

BugBu 210/310 V1 Assembly Guide

(Recommended print settings for printer parts is no less than 6 walls and no less than 20% infill) Print part as oriented and part description tells you quantity of parts and if supports are needed.

Welcome to the assembly guide for the BugBu corexy printer. This guide will serve as assembly instructions for the printer. It is a “210” or “310” as this is the approximate build volume of the printer 210mm cubed. Upon completion, the printable area will be approximately 215x/200y/210z for the “210” and 310x/300y/310z for the “310”.

Any questions during assembly, please contact someone within the group on Discord here <https://discord.gg/kHFhCXZnxb>

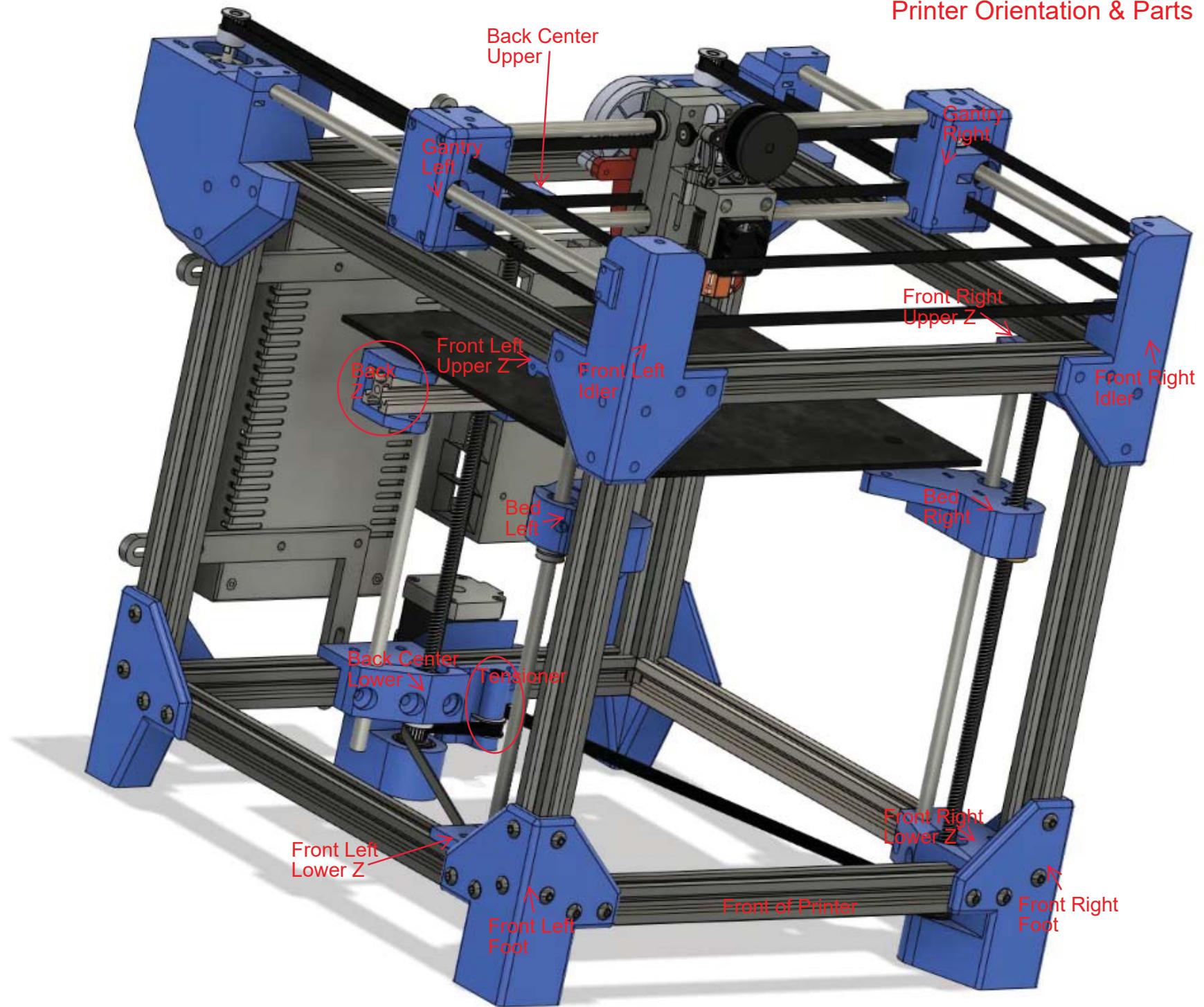
The github <https://github.com/Rolls17/BugBu> as well as printables <https://www.printables.com/model/415677-bugbu-corexy-3d-printer> will have the most recent updates in STL’s and CAD. Please refer to the github page for all slicer configurations and klipper firmware configurations or updates.

This is meant to be an affordable corexy build that is relatively easy to build, high print speed, and quality prints. Any feedback is always welcome as we are always striving to make it better with a great experience for all users.

