



Assembling the Printrbot Play Kit (Model 1505)

Written By: Printrbot Support

TOOLS:

- [#1 Phillips Head Screwdriver](#) (1)
- [Zip tie gun](#) (1)
- [Blue Threadlocker](#) (1)
- [Micro Cutters](#) (1)
- [Needle nosed pliers](#) (1)
- [Rubber Mallet](#) (1)

Step 1 — What's in the box

- Congratulations on receiving your new Printrbot Play kit! Before beginning the build, look over the checklist of materials and tools to make the experience as hassle free as possible.
- **Tools** - Take a look at the top of this guide for a list of tools needed for the build. We have included some, but you will need to supply a couple of your own as well.
- **BOM** - Review the Bill of Materials and check it against what you received in your package. If anything is missing, please contact us at Printrbot.com/Support
- **Docs** - If you are having a hard time with any of the example photos in the steps, you may prefer the exploded view docs attached to the top of this guide. There are also some great files/downloads/videos at Printrbot.com/project/play
- **Vids** - If you would prefer to follow a build video, [click here](#) for a series of build videos contributed by [Warrior Poet Training](#).

Step 2 — Installing Y Axis Bearings



- Place the 8mm linear bearings (x3) into the bearing slot cutouts on top of base.
- Insert Delrin bearing clamps (x3). Insert the two pointed ends of the clamps through the base then rotate the clamps to capture the bearings.
- Fasten bearings with M3 8mm (x6) - Two screws per clamp.

⚠️ Maker to Play Upgrade Users: Before disassembling your existing bot, be sure that you have printed the parts that you will need for this build. [CLICK HERE](#) for printable files.

Step 3 — Assembling Y Axis Idler Pulley



- Press one 624 bearing into a delrin pulley half. Then, repeat this step to make a second pressed bearing/pulley.
- Insert an M4 22mm screw through the 624 bearing/delrin pulley assembly.
- Add 1/8" nylon spacer to the screw, and then the second bearing/pulley.
- NOTE: The thinner sides of the delrin pulleys should be facing inward, towards each other in the stack and the 1/8" nylon spacer should not be visible once this stack has been assembled.

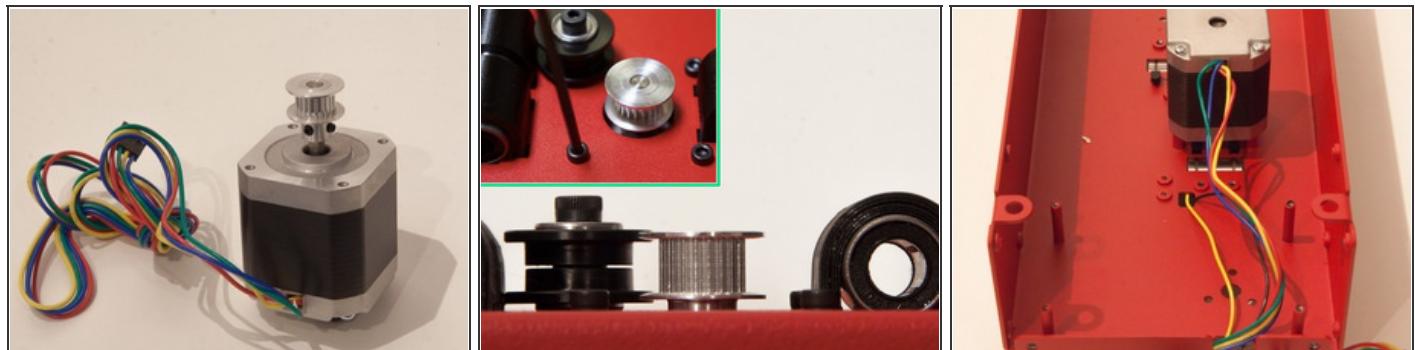
Step 4 — Installing Y Axis Idler Pulley



- Screw your assembled M4 22mm/bearing/pulley stack into the base with a 3mm Allen hex key.
- Use your 1.5mm Allen hex key to attach the end stop with the short wires to the base with M2 10mm screws (x2). The metal switch of the end stop should be oriented to the outside of the base, away from the bearing.
- **NOTE:** Be sure to use the end stop with the shortest wires.

(i) TIP: *This will be your "Y axis end stop" It is a good idea to mark the white plastic connector on with a "Y". This will make things easier when it is time to wire the Printrboard.*

Step 5 — Installing Y Axis Motor / Pulley



- Pick any motor and attach a GT2 pulley to the motor shaft with M3 set screws (x2). Be sure that one of the set screws threads down on to the flat side of the motor shaft. Note that the GT2 pulley is oriented with the flanges away from the body of the motor.
- Adjust the height of the GT2 pulley on motor to align with the delrin pulley/bearing stack assembled earlier.
- Once you have found the correct GT2 pulley alignment, use Threadlocker to secure the set screws on to the motor shaft.
- Face the motor wire leads toward the Y axis end stop.
- Attach the motor to the base with M3 16mm screws (x3).

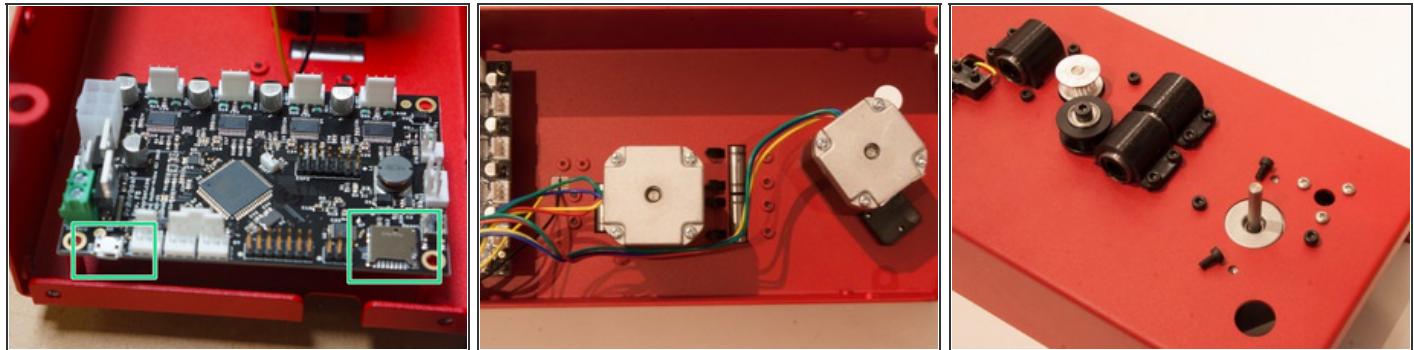
(i) TIP: This will be your "Y axis motor". Take a moment to label the plastic connector on this motor with a "Y".

Step 6 — Installing Z Axis Bar End Supports



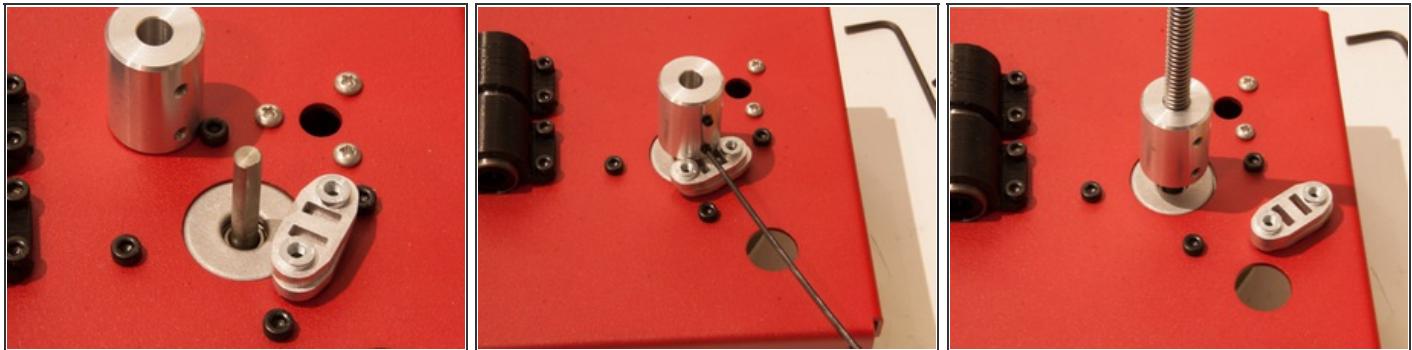
- Find two of the Delrin Z rod supports and #4-20 3/8" plastite screws (x6).
- i TIP:** To identify the "plastite screws", ignore the screw head type and focus on the thread type. The plastite screw threading is wider and more angled.
- Install the Z axis bar ends (x2) onto both sides of the base with #4-20 3/8" plastite screws (x3 each).

Step 7 — Installing Z Axis Motor



- Mount your Printhead with M3 6mm screws (x4). Make sure the USB and SD Card slots are facing towards the opening.
 - Attach a motor with wire leads facing board using M3 6mm screws (x4).
- i TIP:** This will be your "Z axis motor". Take a moment to label the plastic connector on this motor with a "Z".

