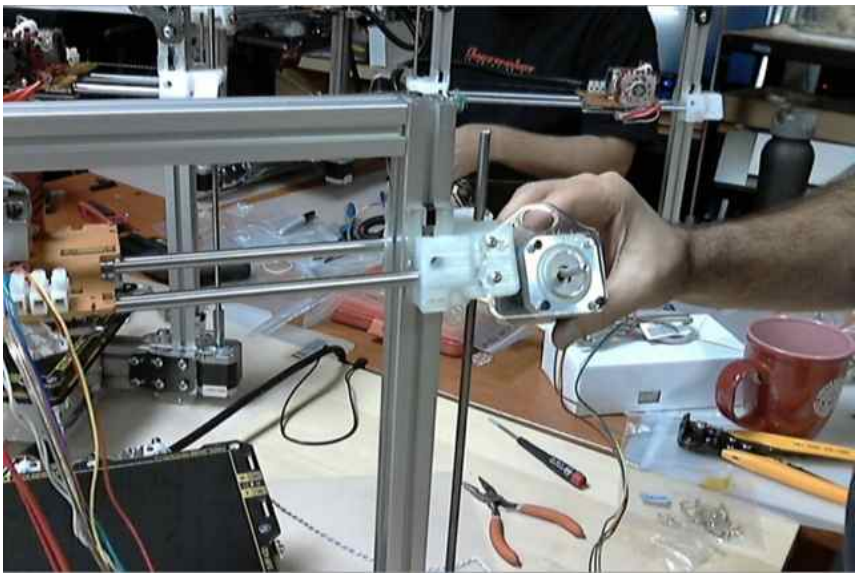
(see pictures for placement of extruder on platform- also see wiring schematic.) Thermistor and fan power run through the block. The rest run directly to the board.

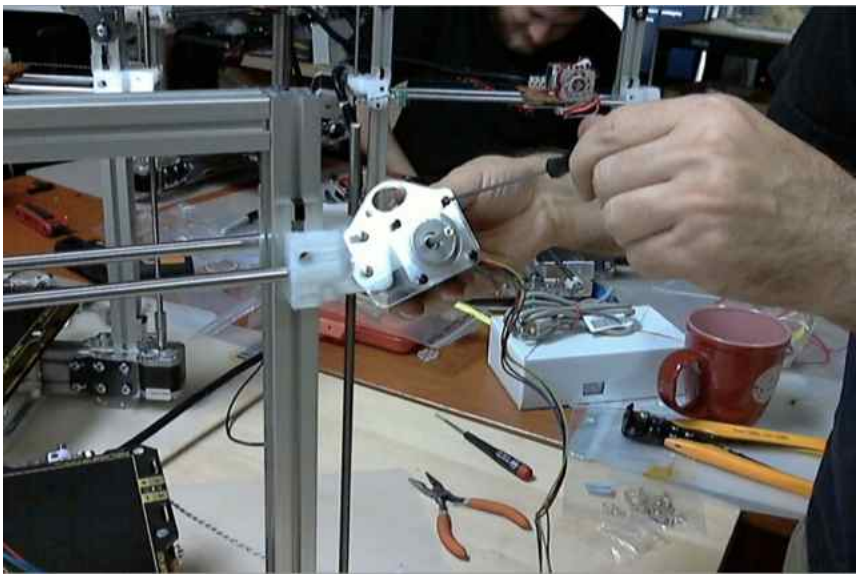
Add top beam- you might have to lower the carriage by twisting the casing. Be sure that the top is flush and there is no gap between sides and top. Tighten down the brackets.



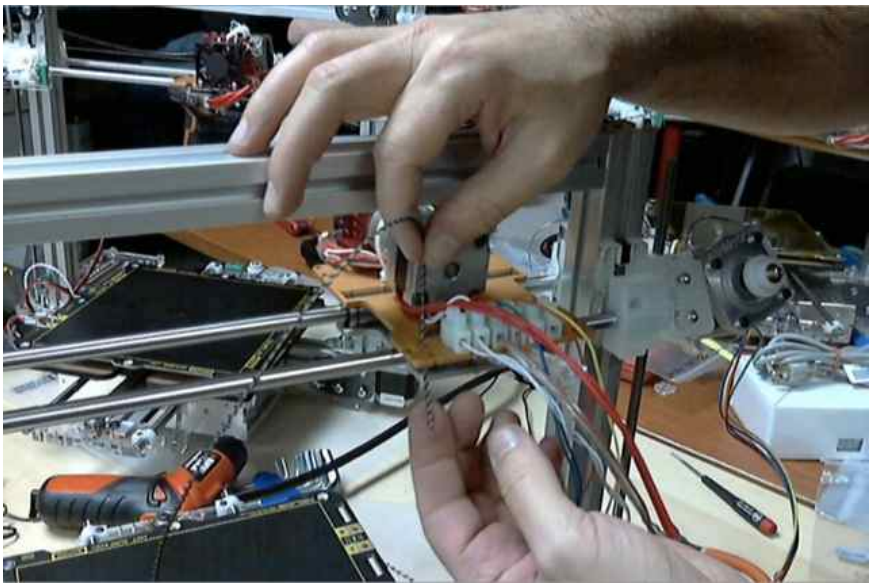
Install X synchromesh and pulley.

Get the X motor. Put X motor in acrylic holder with screws from X end motor mount kit. Tighten the motor mount into place skewed upwards for now, with wires pointed upward for cable management. Put pulley on shaft.

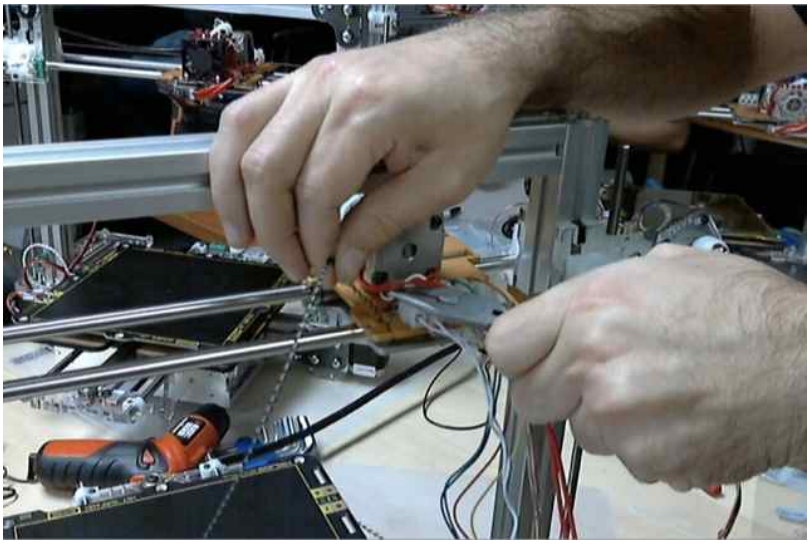




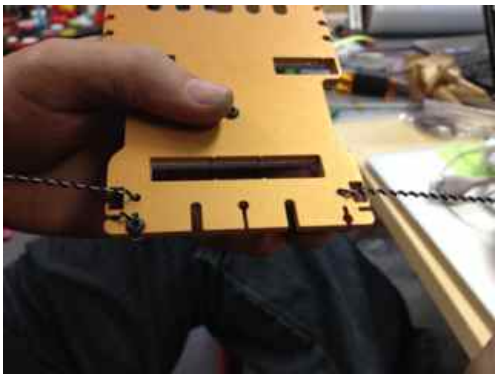
Thread synchromesh through holes in x carriage and crimp down end with screws from synchromesh kit. Thread around pulleys and drive, and then connect back on platform with screw. Check that it is in tension (but not tight.)



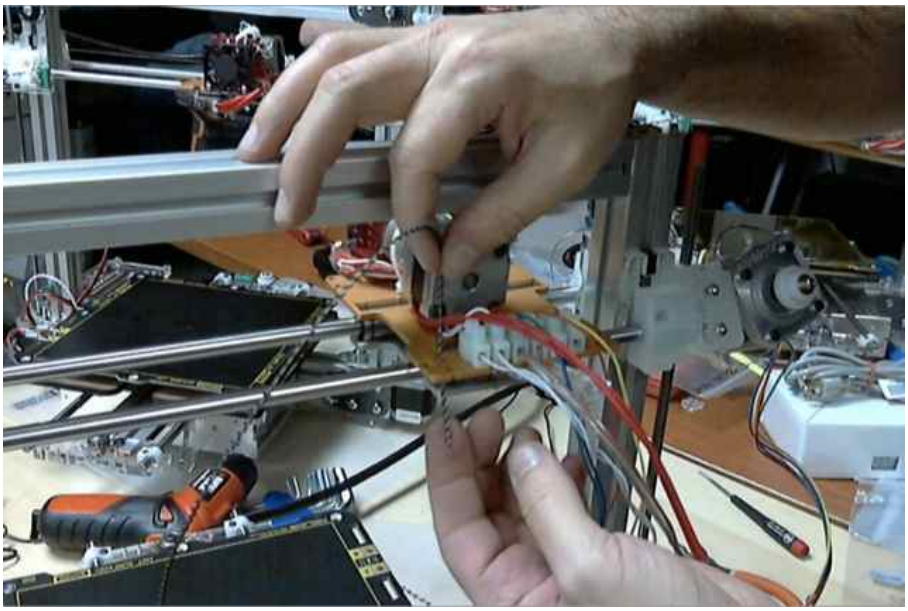
When that is done loosen the motor holder and swing down which should add some tension. If it's too much loosen slightly by loosening tiedown screw. Cut off excess once tension is correct. Note that we are doing this operation from the back side.



