

BabyBelt Pro Build and Info

Layout/Info

Print into
Base Assembly
Gantry Assembly - Revo and Bamboo
Finishing it up
Wiring
Programming/Tuning

www.github.com/robmink/babybeltpro
Discord
Other Stuff

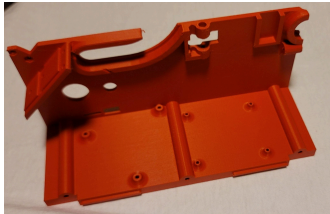
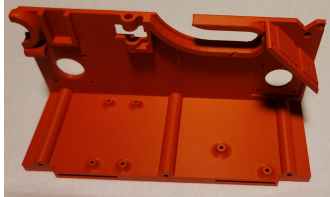
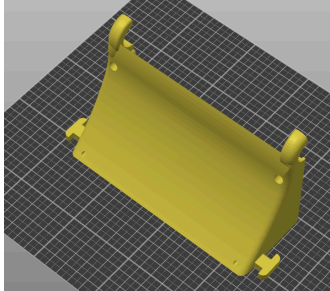
TIPS:

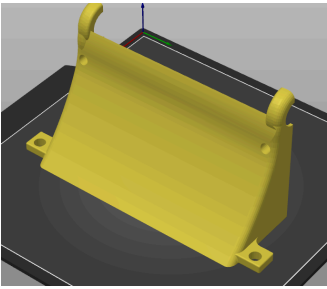
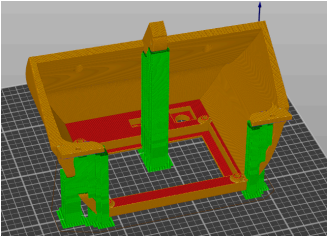
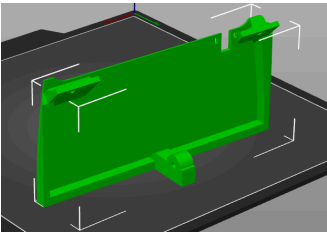
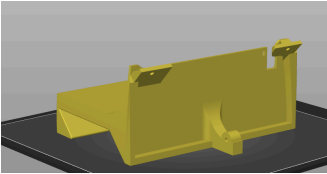
The linear rails will want to fall apart by siding off the end. You can stick some zip ties through the bolt holes in the rails. This will keep the carriages on the rails. You can also put rubber bands around the rails. This is also good if you need to work on the printer for maintenance. If the carriages fall off the rails they can lose ball bearings.

Print Info

Unless noted, all parts do not need supports, are sized for PLA, are oriented in the default position. 0.2 Layer height is fine, 3-4 perim, 20% ish infill

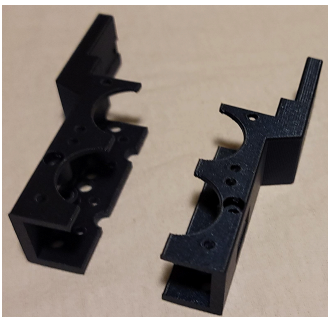
The printed parts are:

Section	Name	Photo	Print Notes
Frame	BBPro_side-A		Make sure no excessive Elephants foot.
	BBPro_side-b		Same as A
	BBPro-Scraper		Might crack around the 608 covers, Not a functional issue. Note, Also has an Alt with a bag mount built in.
			BagMount-Might crack around the 608 covers, Not a functional issue.

			Mount-Might crack around the 608 covers, Not a functional issue.
	Screen Mount or no Screen.		Needs supports
			BBPro-Screen NoScreenbase Also needs supports.
			Cleat Mount no screen Needs supports

Gantry - X

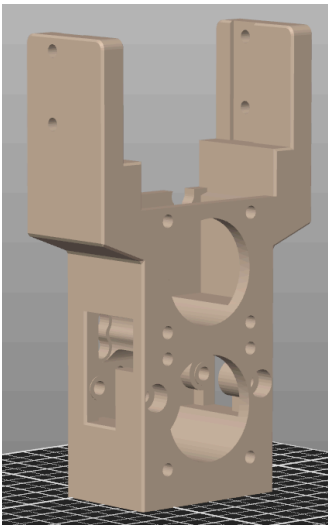
XcarA and XcarB
(LEGACY-WILL BE REMOVED
SOON)



6 prem Higher infill

One of the most labor intensive parts to replace and needs to be strong. Looking into options to make these parts one as well as easier to assemble

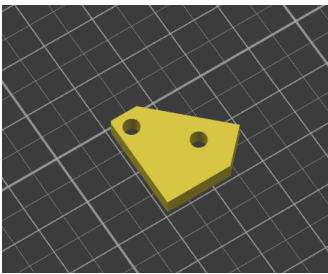
XCARCombo



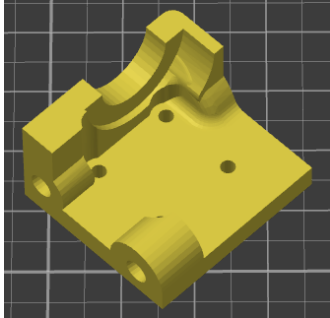
6 prem Higher infill

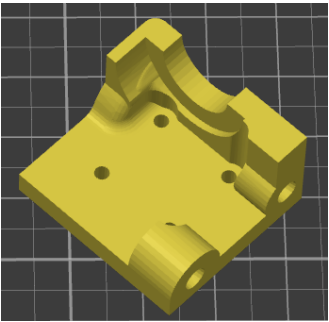
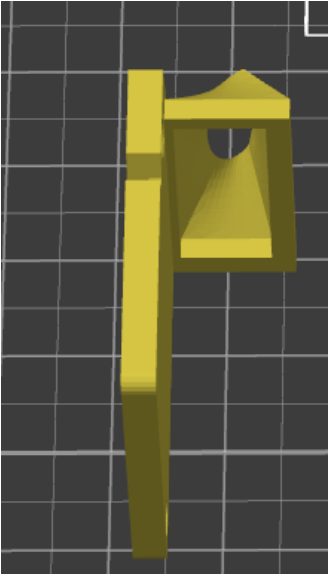
Rework of XCARA and XCARB as one easier to print and use part.

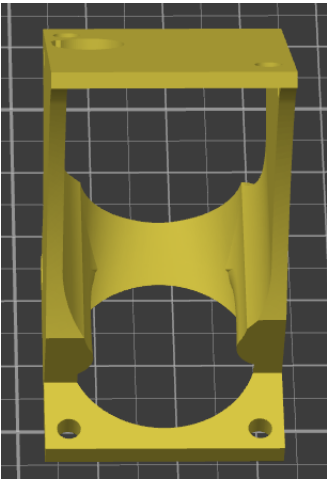
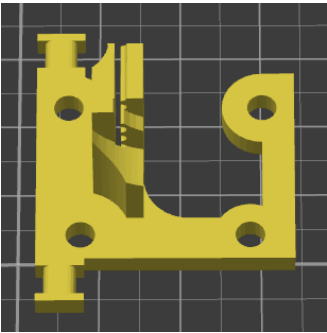
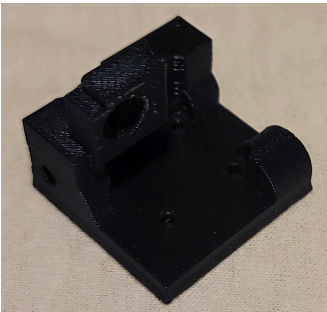
BBPro-XBeltLocker-X2

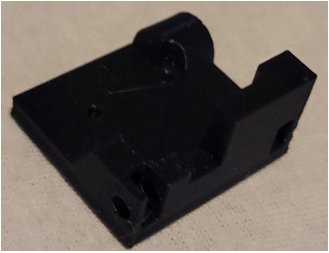
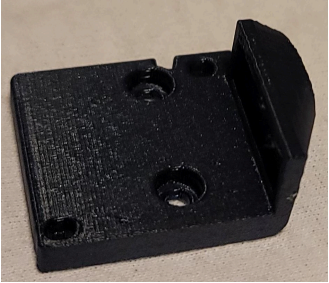
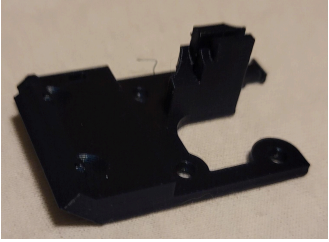


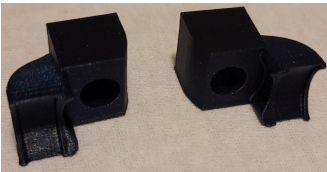
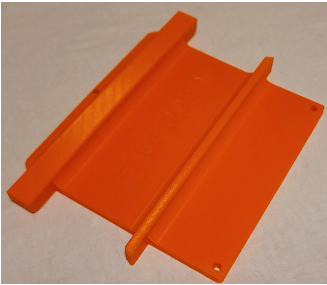
Need two

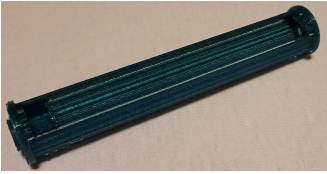
Gantry - Y	BBPro_RockMonsterNo1YEndNut		If too tight or printing in PETG you might have to scale to 102% or 105%
	BBPro_RockMonsterNo1YEndIdleHolder		
	BBPro_RockMonsterNo1YEndBody		5-6 Perms, Note hole in upper left, this sets Y endstop and distance from nozzle to belt.
Gantry-Carriage (Original E3D Revo)	BBPro_YCarLside_A		

	BBPro_YCarLside_B		
	BBPro_partsfanmount		

	BBPro_fanduct		
	BBPro_YCar-WireAndBelt_17		
Gantry-Carriage (Bamboo Hotend Mod)	BBPro_YCarLside_A		Sorry about the quality of these photos, perhaps taking pictures of dark blue parts with a camera w. Focus issues while healing from an eye injury was a bad idea...

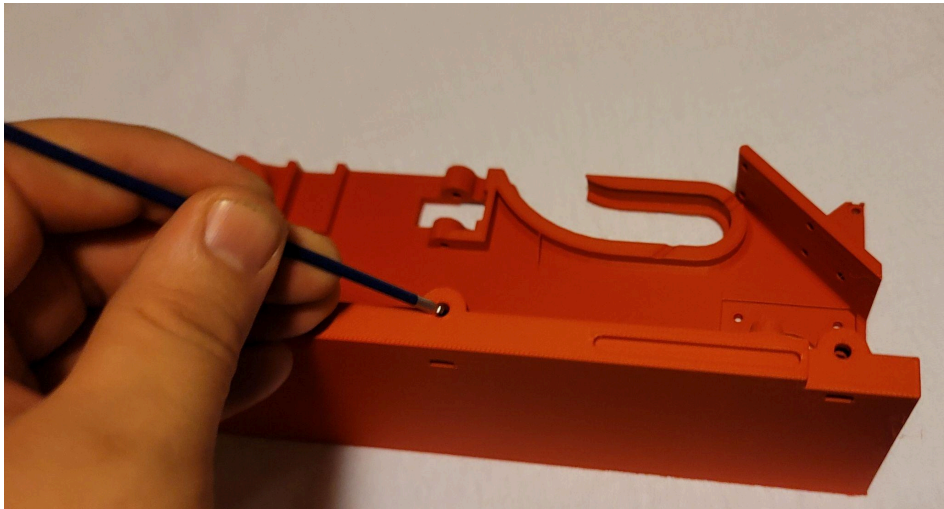
	BBPro_YCarLside_B		
	BBPro_partsfanmount		
	BBPro_YCar-WireAndBelt_17		
Belt Tensioner parts	Frame		Need 2. If printing in PETG, may need to make a little bigger
	Nut knob		

	Pusher (a and b)		Note A and B. Mirrored.
ZBeltDrive	Nema17-Zgear		If printing in petg- scale to 105% Sensitive to Elephants foot
	Roller-ZGear		Note, new versions do not have holes Sensitive to Elephants foot and warping No supports needed
	Underbed		If using a heated bed PETG is highly recommended

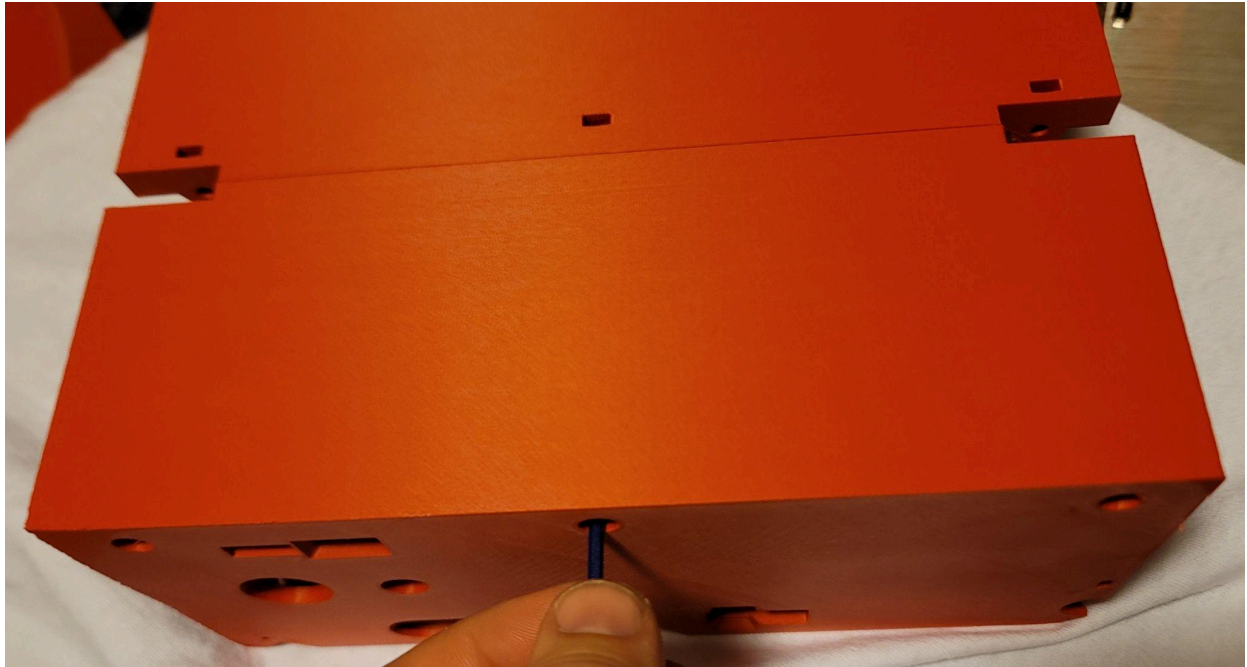
	Roller		Print vertical with supports on one end 6 perm, 30+ infill
Bed	If not using a heated bed the cad file of the Voron 0.1 bed can be printed in PETG		

Base Assembly

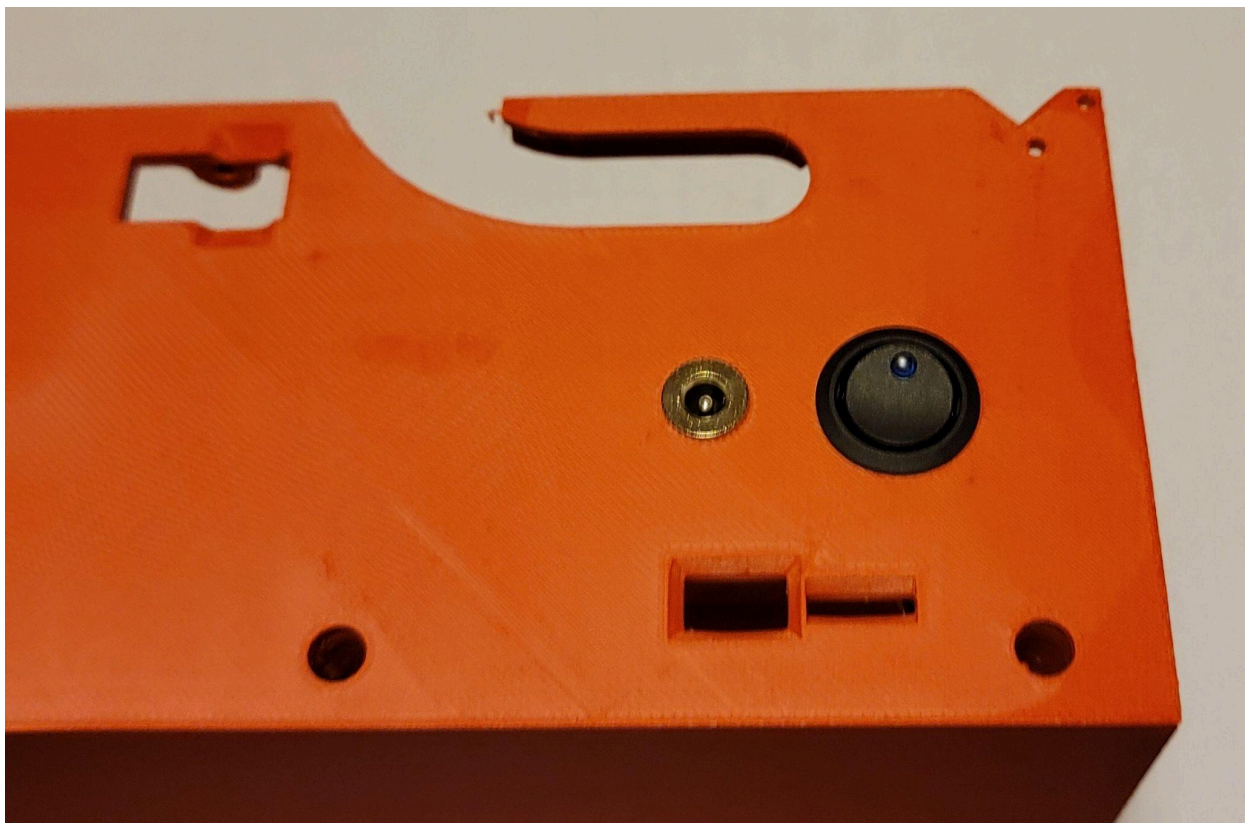
First, make sure the holes in the bottom of the frame sides are clear (as well as the captive nut holes)



Next, put the two sides together. Use an M3X20 bolt and a M3 nut. The nut goes into the square cut out on the bottom, then the bolt into the side. Only install the middle bolt at this time.