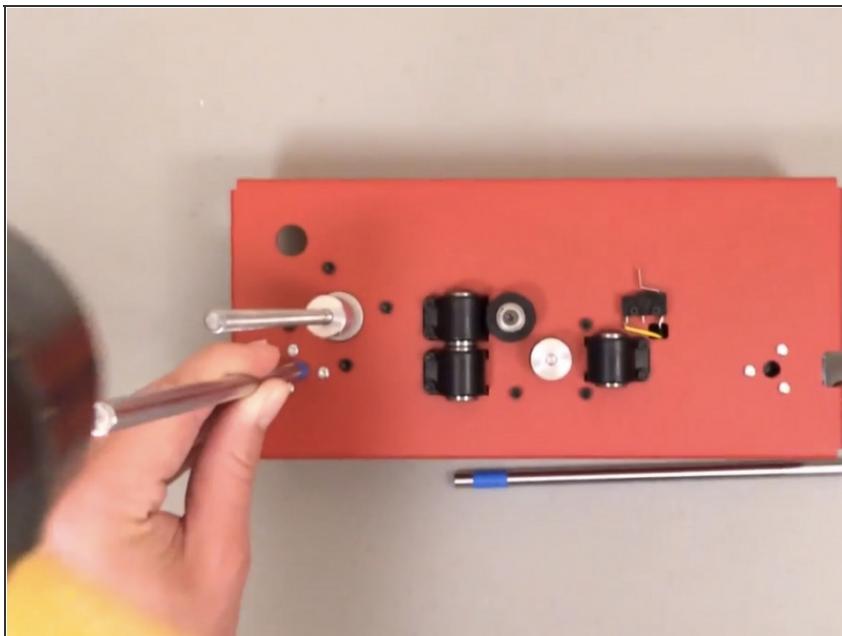
Step 8 — Attach Leadscrew to Z Motor



- Secure your 1/4" acme coupler to the Z axis stepper shaft approximately 7mm up from base plate with an M3 set screw.
- (i) TIP:** You can use a couple of belt tensioner clips as a spacer for the coupler height.
- Insert 1/4"-16 acme rod into the other end of coupler and secure into place with an M3 set screw.
 - NOTE: If the coupler is too low on the motor shaft the set screws will not bite into the acme rod. The set screw will seat itself into the threads on the acme rod as it is tightened. Try lifting up on the threaded rod to make sure it has been secured by the set screw.

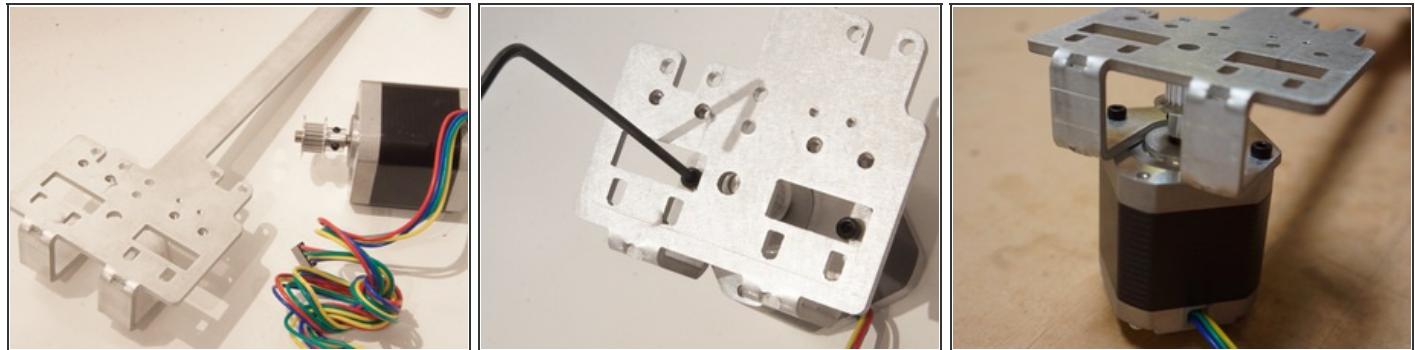
★ REMINDER: Use Threadlocker on your set screws once the coupler is in place.

Step 9 — Insert Z Smooth Rods



- Gently tap 250mm 8mm smooth rods (x2) into the pockets of the Z axis bar ends (previously installed).
- NOTE: Make sure bars are seated fully into the bar end pockets.
- [Click here](#) for a video demonstration of using a mallet to insert the Z axis smooth rods into the Z bar ends.

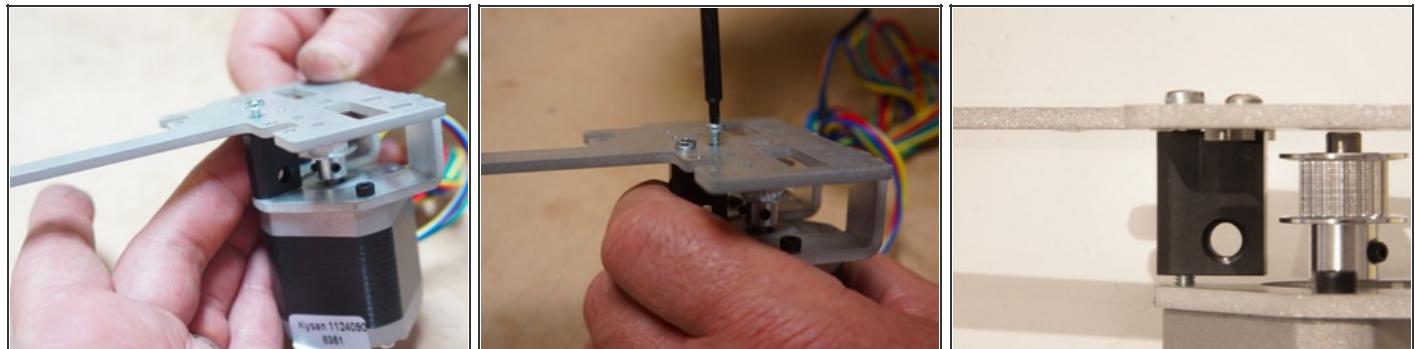
Step 10 — Installing X Motor / Pulley



- Attach a GT2 pulley onto the shaft of an unused motor with M3 set screws (x2). Again, the GT2 pulley should be oriented with the set screws closer to the body of the motor. Leave approximately 3mm of space between the pulley and the body of the motor on the motor shaft.
- Attach the motor to the XZ carriage plate with M3 6mm screws (x2). Note that motor is oriented with the wiring directed away from the XZ carriage plate.

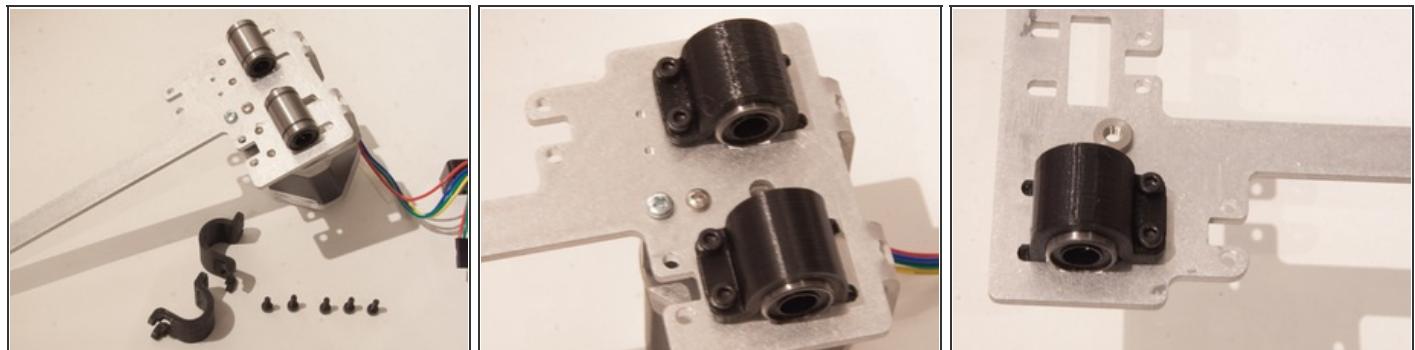
i *TIP: This will be your "X axis motor". Take a moment to label the plastic connector on this motor with a "X".*

Step 11 — Installing Z Axis Delrin Nut



- Install the delrin nut with an M3 30mm phillips head screw and plastite screw.
- The M3 30mm screw goes through the nut and screws into the stepper motor.

Step 12 — Installing X Carriage Bearings



- Install 8mm bearings (x2) with bearing clamps onto the motor end of the XZ plate using M3 8mm screws (x2 each).
- Install one more 8mm bearing with a bearing clamp onto the opposite end with M3 8mm screws (x2).
- [Click here](#) for a video demonstration of installing the 8mm bearings for the Z axis.

Step 13 — Install X Axis Idler Pulley



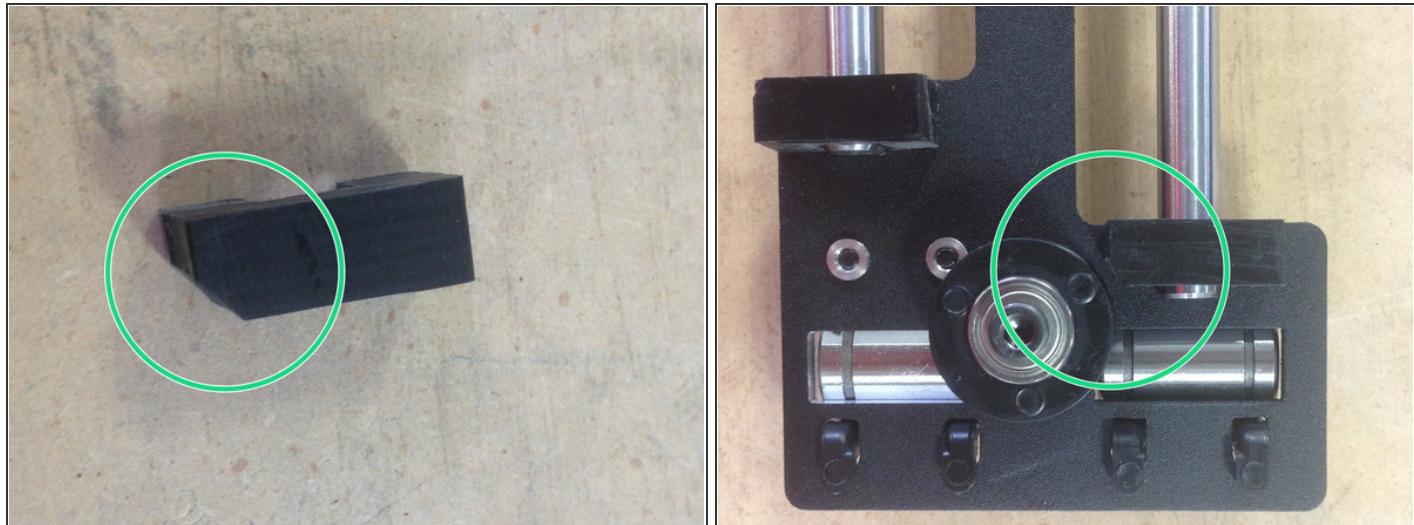
- Press two 624 bearings into two Delrin pulley halves.
- Place 1/8" nylon spacer between the bearing/pulley.
- Insert an M4 20mm screw through the pulley assembly.
- Add an M4 washer to this screw/bearing/pulley "stack", and screw the assembly into the XZ carriage plate. This stack will attach to the end of the carriage without the X axis motor.