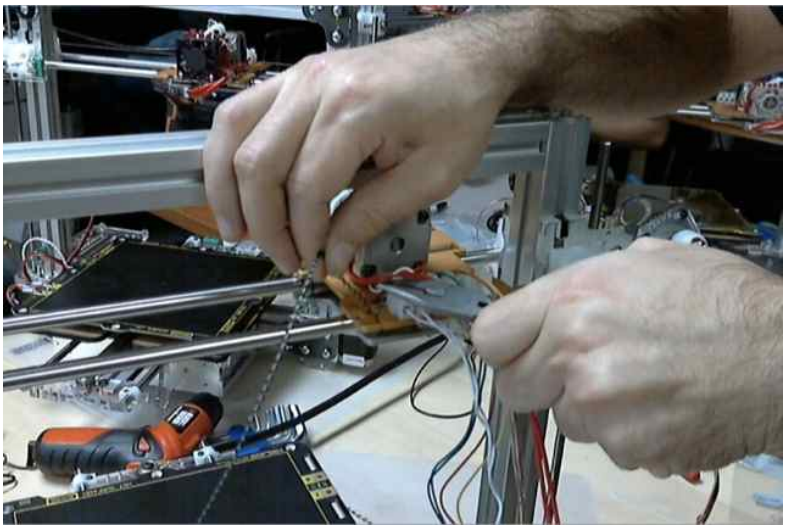
The following is a sequence with just the plate for clarity (just showing the plate alone so the synchromesh is visible):

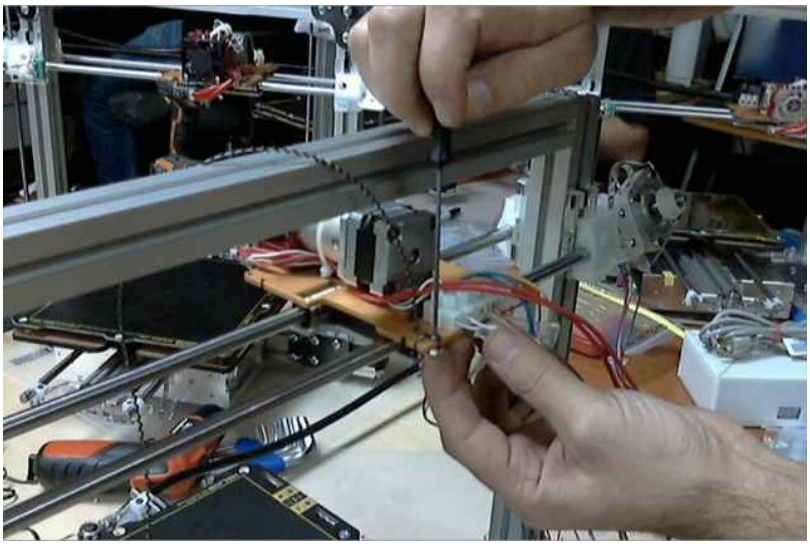


Now returning to the overall assembly sequence pictures:

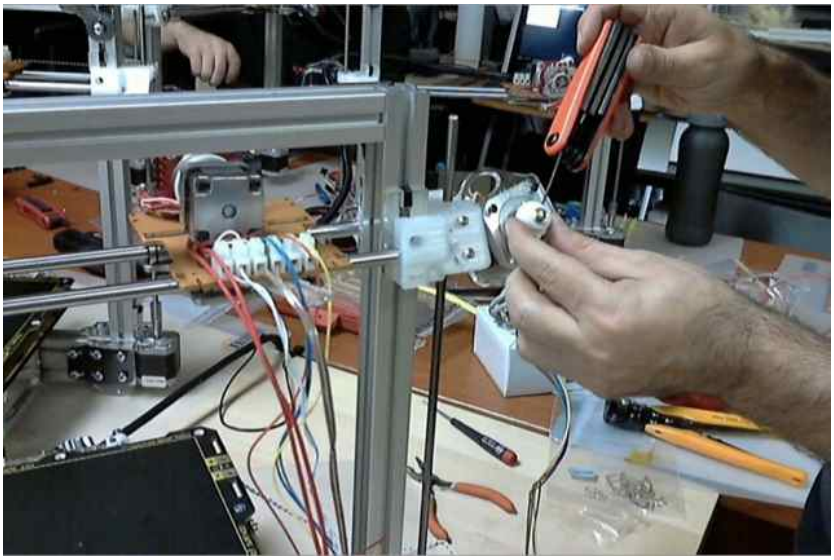


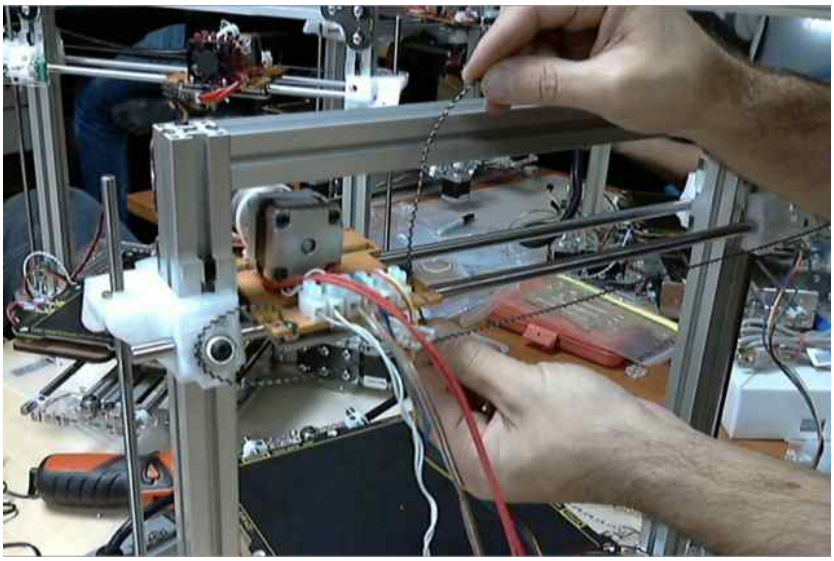
Run wire bundle through hole in motor carriage and put on cable cover. Zip-tie cover in place. Make sure that the carriage can move end to end. Zip tie when the carriage is at its furthest extend of travel so that the cables do not bind. (See photo sequence below.)