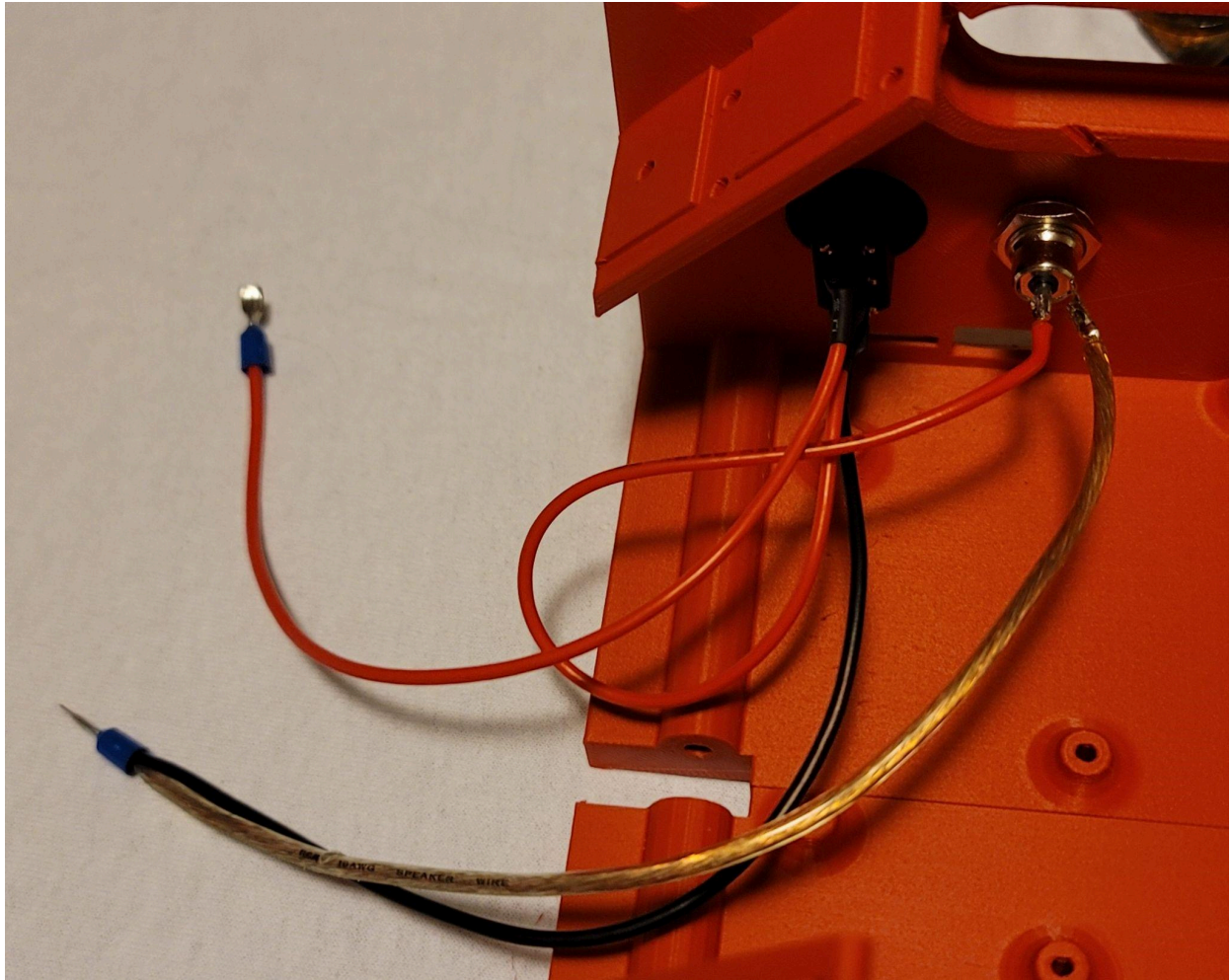
Install the switch and the power jack (TODO: put links for parts in here)



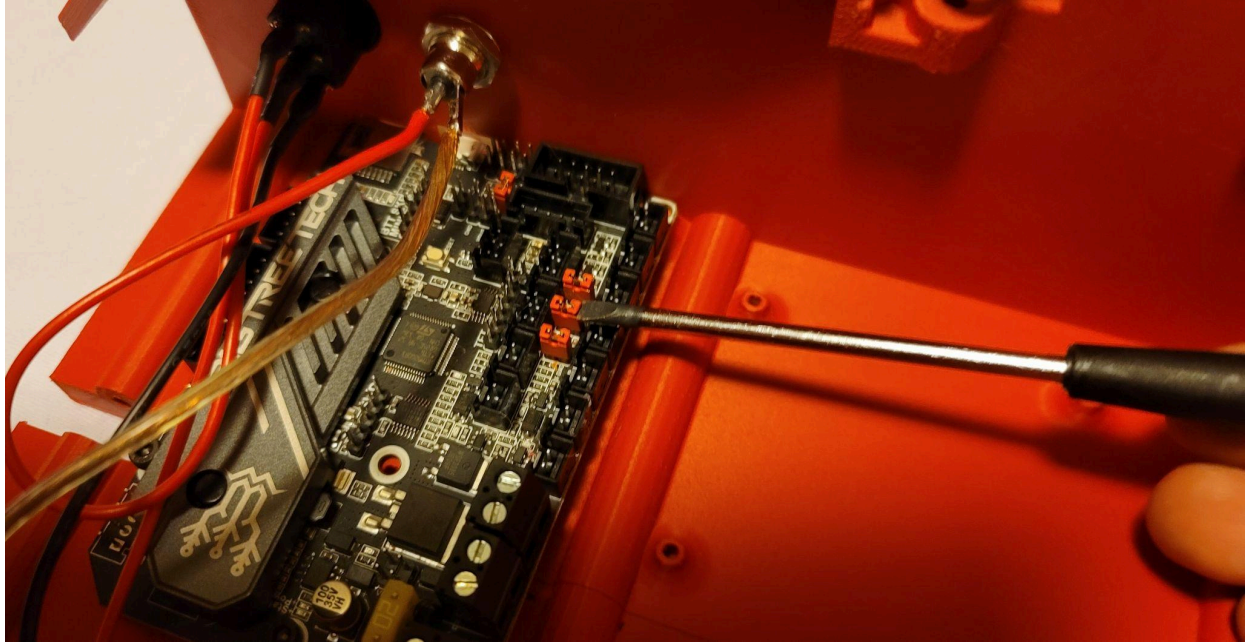
Now its time to wire up the power. This build uses a lit power switch with pigtails and the normal power jack.



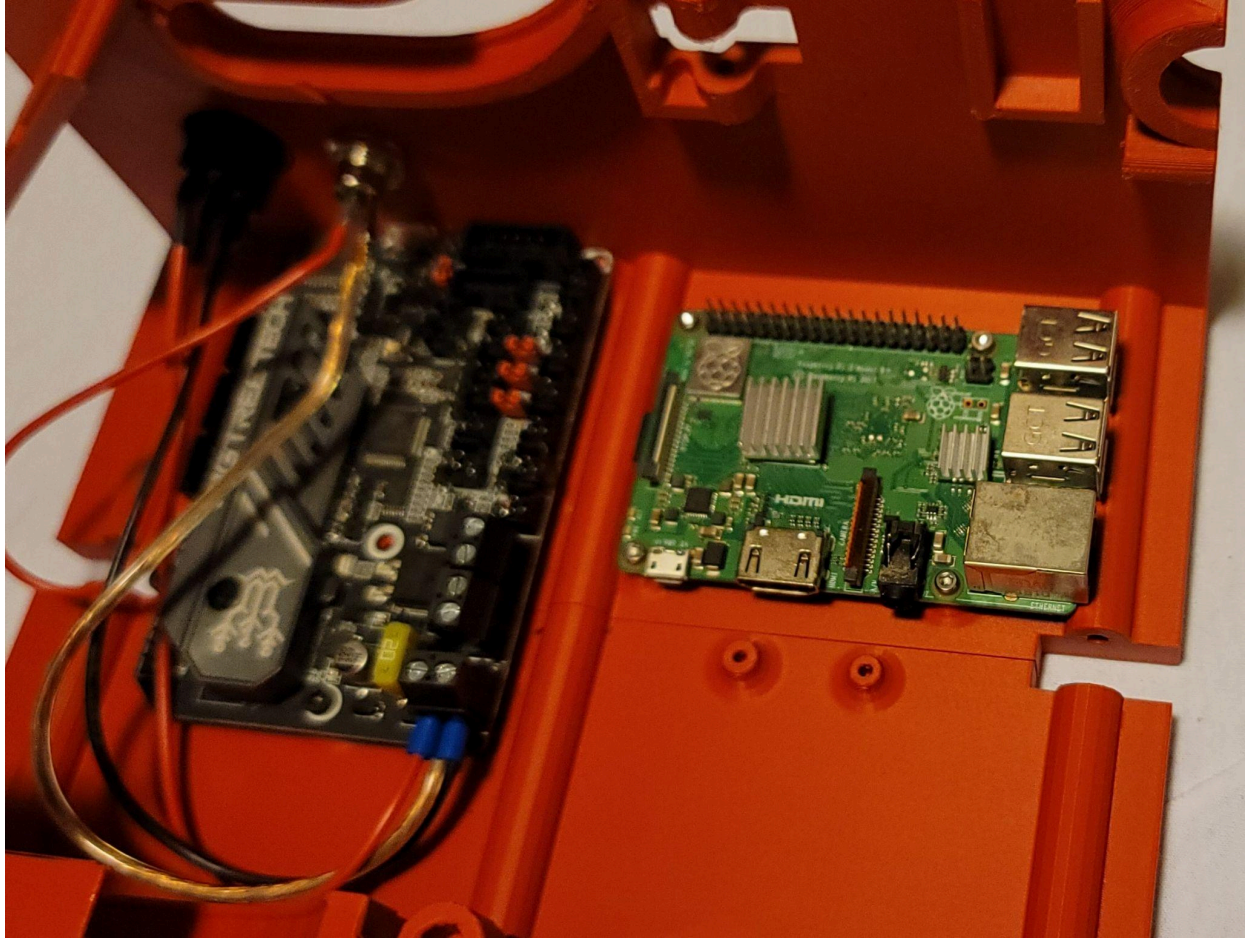
Power all done, Note Ground from jack going to ferrule for the board. And the power going from the jack, switch, to board ferrule. The black ground wire is for the lit power switch. The lit switch is fully optional.



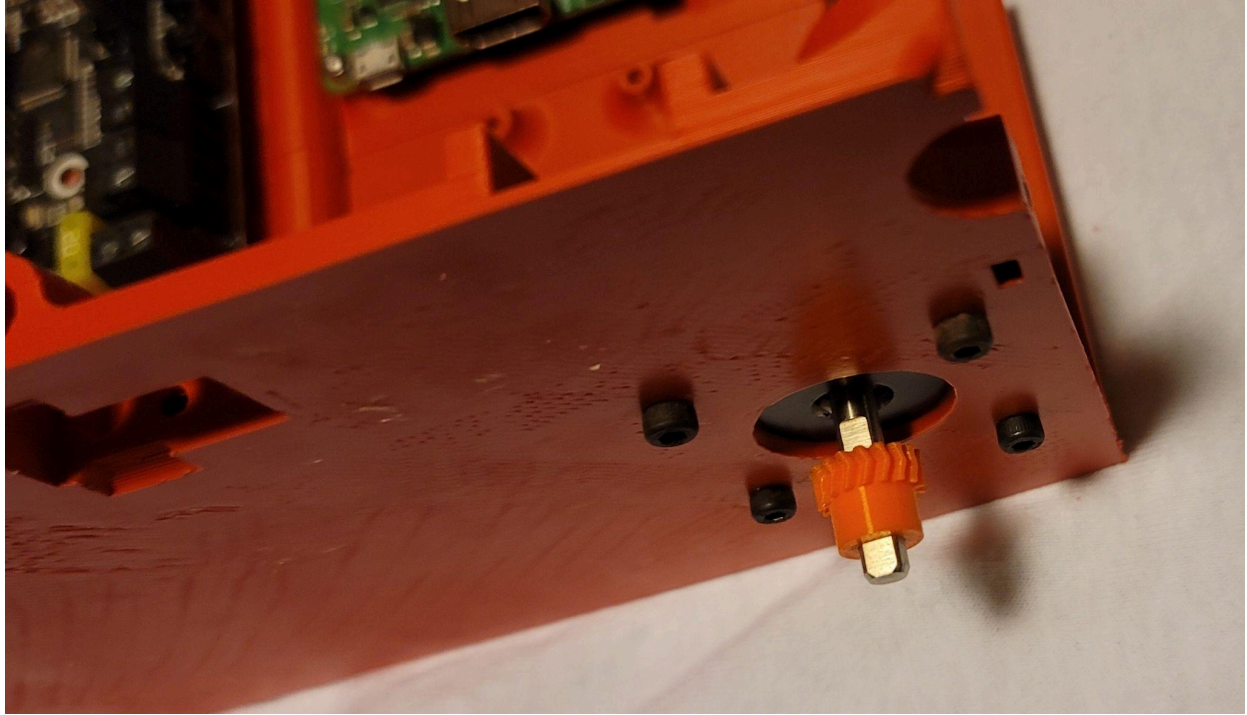
Install electronics! (M3X10) I may have to rework the holes, some did not line up... As we are using sensorless homing make sure your board is set up for that. On the SKR E3 V3 you need to install the red jumpers here



Note, care is to be used **if** using a Pi as the SD card can not be removed when the Pi is installed. It can also be damaged if installed carelessly. Use M2.5 Bolts for the Pi. The lower holes on the other side of the frame from the Pi B is a spot for a Pi Zero. You can pick if you wish, or mounts for other electronics can be put there. Note, power is hooked up to the SKR. Positive on left in this picture.



Install the Z motor and the Z drive gear on the Nema 17. Use M3X8. I Need to thicken this part so that M3X10 can be used.



Assemble the rollers. Note that the BOM lists Hex head bolts. You must use M8 Hex head for the Z driven roller on one side where the bolt head goes into the Z drive gear. For all other M8 bolts used, as long as it is all threaded you can go nuts. These black M8s were cheap and easy for me to find here in the states. To assemble, Put a M8 nut in the cutout, then put a 608 on the M8 and thread into install. Do not overtighten.



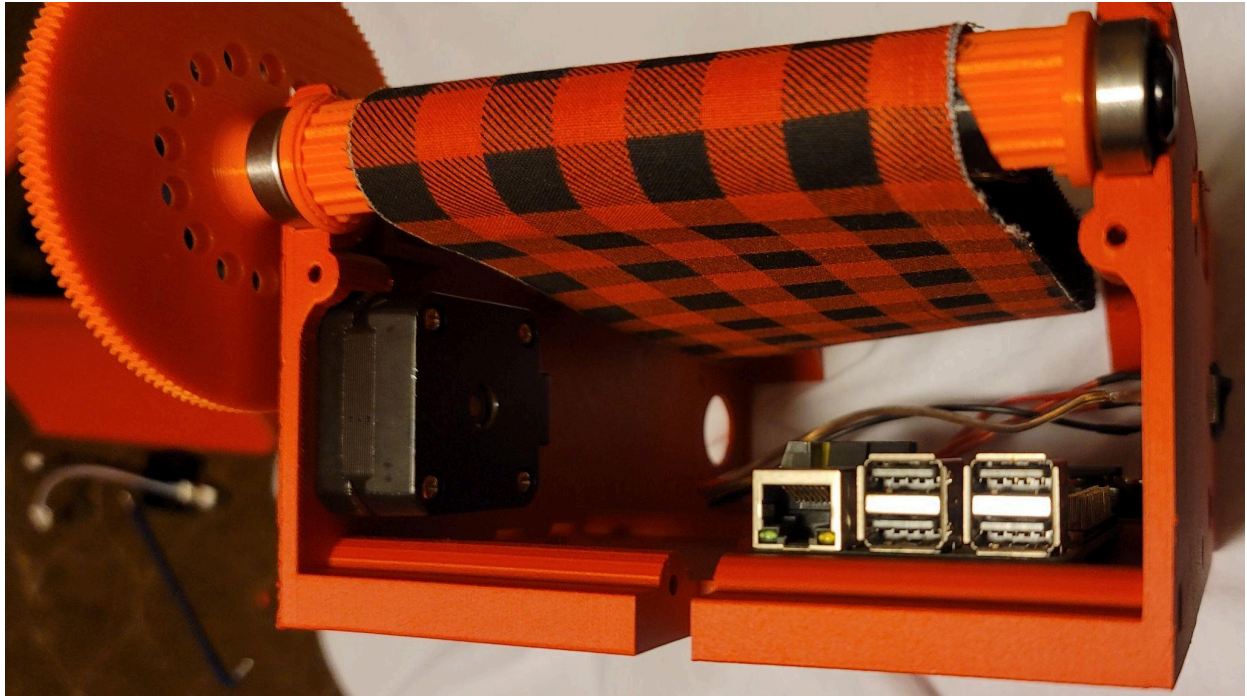
And then the Z drive, This needs a Hex head bolt. Make sure the ends of the rollers are cleaned from all support so that they will roll smoothly



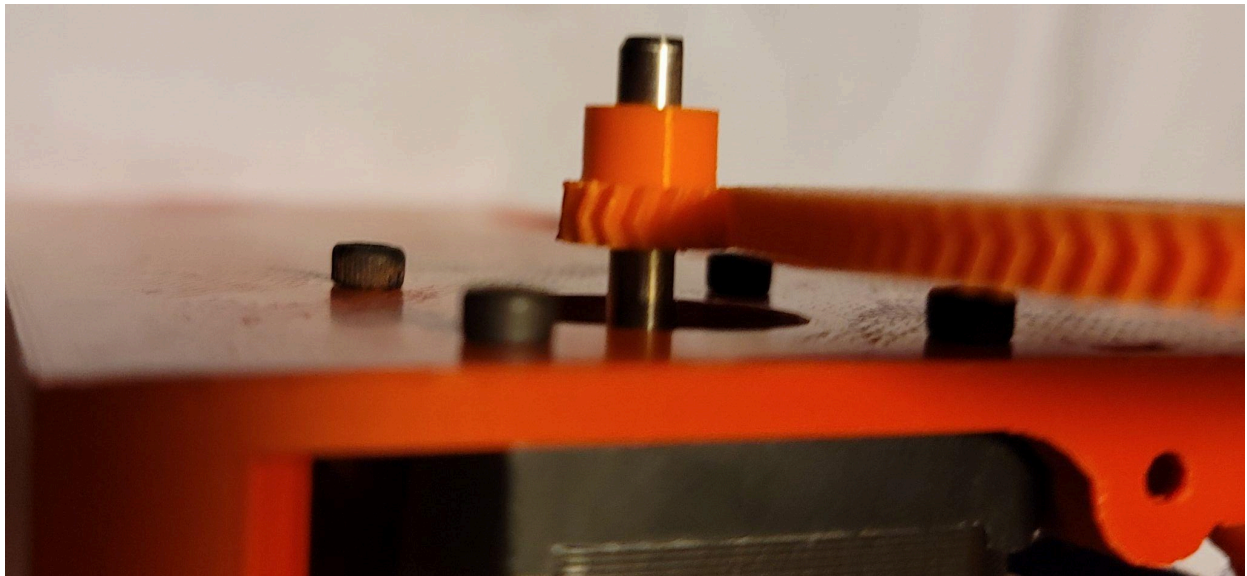
Lightly wrap with electrical tape (or platidip) for extra belt to roller grip



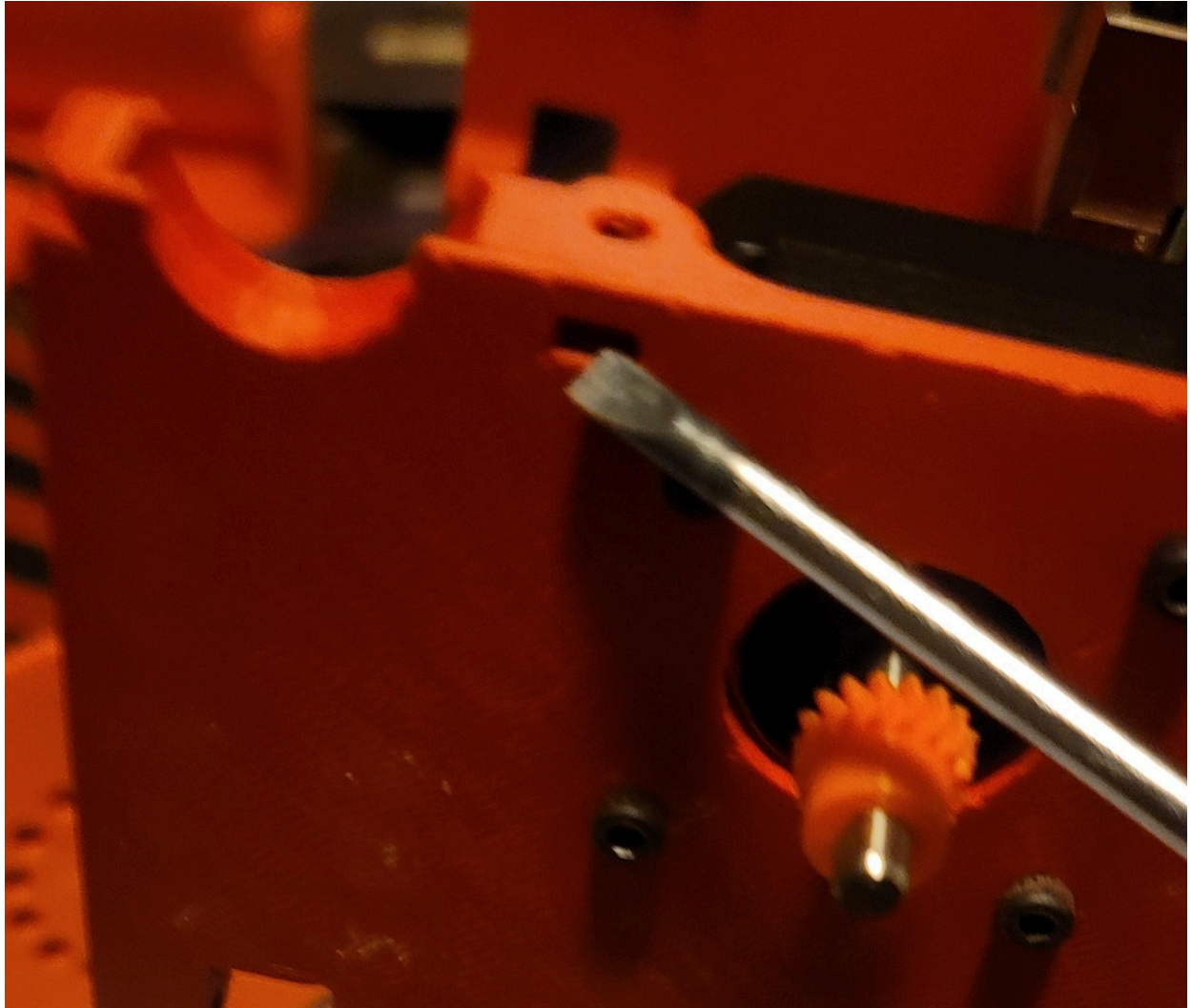
Test fit the roller in the frame (belt is on the driven roller here) You can make your own iron on belt here Note that the measurement in this video is for the BB legacy belt! -> <https://youtu.be/nH6VZ33Sz7w>. 4" iron on by 380MM long is what you need for this printer, the PRO.