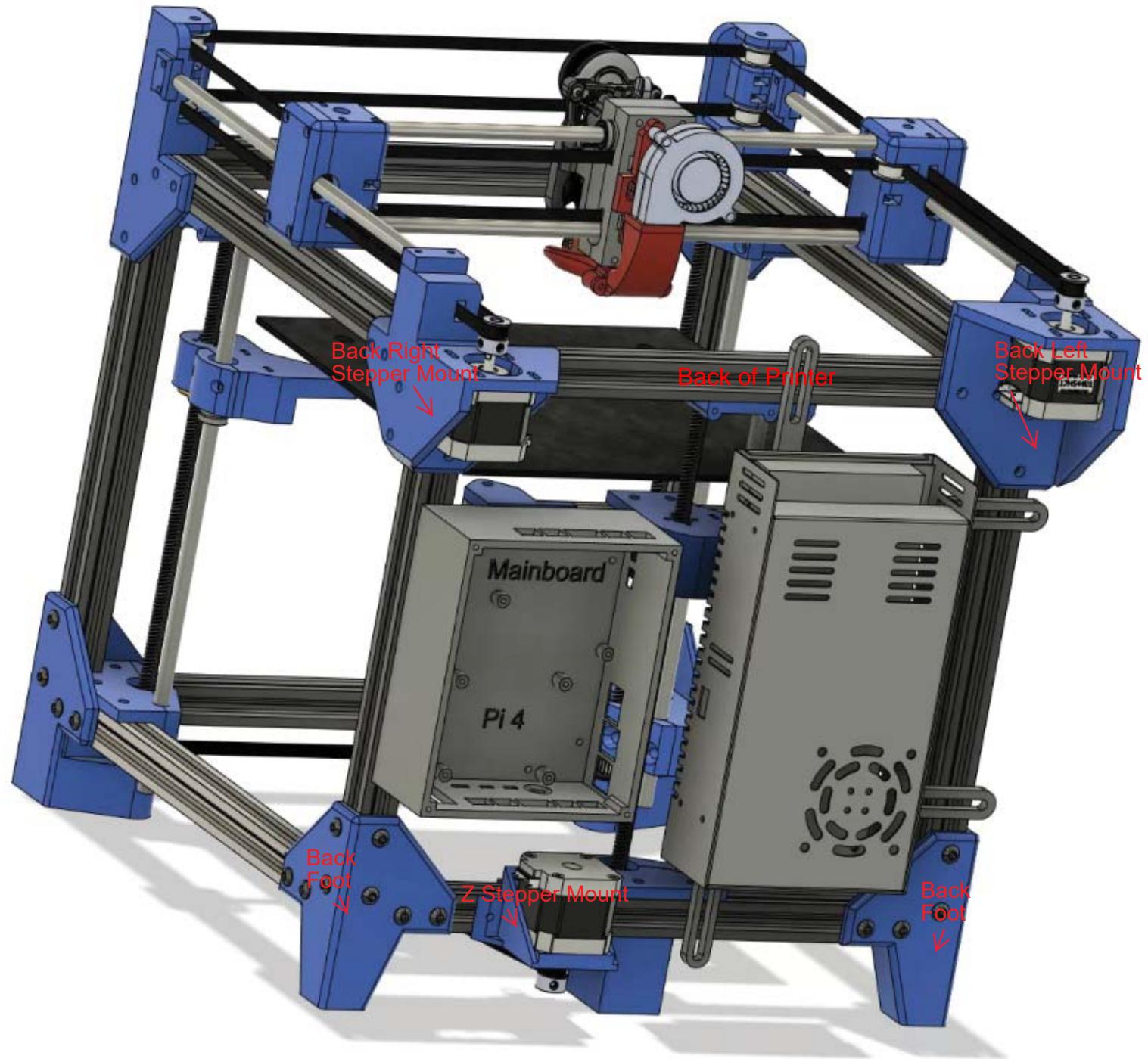
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Printer Orientation & Parts



Printer Orientation & Parts



Section 1:

Frame Assembly

Components needed for this portion:

M5x12 or (M5x10) Button Head Screws	x64
M5 T-nuts	x64
M5x25 Button Head Screws	x4
M5 Nuts	x4
Front Right Foot	x1
Front Left Foot	x1
Back Feet	x2
Front Left Idler	x1
Front Right Idler	x1
Back Left Motor Mount	x1
Back Right Motor Mount	x1
300mm 2020 Extrusions	x12

Parts shown here
are for the 210, all
extrusions for the
310 will be 100mm
longer

Single 200mm 2020 for Bed (300 can be used)

