MZBOT

VORON B

The Manual

DRAFT

PRINTING PARTS

Material

For majority of the parts on the printer, I recommend using ABS plastic (Black if you really want to replicate the look). Electronics enclosures can be printed with PLA as they don't really have handle loads of high temperatures.

Nozzle size

With exception of the X Carriage components, everything is deigned to be printed with a 0.6mm nozzle. You can use a smaller nozzle, of course, but be warned that some of the parts will take a significant time to print, and won't be as strong.

Print settings

In my experience the minimum settings to produce mechanically sound parts are:

- Layer height 50% of the nozzle width
- 5 layers for top and bottom
- 3 shells
- 40% infill (grid or honeycomb work equally well)

TOOLS

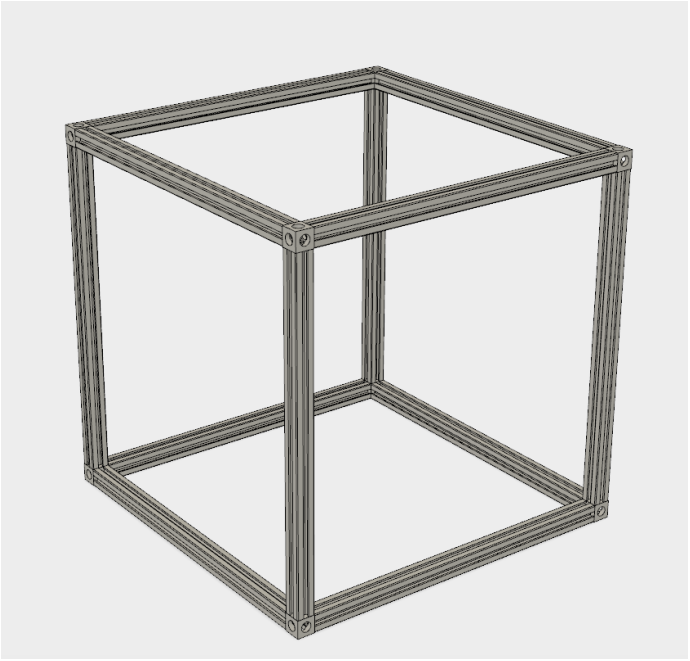
Although no specialty instruments are requires, you will need some basic tools to build this bot. If you've built a RapRap before, you already have almost everything you need.

- Set of metric hex keys (I highly recommend ball-end ones)
- Set of metric drill bits (for cleaning out holes and making mount points in the bed)
- Drill
- Small knife
- Torx T25 driver
- Phillips screwdriver (#1)
- Soldering iron
- Pliers
- Wire cutters
- Ruler

Optional tools (they make the process less painful)

- Dupont connector crimpers (I highly recommend Engineer PA-09)

SECTION1 : FRAME



Items required:

- 370mm 2020 Aluminum extrusions
- Cube Corner Connectors
- Self Tapping Torx Screws
- T Slot Nuts (M5)

We'll be building 2 squares and joining them together. Each length of 2020 extrusion needs to have the T nuts inserted during indicated step as they will be sealed inside the structure afterwards. For the purpose of preserving sanity let's label these as follows:

TR Top Right
TL Top Left
TF Top Front
TB Top Back

Bottom flame pieces are labeled in a similar way.

Verticals are labeled as follows:

FR Front Right
FL Front Left
RR Rear Right (to avoid confusion with Bottom Right)
RL Rear Left

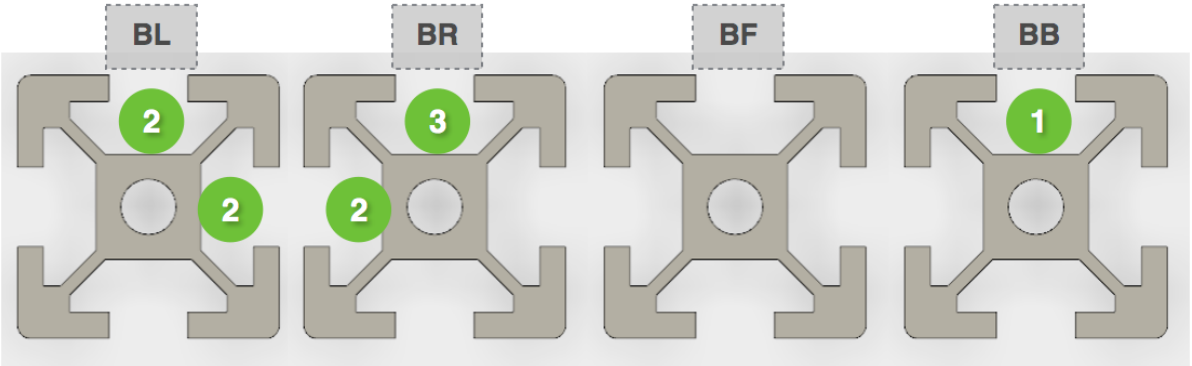
TIP: Put a piece of tape with a label on the top of each extrusion for easier orientation. Put the tape on the front of the verticals.

Step 1: Pre-assemble 4 lengths of bottom square

Start with the bottom square. Take one of the extrusions and secure a corner connector on it using the self tapping screw. Make sure the smaller hole on the cube is facing up. Tighten it slightly, and back it out 1/8 of a turn so it can rotate. Repeat for the remaining 3 bottom extrusions.