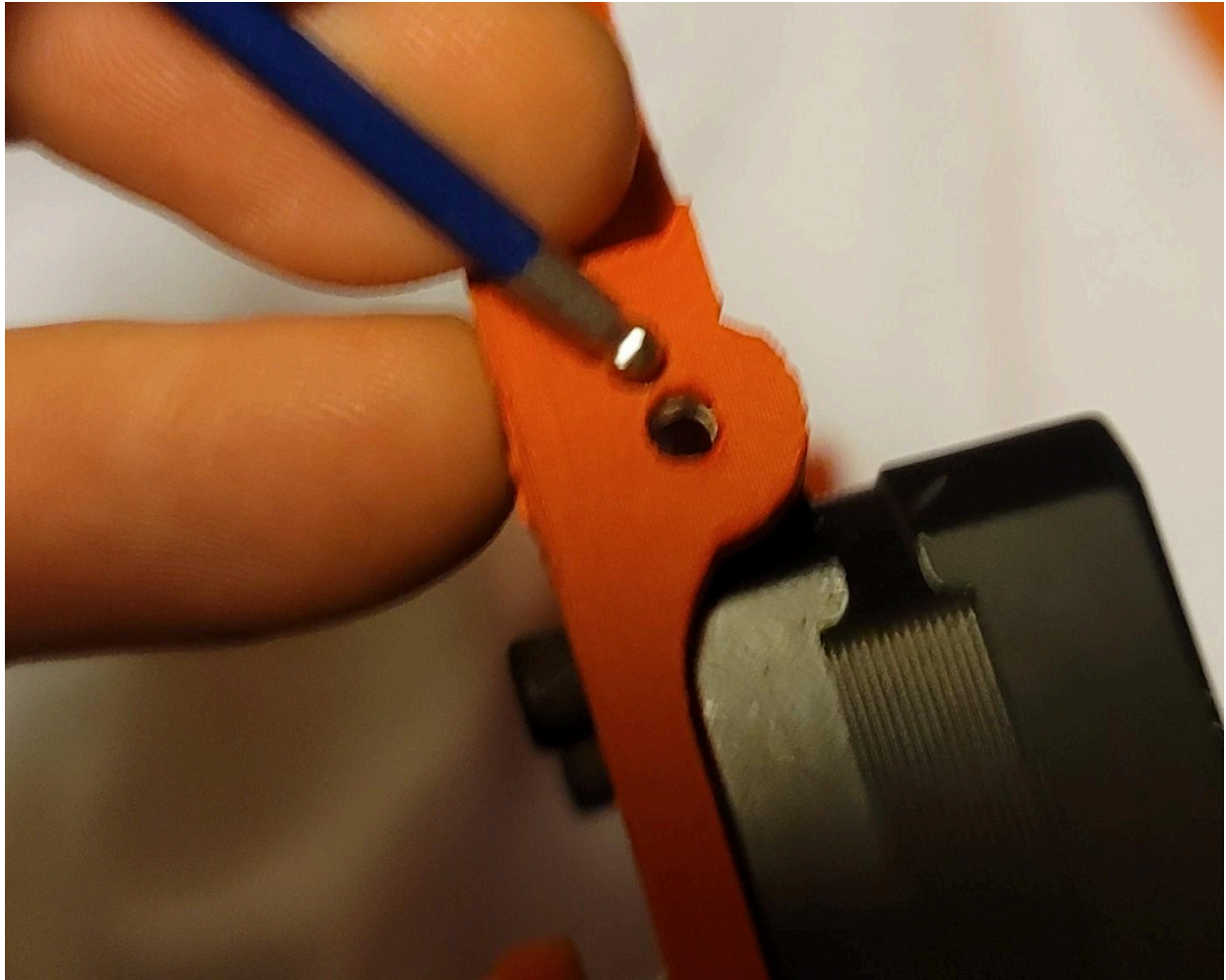
After installing, slide the Nema 17 Z gear so that they mesh.



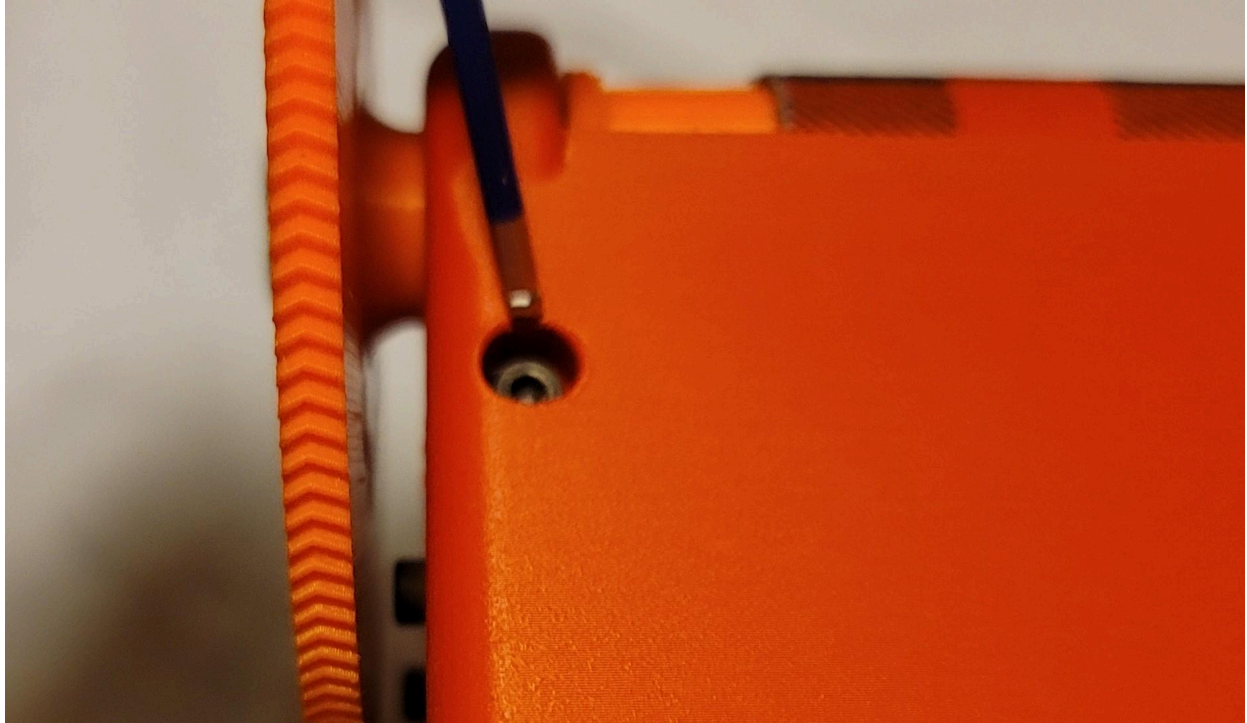
Remove the roller and install M3 nuts in the cutouts on the sides and bottom.



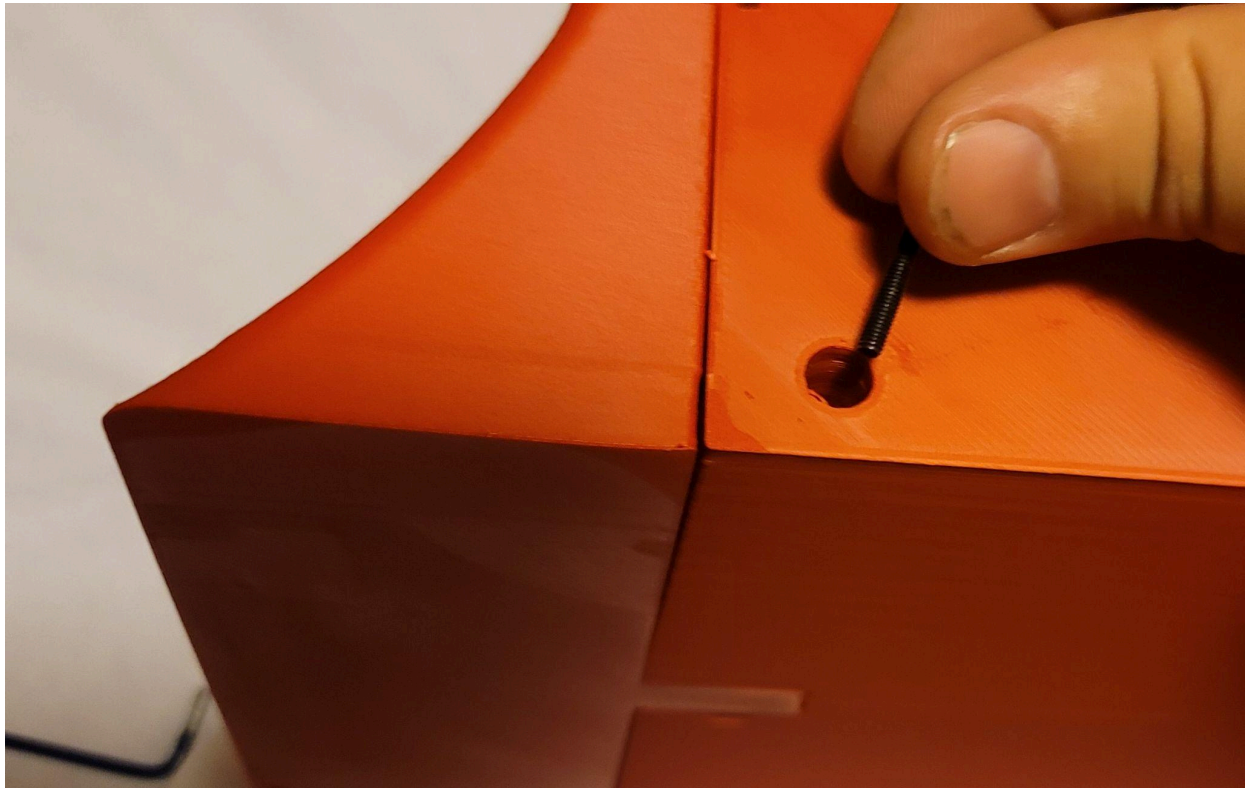
Make sure nuts are fully seated by looking in the holes.



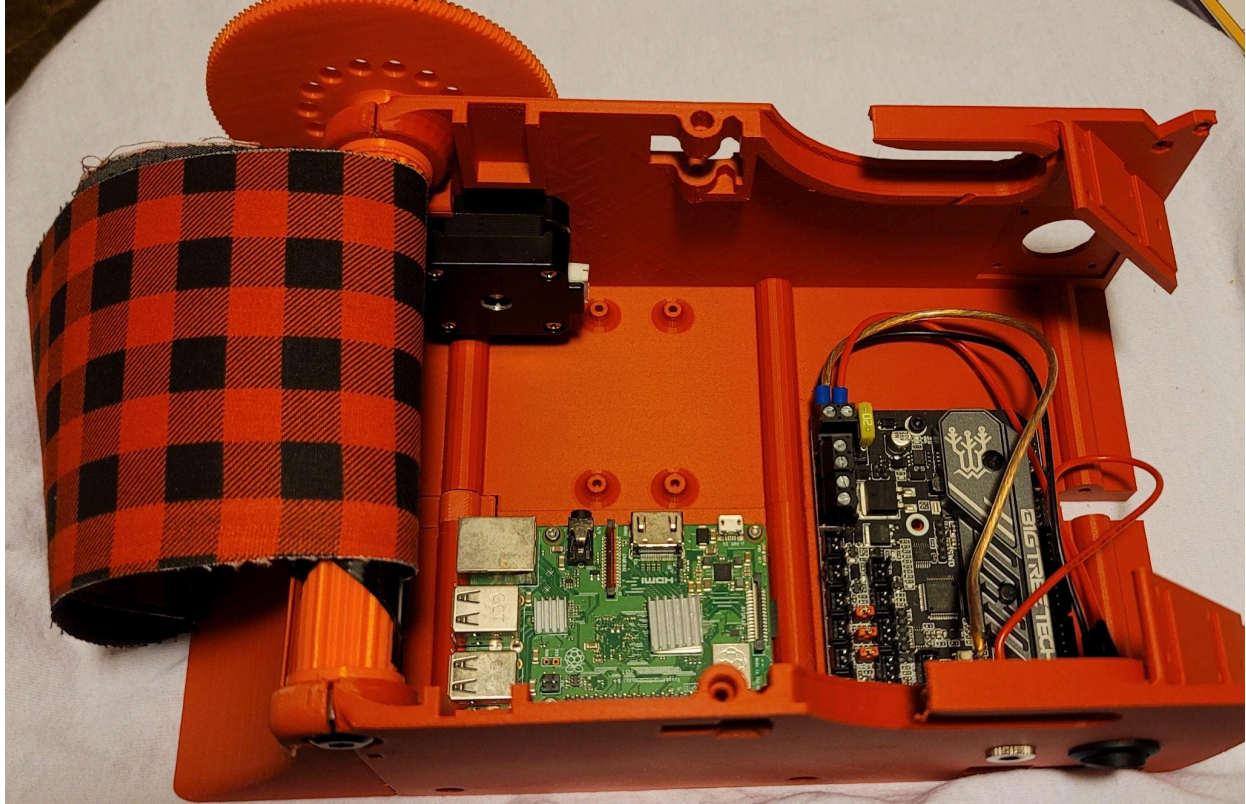
Install the scraper, put the two M3X20 bolts in from the front. Make sure you seat it right before tightening down as you can crack the caps the go over the 608s. If you do, it will not effect the performance, just looks.



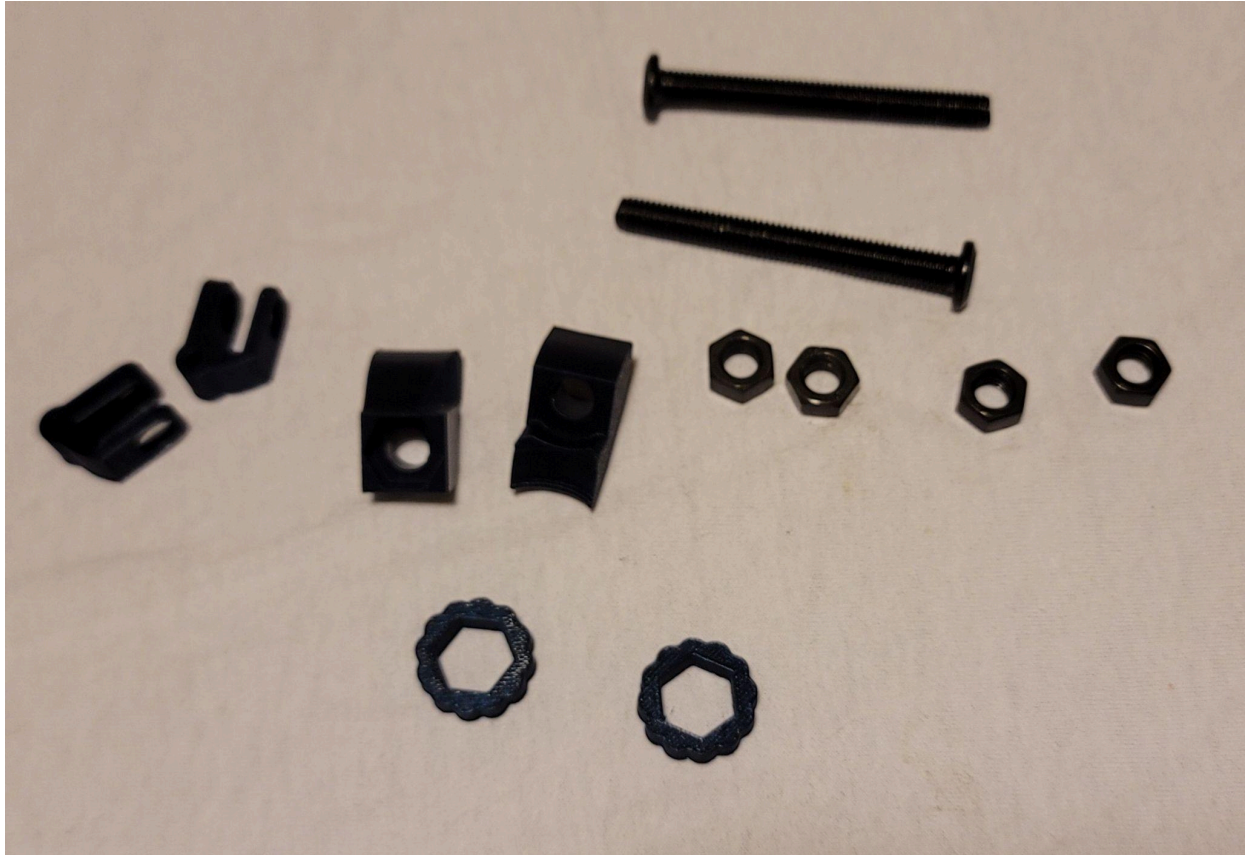
Remember how we put the two sides together? Do the same thing for the bottom of the scraper.



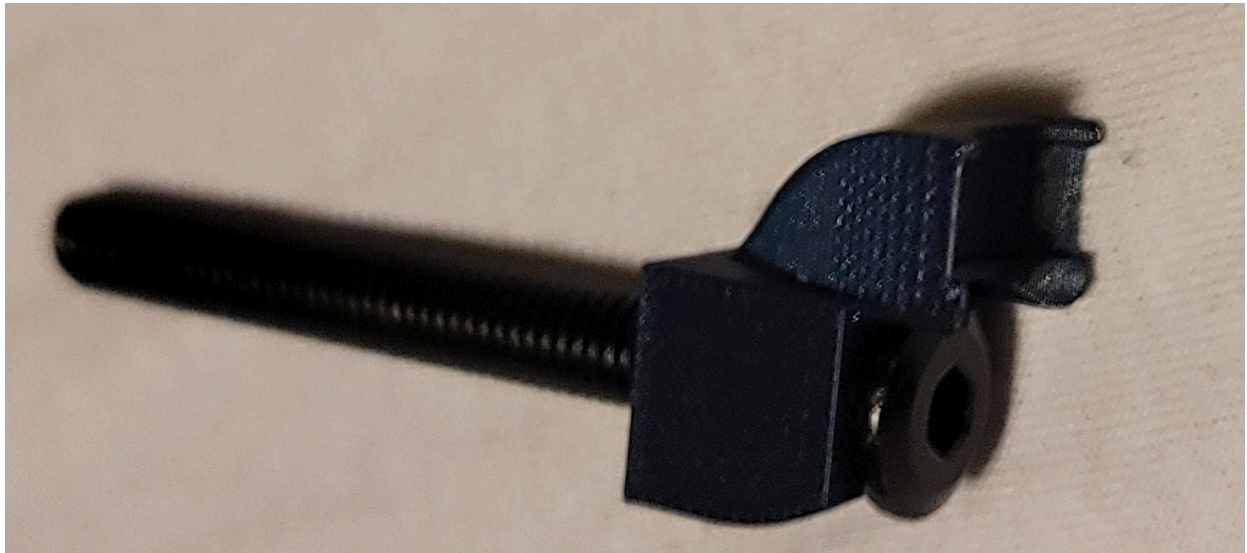
The base should now look like this



Now we build and install the Belt tension parts. M8 and 4X M8 nuts. Note that you **can** use longer bolts than listed in the BOM for this. Must be all threaded with no shoulder, but can be any head style.