Step 14 — XZ Carriage Smooth Rod Installation



- Place an 8mm linear bearing onto a 250mm smooth rod. Repeat this step.
- Seat 250mm the smooth rods w/ bearings (x2) into matching slots of the XZ plate. Rods should be on same side as the X axis motor (opposite side of X idler pulley).
- Use plastite screws (x2 each) to attach X axis bar clamps onto the bar ends and secure the bars to the XZ carriage plate.

Step 15



- NOTE: If you received a rod clamp with a corner cut, it is meant to be installed adjacent to the pulley, to allow the pulley to spin freely.

Step 16 — Installing XZ 4th Bearing



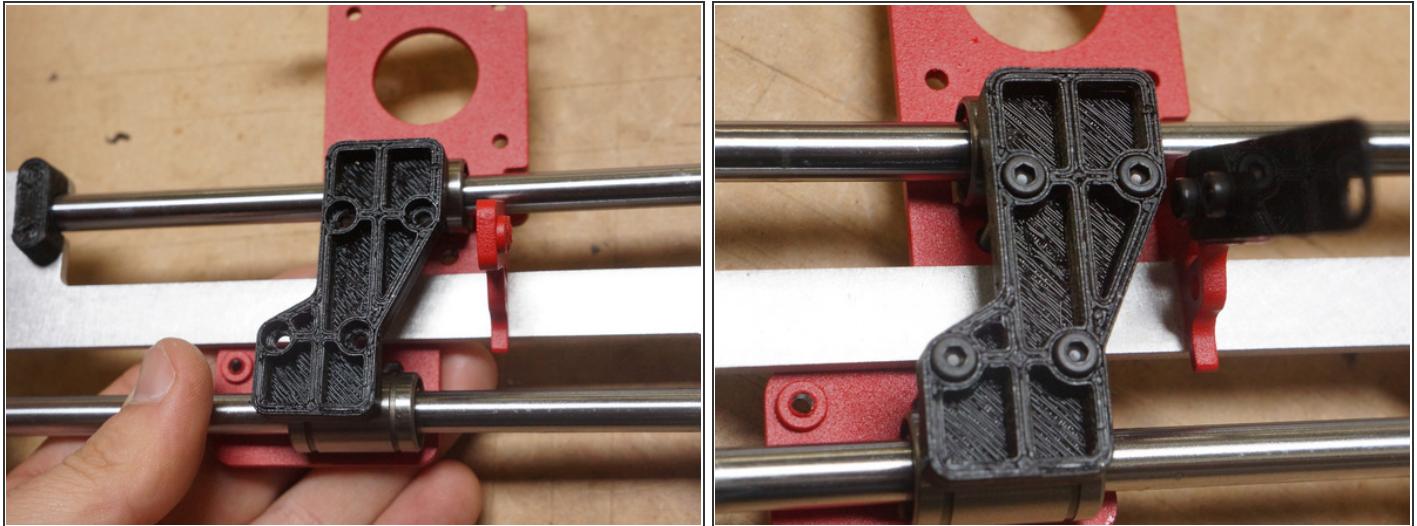
- A fourth 8mm bearing can now be installed and secured into the remaining bearing hole on the XZ carriage. Use plastite screws (x2) to secure the bearing clamp to the bar end on.
- (i) TIP:** Use one of your remaining 8mm rods to make sure bearing alignment is correct. If bearings do not move freely loosen bearing holder screws and re-tighten. Bar clamps should be snug and not rattle while linear bearings should slide smoothly.
- Attach the 28" end stop to the XZ carriage with M2.5 10mm screws (x2).
 - NOTE: The end stop switch should open towards the middle of the XZ carriage plate, with the "gator mouth" open towards the X axis motor.

Step 17 — Install Wire Relief and Position Extruder Cart



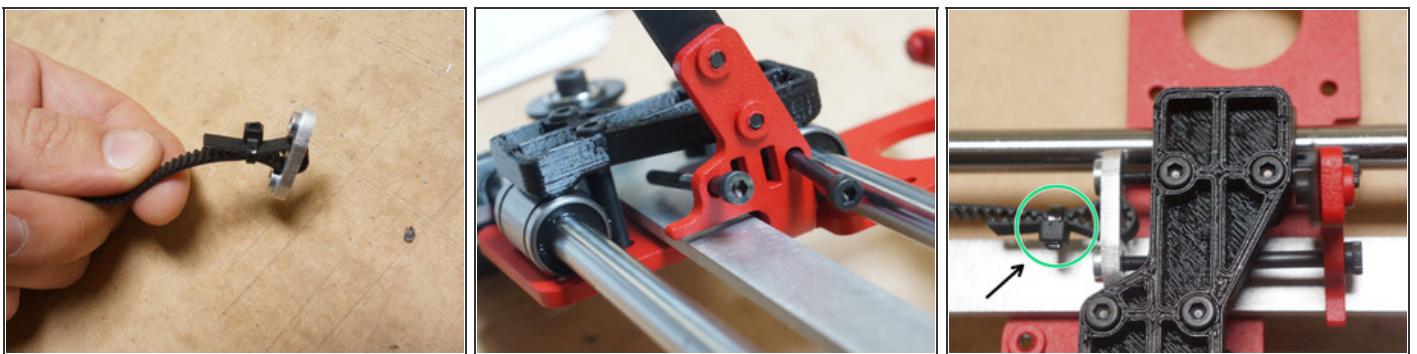
- Attach the delrin wire relief onto the extruder cart using M3 6mm screws (x2). Note that the single hole on the wire relief should be oriented to the top after the delrin piece has been screwed to the carriage.
- Insert the extruder cart horizontally between the middle bar of the carriage plate and the upper smooth rod. Next, twist the carriage vertically until bearings match up with bearing cutouts.

Step 18 — Attaching X Axis Bearing Brace



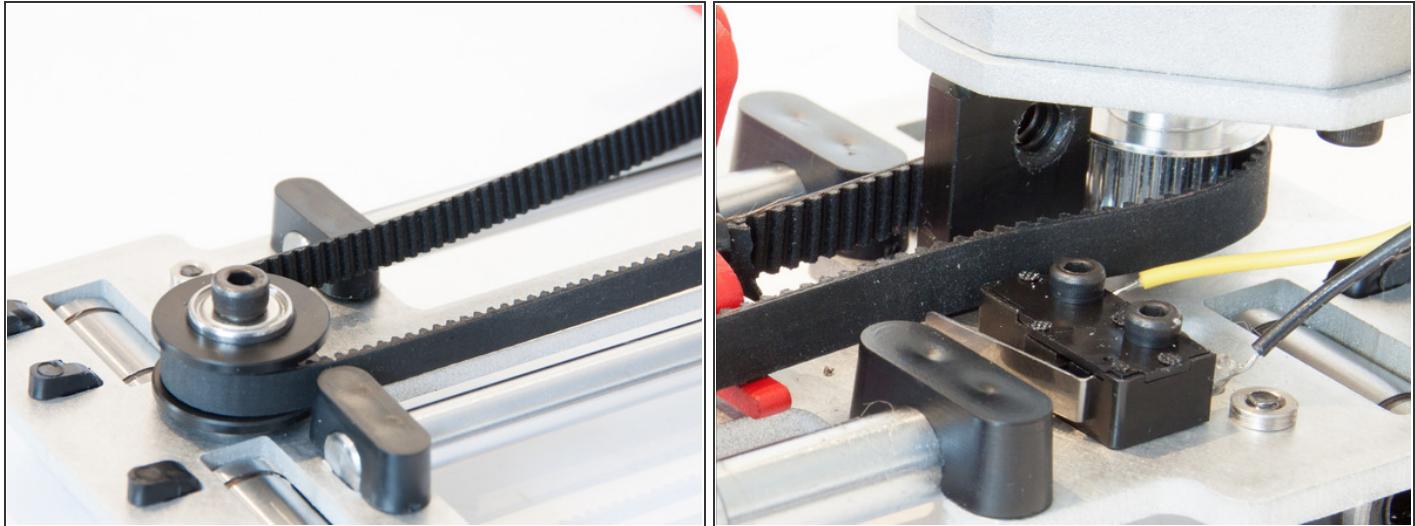
- Place the flat portion of X axis bearing clamp away from the arm of the the X cart. Notice the orientation of clamp to the extruder cart. The clamp should mimic the shape of the carriage, stair-stepping to the right.
 - Secure the X axis bearing clamp to extruder card using M3 25mm screws (x4).
- (i) TIP:** *Tighten each screw evenly a little bit at a time alternating between the 4 screws until all are tight.*