Step 2: Insert bottom T nuts according to the diagram below:

⇧TOP



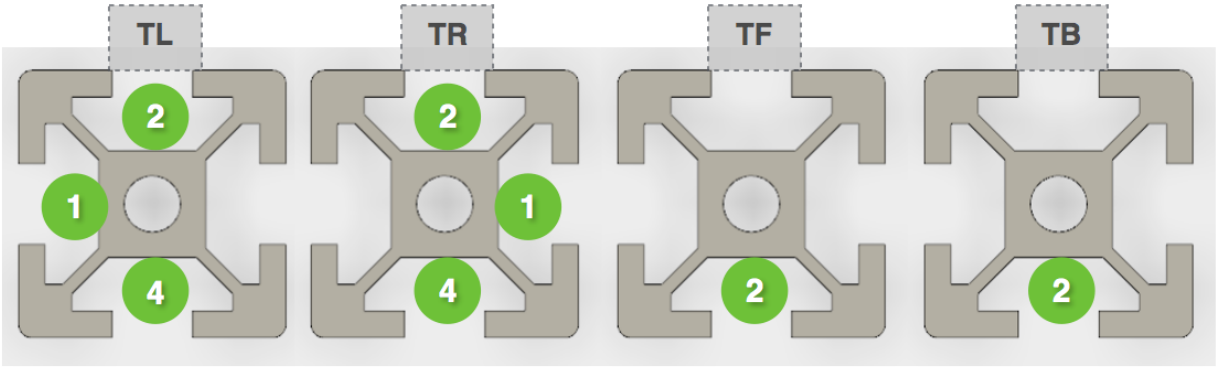
Step 3: Join the 4 pieces into a square.

You'll have to apply some force to get the screws to go in all the way. It's a really tight fit inside the cube. Don't worry, it'll connect. Just go slow and make sure the screws are all the way in. You can then back them out 1/8 of a turn. Make sure you are applying ample thrust so the torx drive doesn't slip.

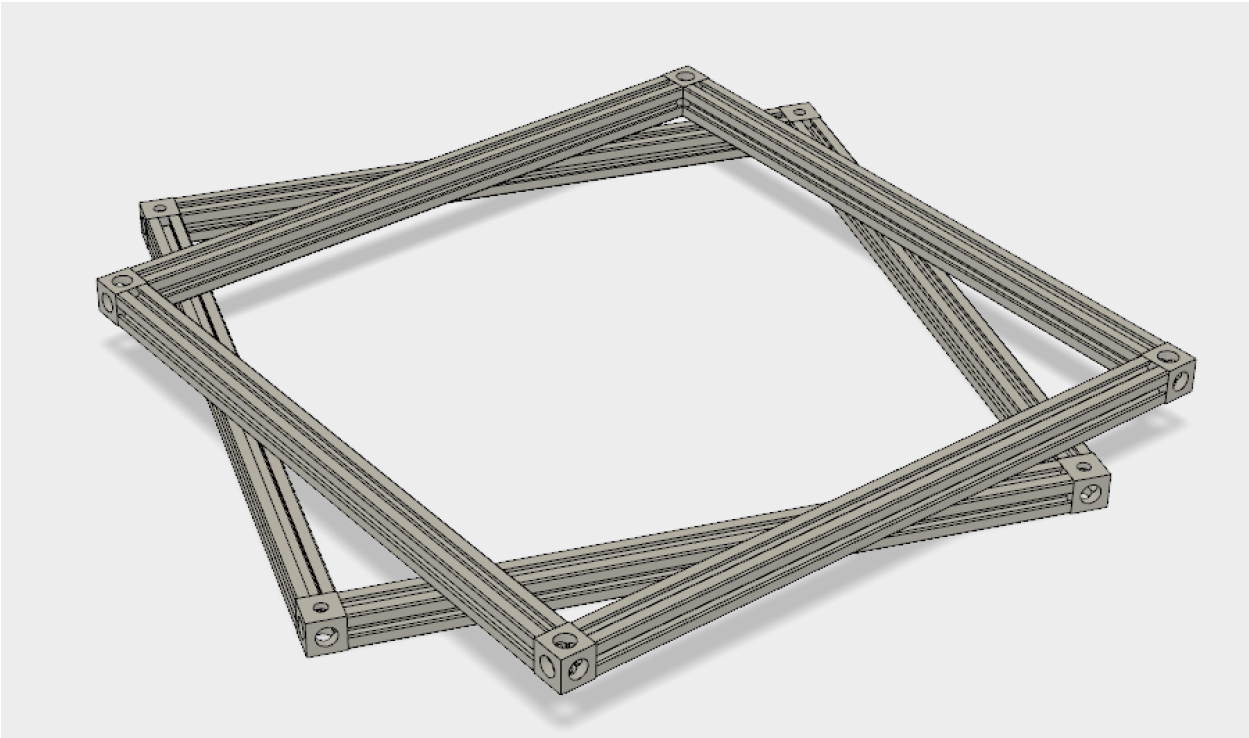
Find a flat surface, and applying pressure to the top of it, tighten all of the screws. This will ensure the square is flat (or flat enough).