12 PCS 300MM
2020 for Frame

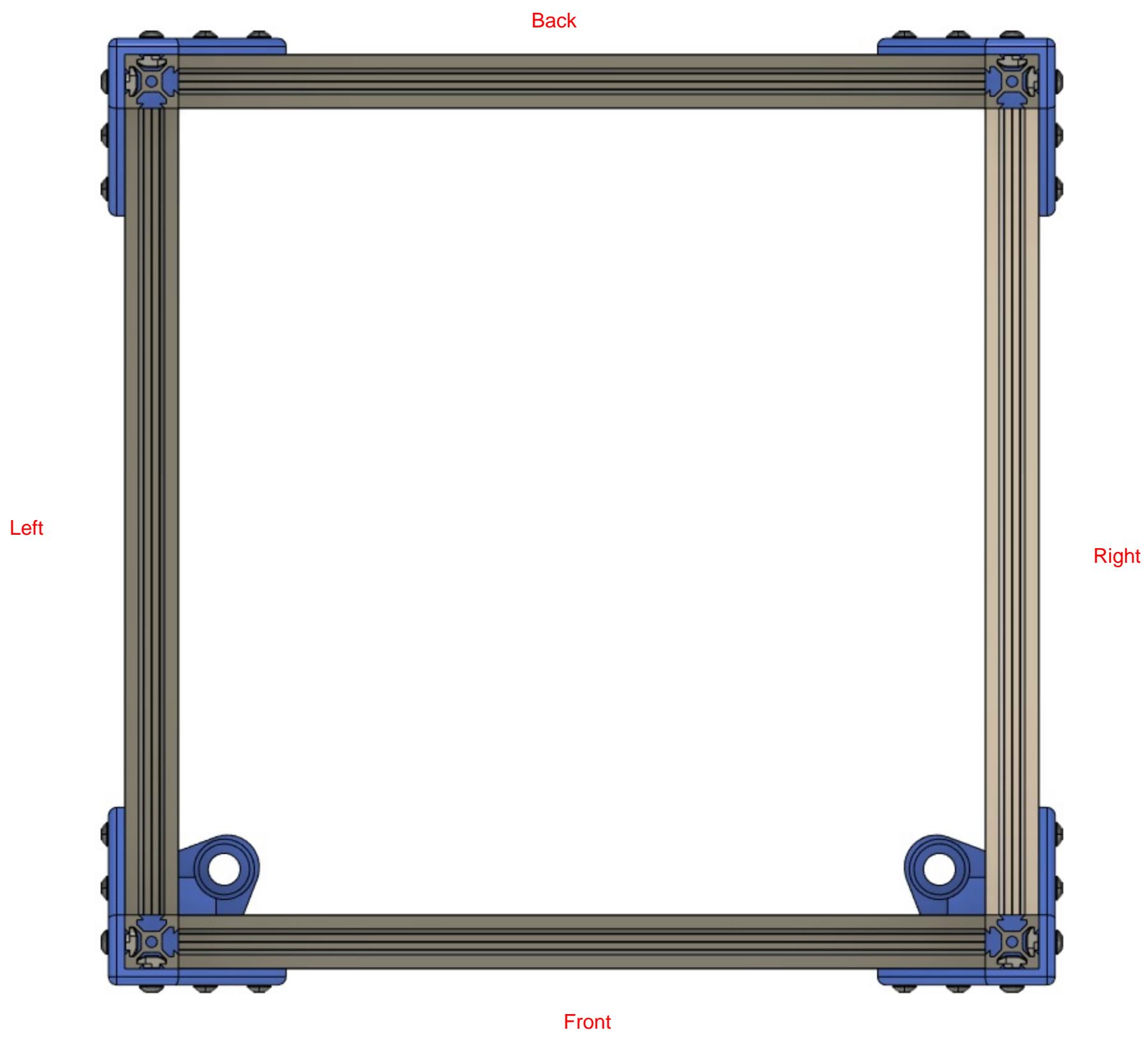


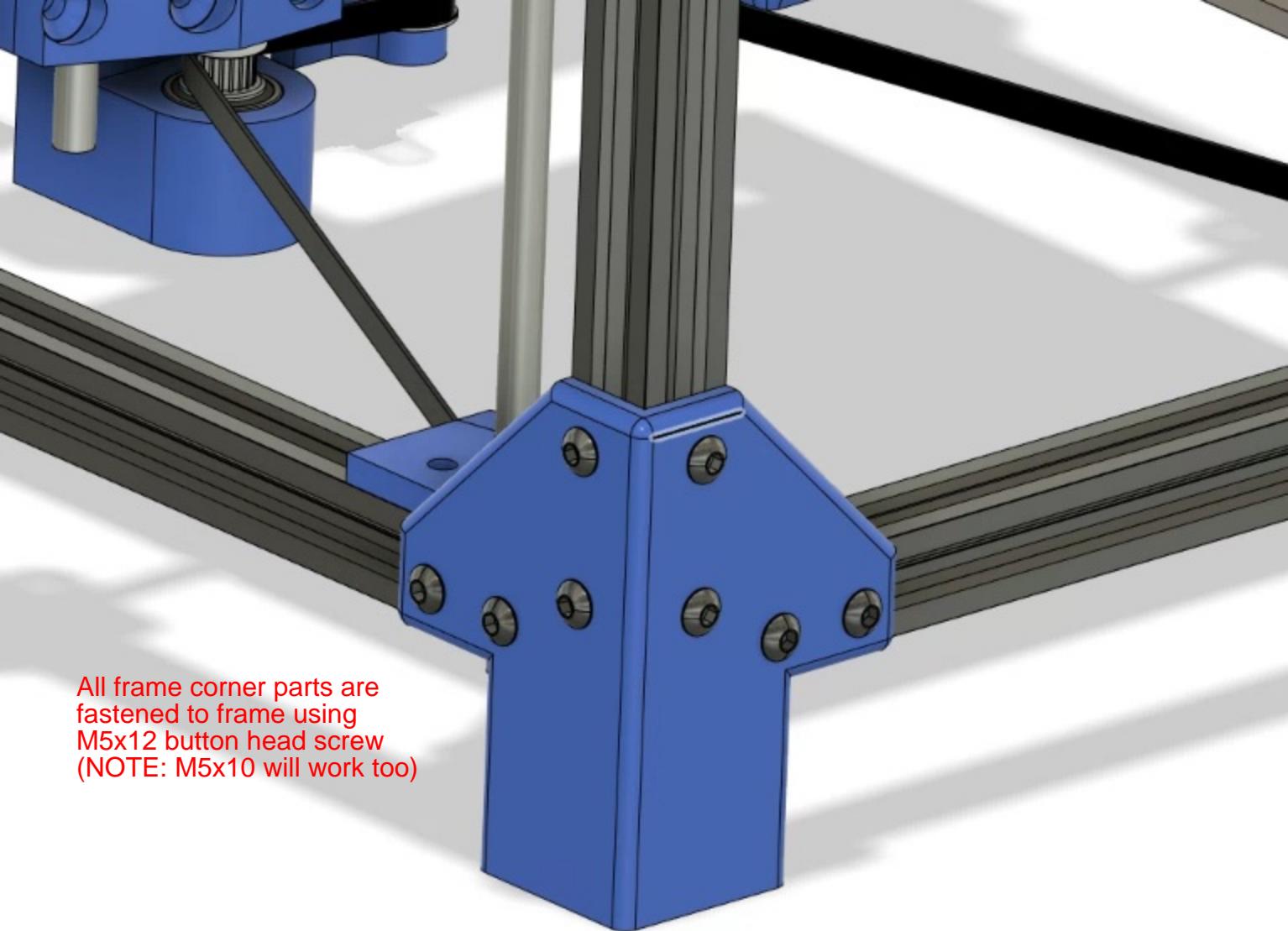
The Frame

1. Ensure 608 bearings fit in each of the front feet without too much force, remove after verifying and set aside to install with Z system
2. Using 4 m5x12 screws and T nuts, insert the vertical 300mm extrusions into the front feet first.
3. Using 2 m5x12 screws and T nuts on each side, insert the horizontal 300mm extrusion between the two verticals. Ensuring a strict 90 degree angle on both sides, secure all 4 screws.
4. Using 4 m5x12 screws and T nuts, insert the vertical 300mm extrusions into the rear feet.
5. Using 2 m5x12 screws and T nuts on each side, insert the horizontal 300mm extrusions between the front and rear verticals, ensuring a strict 90 degree angle.
6. Using 2 m5x12 screws and T nuts on each side, insert the rear 300mm horizontal extrusion.