Step 19 — Install X Axis Belt Tensioner



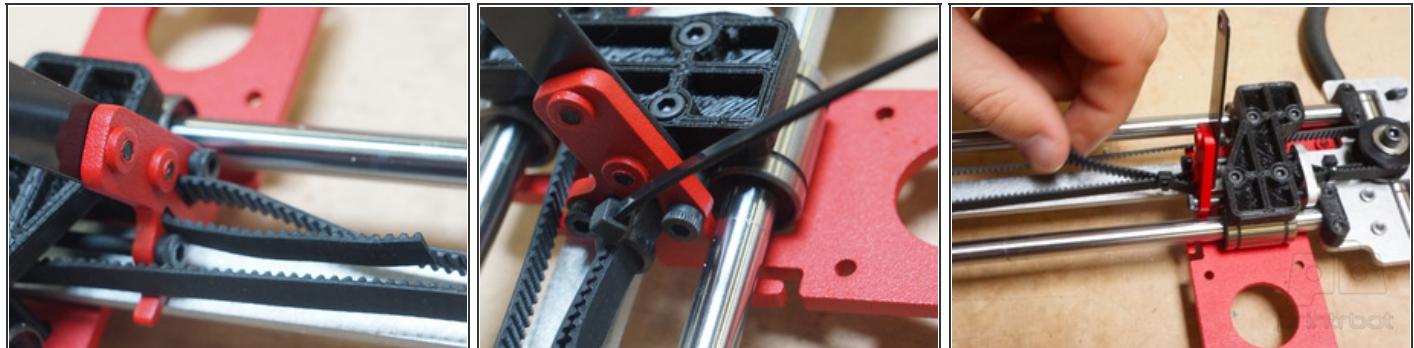
- Thread the 500mm belt (longer belt) through the 2 holes in the belt tensioner as shown. Zip tie close to the tensioner, lastly cut off excess plastic tie.
- Place M3 40mm screws (x2) through the matching holes in the extruder carriage and thread them just slightly into the belt tensioner to get started. Make sure that the nub of the zip tie is facing down, towards the bottom side of the extruder assembly.

Step 20 — X Axis Belt Part 1



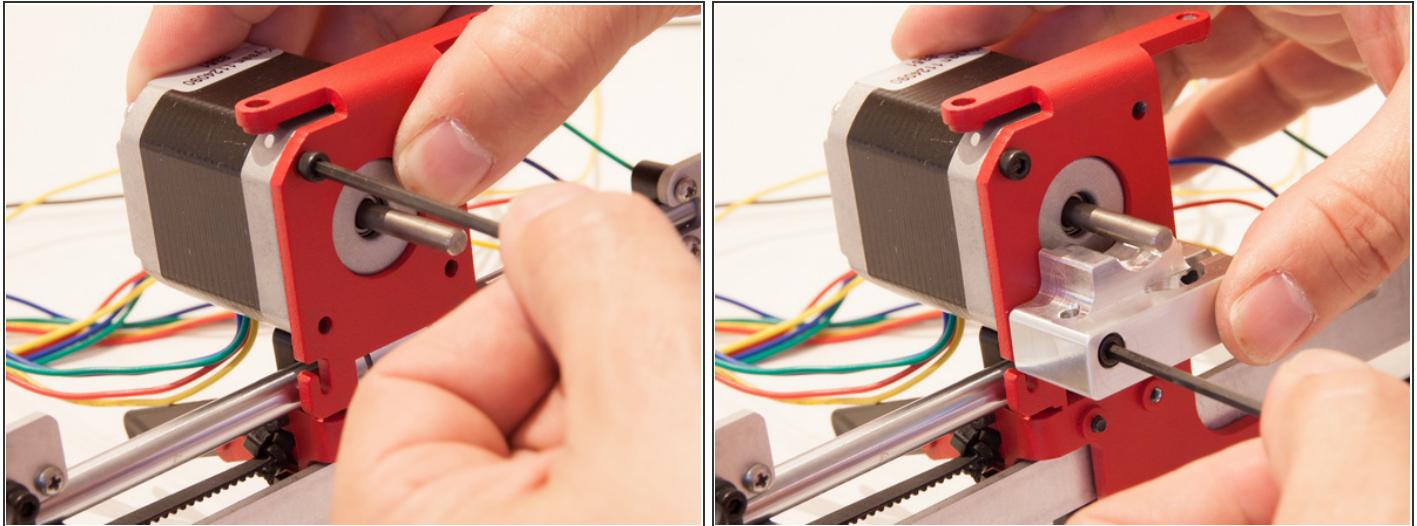
- Wrap the belt around X axis idler pulley.
- Next, route the belt around the GT2 pulley, aligning the teeth of the belt with the grooves of the pulley.

Step 21 — X Axis Belt Part 2



- Using needle nose pliers, feed belt back towards extruder cart and through belt slots in extruder cart. Pull tight by hand to remove slack for now.
- Keeping the X belt tight, secure the now threaded belt end with a zip tie. Before tightening the zip tie, align the teeth of the GT2 belt against the grooves of the belt.
- NOTE: Secure the zip tie as close to the extruder cart as possible. Also, make sure the nub of the zip tie is pointing away from the carriage. Failure to do so could cause the nub to hit the Z axis delrin nut when the printer is in use.
- Tighten the belt further by turning the tensioner screws.
- Cut off extra belt length as close to zip ties as possible to prevent it from interfering with the motor pulley.

Step 22 — Install Extruder Gear



- Attach a motor to the extruder carriage with an M3 6mm screw. Only attach the left side of the base for now leaving the right hole empty.
- Attach the extruder base to the carriage, using an M3 25mm screw, to the bottom left screw hole.

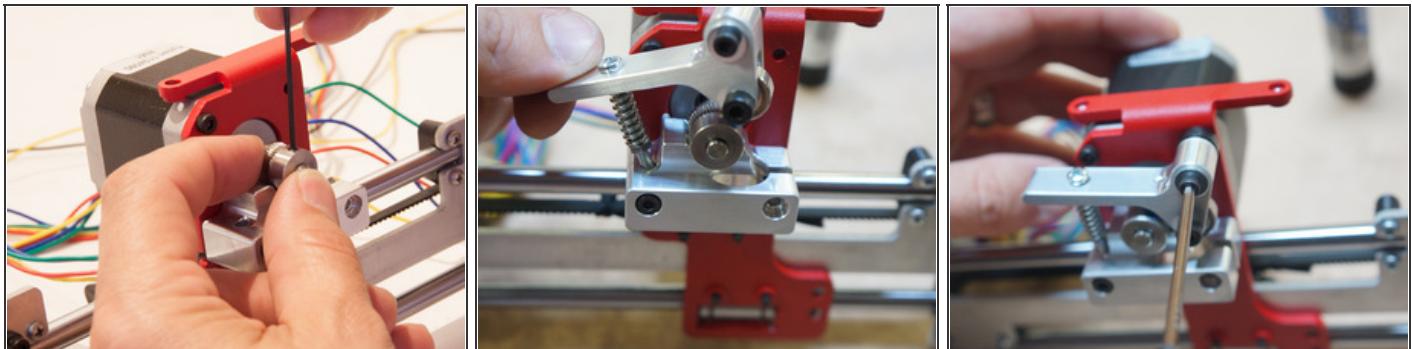
(i) TIP: This will be your "extruder motor". Take a moment to label the plastic connector on this motor with a "E".

Step 23 — Preparing Extruder Arm



- Thread an M3 30mm philips head screw through hole in extruder arm. Add the extruder spring onto screw and secure with an M3 hex nut.
- Place a 624 bearing into bearing slot on extruder arm. Secure with an M4 12mm screw.
- Insert the extruder arm post into the post hole of extruder arm. The flange of the insert should be on the inside and face the extruder motor. Thread an M3 30mm screw and M4 washer through the extruder arm.

Step 24 — Install Extruder Arm

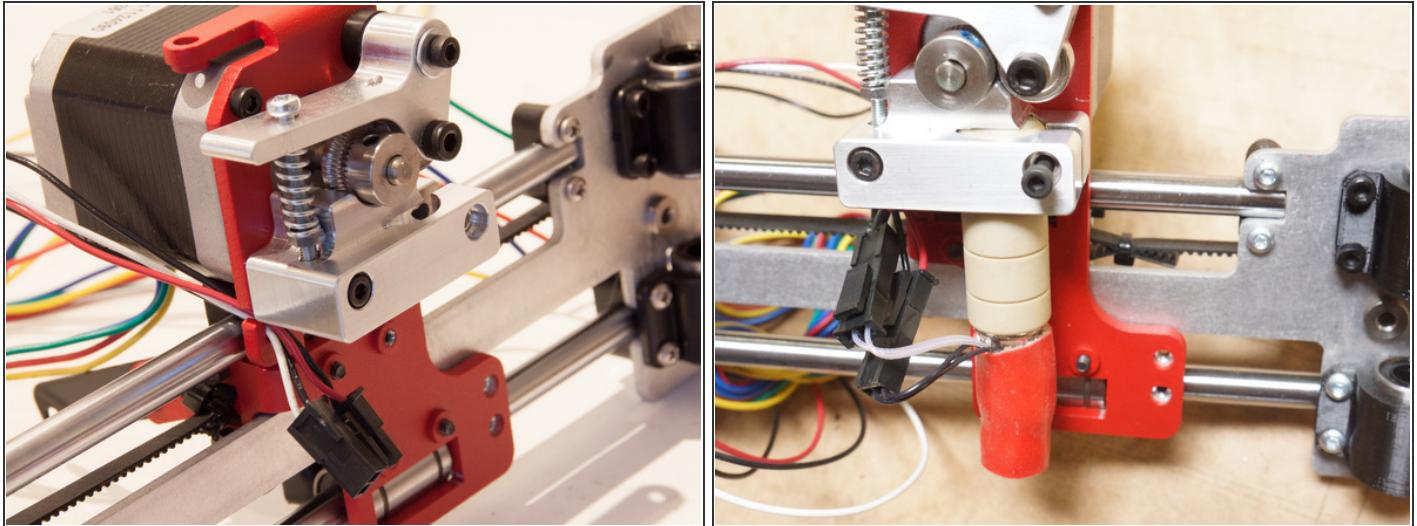


- Attach the drive gear to the extruder motor by tightening an M3 set screw down on to the flat side of the shaft. Make sure the serrated portion of the extruder gear lines up with the ridge of the extruder base. Take set screw and dip in thread locker and secure the drive gear onto the motor shaft with set screw

 **REMINDER:** Once the drive gear is aligned, use Threadlocker to secure the set screw on to the motor shaft.

- Place end of spring / screw assembly of extruder arm into matching hole of the extruder base.
- Secure extruder arm pivot by threading an M3 25mm screw through extruder cart into extruder motor.