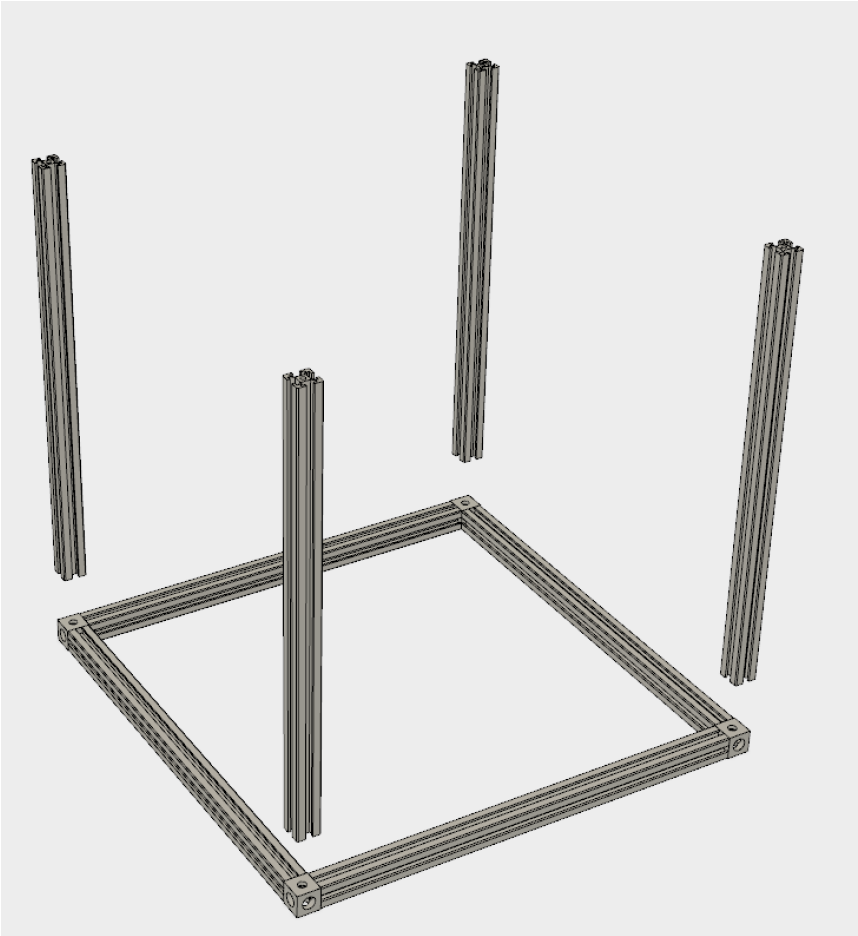
Step 4: Repeat Step 1 for the top 4 extrusions, making sure the smaller holes on the cubes are facing the bottom this time.
Then insert the T nuts according to the diagram below:

⇧TOP



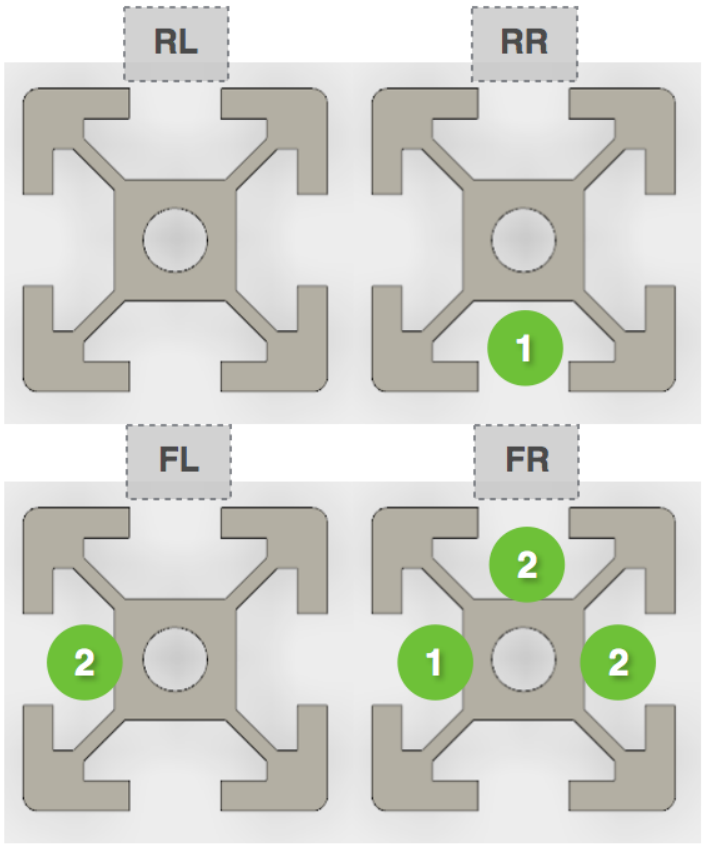
Step 5: Join the top rails same way you did the bottom ones. You should now have 2 squares full of T nuts.