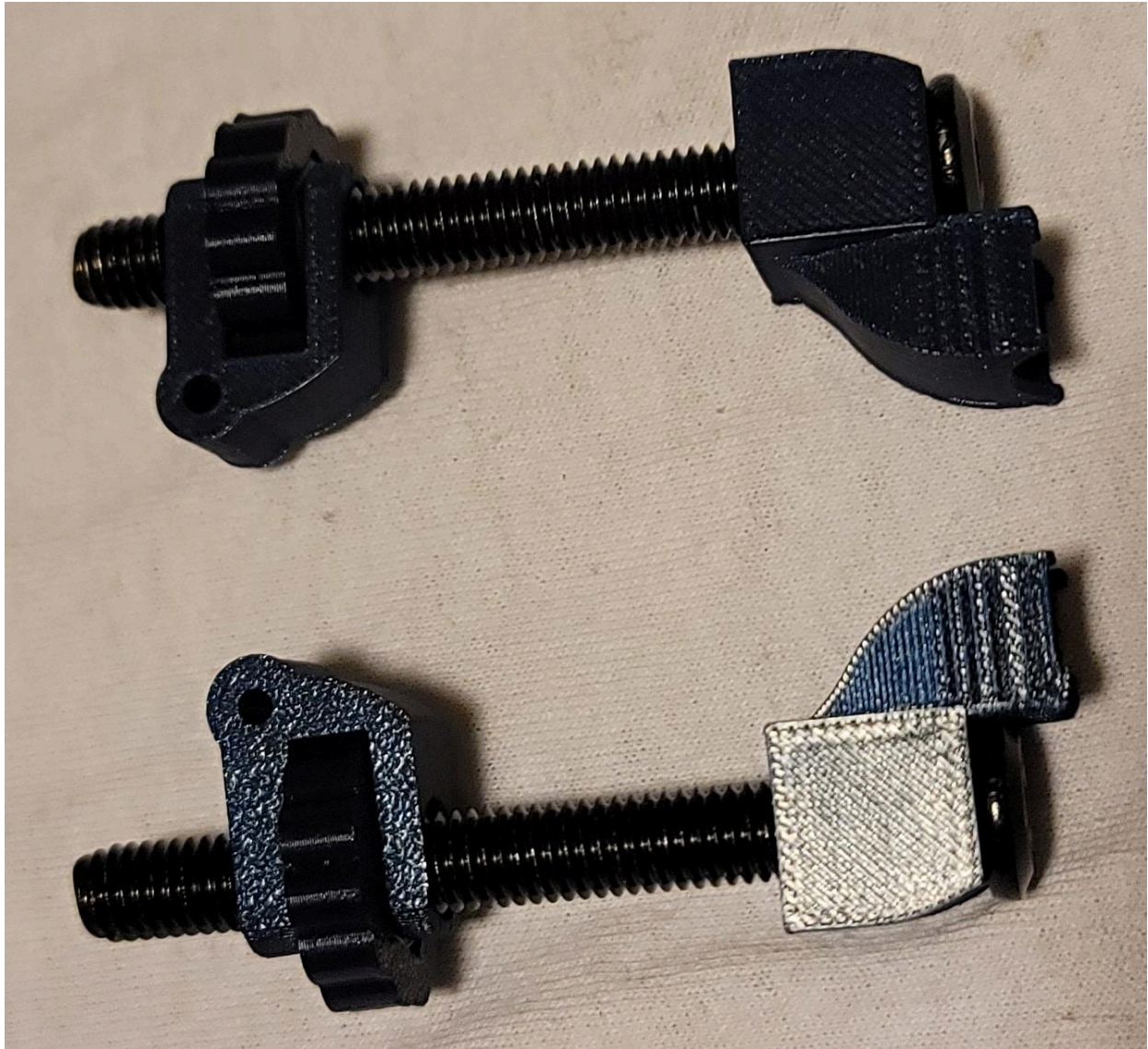
Put the bolt through the pusher parts and then crank down one nut into the hex cutout. Get this pretty snug. Do this for both sides.



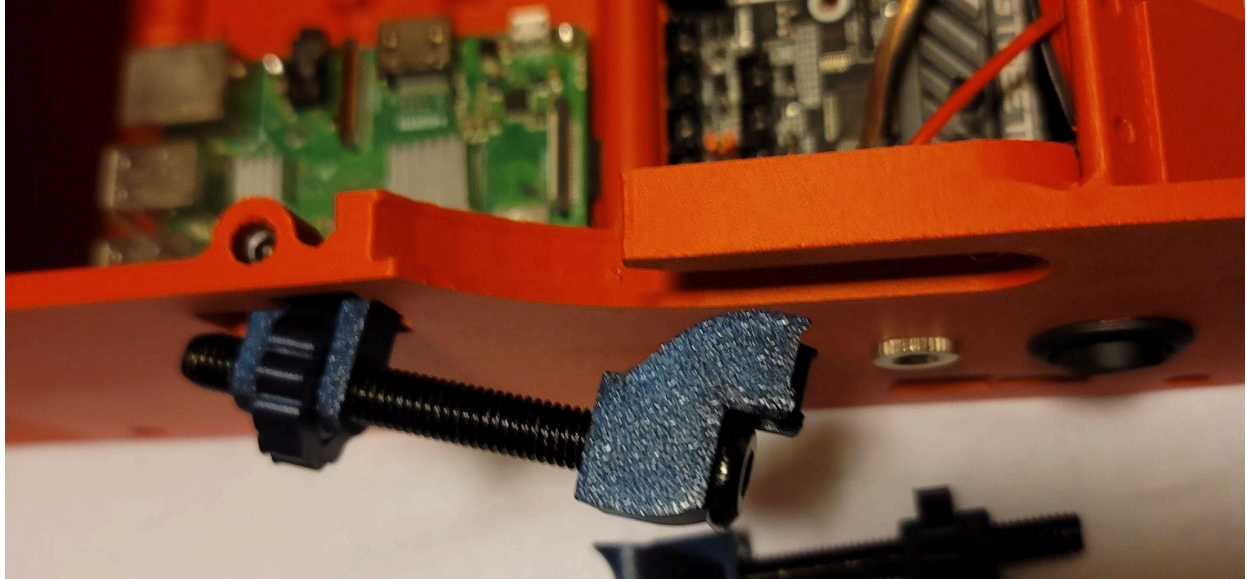
Put the M8 nuts into the nut knobs, then slide into the frames



Screw the frames onto the pushers. Make sure that the frames are facing the correct way (thicker part on back with M3 hole further away from the pusher part).



Now use M3X20 bolts to install the pushers in the frame. Note that the curved sides of the pushers face down and the flat sides of the pushers face up. Do this for both sides



And this part is DONE

Gantry Assembly

Revo

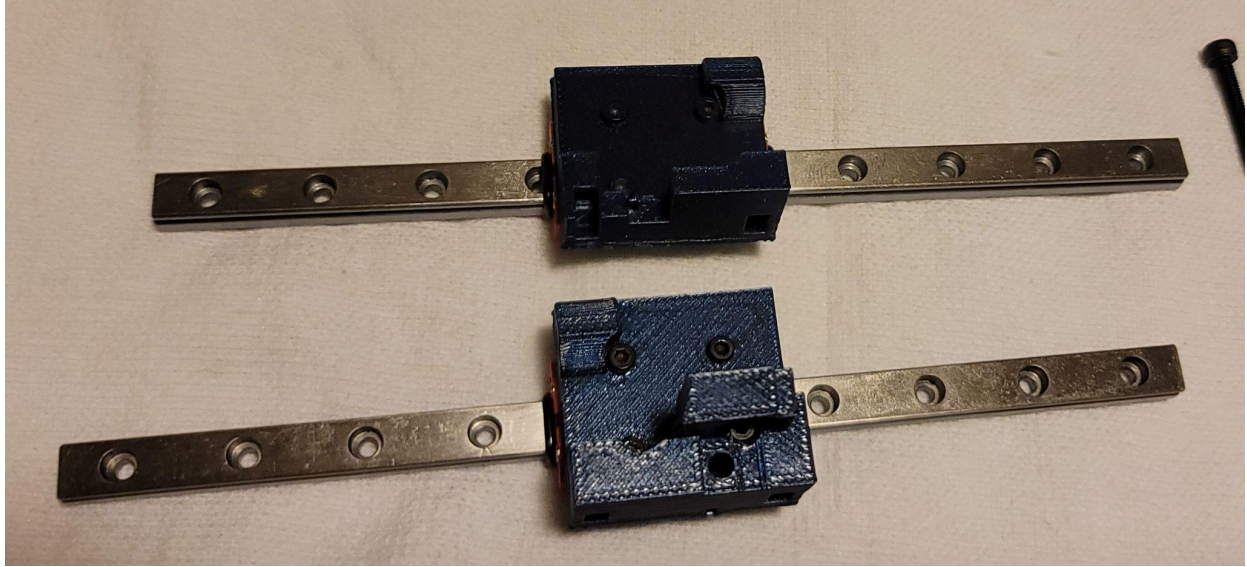
First we need to assemble the Y end (rockmon parts) Side the Base and idler parts together. Install the idler, then use a MMX14 to M3X20 bolt. Note that the bolt head should face up (up is when the hole inside the end is in the upper left when looking at it) This prevents any chance of the bolt falling out. This is done this way as there is little clearance for assembly if a bolt is put in and then slid together.



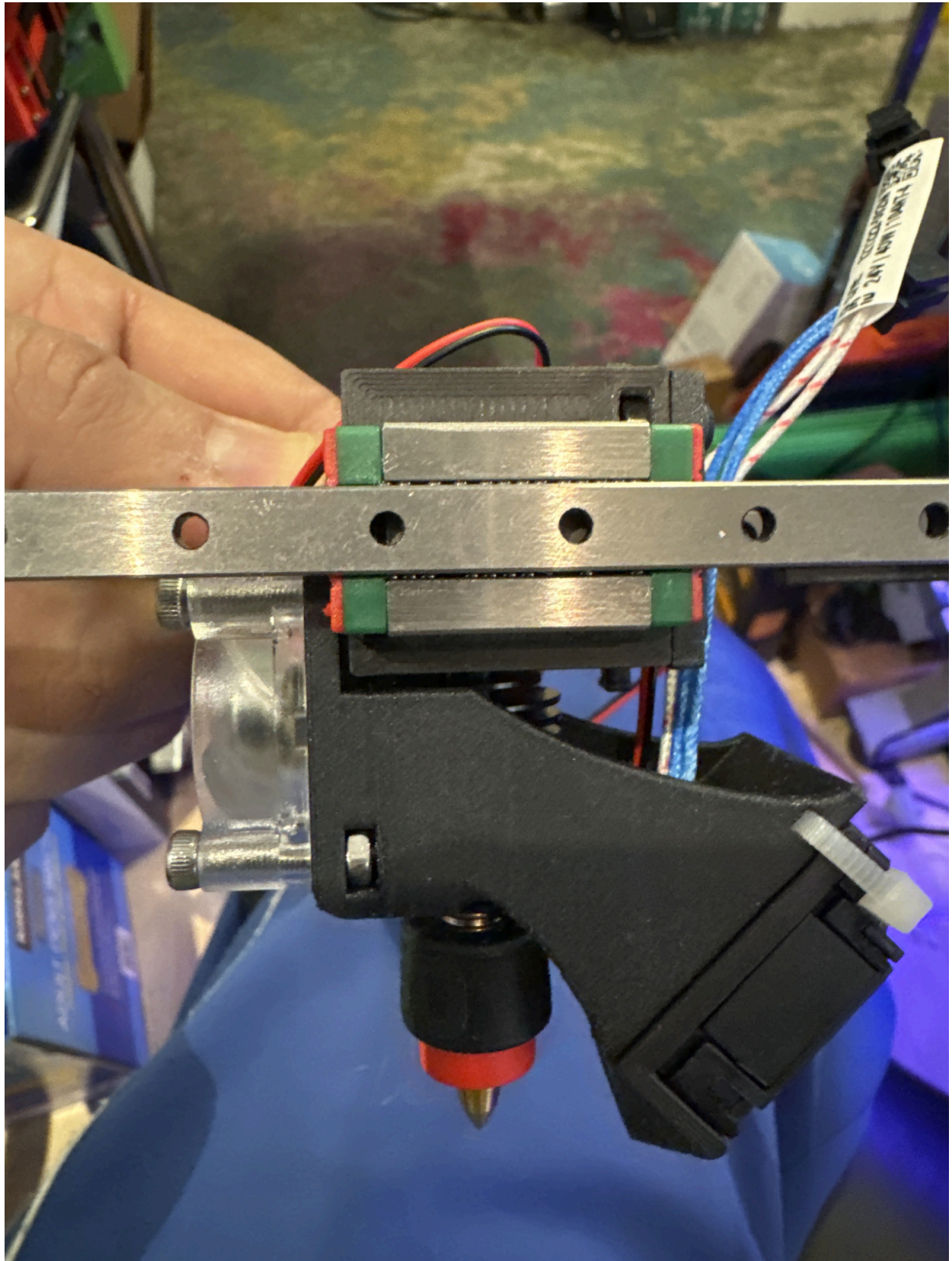
All assembled! Loosely put the tension nut on. Note the arrow pointing to the hole. In this orientation this is up.



Now we will assemble the carriage. Put M3 nuts in the slots on the outside flat sides. Then Screw the BBPro_YCarLside_A and BBPro_YCarLside_B onto the linear rails. (shown are the bamboo versions, but same idea)

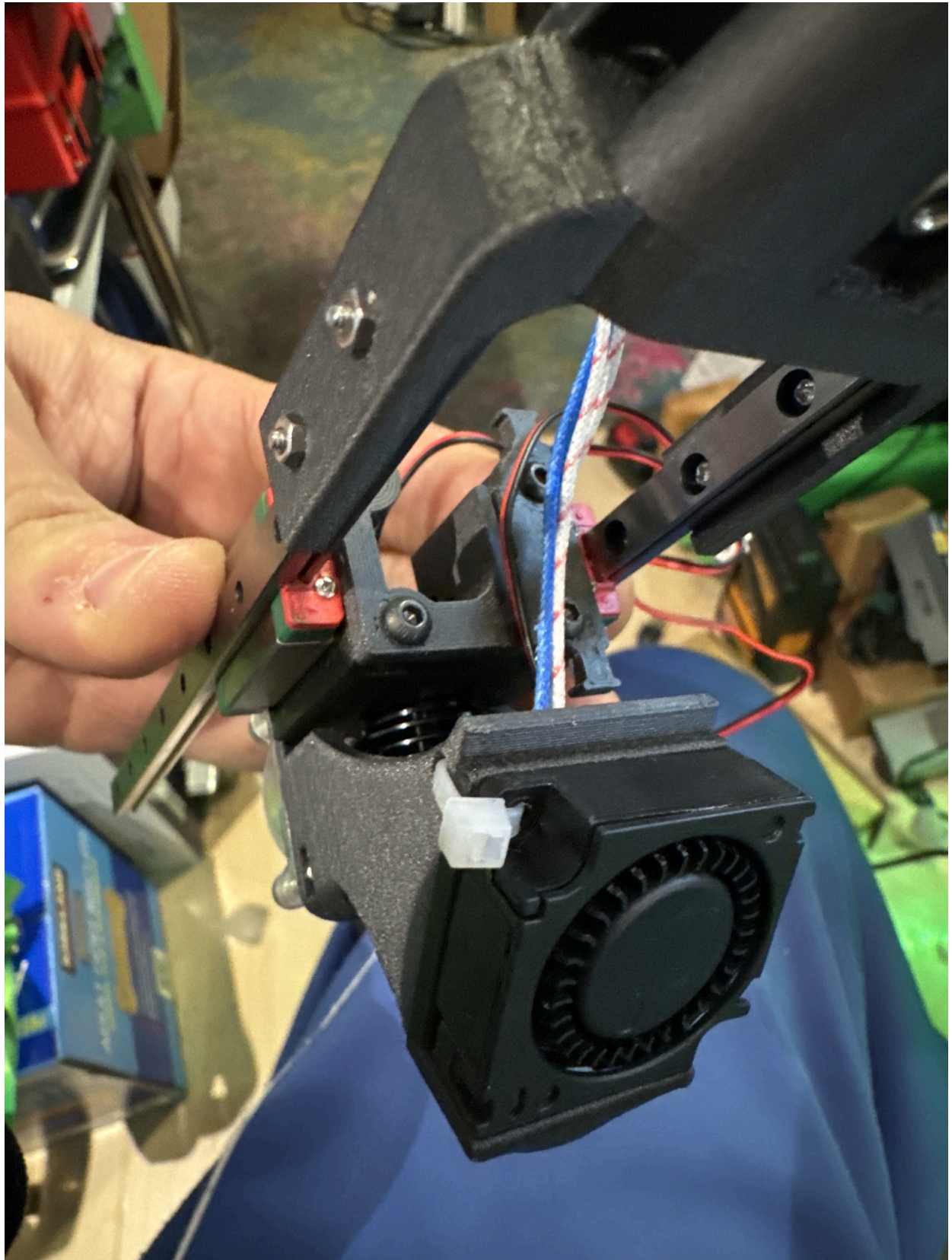


Alright! Now, we can the fan shroud, add the parts cooling fan mount, and the parts cooling fan. These three parts get ziptied together. Note that bolts can be used, but zipties are better as they can not vibrate apart. See the parts cooling fan and mount in the bottom right of PeteS's photo below.



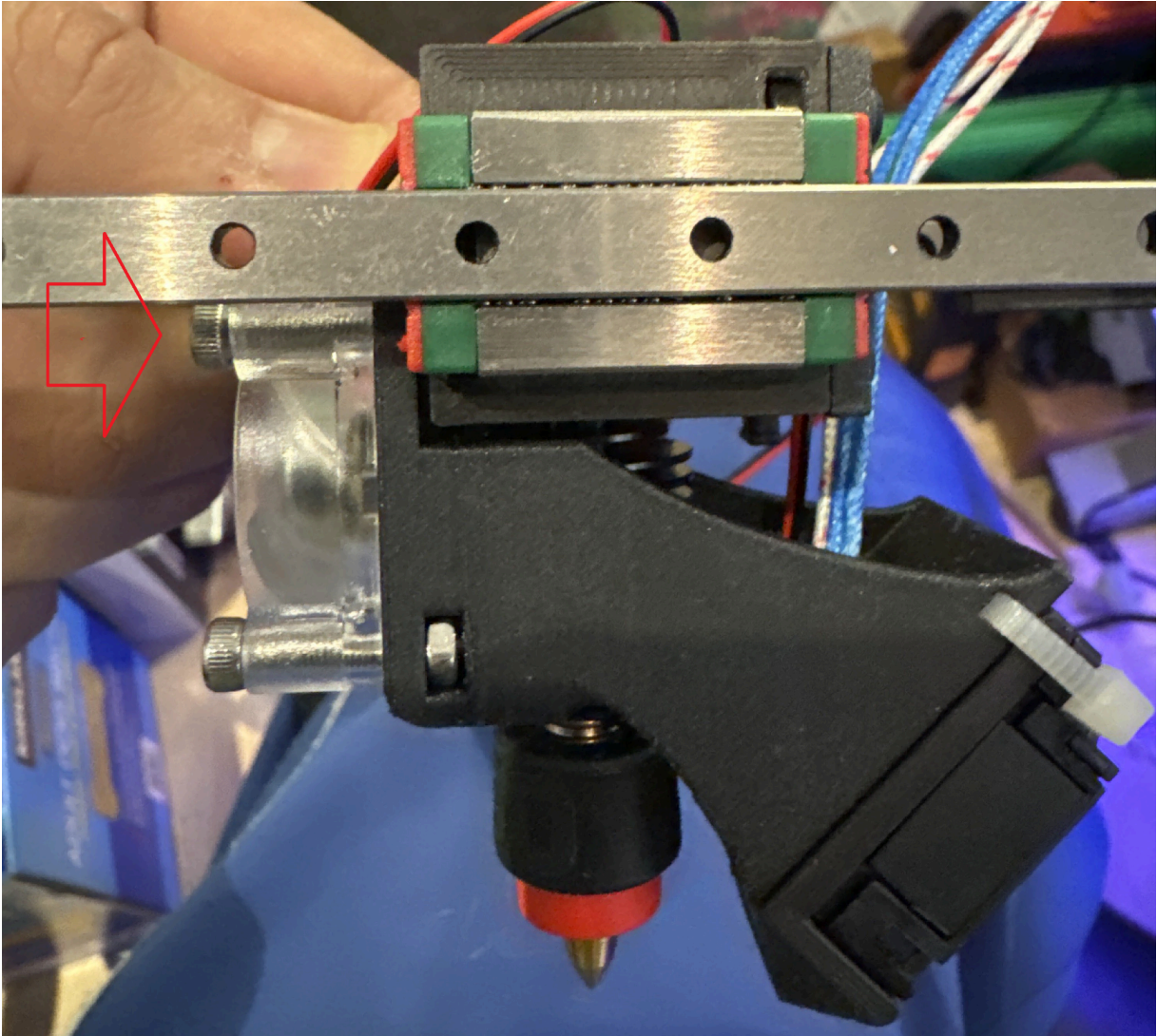
Now we add the nuts and bolt on the fan. Use the lower holes in the 3010 hot end cooling fan to bolt it to the shroud. M3X20 bolts.