Step 25 — Installing Hot end



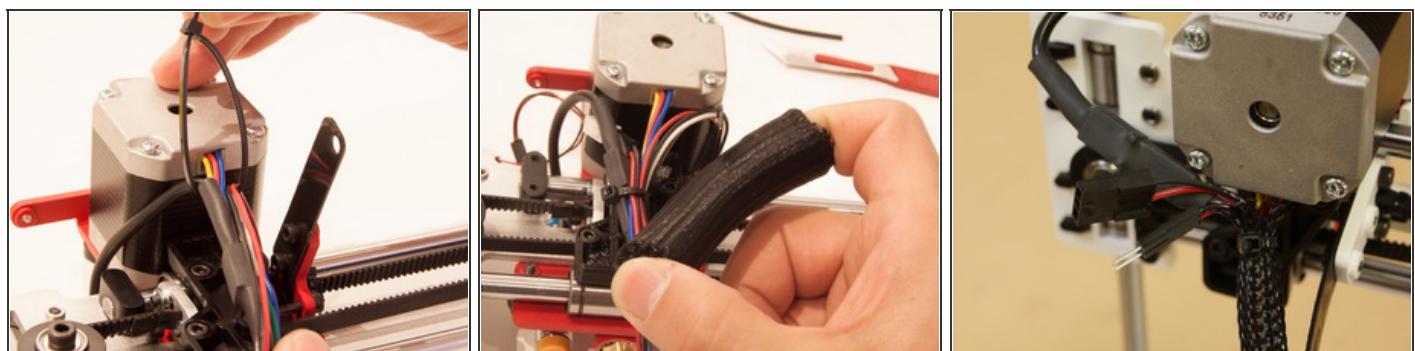
- Loosen the M3 25mm screw to allow room to feed thermistor and power cables through the cable retention notch on extruder carriage.
- Secure extruder base again making sure no wires are pinched.
- White/black cable extension goes to clear wired connector on the hot end. Black/red wiring cable extension connects to black wired connector on hot end.
- Attach extension cables as advised in previous step.
- Press hot end into matching hole on extruder base, press the hot end all the way in so that it is flush with the aluminum. Secure hot end by inserting and securing (1) M3 25mm screw into remaining hole of extruder base.

Step 26 — Attaching Sensor Probe



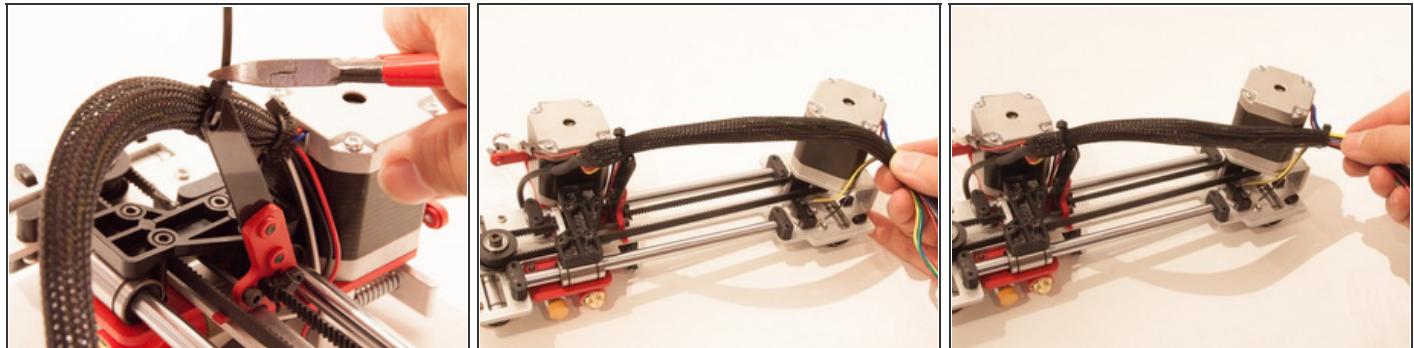
- Remove all extra nuts and washers from the Auto-Leveling Probe.
- Use an M3 6mm screw to attach the delrin sensor clamp to the XZ carriage plate.
- Wrap the sensor clamp around the probe, and secure the Auto-Leveling Probe within the sensor probe clamp using the M3 16mm screw. Tighten until the probe is secure.

Step 27 — Extruder Wiring



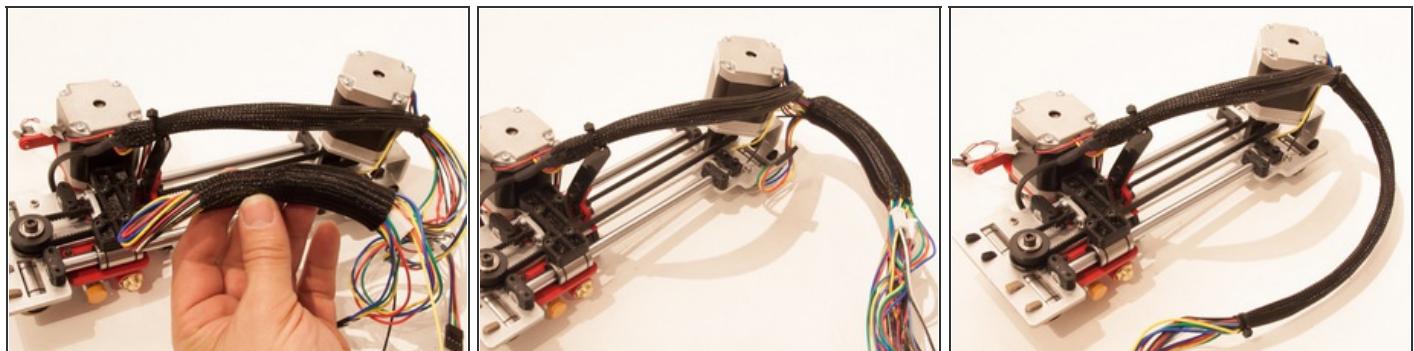
- Tighten a zip tie around the extruder assembly wiring. Any connectors (probe, hot end thermistor, power, etc) should be above the zip tie.
- Compress the wire wrap and work the wiring through the wire wrap.

Step 28 — Secure Extruder Wire Braiding



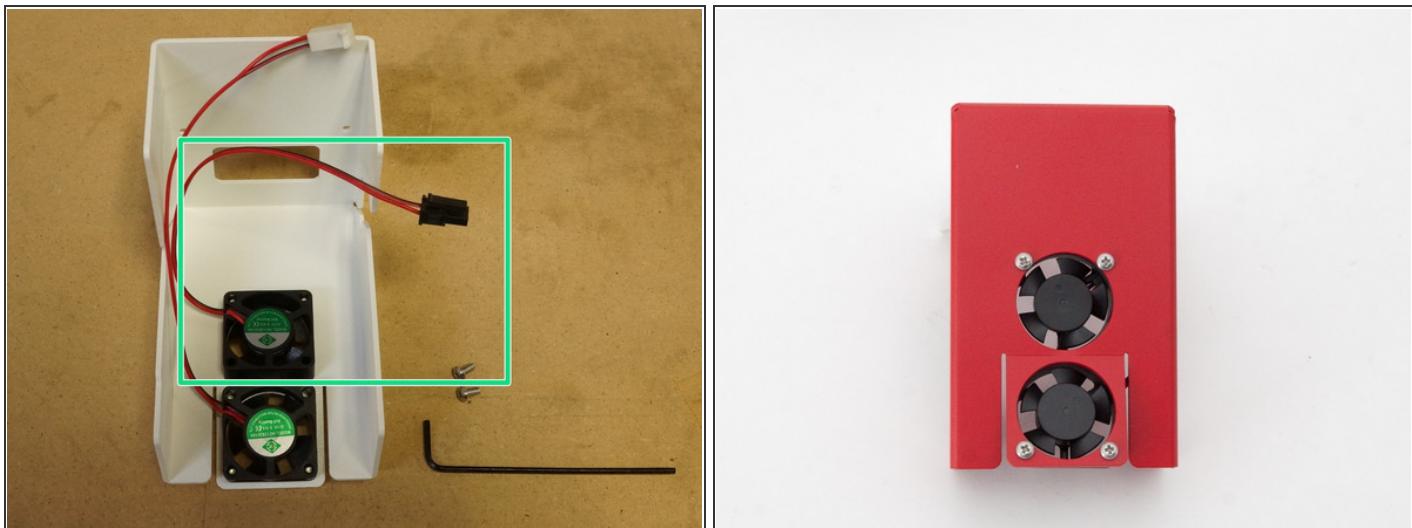
- Secure the extruder assembly wiring against the wire relief with a zip tie.
- Use another zip tie to manage the wiring for the X axis motor wiring.

Step 29



- Bend the wires in middle and pull all wires together through second wire wrap.
- Stretch out the wrap to its full length and zip-tie at the far end.