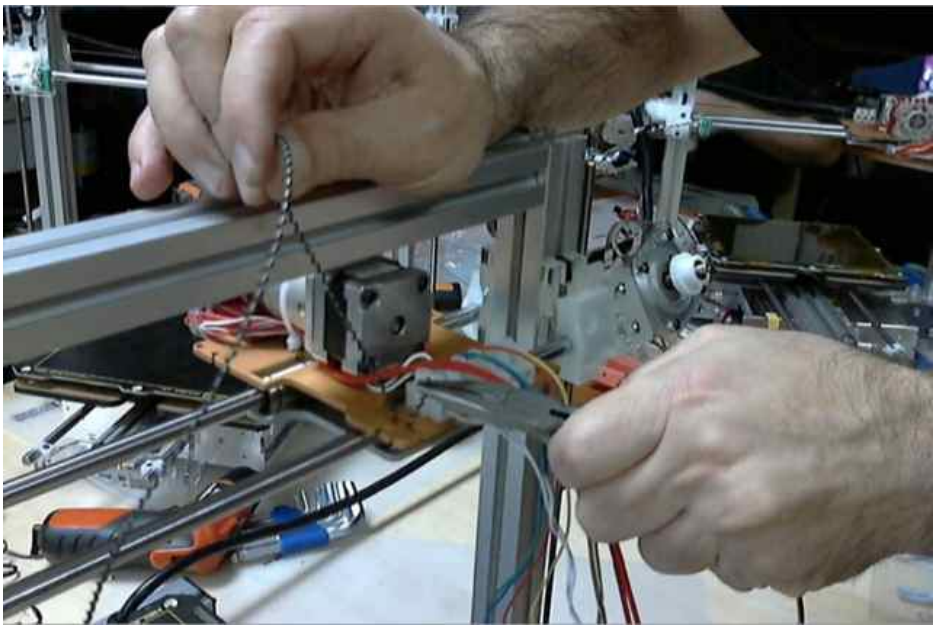


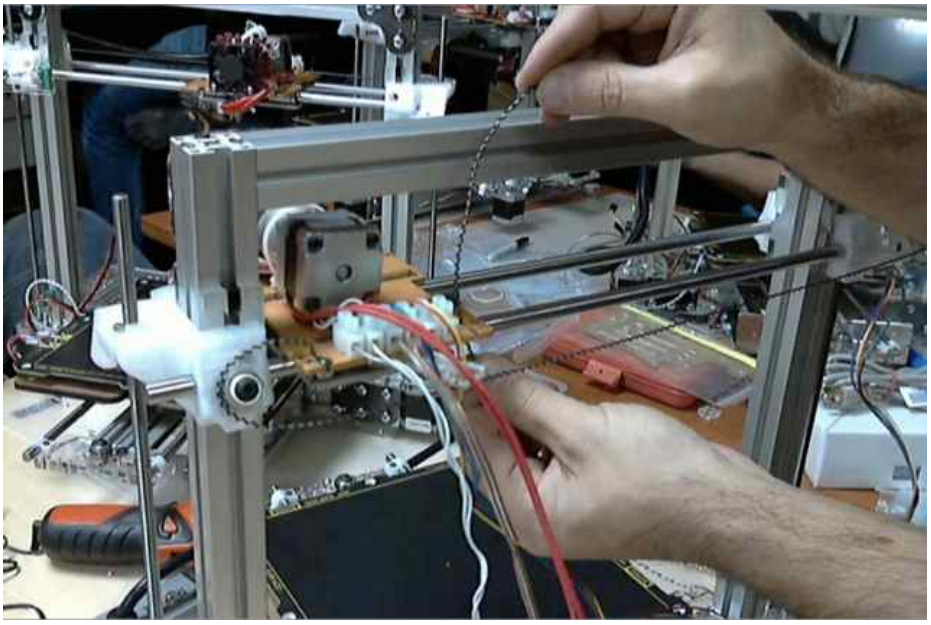


Now set the syncromesh drive pulley on the motor.