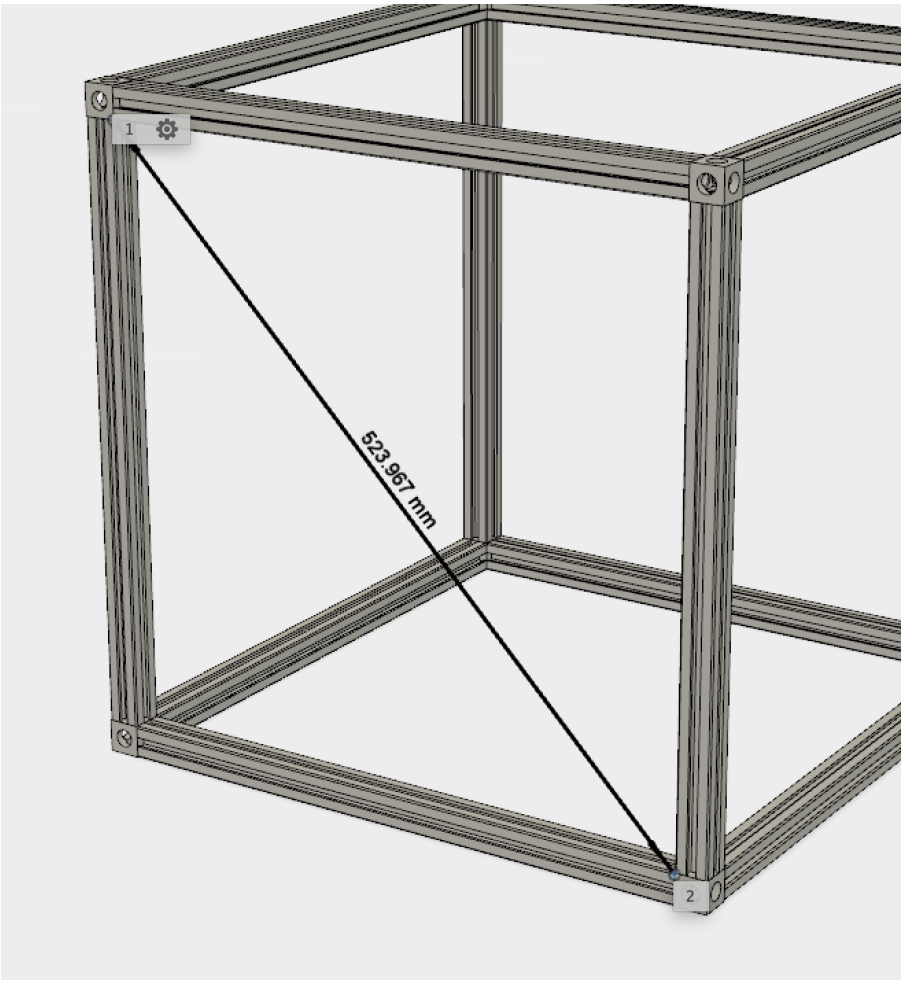
Step 6: Screw in the verticals. Make sure they don't look rotated after you've tighten them. This will throw off some dimensions later on.

Step 7: Insert the remaining T nuts into the verticals:



↓FRONT

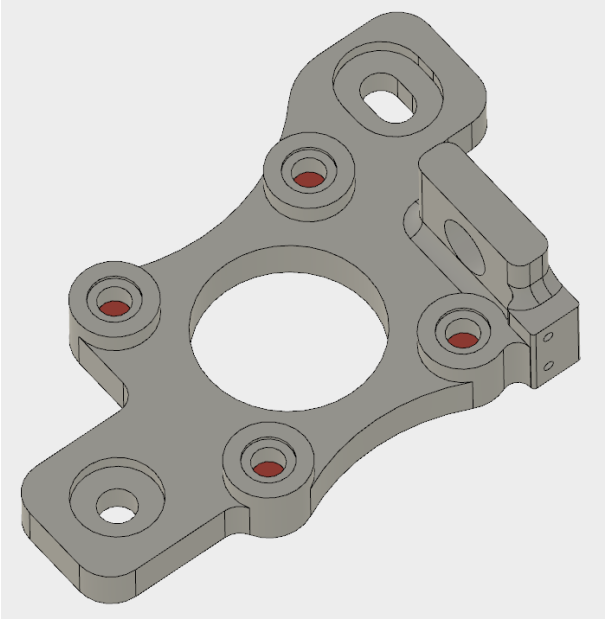
Step 8: Attach the top square to the verticals. Tighten everything and check the diagonals with a ruler. The diagonals need to be as close to 524mm as possible. If they are off too much, you'll need to loosen some screws and re-tighten them on a flat surface. If they are still tweaked, you can gently guide them into true with some strategically applied pressure. Having a square frame will save you a lot of calibration headaches in the future.



Congrats! You now have a solid frame to build your printer on. On to the more fun bits.