Also, now we put the two halves of the carriage together. Hold 'em together with the belt locker part. Also bolt all this to the Y end. Make sure that the hot end cooling fan faces away from the Y end and that they are not upside down from each other. M2X8 with M2 nuts. Make sure this is pretty tight. You should also put a M3X10 bolt into the hole on the Y end stop now. Not all the way in. This sets your endstop for the sensorless home. By adjusting this, you set the nozzle to print belt height.



Install the Revo hot end. Make sure you get the nut on the top nice and tight.

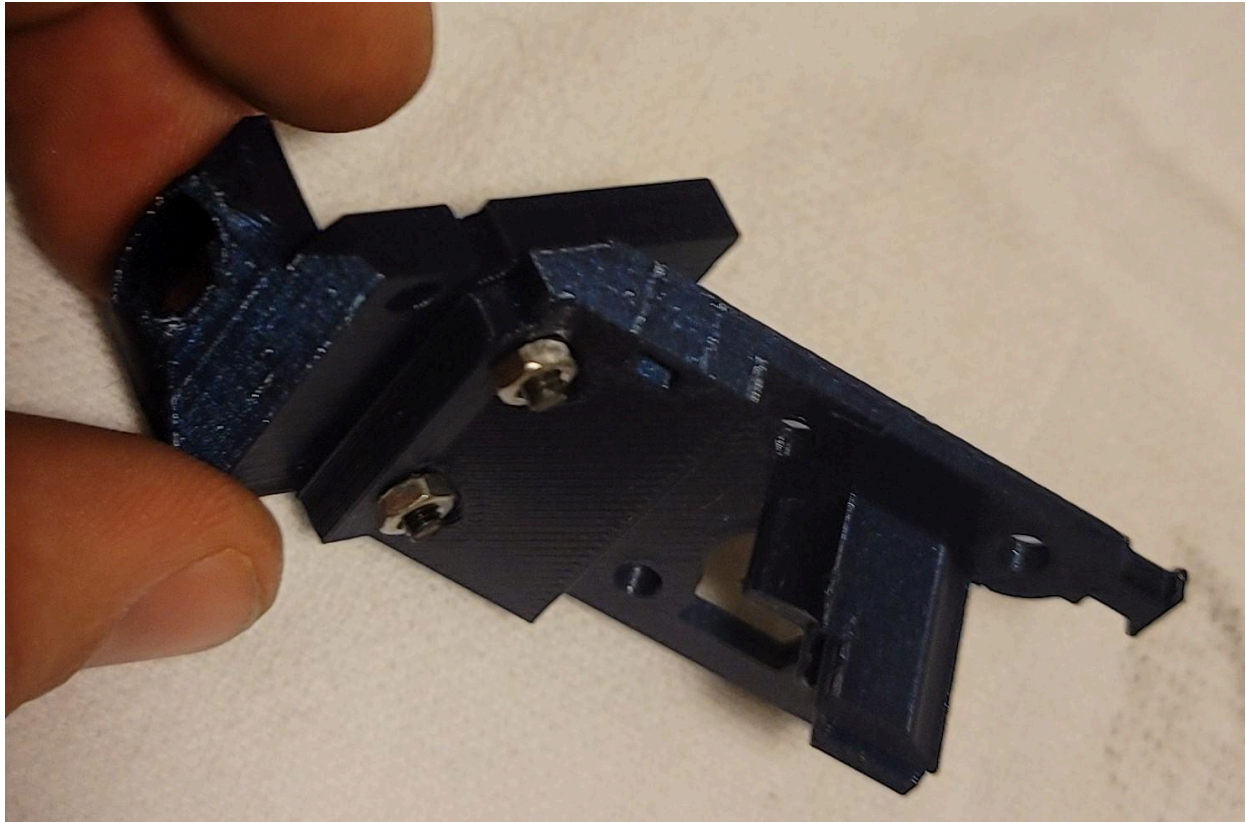
Now install the fan assembly using two M3X20 bolts through the top of the hot end cooling fan holes.



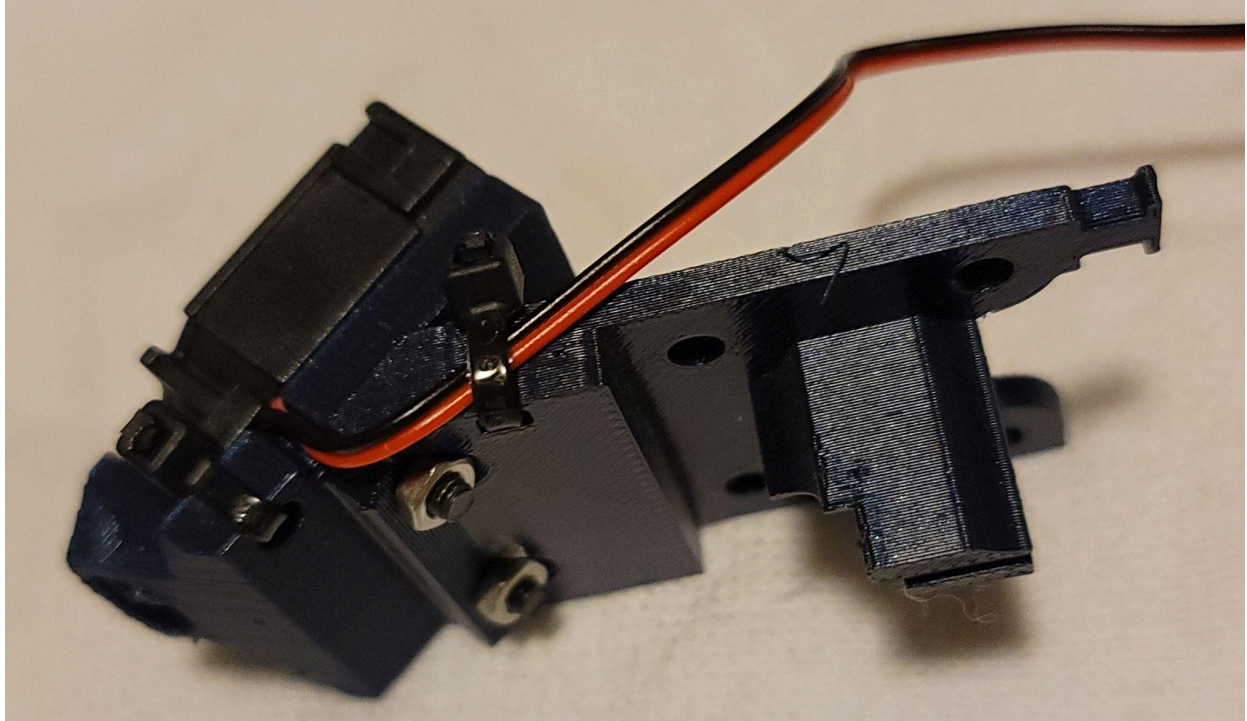
Bamboo

Now we will assemble the carriage. This is going to show the Bamboo style hot end, but the Revo is close to this as well.

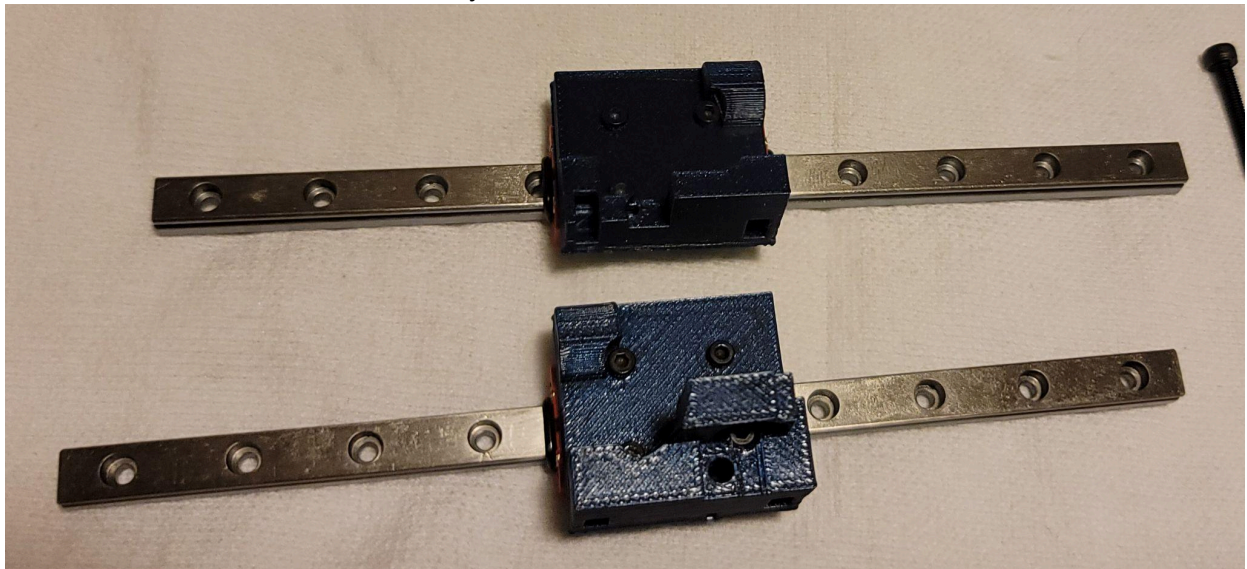
Bolt the fan shroud to the beltHolder with M3X10 and M3 nuts (for Revo, Ziptie the partsfan to the parts fan mount and to the fan shroud. Note that Zips are recd as bolts can work loose at that size and location



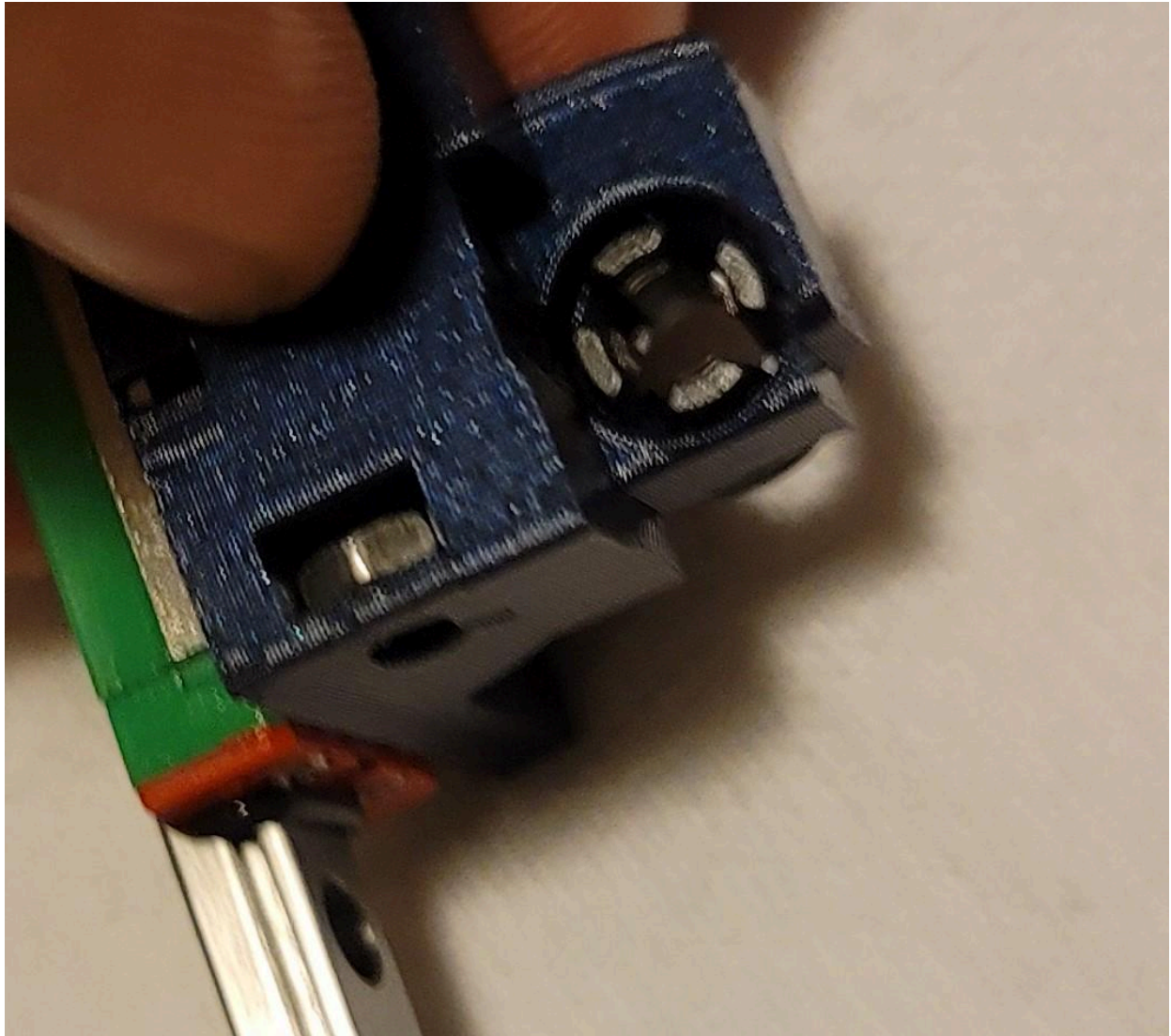
Zip on the fan and secure the wire (for revo, the parts cooling fan mounts to the fan shroud from the other side of the carriage, not onto this belt locker part)



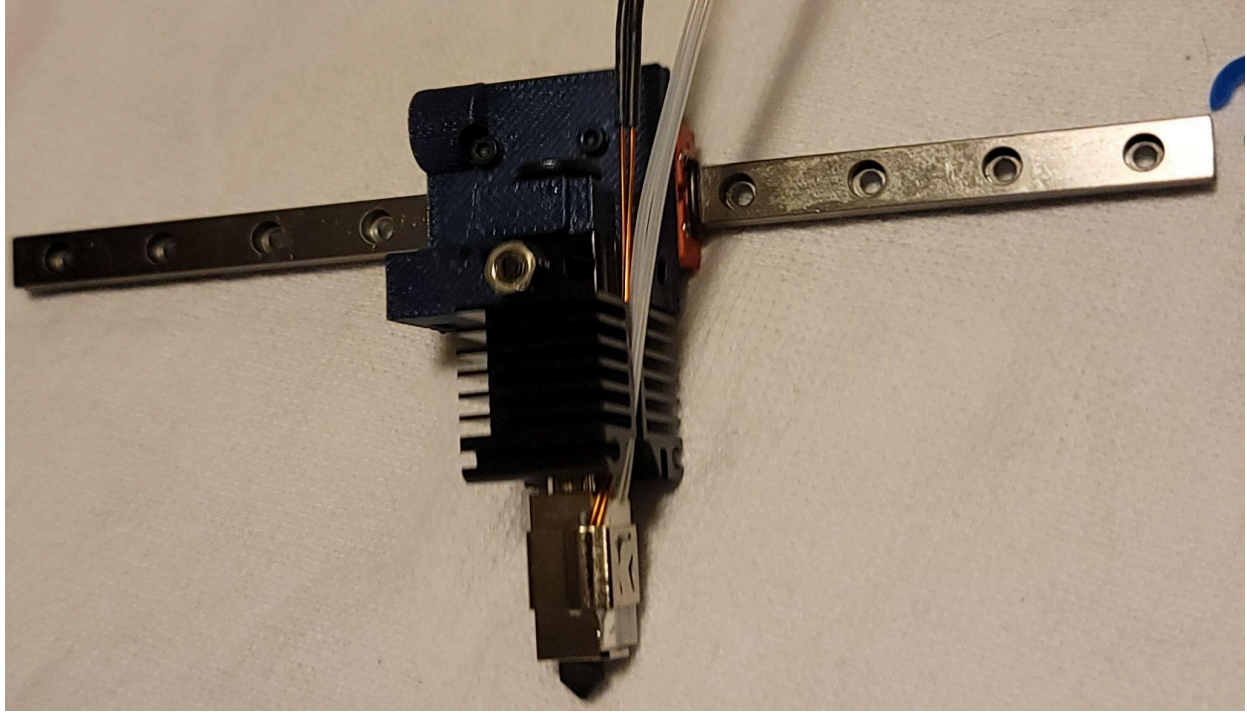
Load nuts into the sides of the Y carriage parts, a M3X20 into the bolt hole, and then use M2X6 to bolt the halves onto the rails. Only 3 can be used on one side of the bamboo mount Y car



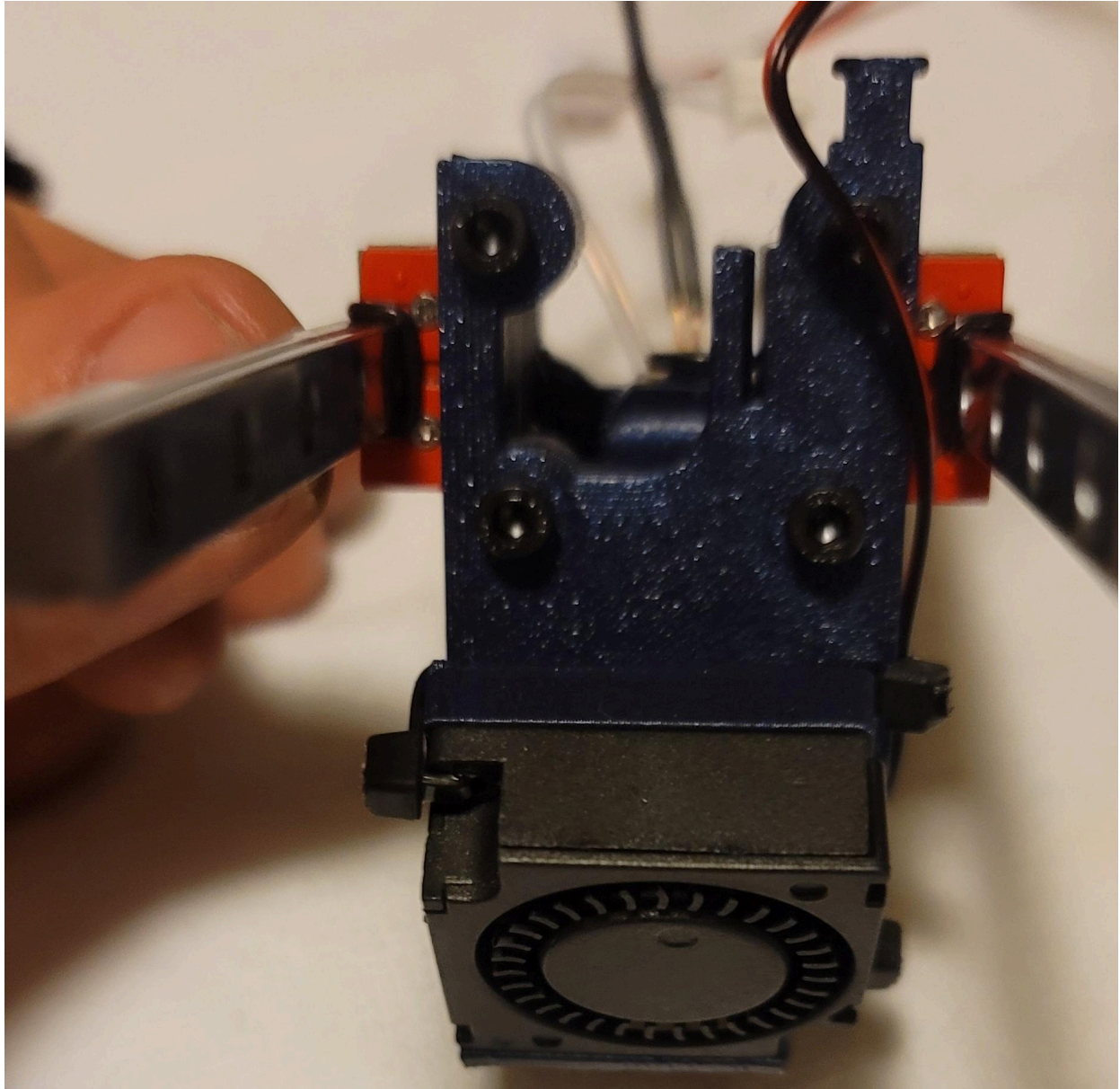
Skip this part for Revo, for Bamboo put a M2.5 nut into the bottom hole on the right of the part with the M3 bolt. Push the PTFE collet in. Note this is a bottom view.