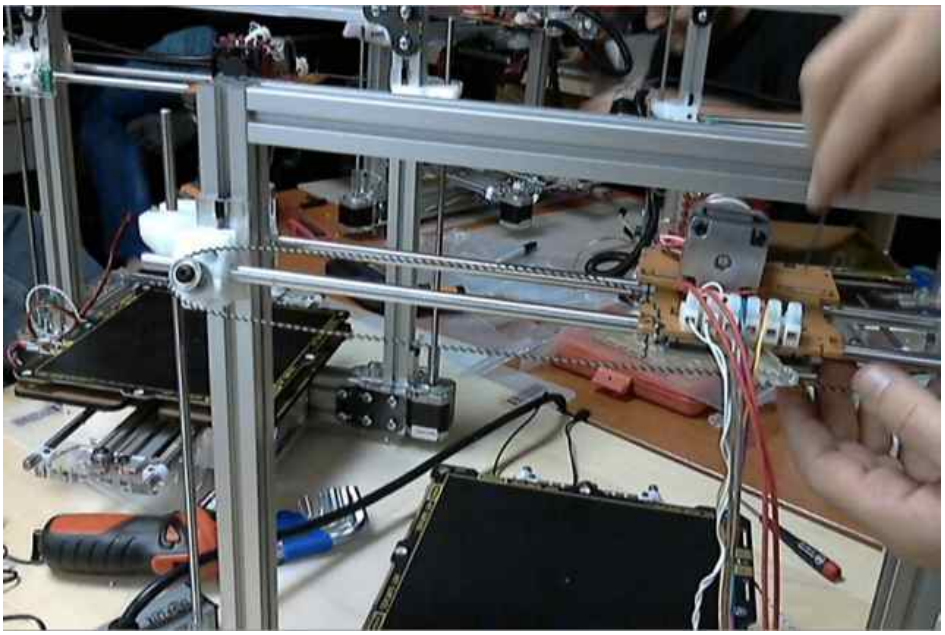


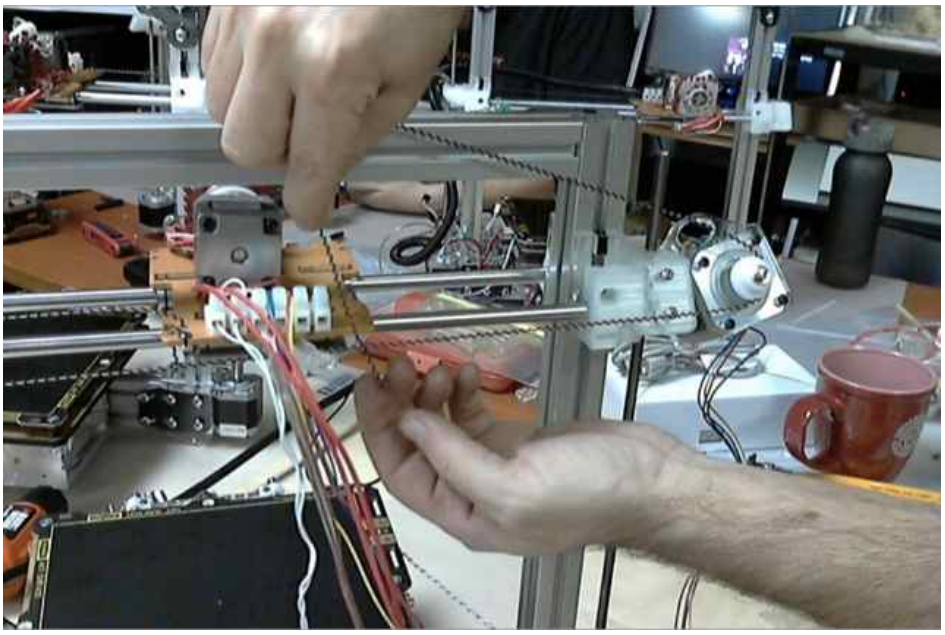


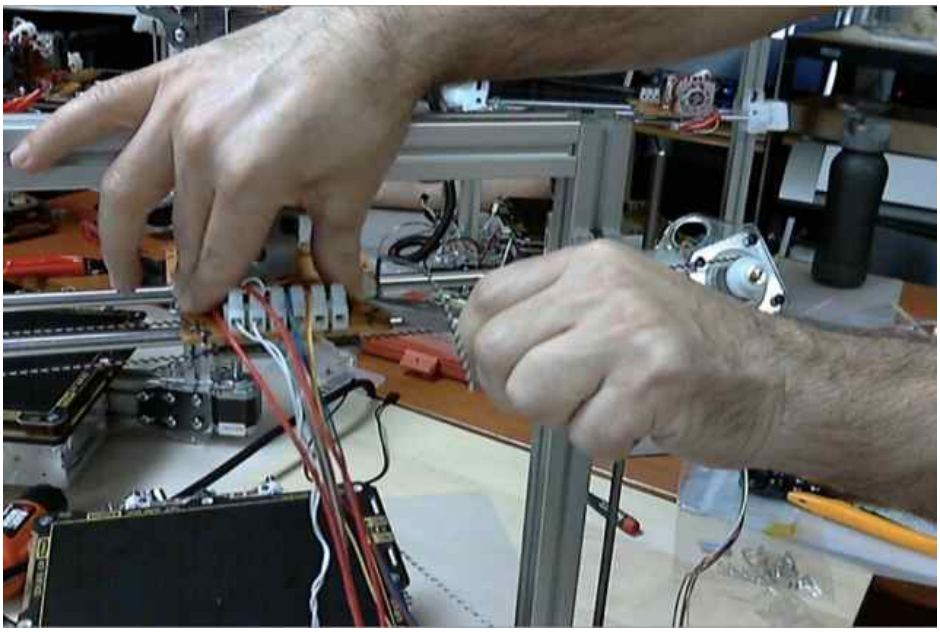


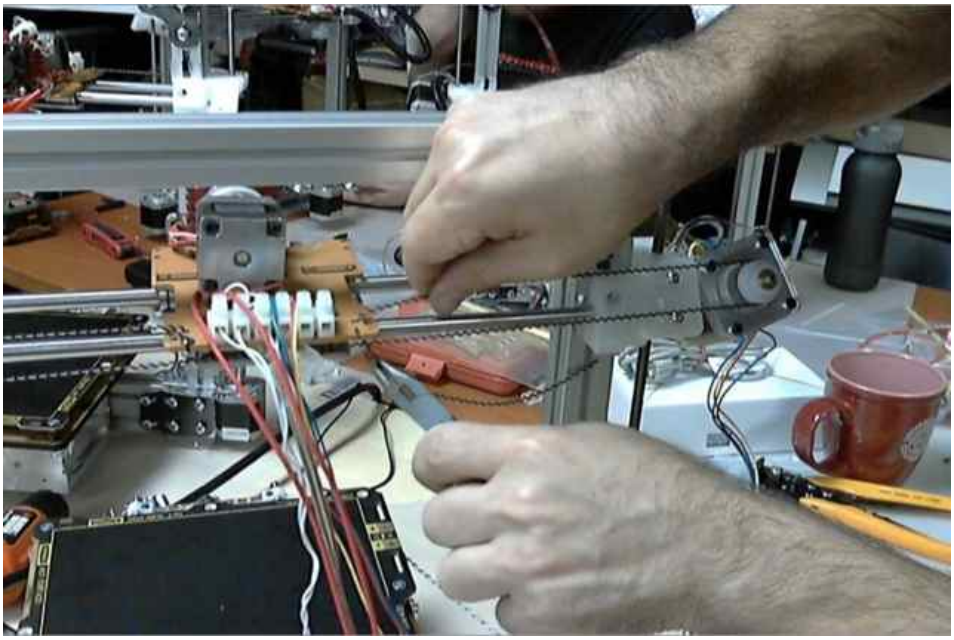


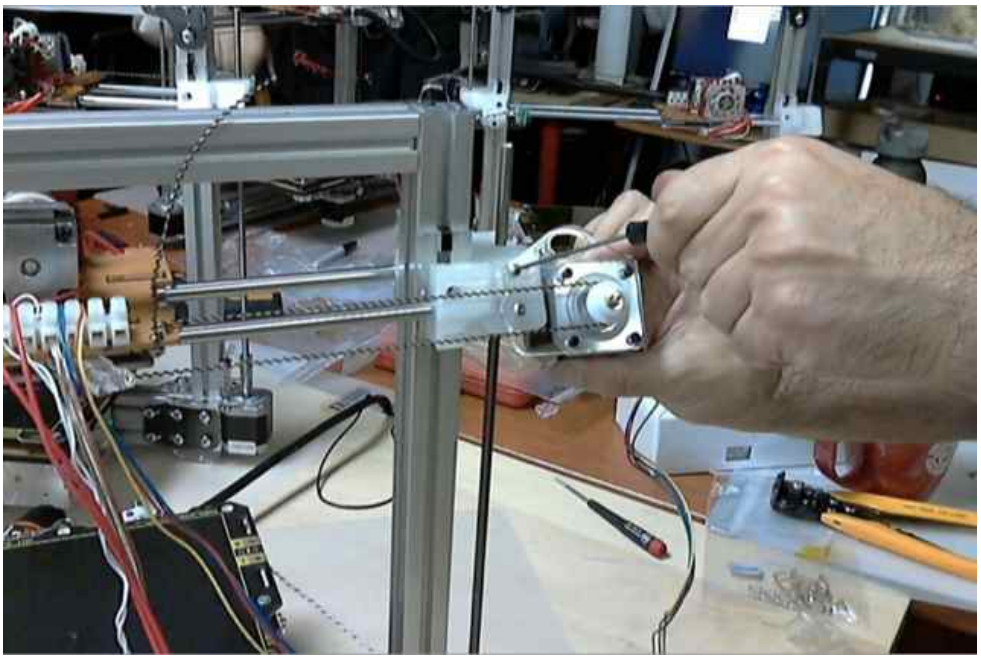
The final threading is from top to bottom.