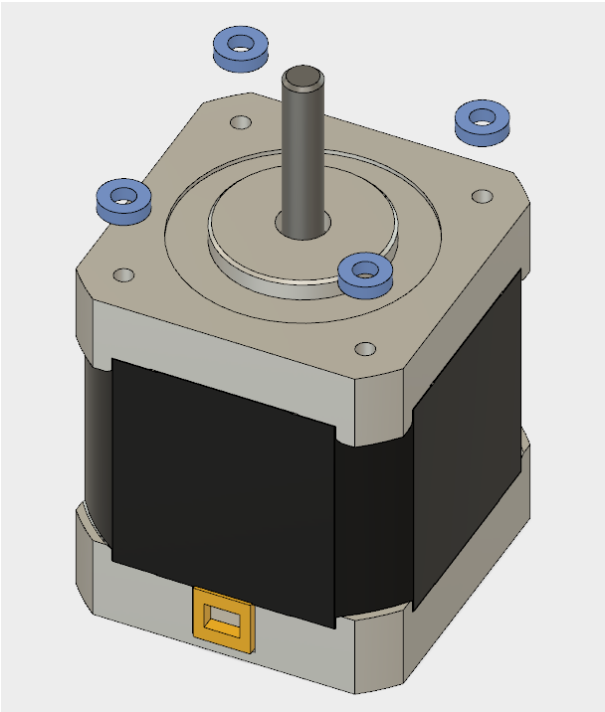
SECTION2 : GANTRY

A/B Motor Mounts

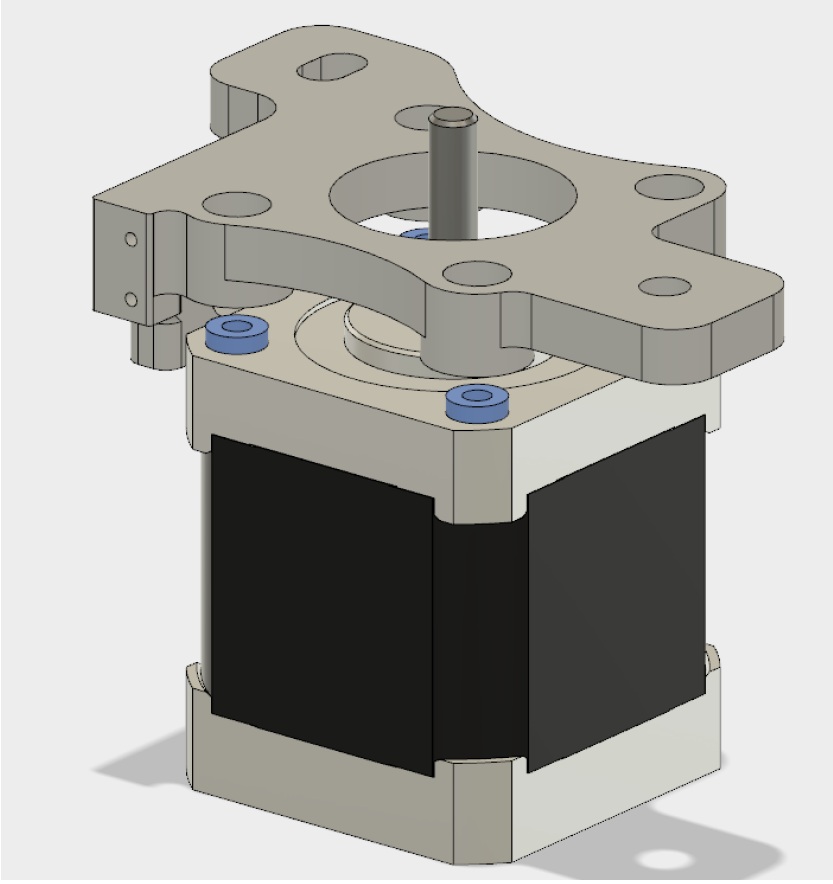


Step 1: First, a little cleanup. You'll need to remove some bridging support material from the motor mount holes (colored red in the illustration). 4mm drill bit does the job quite well, but a small knife will do the trick.

Now is a good time to check if the 8mm shaft fits into its mount point. It should be a snug fit, but go in with only a little pressure. If you feel you have to hammer it in, *stop* and clean out the hole a little.

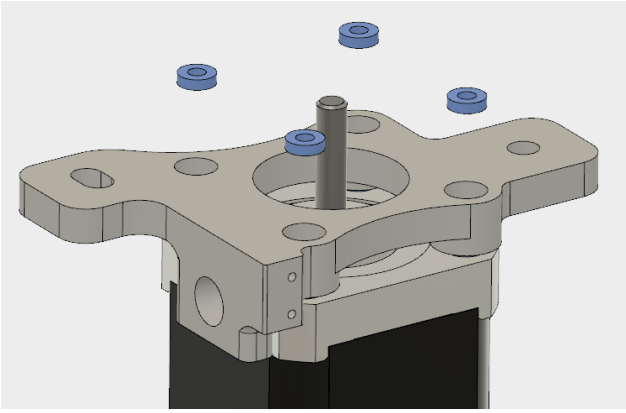


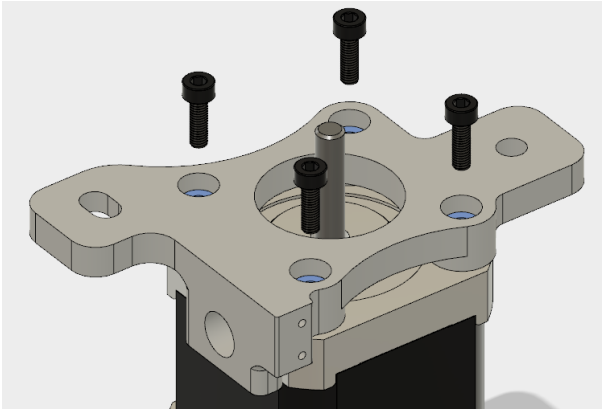
Step 2: Place the NEMA17 stepper on a level surface, and place 4 silicone washers on top of it, aligning them with the holes on the stepper. The washers are a little sticky and should stay in place.