Step 30 — Attach Fans to Extruder Cover



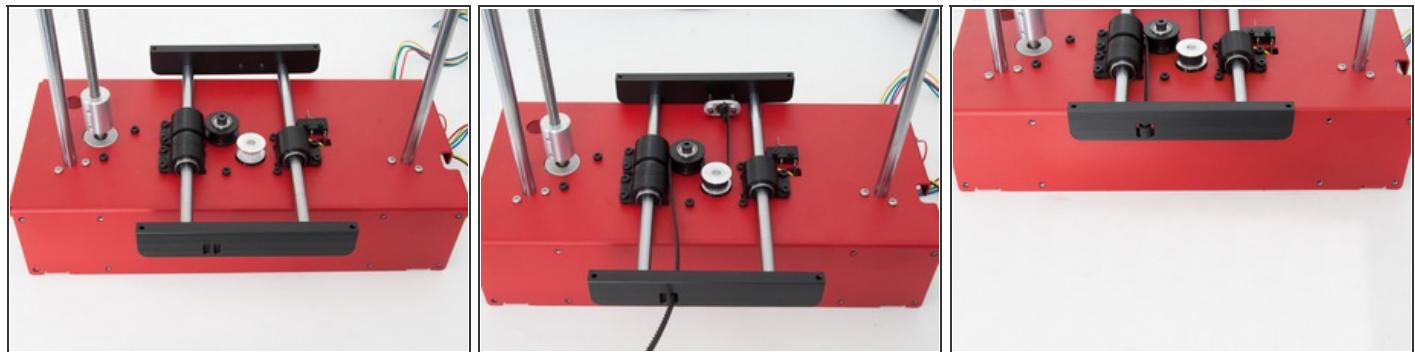
- Attach two fans to the extruder fan shroud with plastite screws (x2 each).
- NOTE: Be sure to place the fan with the black 3-pin connector in the top position. This fan will provide constant air to your hot end when the bot is powered on.
- Note that the fan wires are directed to the top of the fan shroud and the stickers for the fan are facing away from the front of the fan shroud.

Step 31 — Attach Top Z Axis Bar Ends



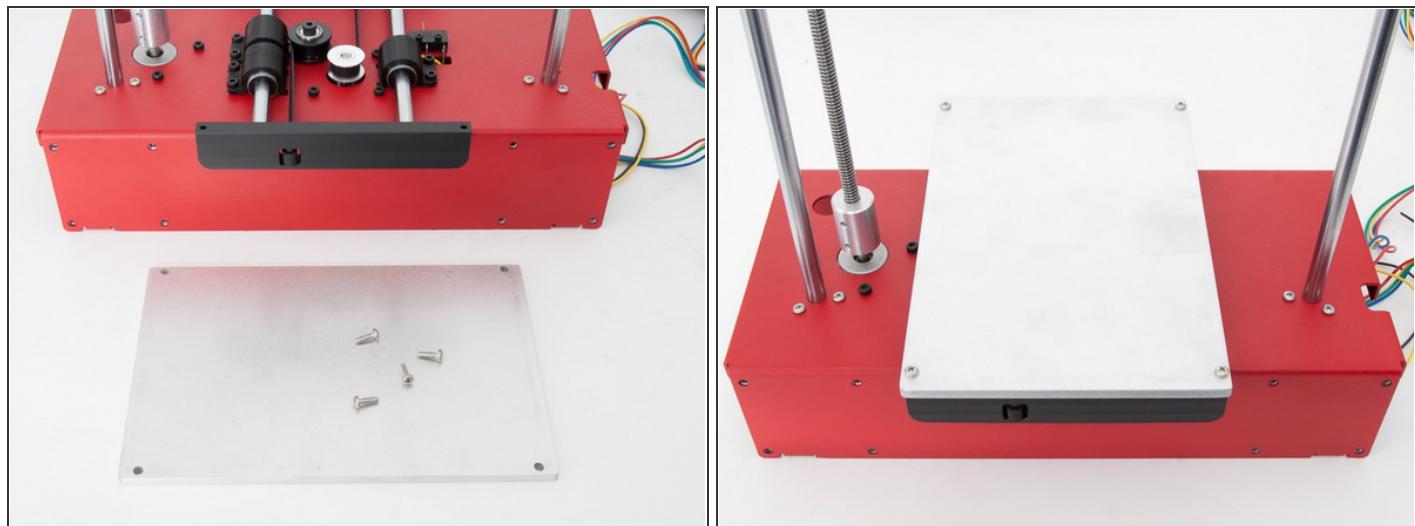
- Use plastite screws (x3 each) to attach the two remaining Z bar ends to the top base metal part.
- (i) TIP:** *The pockets in the bar ends should face the bottom of the machine so that they can accept the smooth rod ends.*

Step 32 — Y Axis Assembly

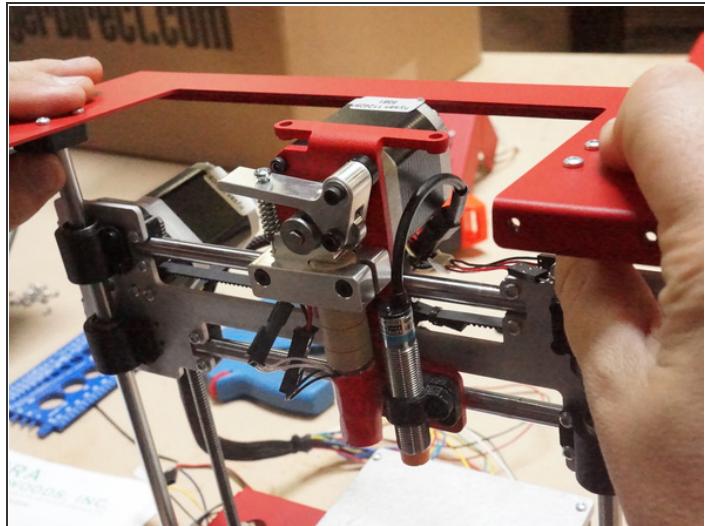


- Insert 6 1/2" smooth rods into the 8mm bearings on the Y axis (2x).
- Attach the bar end pieces to the end of the smooth rods. Note that the front bar end has slots for the Y axis belt. The rear bar end has holes to be used to attach the Y axis belt tensioner.
- Place M3 22mm screws (x2) through the rear bed end piece and thread them just slightly into the Y axis belt tensioner.
- Feed the remaining GT2 belt into the belt tensioner.
- Route the GT2 belt around the outside of the GT2 pulley, and then back around the delrin pulley/bearing assembly for the Y axis.
- Pull the belt tight through the remaining belt slot in the bar end. Secure the belt with a zip tie, making sure that the GT2 belt teeth and grooves are aligned.

Step 33 — Attach Print Bed



Step 34 — Attach X Axis



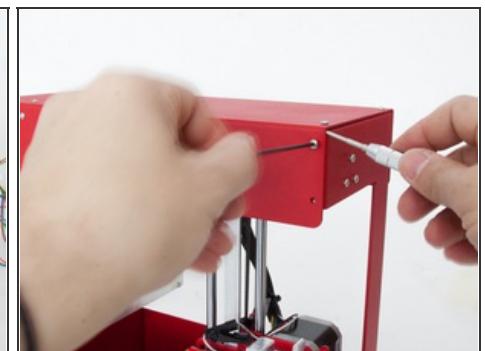
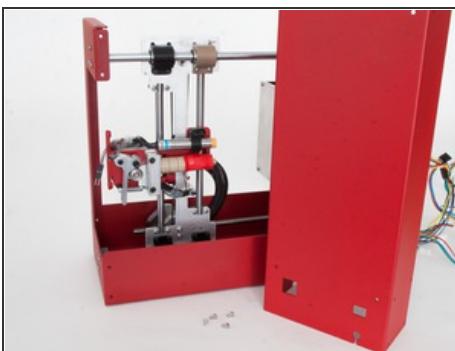
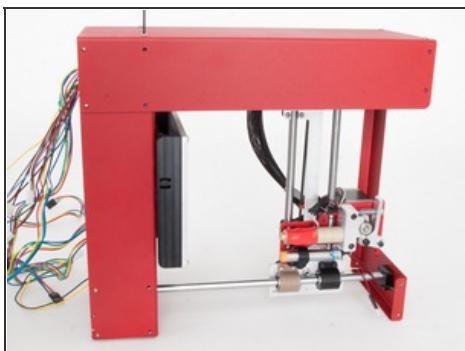
- Add the XZ carriage assembly to the bot, inserting the two Z axis smooth rods into the 8mm bearings in the carriage. Thread the acme rod into the delrin acme nut.
- Attach the top plate / delrin Z rod bar end assembly to the printer by pushing the existing vertical smooth rods ends into the delrin pockets of the top plate.
- Push the smooth rods all the way into the top plate bar end pockets.

Step 35 — Install Base Grommit



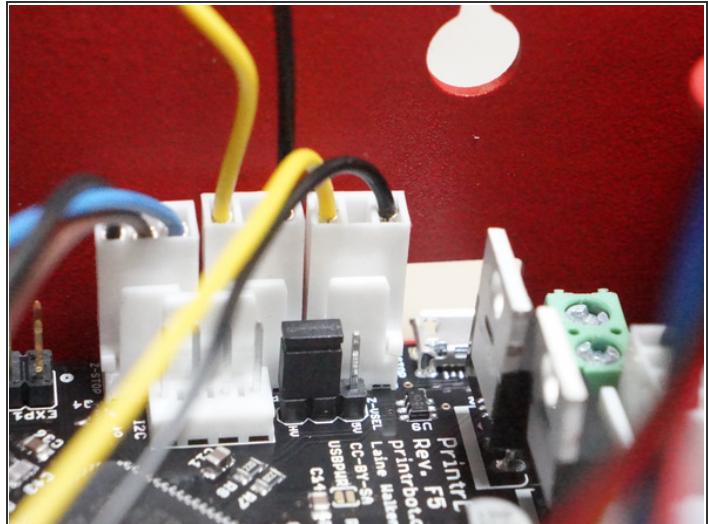
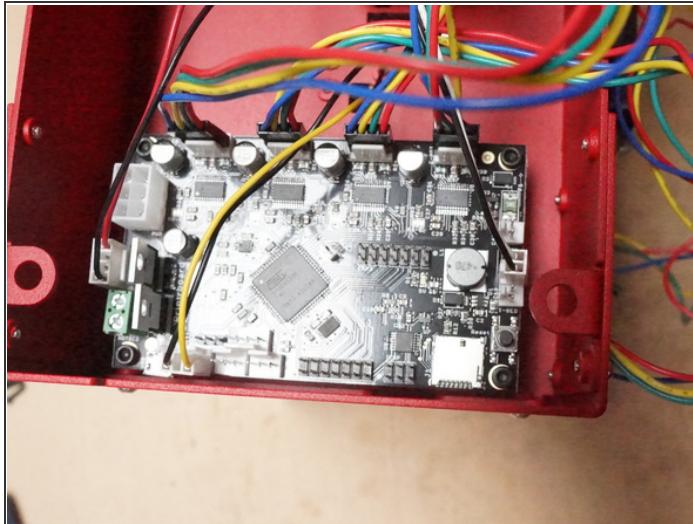
- Add the rubber grommit to the wire wrap. Thread the Extruder / X motor wire bundle through it.
- Feed the wire bundle through the matching hole in base. Press the grommit into the the base plate hole.