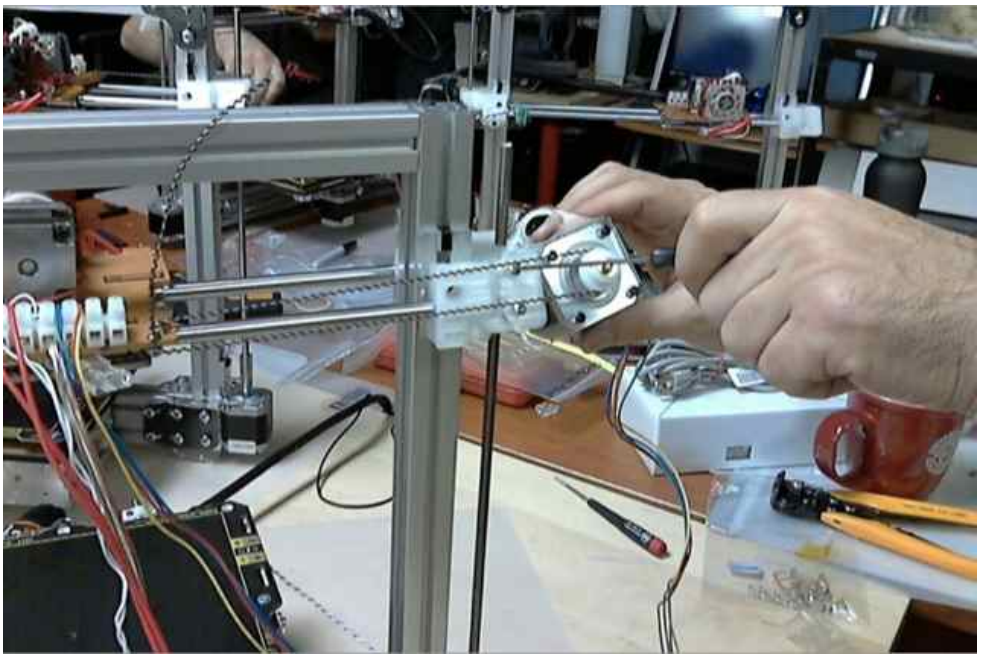


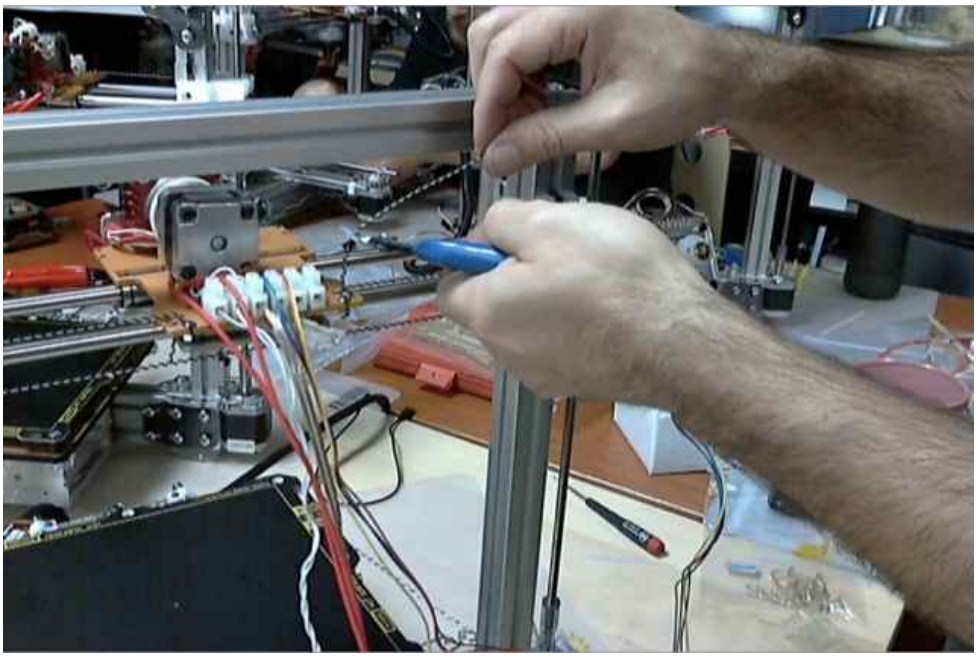




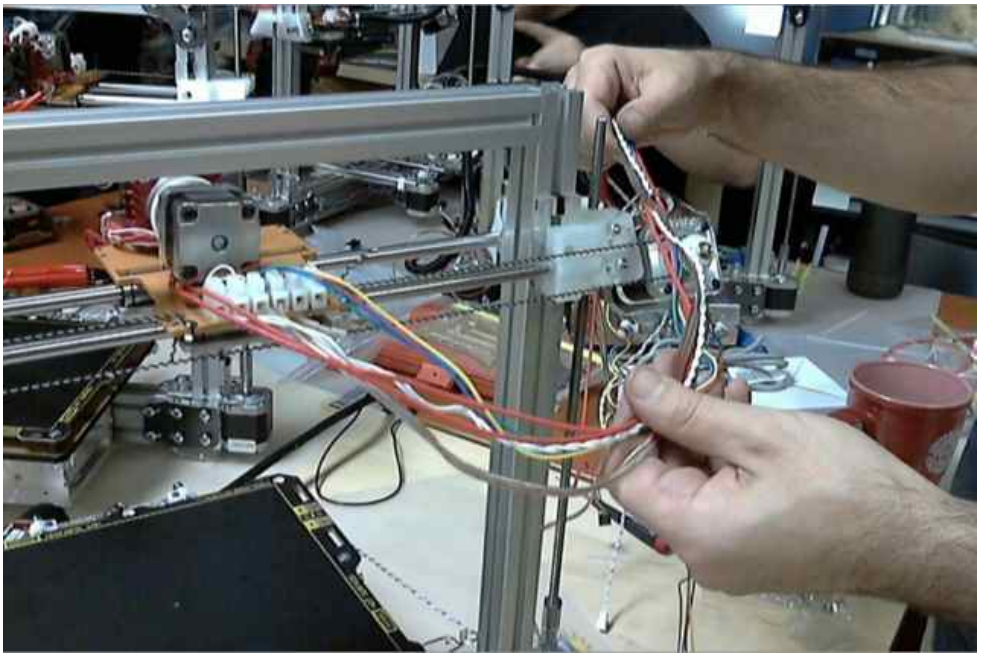


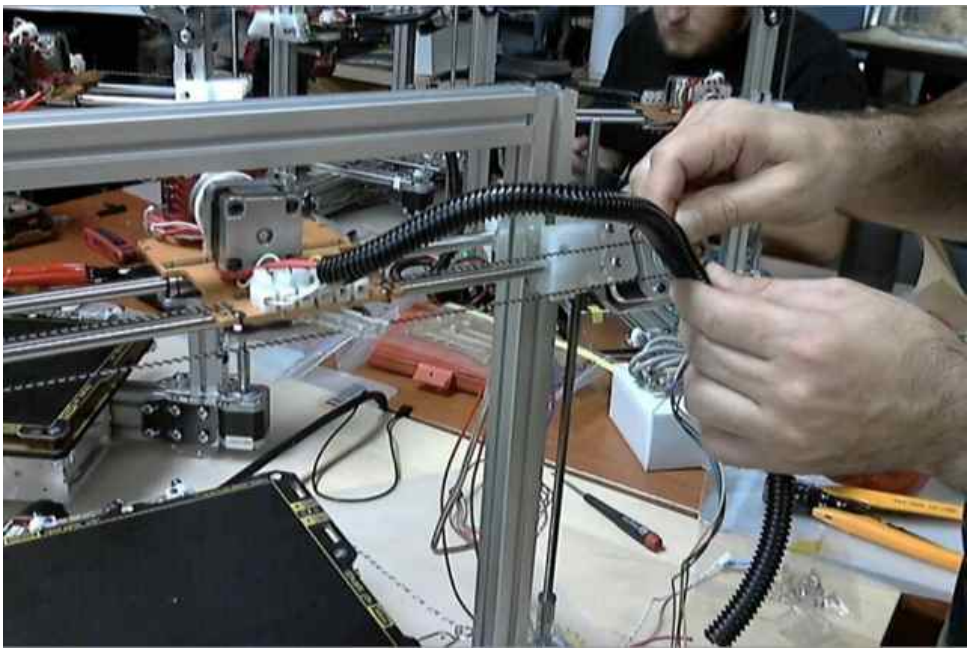


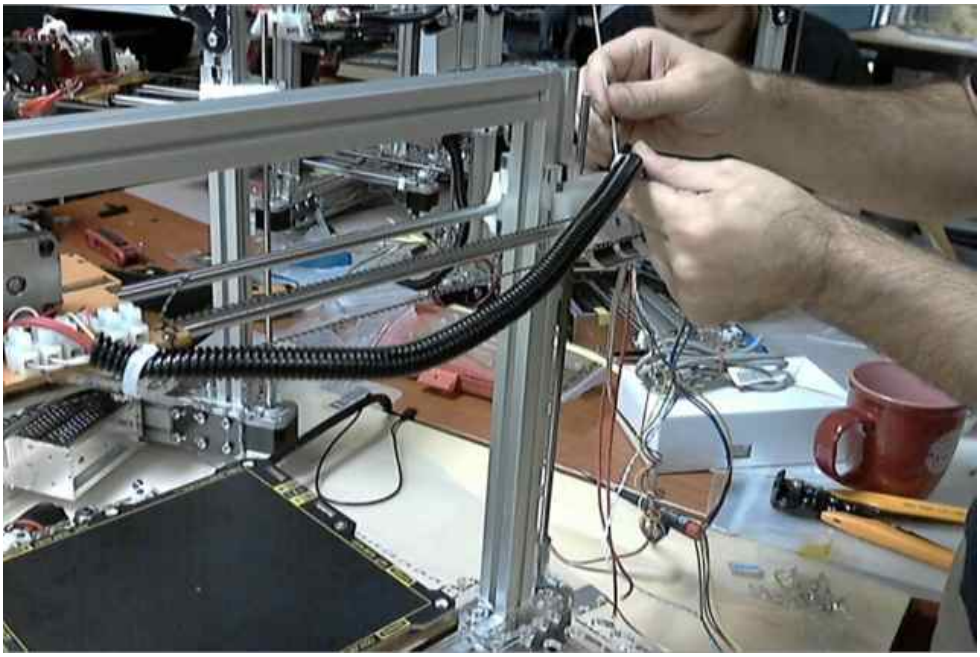




Now we will do final cable management. Put the cable into the cover.



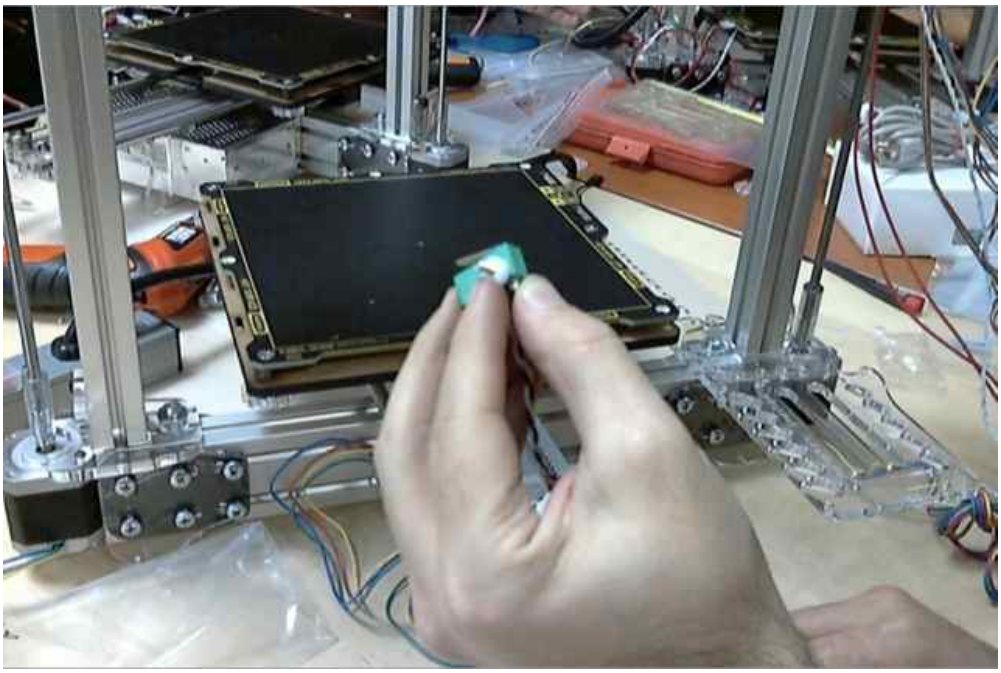


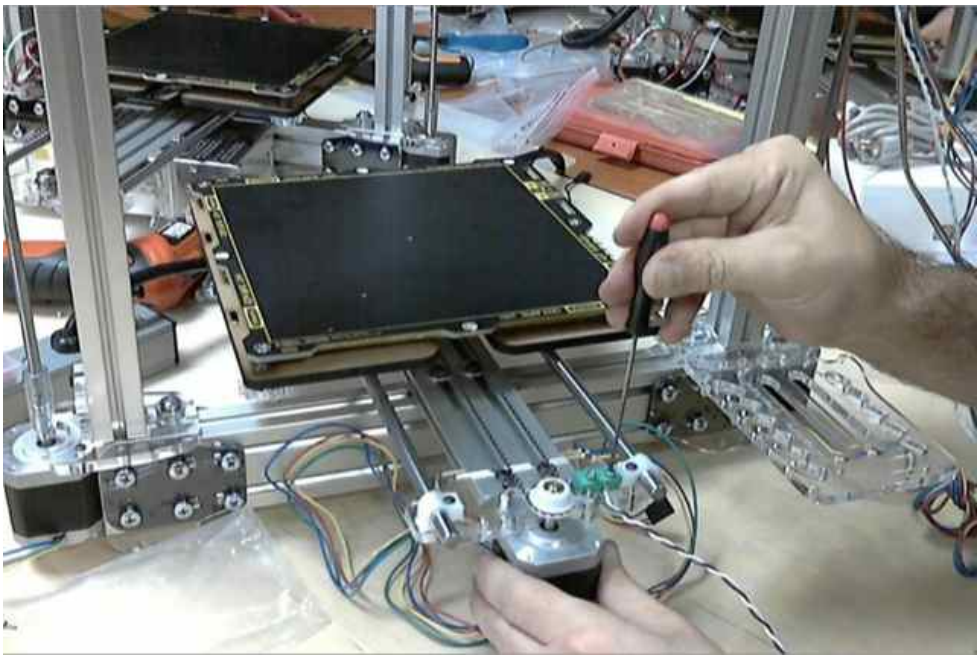


12.Place end stops.