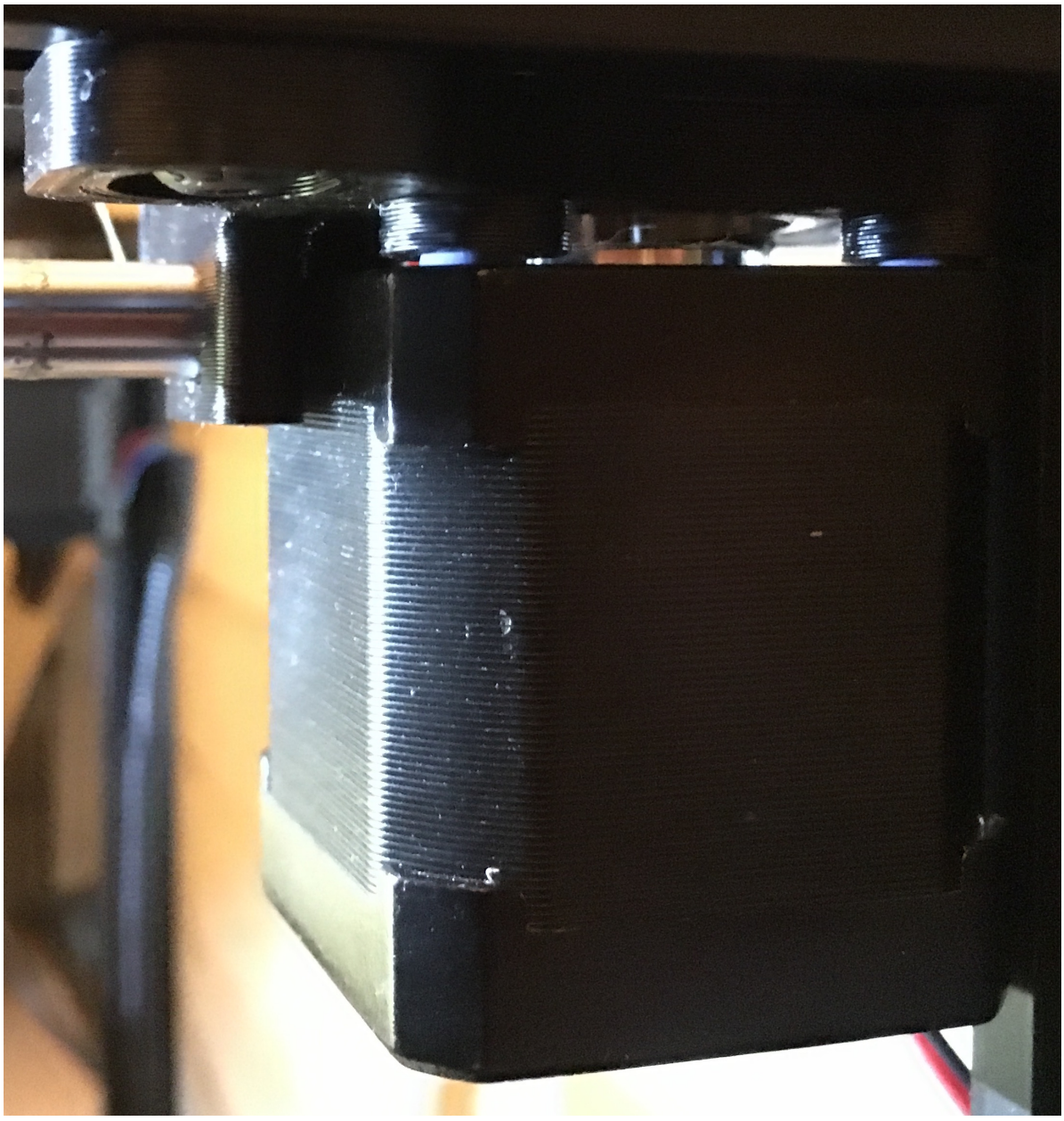
Step 3: Line up the motor mount over the 4 holes, and lower it on top of the washers. The small shoulders on the A/B mount should catch the washers, so if you have to move the mount to get everything to line up properly, the washers should now move with it.

Step 4: Insert 4 silicone washers into the top holes, and secure the motor with 4 M3 8mm screws.