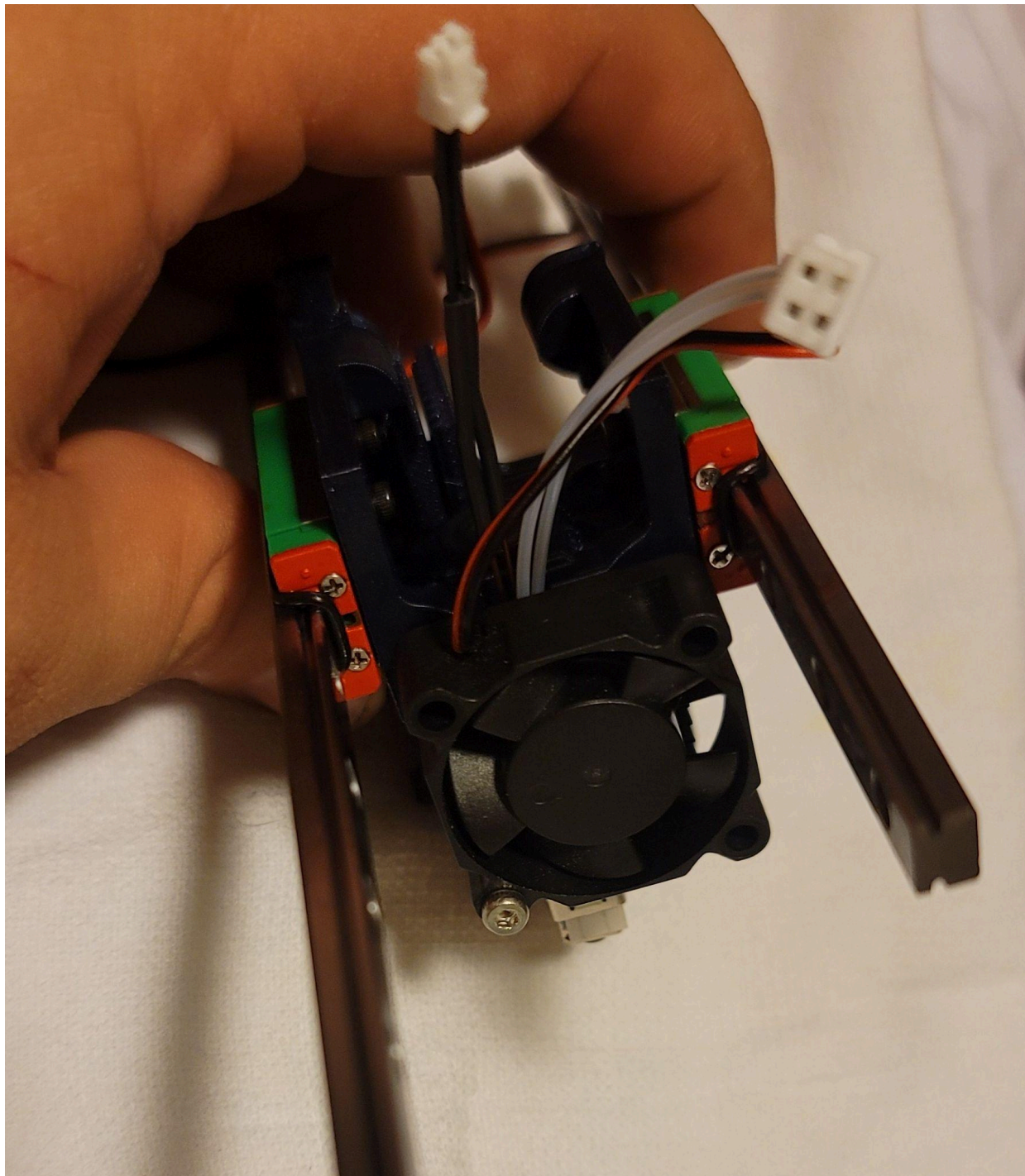
Now bolt the bamboo hot end on with the wires facing away from the frame. M3 nut needed. Make this nice and snug!



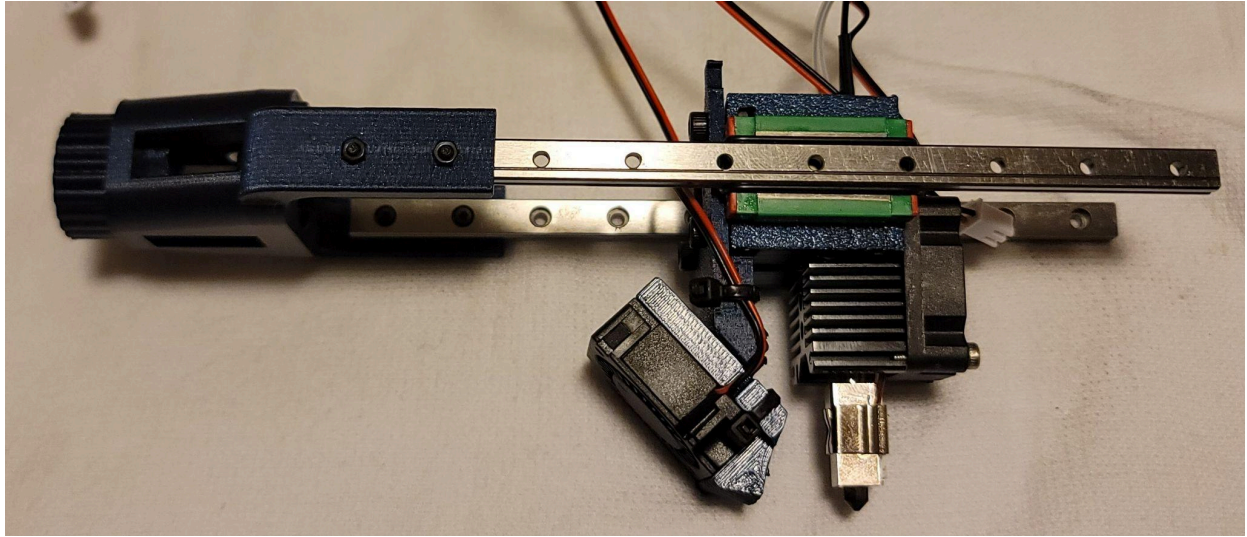
Put the sides together and install the belt tension part (and if bamboo the part with the fan we just made) Note that the sides for the bamboo need to be worked together and lined up with the nut that holds the hot end on. The bottom of the bamboo sides are not even with each other.



Install the 25 MM fan I did not get them yet, so here is a cheater 30MM fan. Use M2.5X14 bolts.



Now bolt all this to the Y end. Make sure that the hot end cooling fan faces away from the Y end and that they are not upside down from each other. M2X8 with M2 nuts. Make sure this is pretty tight. You should also put a M3X10 bolt into the hole on the Y end stop now. Not all the way in. This sets your endstop for the sensorless home. By adjusting this, you set the nozzle to print belt height.

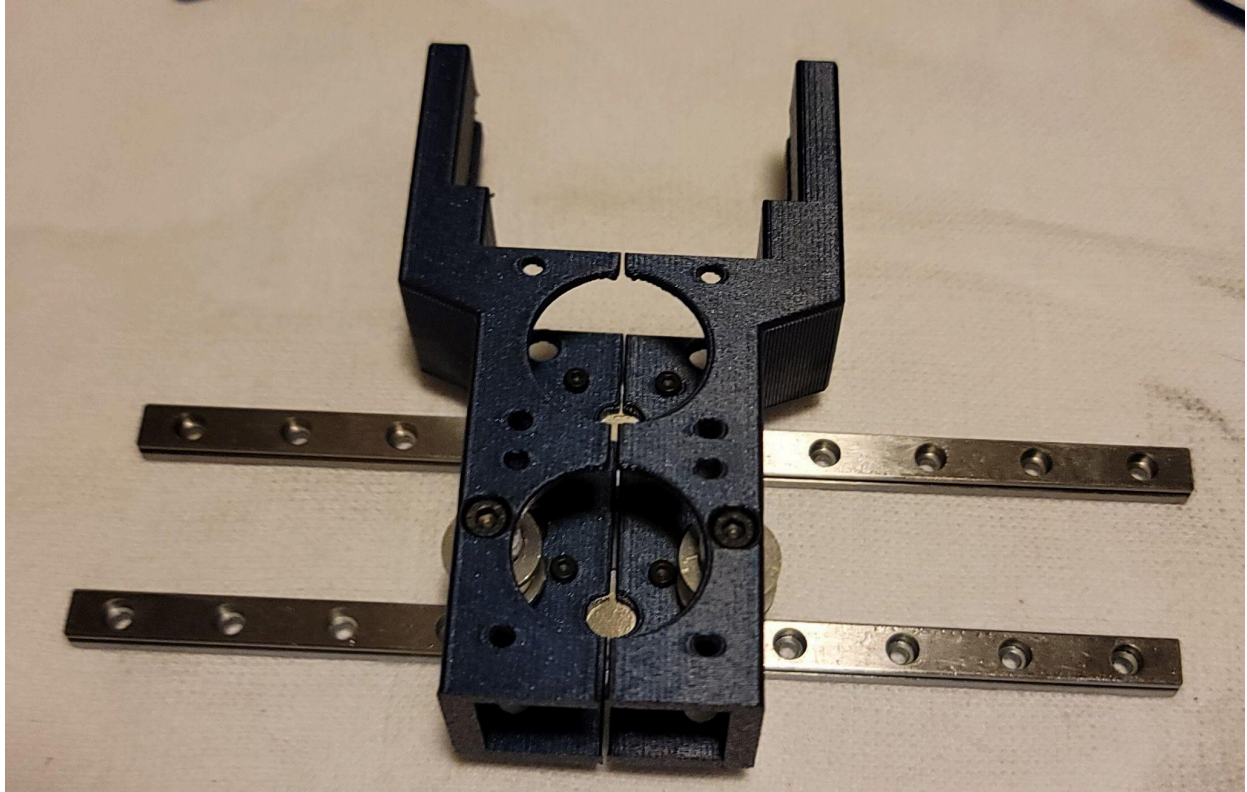


X carriage Assembly

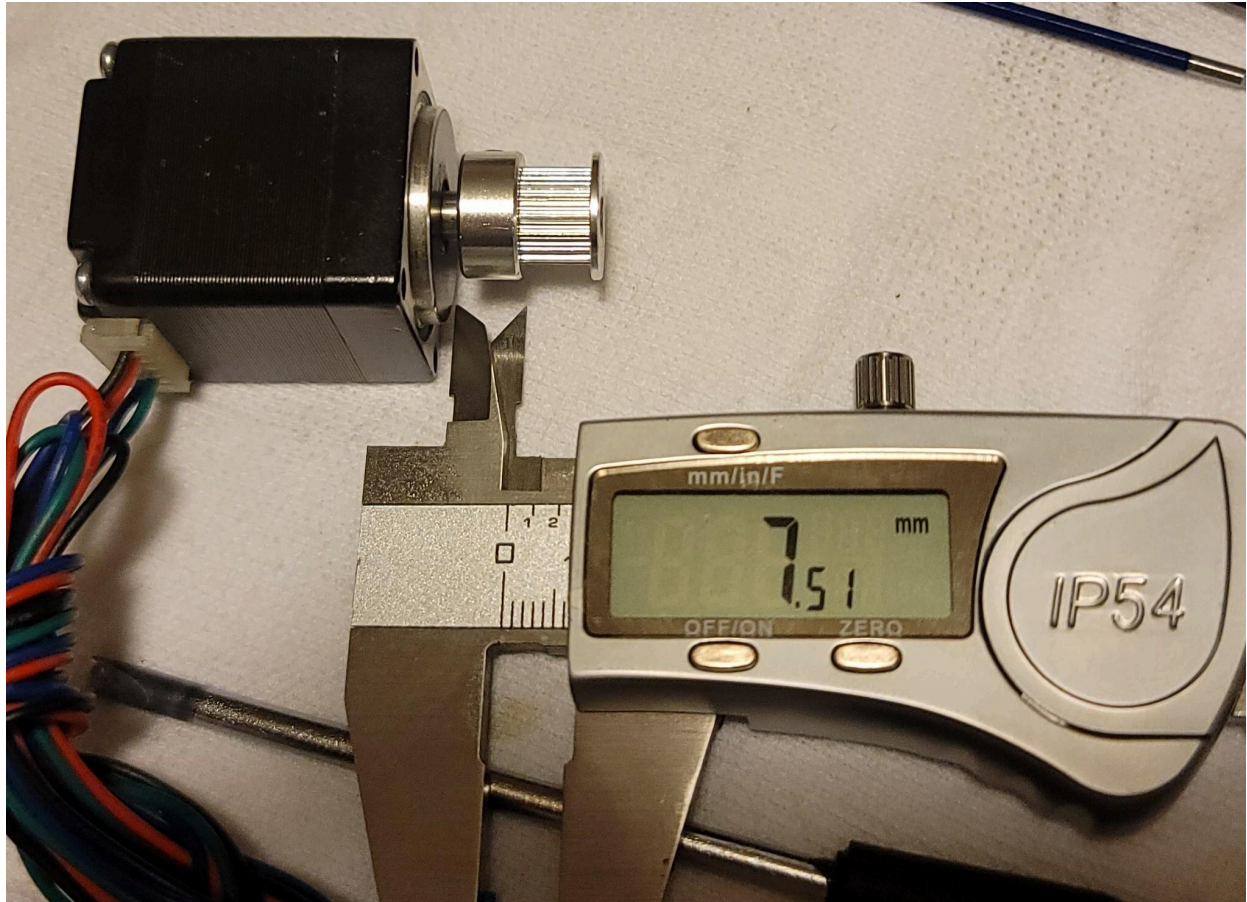
~~Now time for the hardest part of the build. I plan on reworking this to make it easier.~~

I reworked it to make it as one piece that is easier to assemble.

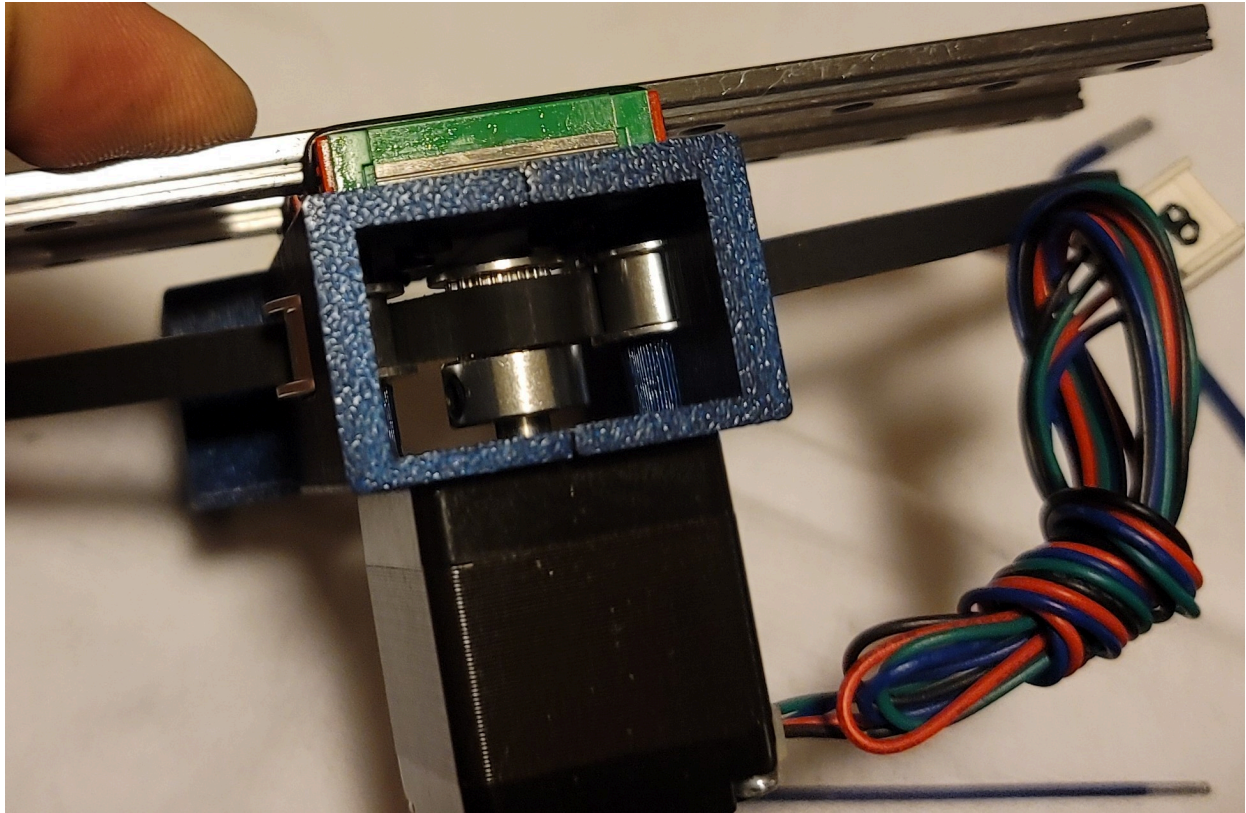
Take the X carcombo and use M3X20 to put the idlers in. Then bolt it to the rails using M2X6 (note that pics in this part show the two XCAR piece design, TOTO take pics with the next BBPro made, this part has been tested) Some of the screws might need to be a little longer.