Step 36 — Install Side Panels



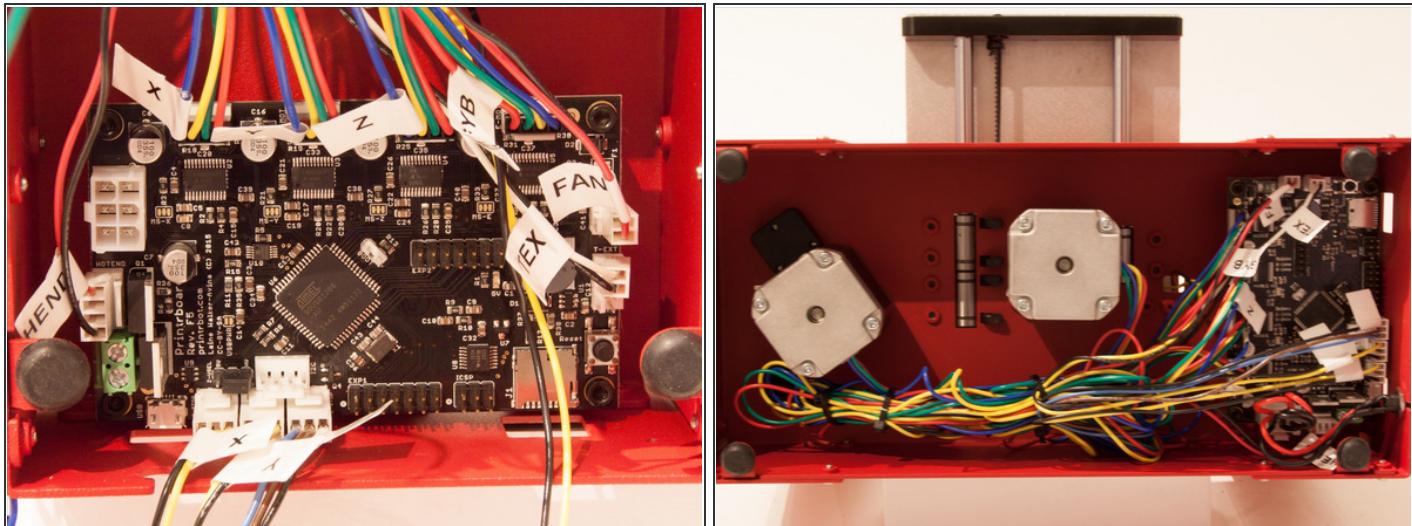
- Add the left side panel onto the bottom and top plates.
- Secure the left panel to top panel with M3 6mm button head screws (x6), using a 2mm allen hex key.
- Next, secure left panel to base panel using M3 6mm button head screws (x10).
- Repeat this step with right side panel. Note that the right side panel has access holes for the micro-USB port and SD card slot on the Printrboard

Step 37 — Printrboard Wiring



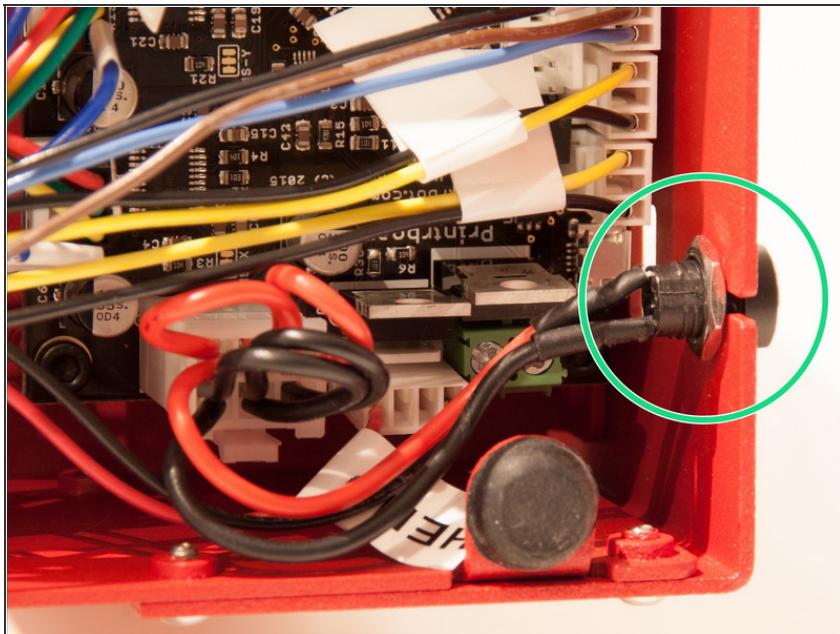
- Motor connectors are not keyed so note the direction they are installed in the photos. Other connectors are keyed and only plug in one way. The Extruder motor wire will be shorter than the X motor wire.
- X axis motor - "X-MOT" (blue, yellow, green, red)
- Y axis motor - "Y-MOT" (blue, yellow, green, red)
- Z axis motor - "Z-MOT" (blue, yellow, green, red)
- Extruder motor - "E-MOT" (red, green, yellow, blue)
- Fan ext - "FAN"
- Hot End Power ext - "HOTEND"

Step 38



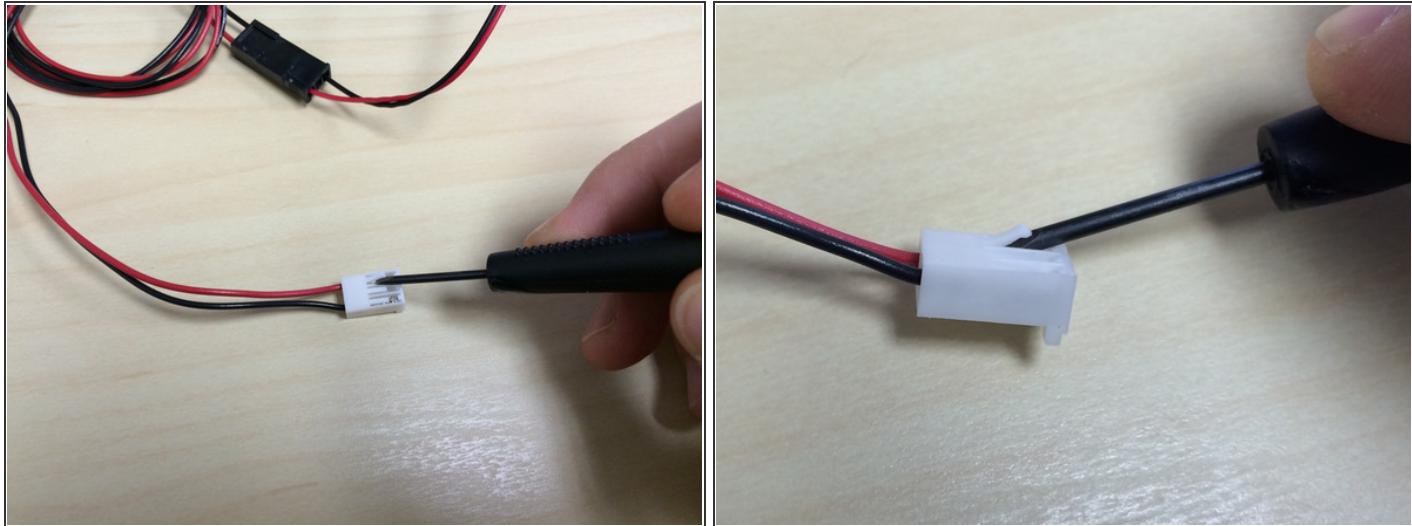
- Printrboard wiring cont'd
 - Hot End Thermistor ext - "T-EXT"
 - Fan ext - "FAN"
 - Red/Black Power Adapter - "PWR"
 - X End Stop - "X-STOP"
 - Y End Stop - "Y-STOP"

Step 39



- Plug the 6 pin connector of the power harness dongle into the Printrboard. The barrel connector can be attached to the base by loosening the nut off of the threads and then tightening it back down against the wiring hole of the base of the bot.

Step 40 — Modify Hotend Fan Extension



- Remove the red wire from the white molex connector end.
- Use a micro slotted screw driver to pry up the retaining latch so that you can slide out the female pin / connector.