7. Begin assembly on the upper frame by inserting two GT20 20T or toothless idlers into the top front brackets. Insert an M5 nut into the captive slot, and secure with 1 M5x25 bolt from the top, and 1 M5x25 bolt from the bottom. Do not over tighten these bolts, as that will cause binding on the idlers.
8. Start in one corner and attaching the bracket to the vertical 300mm extrusion using 4 m5x12 screws and T nuts.

**NOTE: While in most cases the screw type (button head, socket head, etc) are interchangeable, there is not enough clearance for a socket head m5 bolt on the motor mount brackets. Ensure to use button head bolts otherwise you will not be able to mount the motor.

9. Attach the next top corner in the same manner.
10. Using 2 m5x12 screws and T nuts on either side, connect the two corners using a 300mm extrusion.
11. Repeat this process working your way around the top frame until it is complete. The top rear corners will require m5x20 screws and T nuts.
12. Congratulations on completing the assembly of the BugBu Frame!





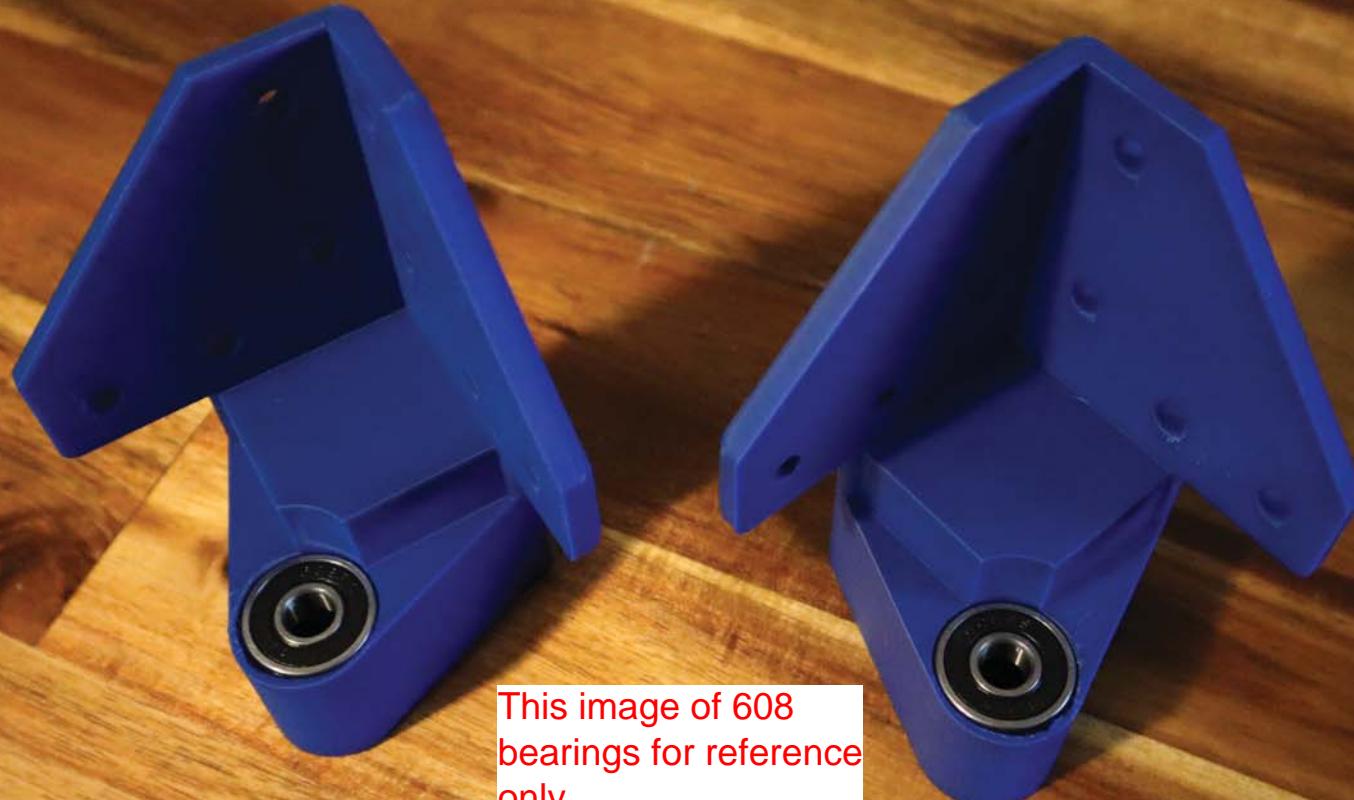
All frame corner parts are
fastened to frame using
M5x12 button head screw
(NOTE: M5x10 will work too)