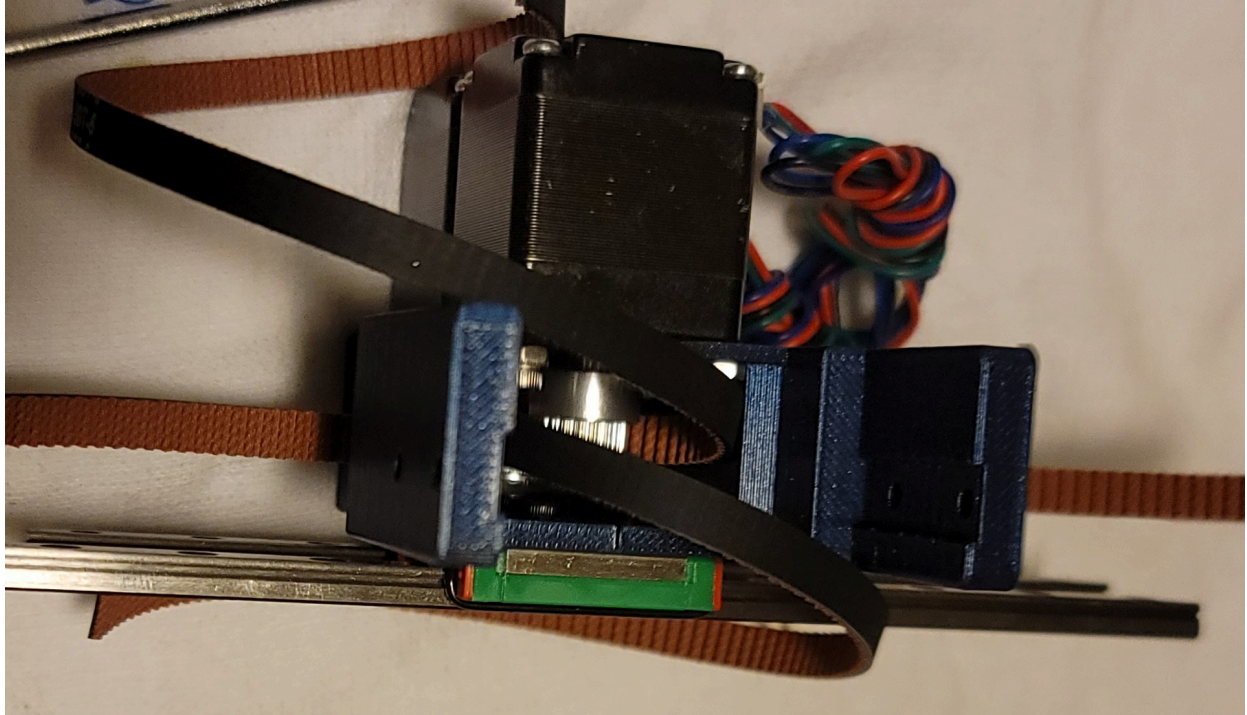
Cut a 9.5 inch (240 MM or so) part of GT2 Belt. There will be more you cut off in a little bit. Install the pulleys on the Nema11 motors too! Make sure you space the pulleys correctly. Should be about 7.5 MM between the face of the motor and the bottom of the toothed part of GT2 pulley.



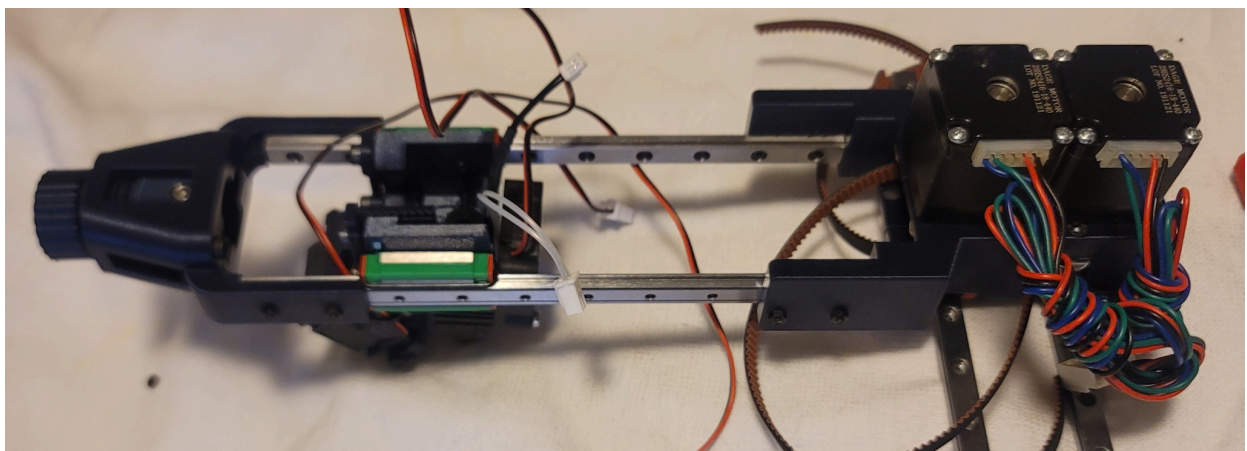
Ok! Now we can put the belt you just cut through the X carriage. Flat side of the belt to the smooth sides of the idlers. Tuck the belt back then put in the motor. The belt should form a U shape in the carriage. It should look something like this from the back side.



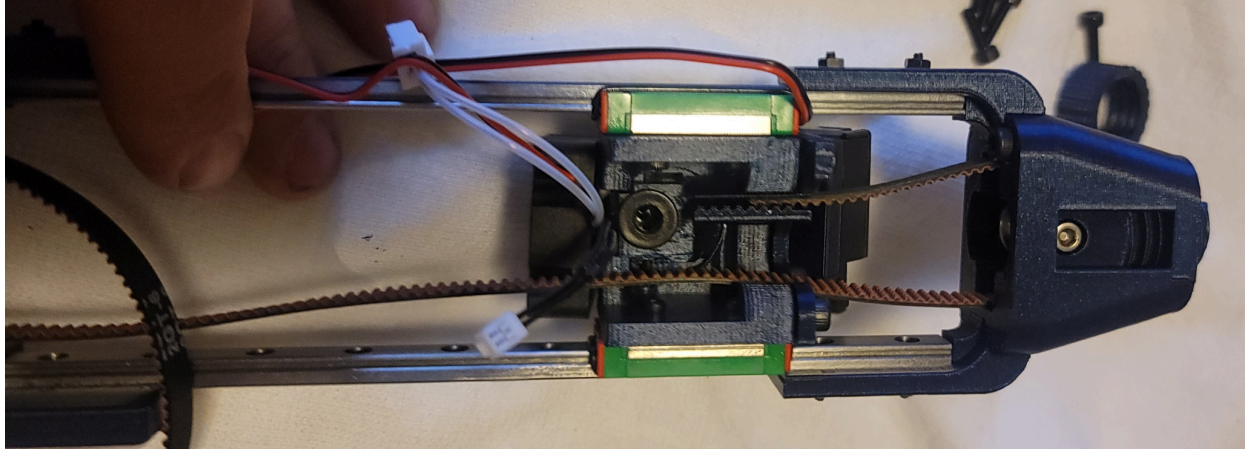
This part gets a little tricky, use some M2.5 bolts to hold this motor in. Then cut another GT2 belt to about 19" (480MM) It will also be trimmed down. Stick it toothed sides together as a loop into the other side of the X carriage and then install the other motor. Should look like this when done. (note this is a view from where the Y axes bolts to the X axes. The motor just installed is the top motor.



Now we can bolt the Y axis to the X axes to form the gantry assembly. Use M2 X10 MM bolts. You should end up with this. Be careful not to remove the belts as they are tricky to get back in.



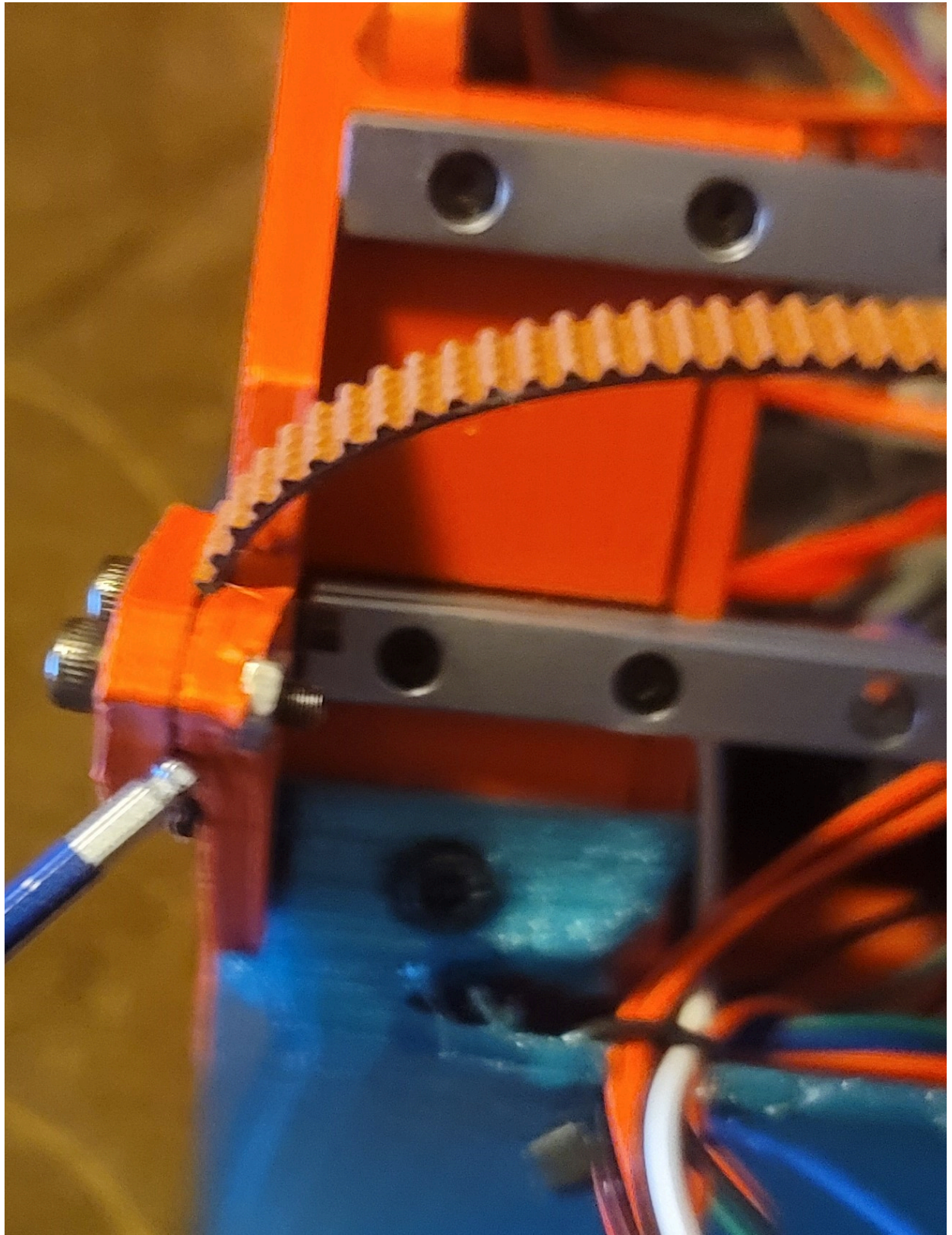
Now you can take the Y belt, run it up the right side of the gantry, over the idler pulley, then put it into half of the belt locker in the print head Y carriage. Make sure your tension knob is set to pretty loose on the Y end RockMon tension. Also, make sure that the end of the belt is cut square.



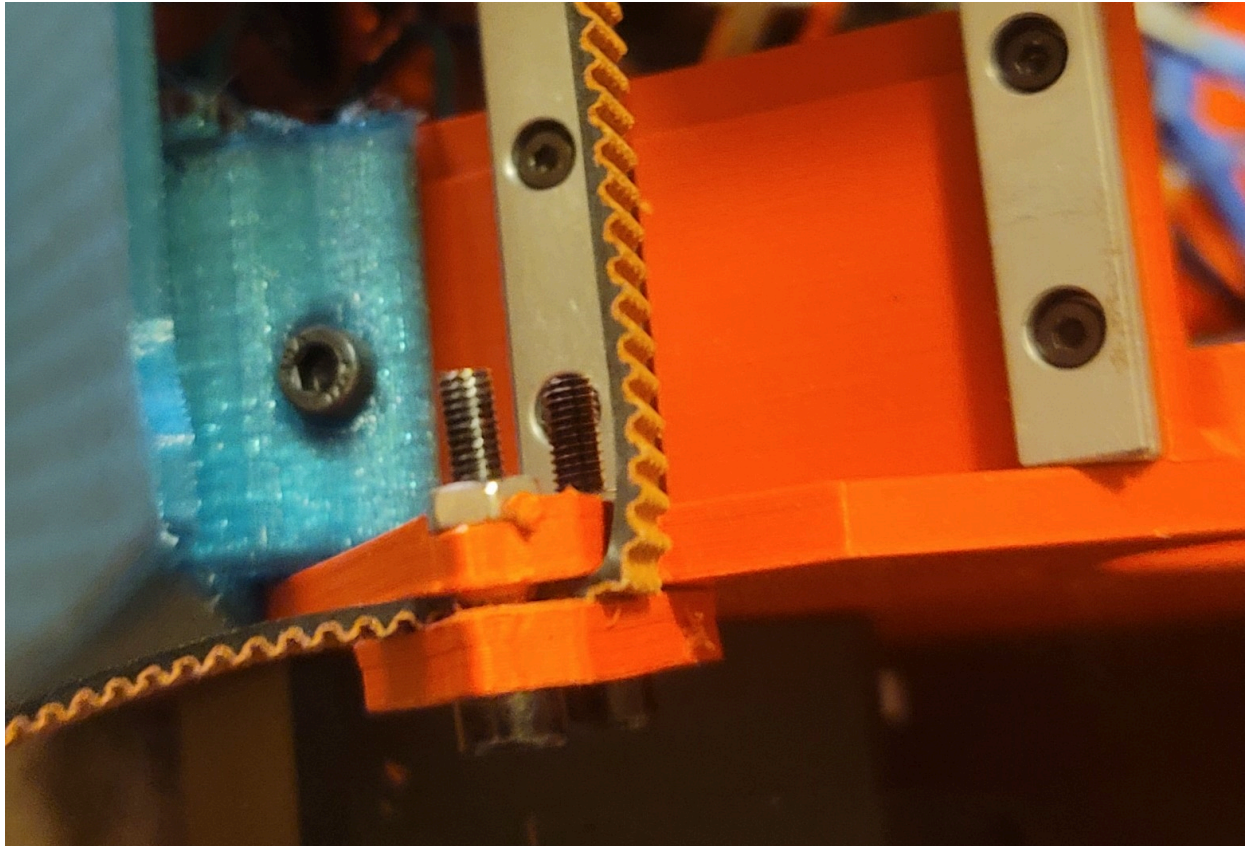
Great! Now you can take the other end of the belt, pull it tight as a loop and cut it even with the end of the other belt. Keep in mind that you can take up some slack with the tension knob system. Slide em in and push down to the bottom of the locker with a 1.5MM key. Tighten the plastic Y end tension nut to get the belt right. The Y axis should move freely and the motor should be turning if you slide the carriage up and down.

Bolting it together and wrapping up the build

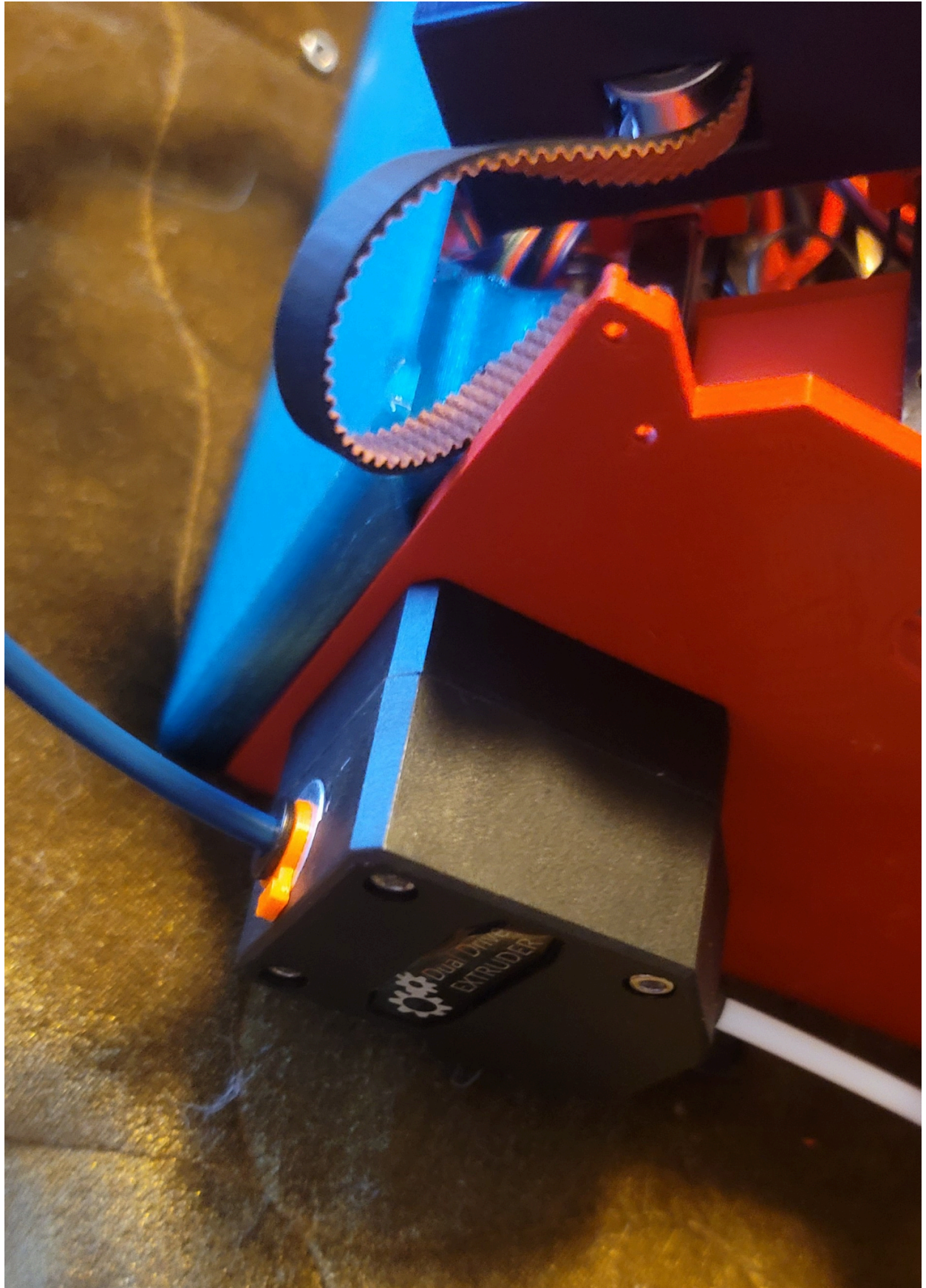
Now we bolt the two rails for the X axis to the frame. M2 Screws and nuts here. (Ignore the key pointing at the end of the belt here) Note that when the rails are installed the gantry should be able to side back and forth just from gravity if you shift the printer on the left and right sides. V2 clears up this misalignment difficulty.



Ok, now pay attention to the key! M3X10 bolts and two nuts. Use it to clamp down the belt on one side. Then put the other side on loosely, pull the belt tight and crank it down. Now your X axis should be done and be nice and tight!. Note that I used too long of bolts for this side, wanted to hurry things up for this manual. You can cut down the tail on the 2nd side of the X belt so that you don't have a bit of dangle.



Put your extruder in now. Just about any extruder will work as long as it is bowden compatible with a Nema 17 (I know you can't use wade-gregs, sorry...). I have been using Bondech style extruders because I have them. Make sure your bowden output tube is facing away from the hot end, the bowden tube loops around. In this pic, the white tube is input from the spool, the blue is output to the hot end. Note that you might want to think about what way the wire faces inside the printer coming off the motor. I like facing it to the scraper side of the printer. (yes, the belt is not mounted here, it should be at this point)



Mount the screen into the screen mount (four M3X10), then put the screen mount or the no screen plate onto the printer. One screw M3X20 through the side one and M3 nut in the bottom just like the scraper part, then two M3X10s on the top wings next to the X rails.

NO PIC HERE

Put the bowden tube into the extruder and the hot end.

Now we assemble the hot bed and underbed. If you do not wish to use a hotbed, you can just print the cad file for a voron 0.1 bed. This will be added to the files in github soon.

Put the heater on the aluminum bed if using a heater. The bed mounting holes are in a triangle. The wires work best if facing back between the two holes on one side. See my hand? The wires come out where I am holding it. Also note the side of the plate that has the recessed holes for the M3 bolt heads.