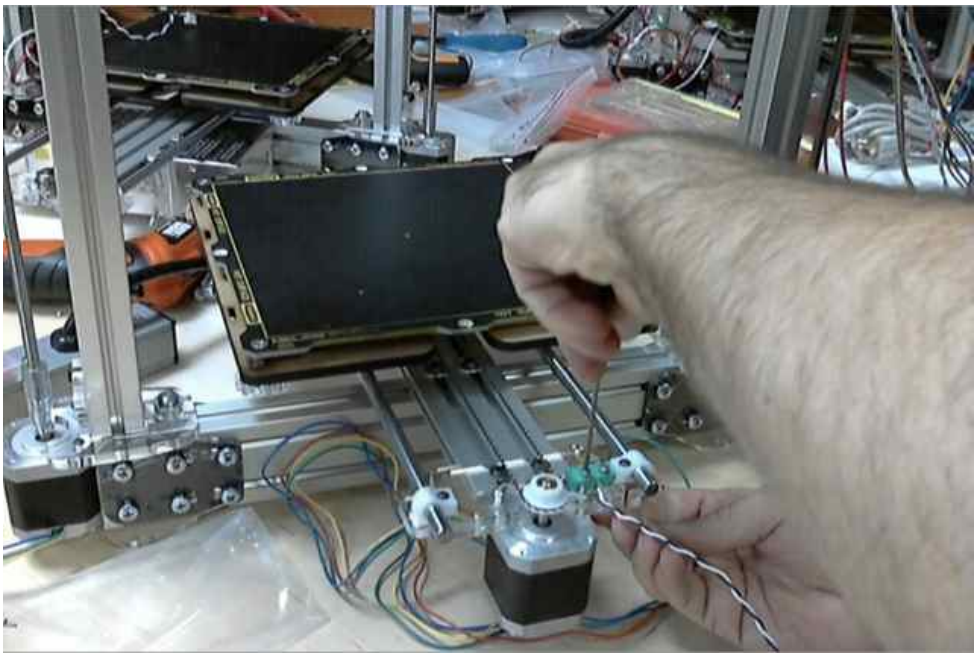
Open the end stops kit.

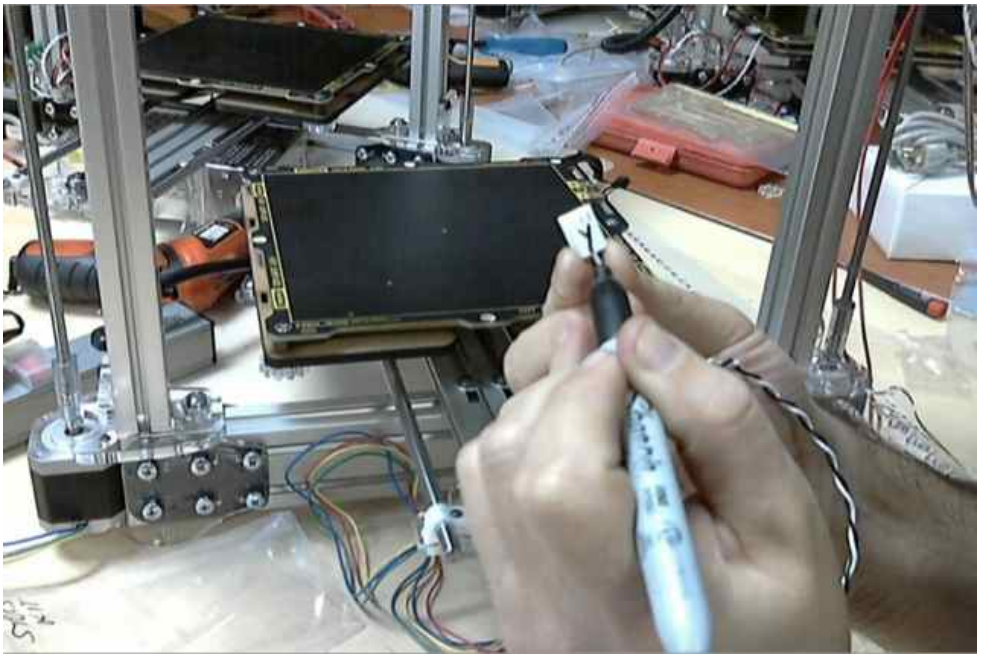
Take one end stop (small switch) and put it on the motor end of the y axis.



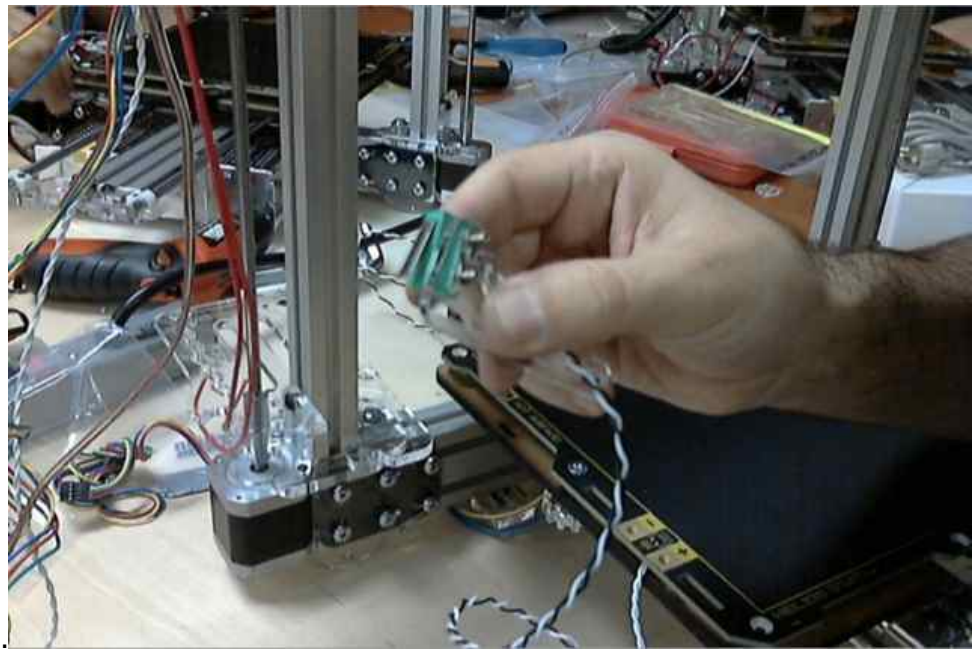


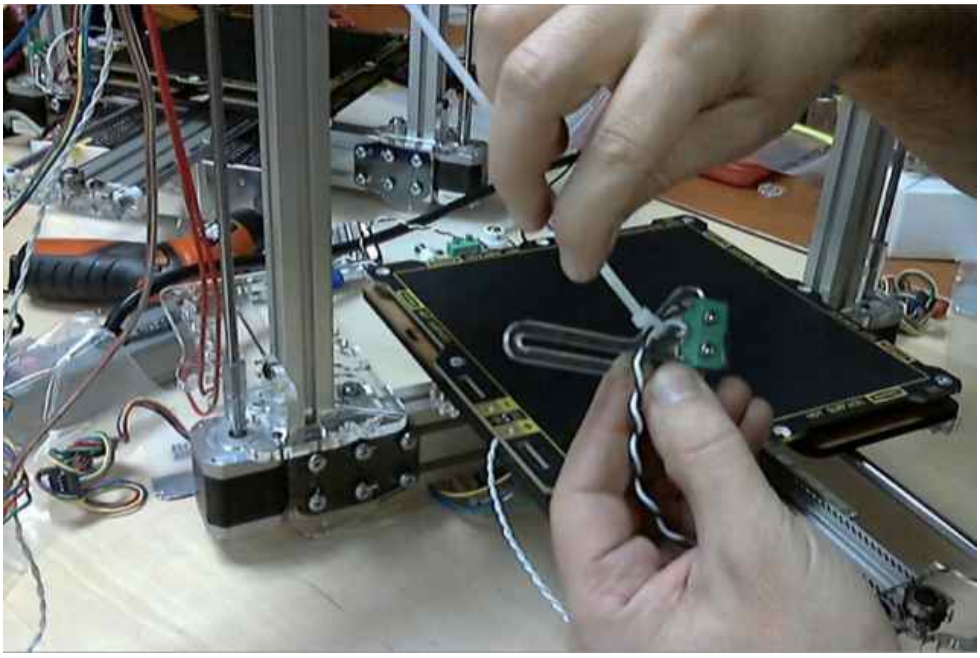
Assemble the screw and spacer. Screw down the end stop. This end stop should be triggered by the screw on the wooden platform support. Label the connector so that you can remember which connector goes where (this is the Y end stop.)