STEP 1:



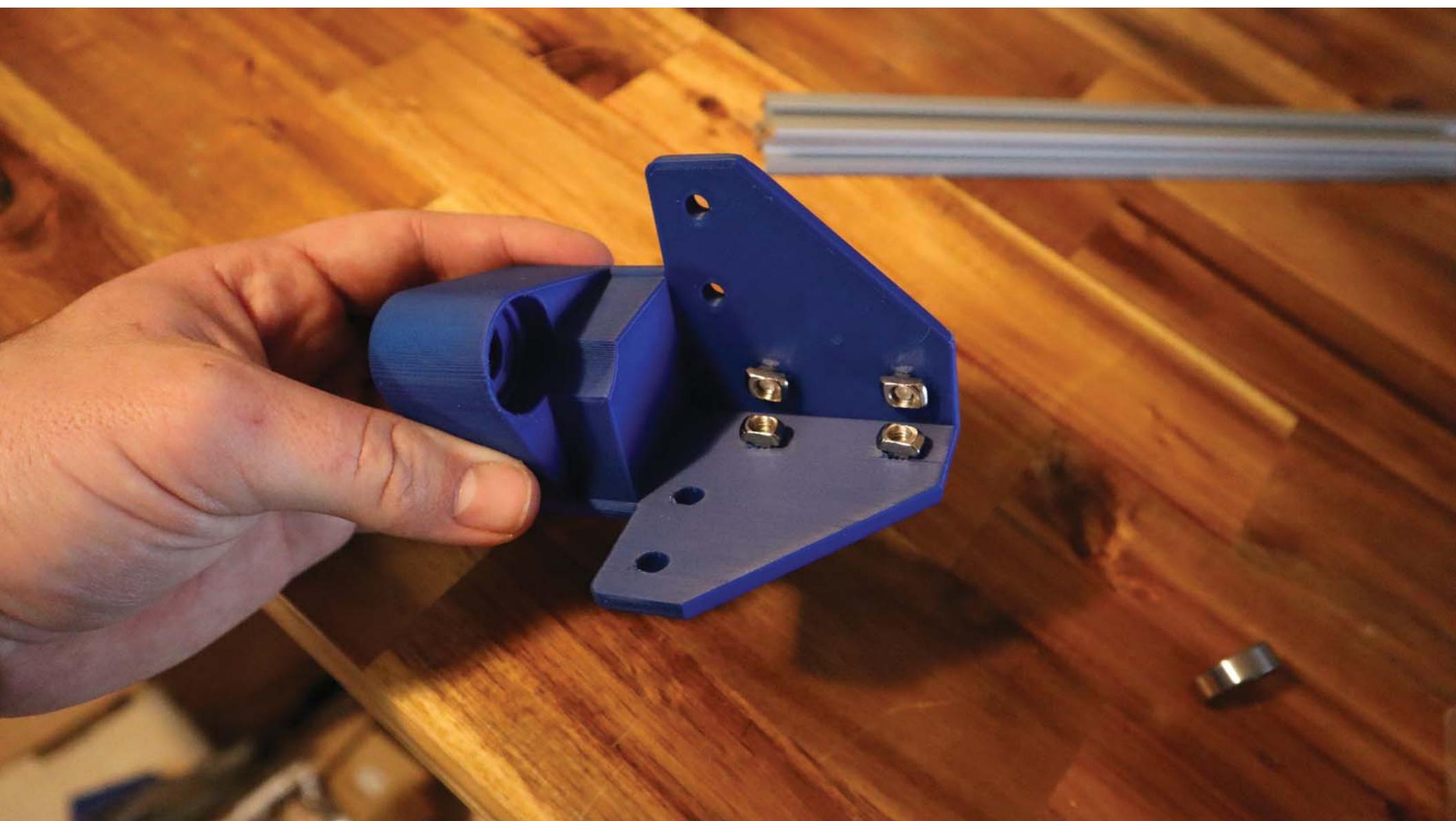
This image of 608
bearings for reference
only

STEP 1:

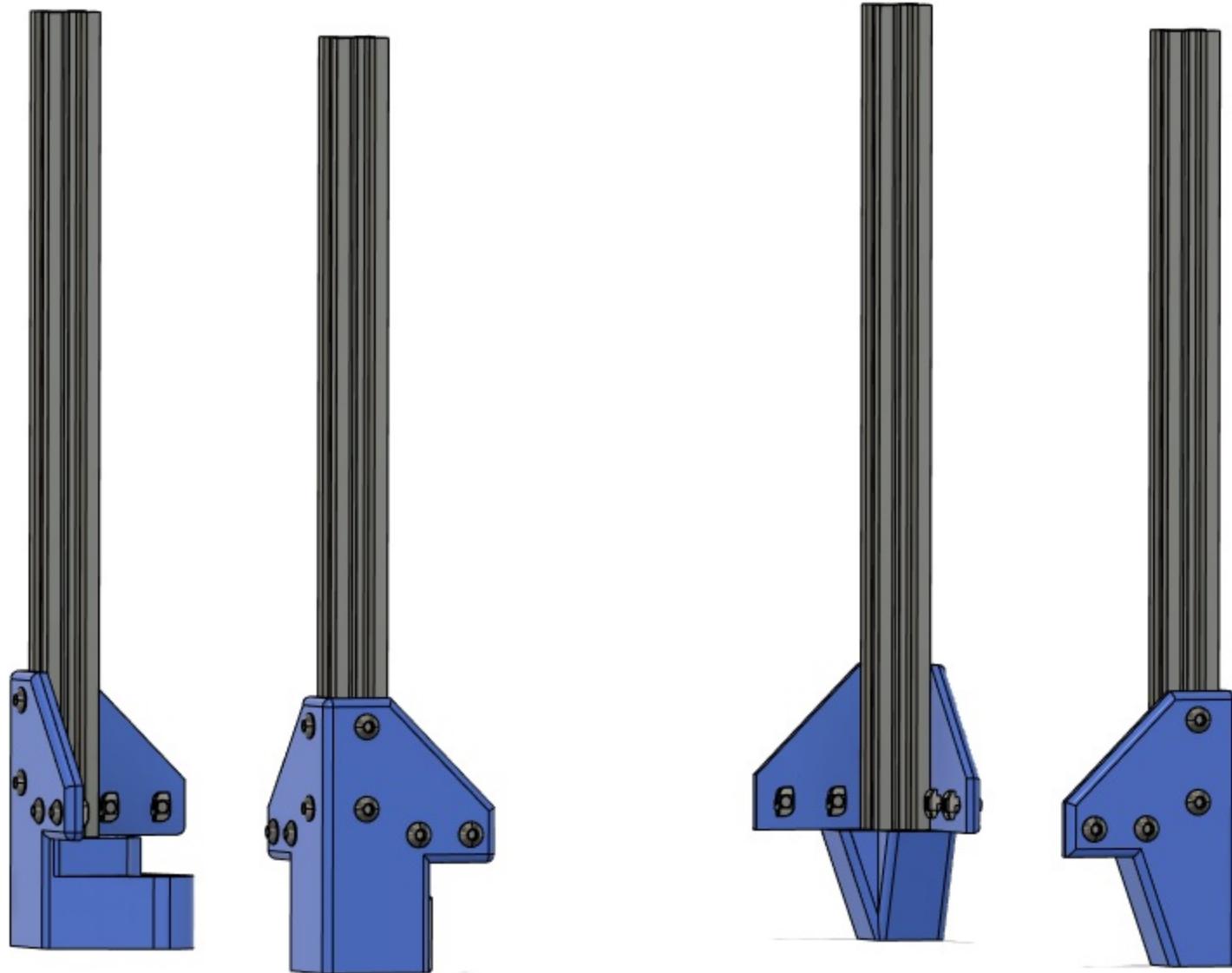


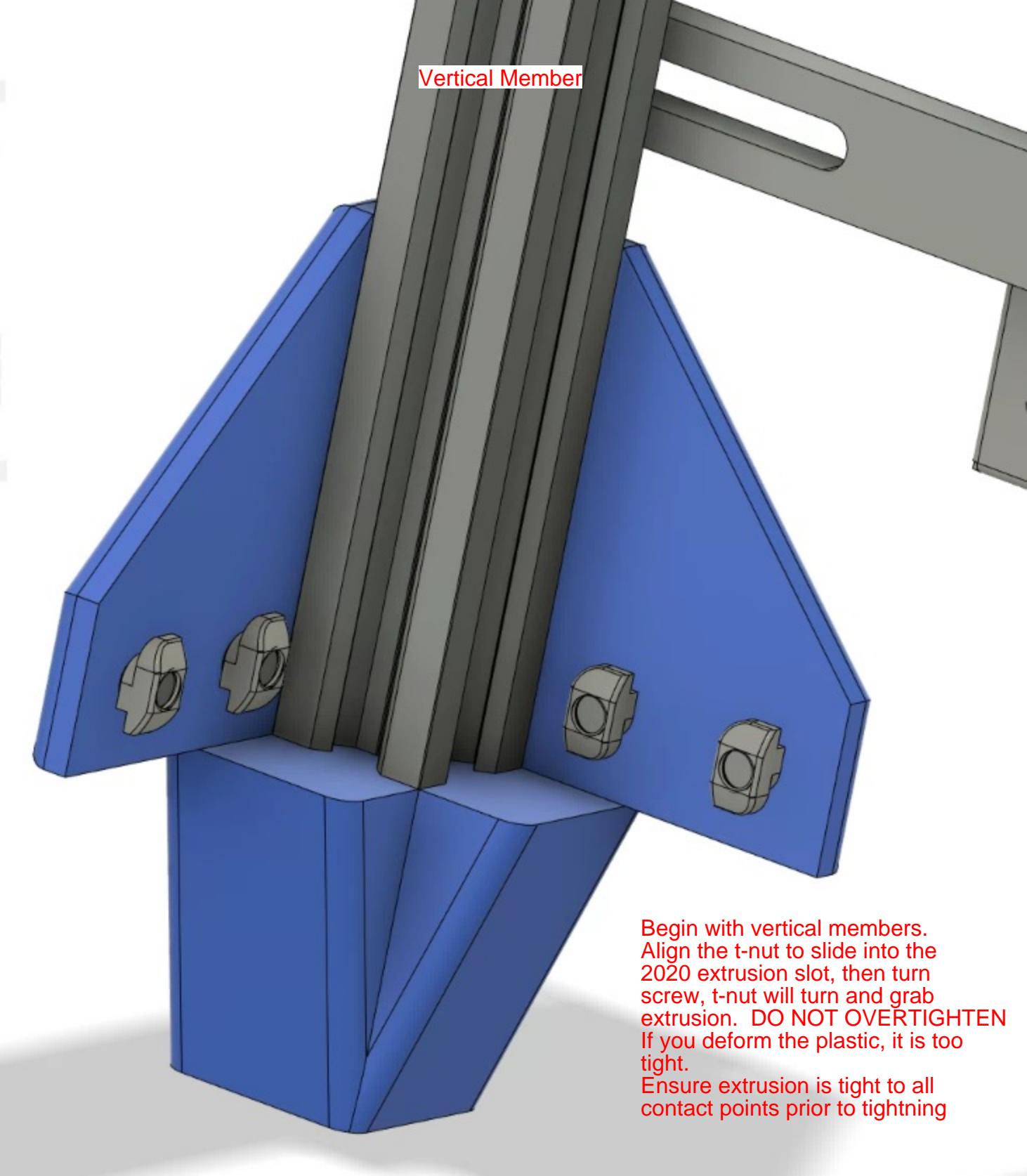
This image of 608
bearings for reference
only

STEP 2:



STEP 2:





Vertical Member

Begin with vertical members.
Align the t-nut to slide into the
2020 extrusion slot, then turn
screw, t-nut will turn and grab