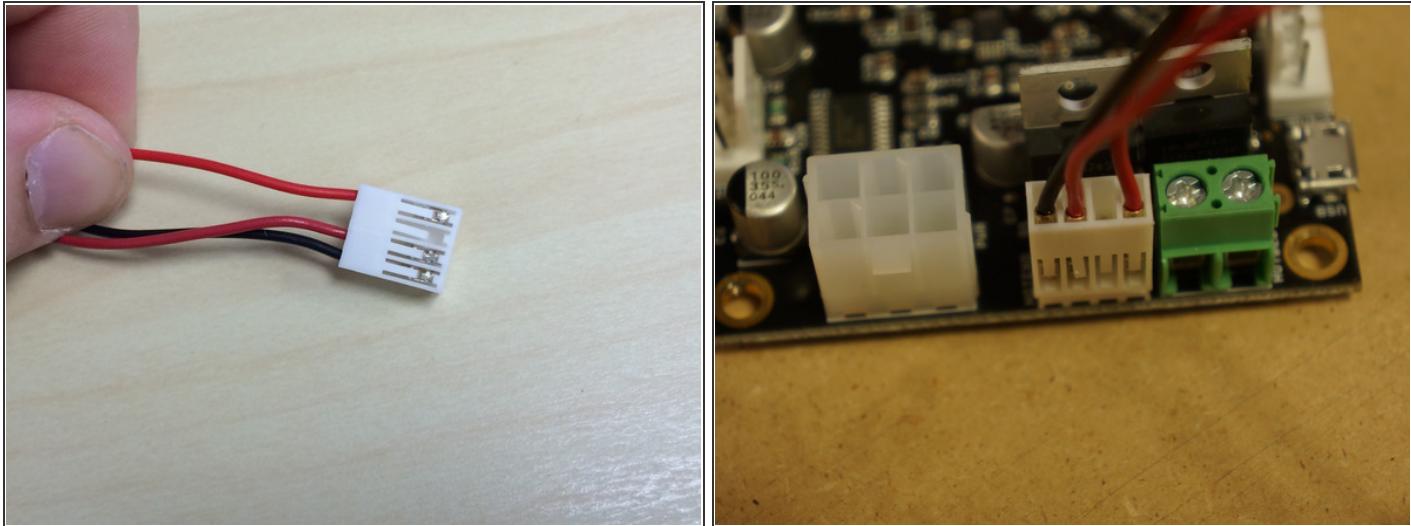
i *TIP: This fan will run any time that the bot is powered on.*

Step 41 — Modify Hotend Fan Extension Part 2



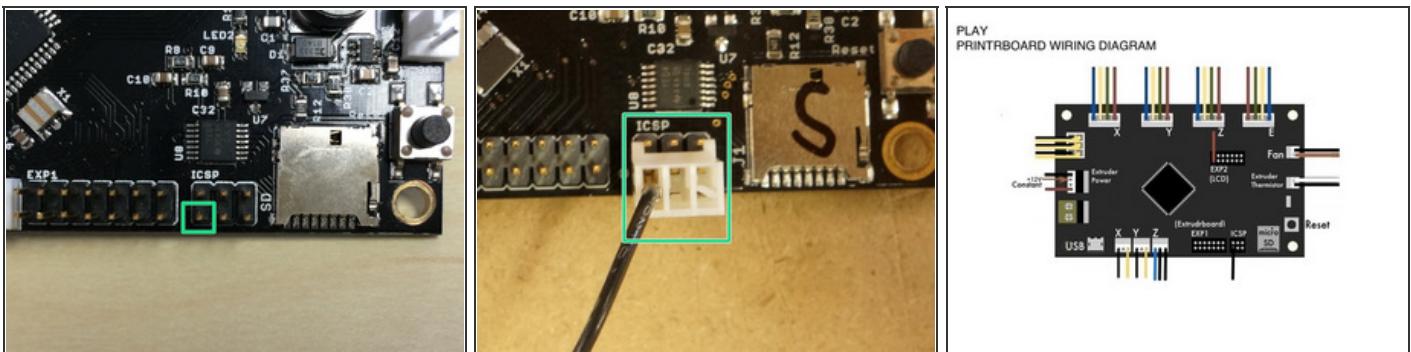
- Pull the red wire out of molex connector.
- Insert the freed red wire connector into slot next to black wire on the (4) pin white molex connector used by the hotend heater.
- Make sure that the wire is inserted the proper way, next to the black wire.
- Try tugging gently on the wire to make sure it is retained properly by the connectors locking mechanism.

Step 42 — Install Hotend Fan Extension



- Verify that your modified connector looks like the connector pictured.
- Plug the extruder hot end heater connector into the Printrboard as pictured.

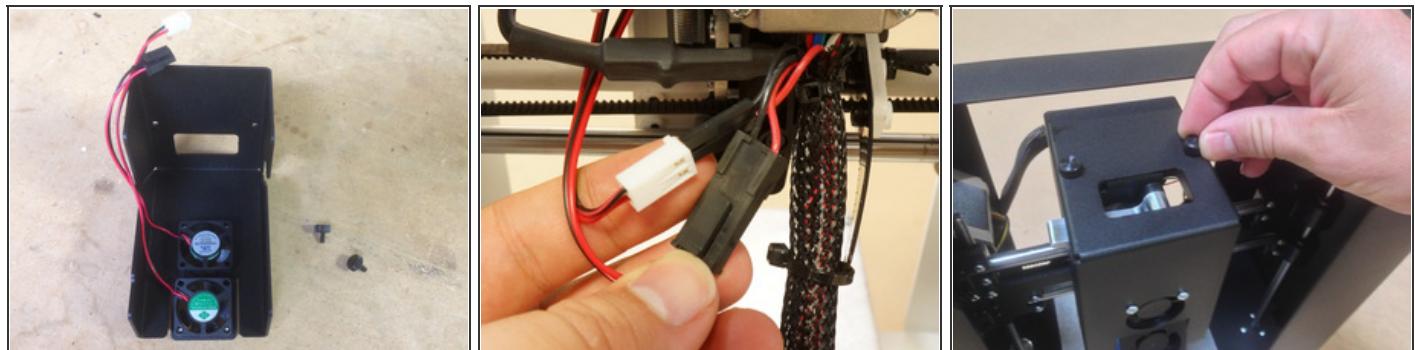
Step 43 — Install Fan Extension Part 2



- Take the (3) pin fan extension connector and insert into the (3) pin ICSP pin closest to the edge of the board.
- Make sure the black wire is connecting to the ICSP bottom left pin (highlighted by green square).

⚠ Take note of the orientation of the molex connector when connecting the (3) pin fan extension connector. Make sure that the (3) top pins of the ICSP header are exposed, and the black wire of the (3) pin fan extension connector is connected to the bottom left ICSP pin.

Step 44 — Connect Hotend and Bed Fans



- Connect the 2 pin fan extension to the 2 pin fan connector (white).
- Connect the 3 pin fan extension to the 3 pin fan connector (black).
- Install the extruder shroud / fan assembly using M3 6mm thumb screws (x2).

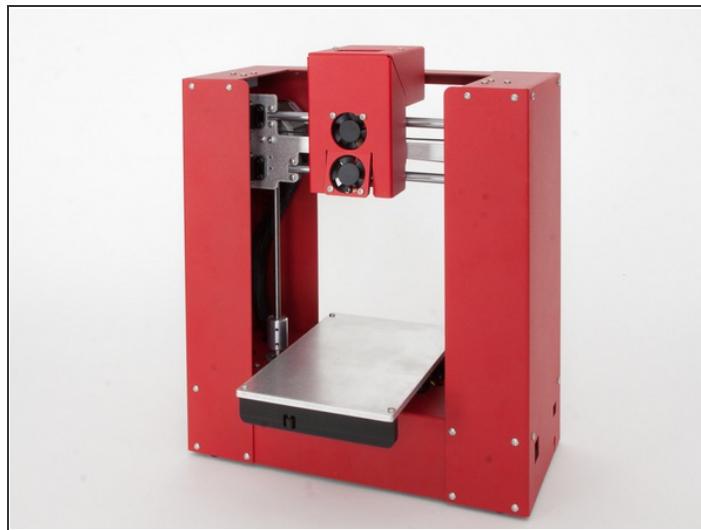
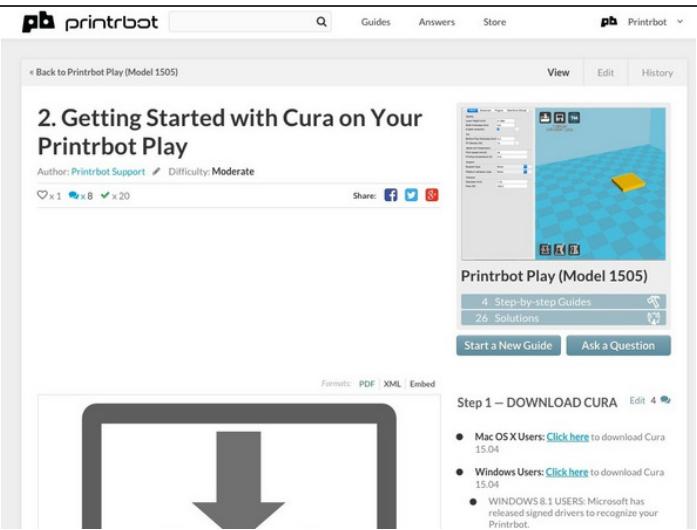
★ Not finding your thumb screws? The earliest Play kits shipped with M3 6mm button head screws (x2) to attach the shroud. [Click here](#) to view a picture of this.

Step 45 — Install Printer Feet and Power Connector



- Take a moment to manage the wiring under the base of the bot with zip ties.
- Place four rubber feet into matching holes on base plate.
- Push and twist at the same time to make it easier for the feet to seat flush and for the metal panel to fit properly into the retaining grooves of the rubber feet.

Step 46 — Bundling Wiring

- Great job! Play build finished. You're not quite done though. There are a couple more steps on your journey to 3D printing glory.
- **NEXT STEPS!**
- Download Cura version 15.04. This is the software that you will use to communicate with your Printrbot Play.
 - **Mac OS X Users:** [Click here](#) to download Cura 15.04
 - **Windows Users:** [Click here](#) to download Cura 15.04
- See [Getting Started With Cura on Your Printrbot Play](#)

⚠️ IMPORTANT: FAILURE TO FOLLOW THE STEPS IN THE GETTING STARTED AND CALIBRATION GUIDES WILL RESULT IN DAMAGE TO YOUR PRINTRBOT

- Go to <http://printrbot.com/project/play> for more on drivers, software and getting started with your new 3D printer.

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