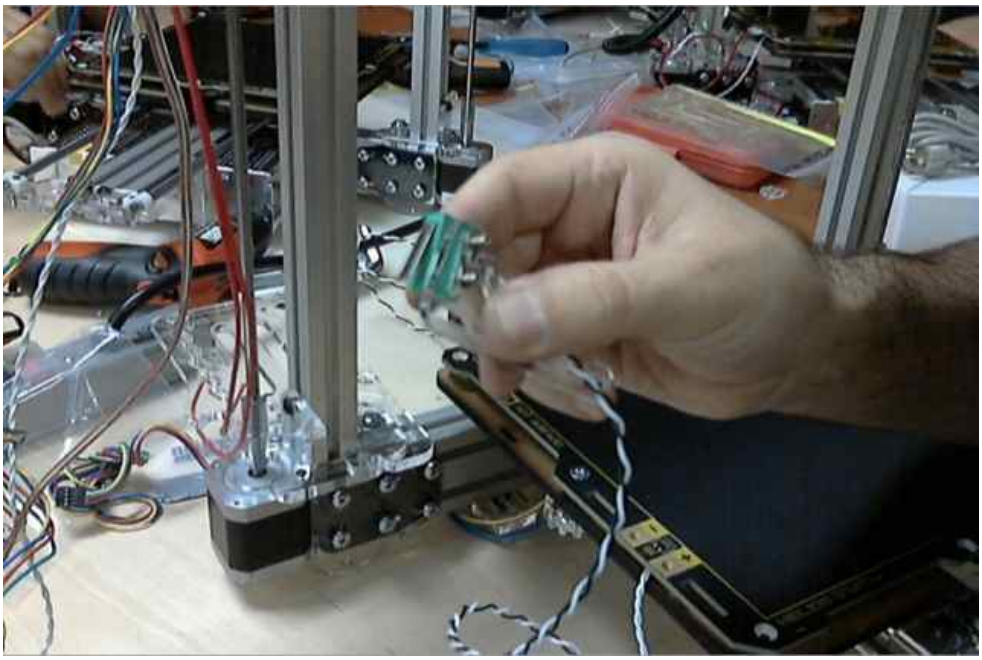


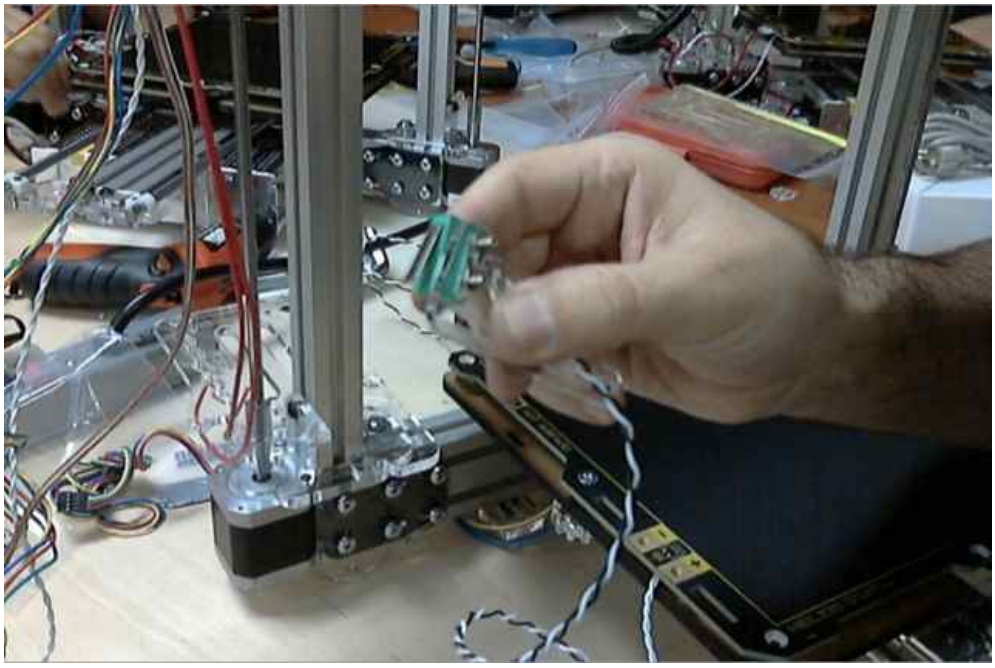


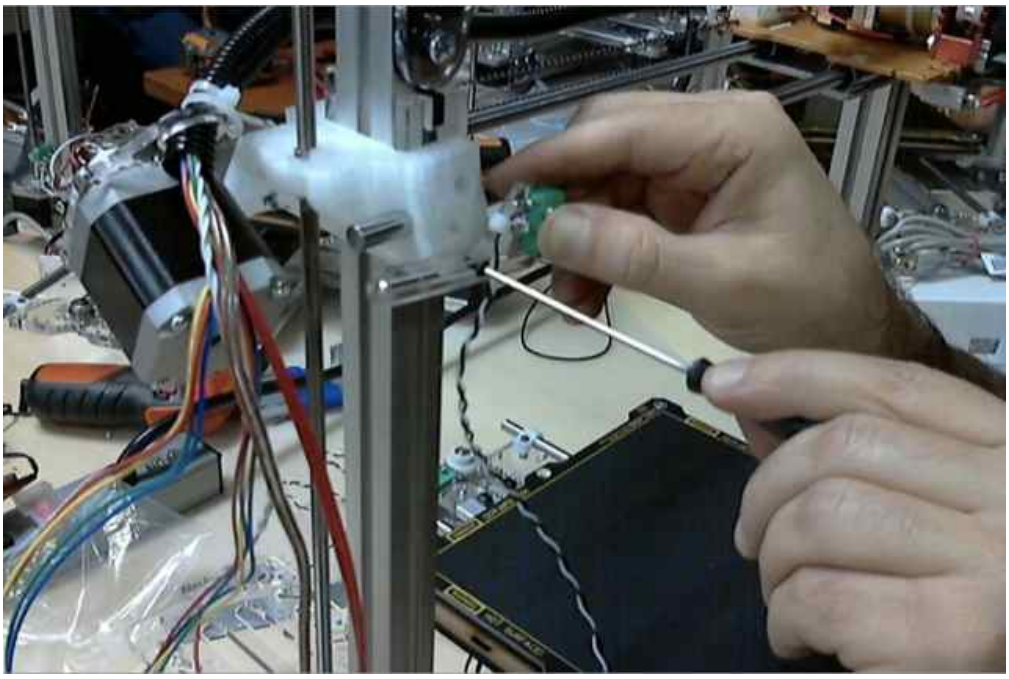
Next assemble the X end stop. This one adds a plastic clip. Zip tie the plastic clip on. Attach it to the motor end of the x axis. Make sure it is as high as possible so that the platform triggers the stop. If it doesn't work you can try installing it upside down. Be sure to label this one too.