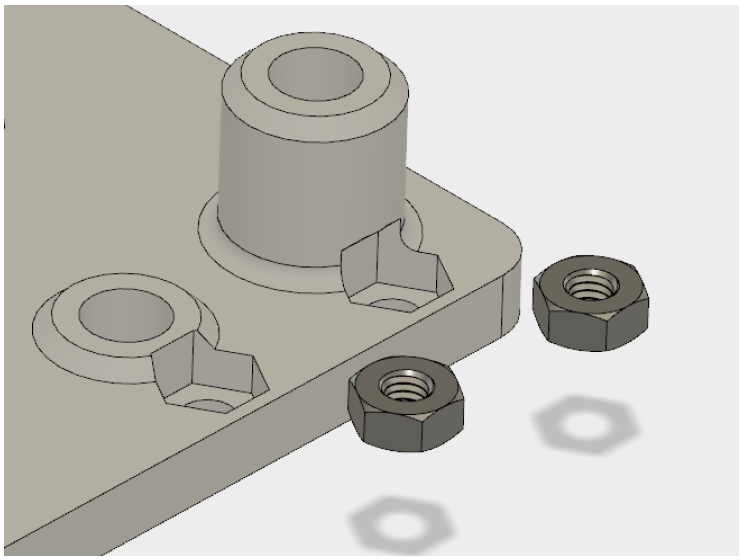


Tighten the screws until there's about 0.5mm gap between mount and the motor. You should still be able to see the blue washers between the stepper and the mount (as in the picture below). We're trying to stiffen the joint, while preventing the stepper from making contact.



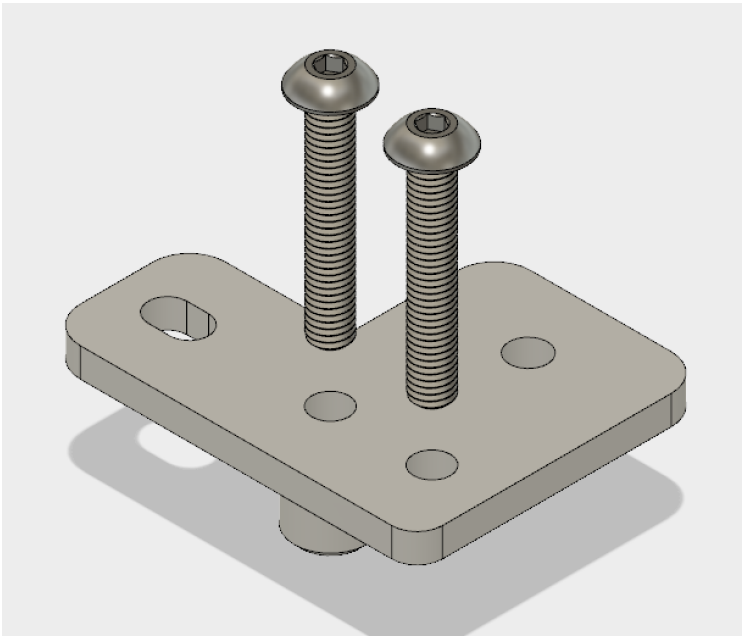
Repeat this process for the other motor mount.