extrusion. DO NOT OVERTIGHTEN
If you deform the plastic, it is too
tight.
Ensure extrusion is tight to all
contact points prior to tightening

STEP 2:



STEP 2:



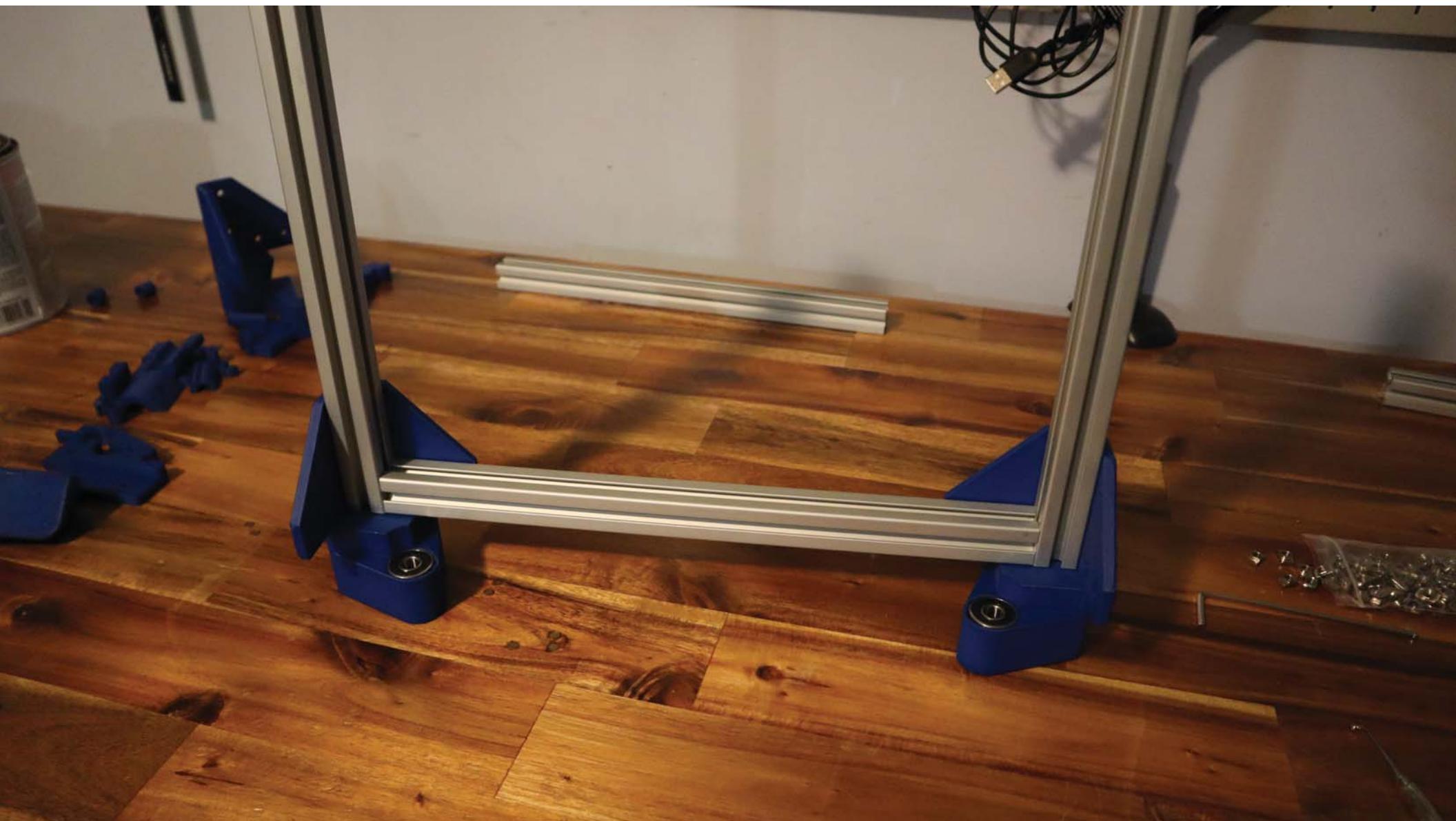
Install horizontal members
after vertical. Affix with t-nut