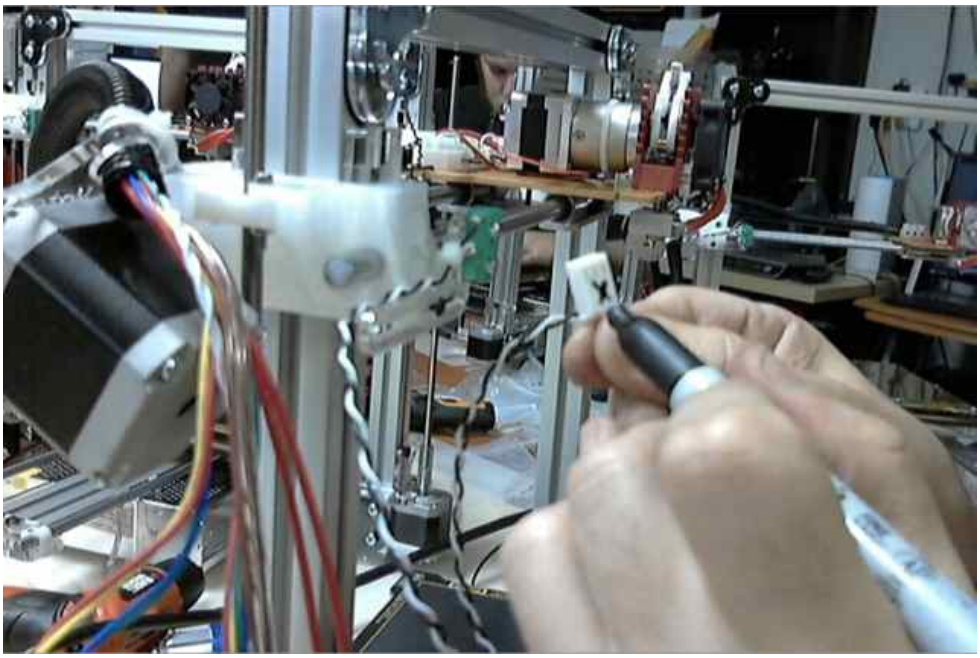




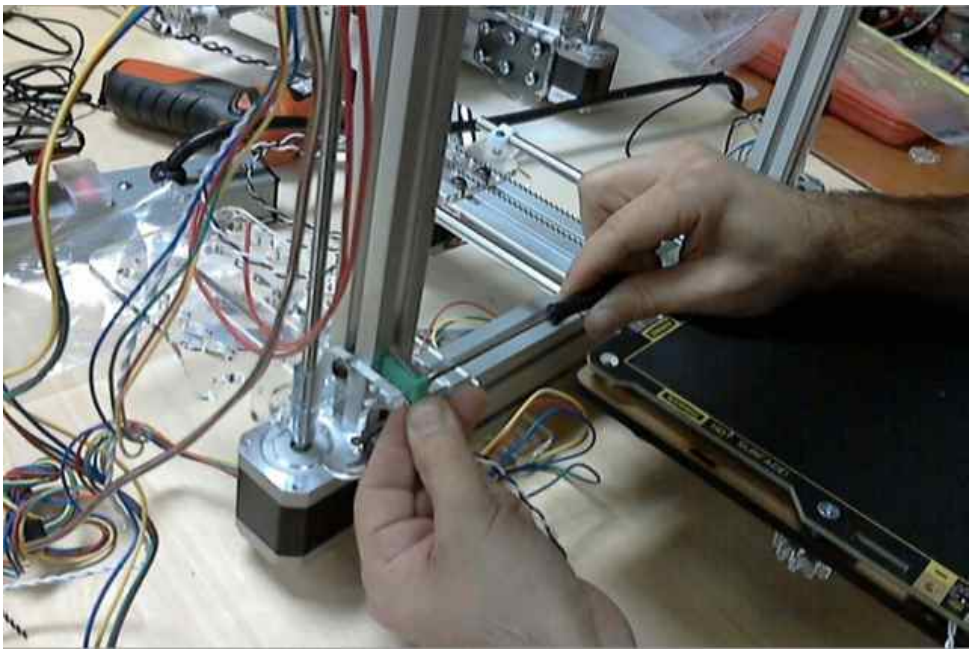


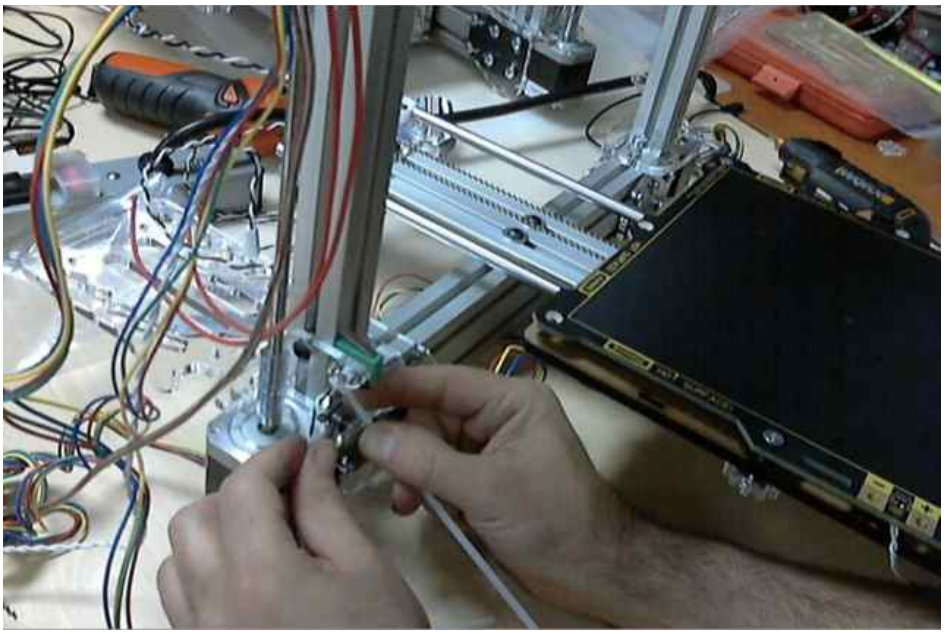


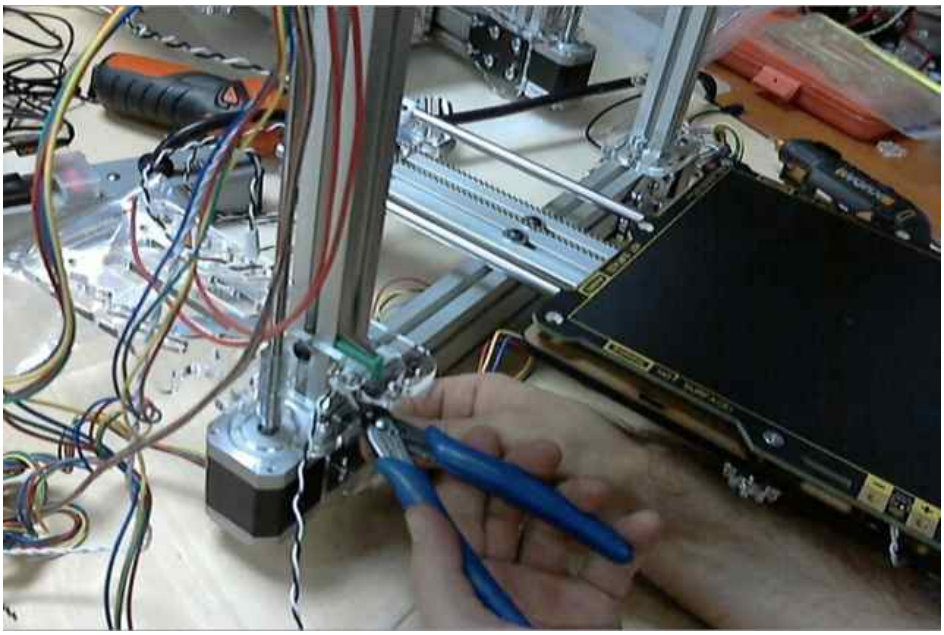


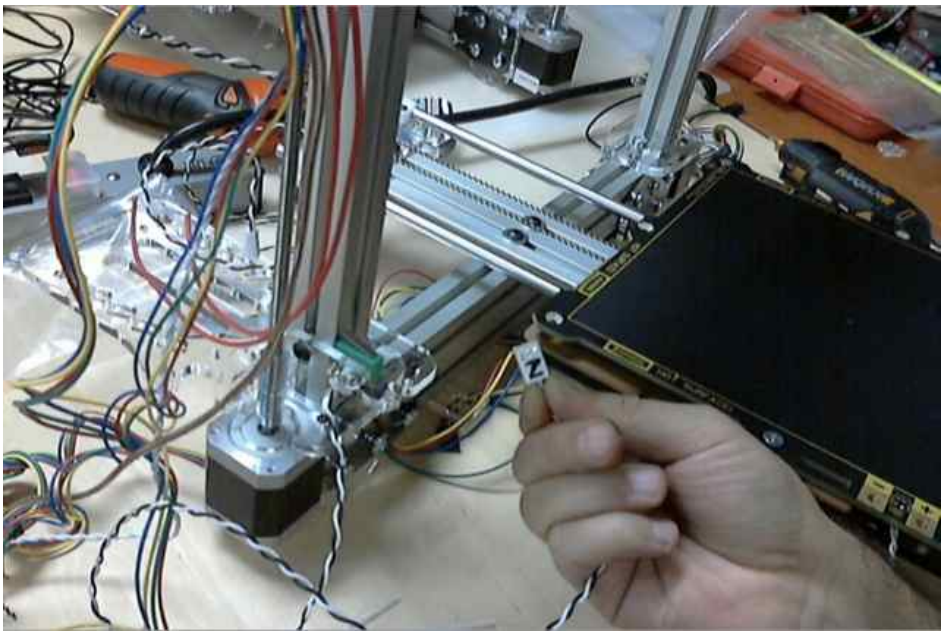


Now assemble the z axis stop. It will attach to the Z motor vertical support. Screw in and fasten with nuts. Be sure this stop is stiff and well-mounted since if it is not your first layer may have issues. Cable tie it down through the slot. The zip tie protects the wires. Label the Z axis stop.









You will also need to cover the glass platform cover with Kapton tape (yellowish clear tape) and tape the glass down on top of the platform assembly.

Congratulations! You have now finished mechanical assembly of your Bukobot. See the wiring diagram to finish up the attachment of the electrical cabling and power supply.