A/B Idler

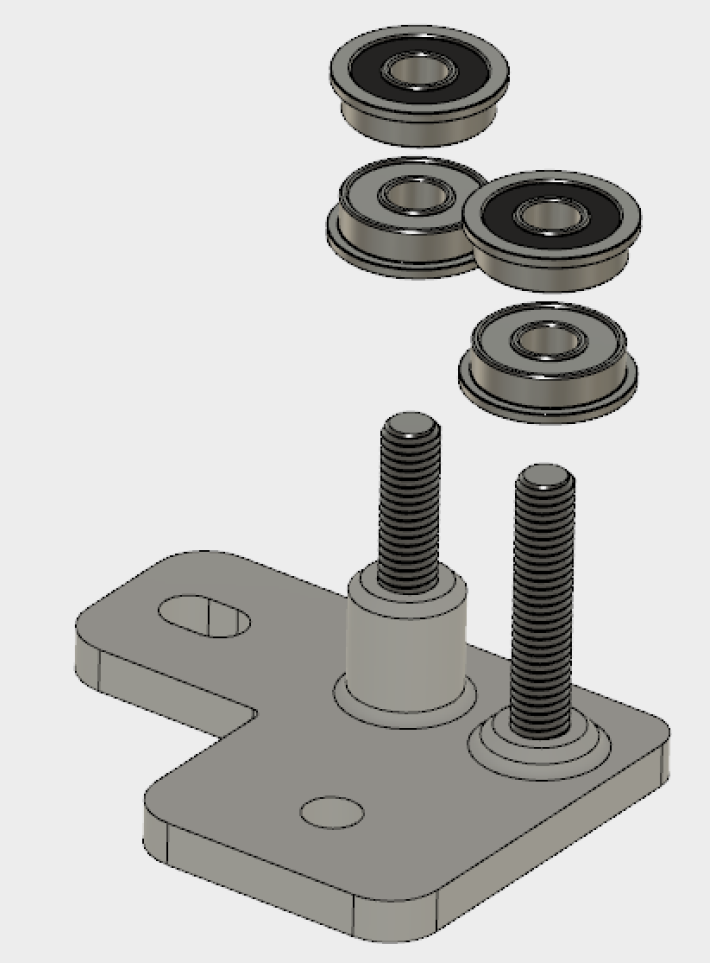


Step 1: Insert M3 hex nuts into the lower idler plate

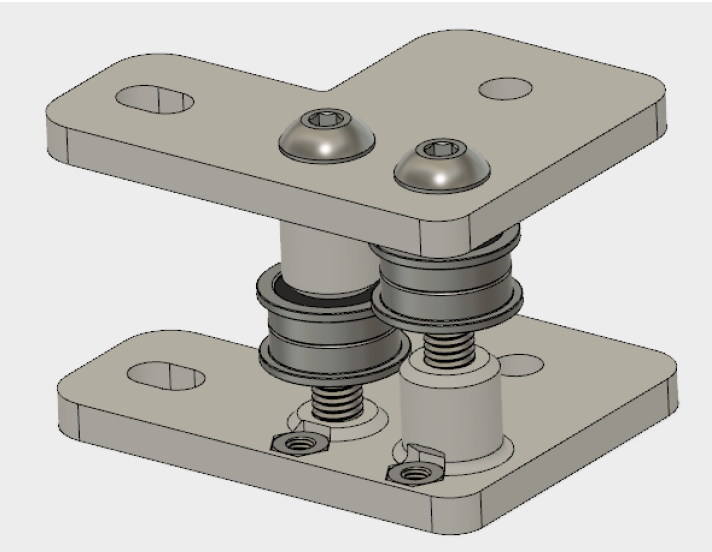
WARNING: Do not drill out the bottom 2 idler posts. We need them to be snug so the screws have something to form threads in.



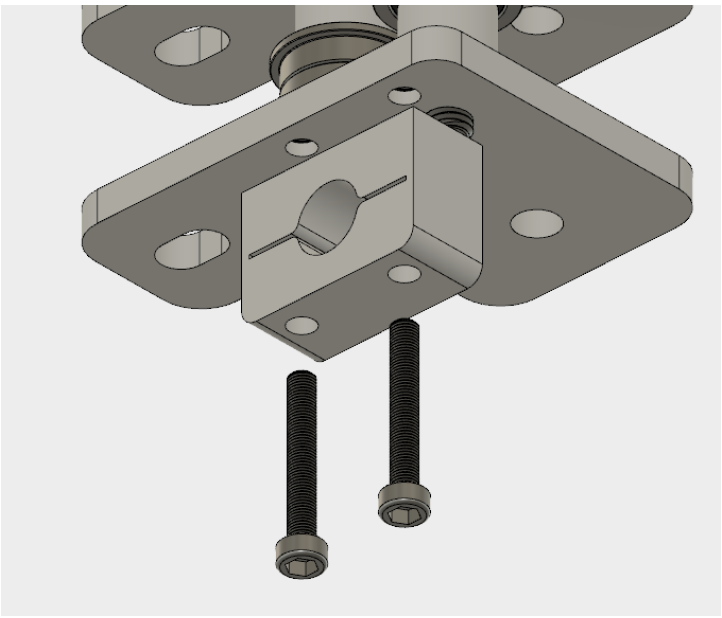
Step 2: Screw the 2 M5 30mm screws into the upper idler plate, and give them a few twists so they break the threads they just formed in the plastic. These holes have intentionally tight tolerances.



Step 3: Slide the flanged bearing over the screws as pictures. The flanges will form the shoulders of the belt idler.



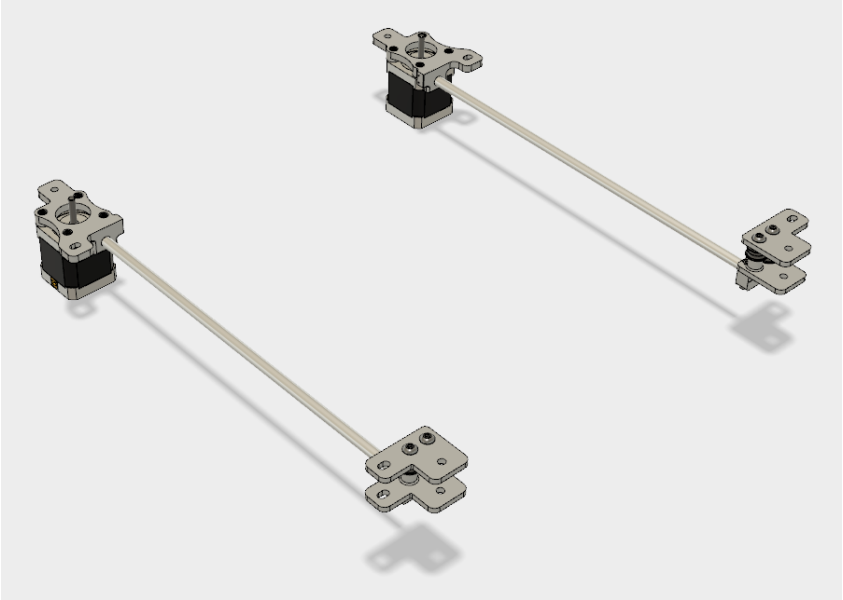
Step 4: Screw on the bottom idler plate. Do one turn per screw and alternate to keep them level with each other. Don’t over-tighten. Remember, you are threading into printed plastic. These screws are only going to experience lateral forces, and the actual force of keeping the two plates together will come from the 4 screws that will secure this part to the frame.



Step 5: Using 2 M3 20mm screws, secure the Y shaft retainer into the lower idler plate. We're not tightening these yet, just keeping them in place for later.

Repeat for the other idler.

Woo! You now have a Y axis!



After you're done admiring your handy work, remove the Y shafts. They will be installed after the components are bolted into the frame.