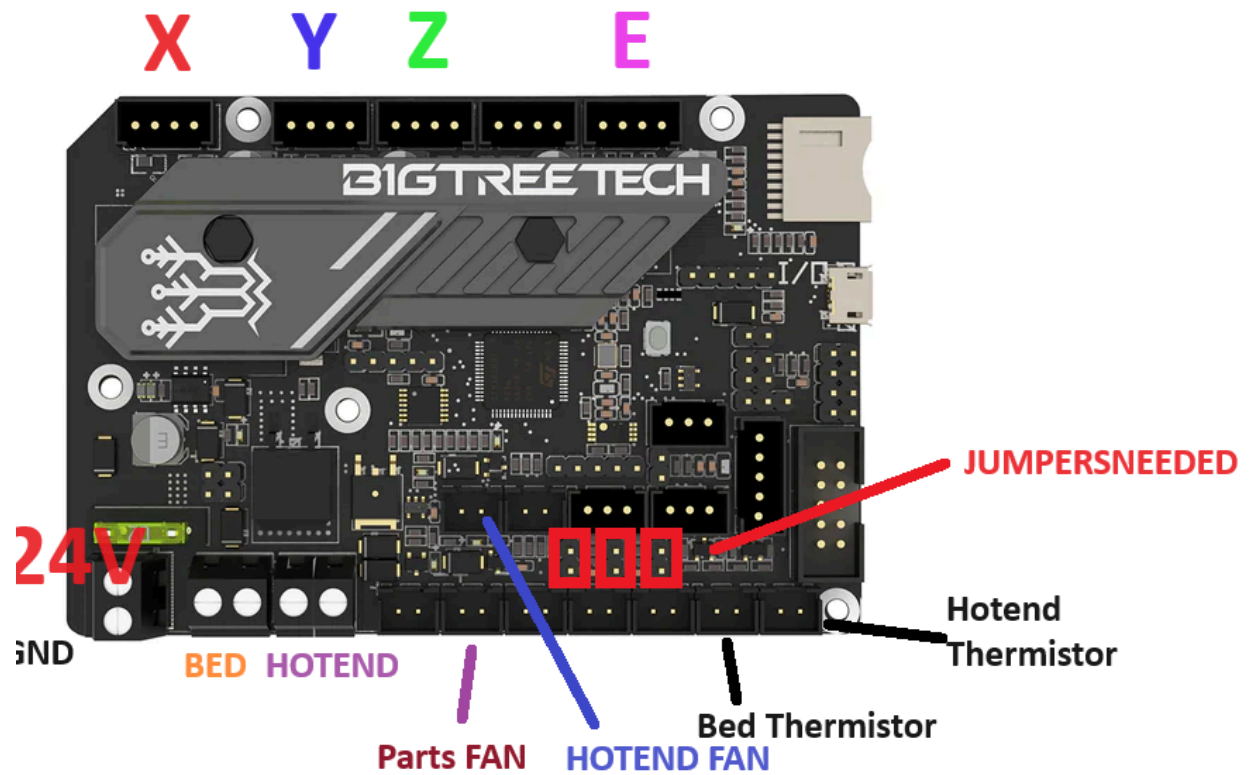
As you can see above, the M3X20 bolts go into the bed, are held in with a nut, then get two more nuts as lock nuts to space them away from the underbed support. The bed will be pushed into the underbed by the belt, so you do not need to put any nuts on the other side. Yep, that's a really bad print.... And an older design, but you get the idea... This part was reworked so that it would not warp like the one in the picture is.



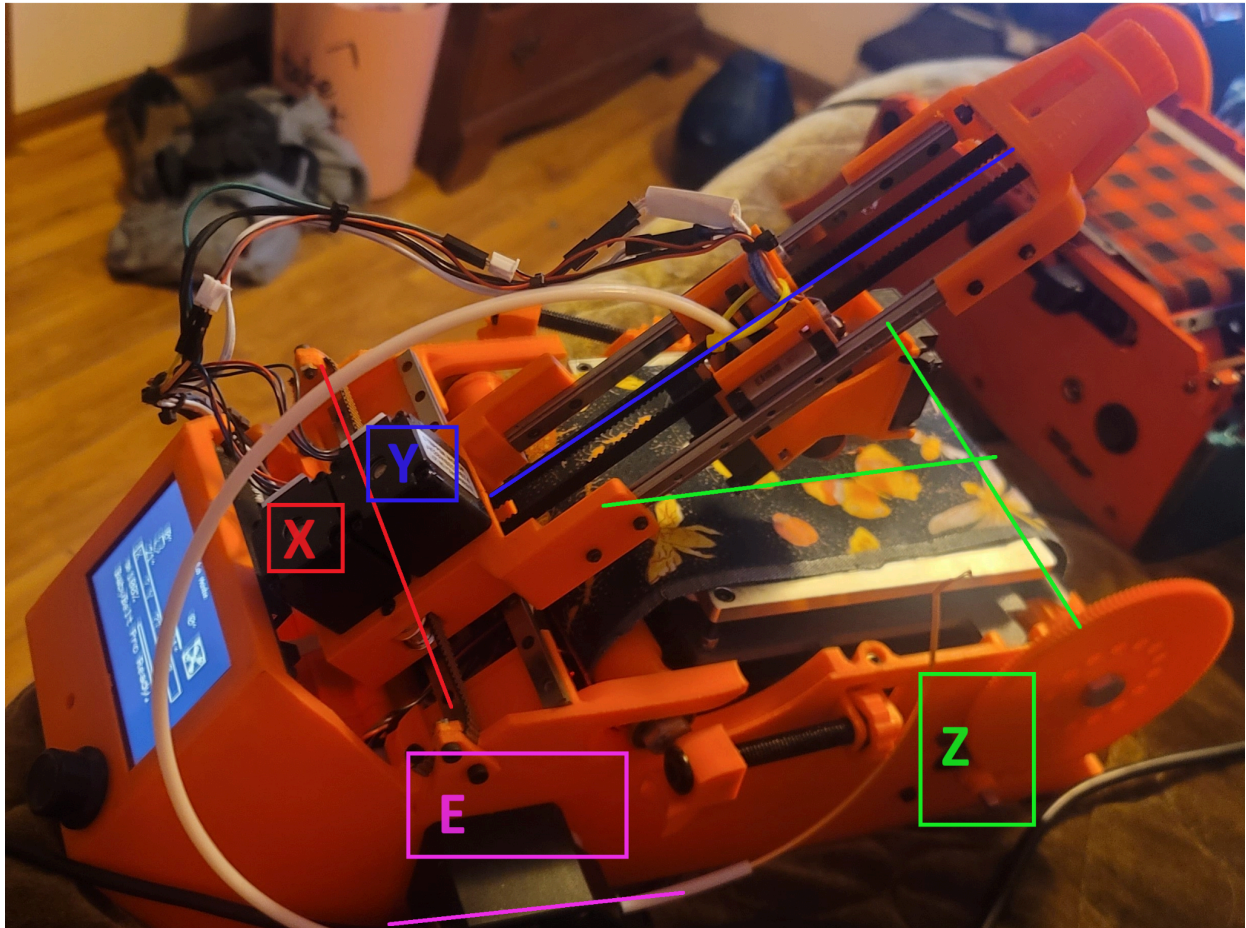
Ok! We are all basically done, time for wiring!

Wiring

The SKR E3 V3 is the recommended board for this printer.



Here are all the axes, motor locations for each, and color coded matched for the board above. Note that the Y axis homes to Y max, or the top of the travel away from the bed.

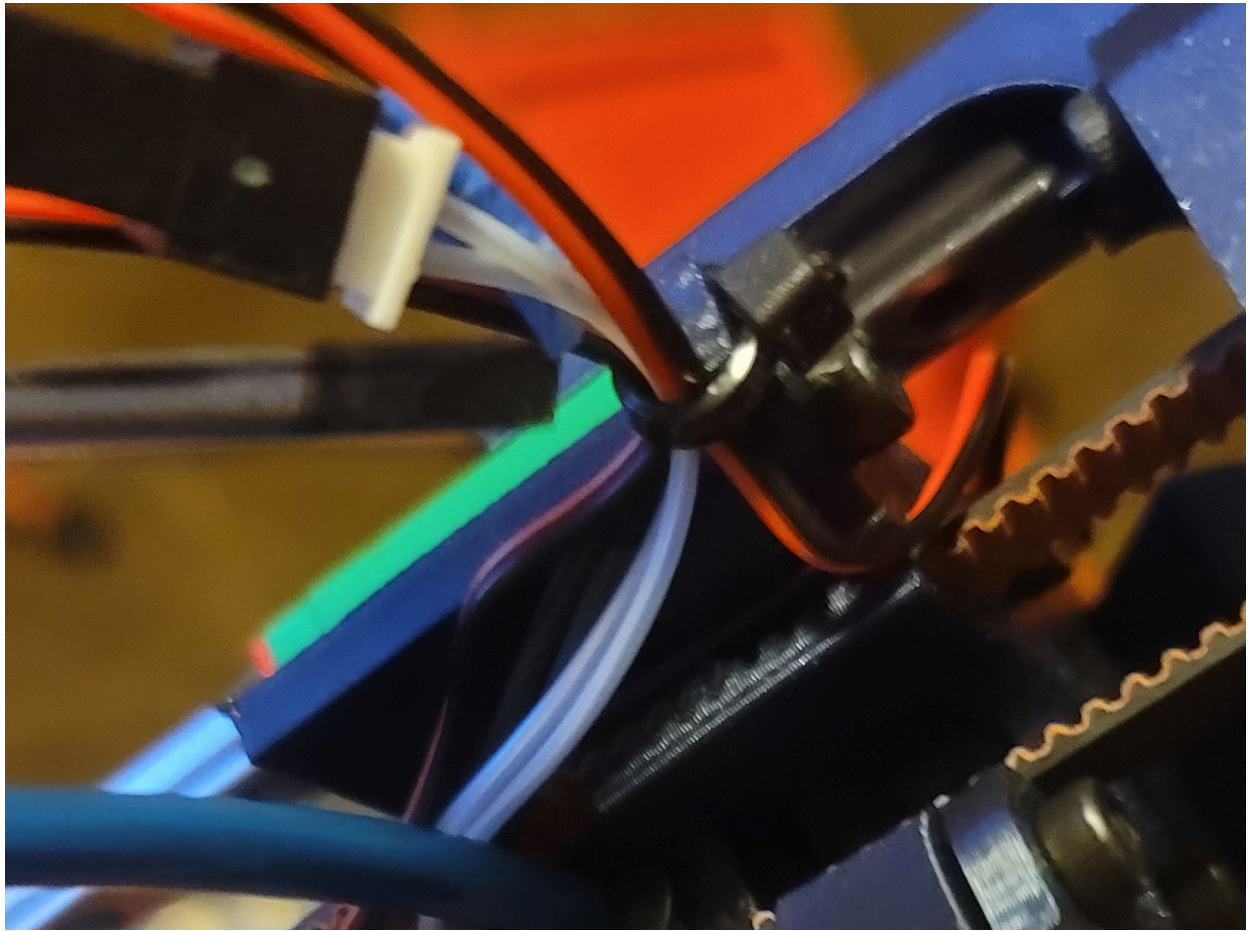


The fan wires will not be long enough, you can 'cheat' and use these. Or crimp your own. These fan extension wires are about 6 for about \$10 on many popular websites including Amazon.

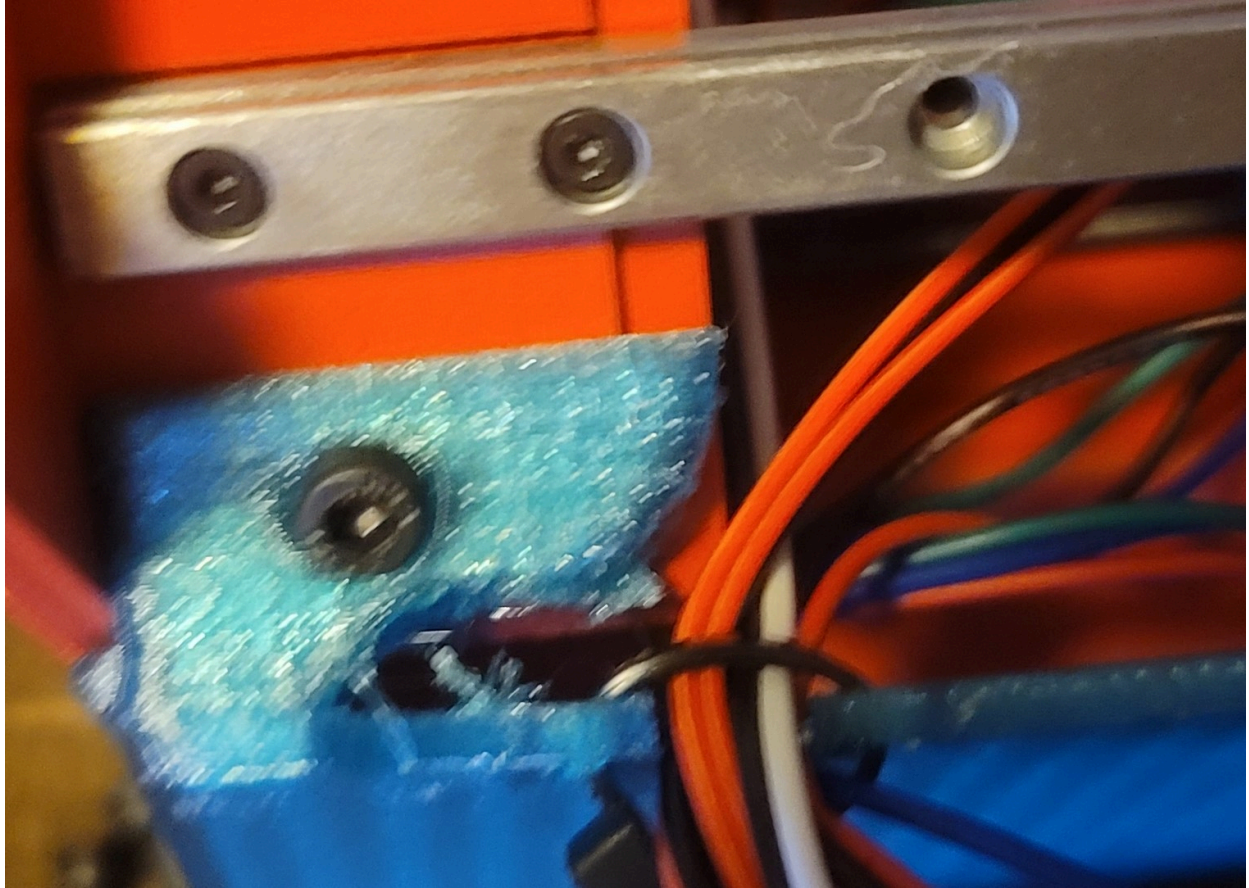


Note that the heaters and thermistor wires do not care about + or -, you can plug em in either way.

If you are using a screen you can plug it in now. You can put loom over the wires if you wish, but some zipties are needed for wire management. On the Y carriage the hot end wires need to be ziptied to the belt locker part.

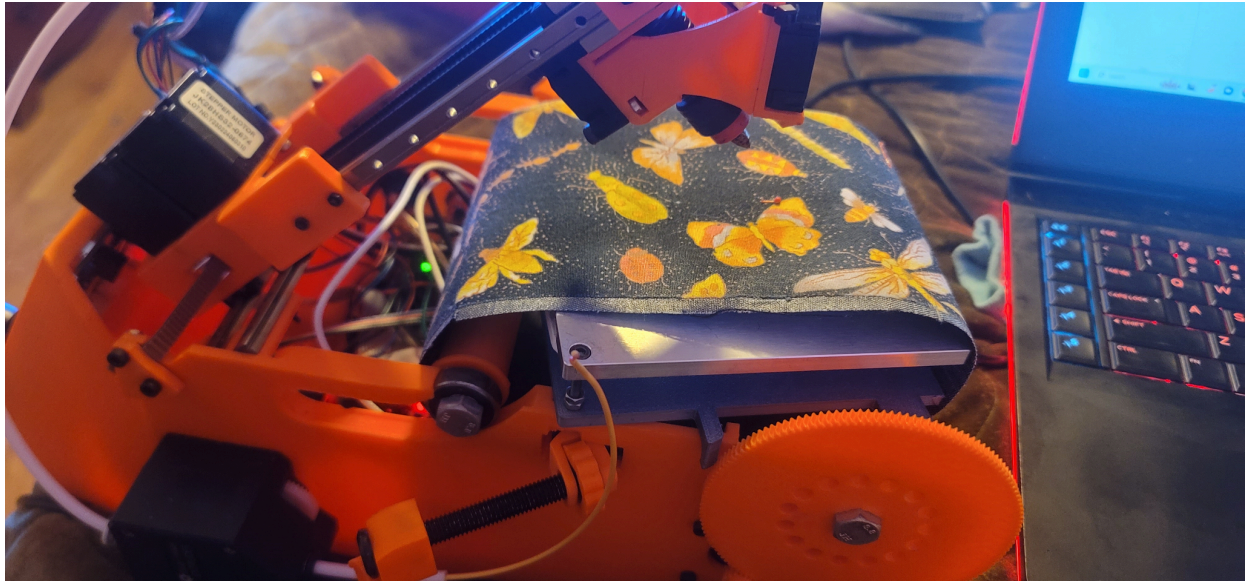


At the other end, the X, Y and other end of these wires need to be mounted to the screen mount or no screen plate. I guess I need to dry the green PETG... See the Ziptie where the wires go though? That holds them so that the wires will not get yanked or caught on the X carriage. Note that the wires are going from the control board, in this picture down, out of the green part, then up and around to the Y carriage fans, hot end and X carriage's motors



I think you are all wired up now!

Flip the loop of the bed back under the gantry, slide the bed into the loop in the belt and the last belt roller.



Then start the belt roller into the channel and slide the bed down in.



Put the bed tension pushers in place and tighten down till the bed is nice and tight. If the belt is too long, you can use longer than M8X80MM Bolts to gain a little extra push length.



You will need to also adjust the double nuts under the bed. The double nuts will level the bed front to back and side to side. The bed should be as close as possible to the height of the top of the rollers.

Pat yourself on the back! This should be all done. You will just need to adjust one screw now, but that's in a little bit.

Programming/Tuning

If you are using Marlin, put the firmware.bin file on an SD card then power up the printer. The BTT screen in the BOM should be put in marlin mode. You can do this by Pressing on the knob till a menu pops up.

In Marlin, go motion, then Auto Home.

If no screen, then in Pronterface push G28.

If the printer does not home all the way on an axis, then configuration, advanced settings, TMC drivers, Sensorless Homing Pronterface is M914 (you can see what it is in Pronterface with M503)

Adjust the axis to a higher number if the printer grinds on the end of the axis, and lower it if it does not go all the way. I would go 5 or so at a time. Once done, Configuration, Store Settings. Or Pronterface M500

In my marlin printer in front of me, I find

X 50

Y 45

Z 255

Also, note stepper current. (M906 in pronterface) I find:

X 380

Y 400

Z 650

E 650

Only adjust if your motors are skipping or getting hot. If it gets hot, lower by 50 or 100, if too weak, try the other way. Note that this does mean that you may have to re-tweak the homing.

I would also recommend a PID tune.

<https://marlinfw.org/docs/gcode/M303.html>

Once homed, Move the hotend to 50 or so, then move Y to 0.1 . (Pronterface Home with G28, then G1 X50 Y0.1 F600) You can use the paper trick here for setting your offset. This is not a Z offset like cartesian printer, but a Y offset. If the nozzle is too close, screw in the bolt in the Y end. If too loose, unscrew the bolt from the Y end. Rehome and try again!

You should be ready to push plastic with a test print now!

Default settings:

X steps 100

Y steps 100

Z steps 364

E steps (depends on your extruder! 420 for a bondtech style)

Speeds

XY - 70

Z 20

E 35 - extruder dependant

Accel

X 1250

Y 900

Z 75

E 1500 -extruder dependant

Note that this is NOT set in stone, depends on lots of things and this is still being fully sussed out.

Klipper config is in github now too.