Vertical Member

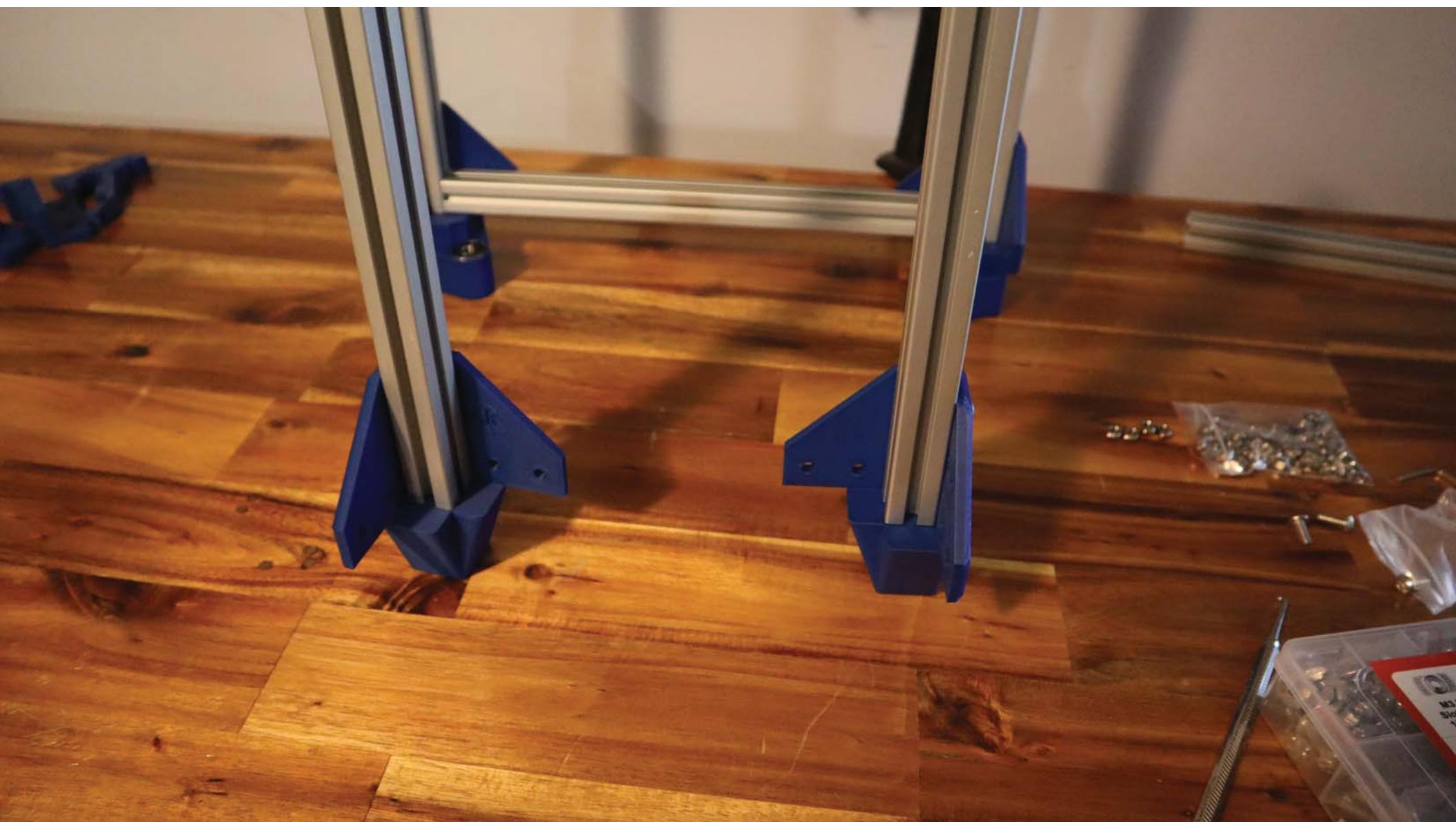
Horizontal Member

Horizontal Member

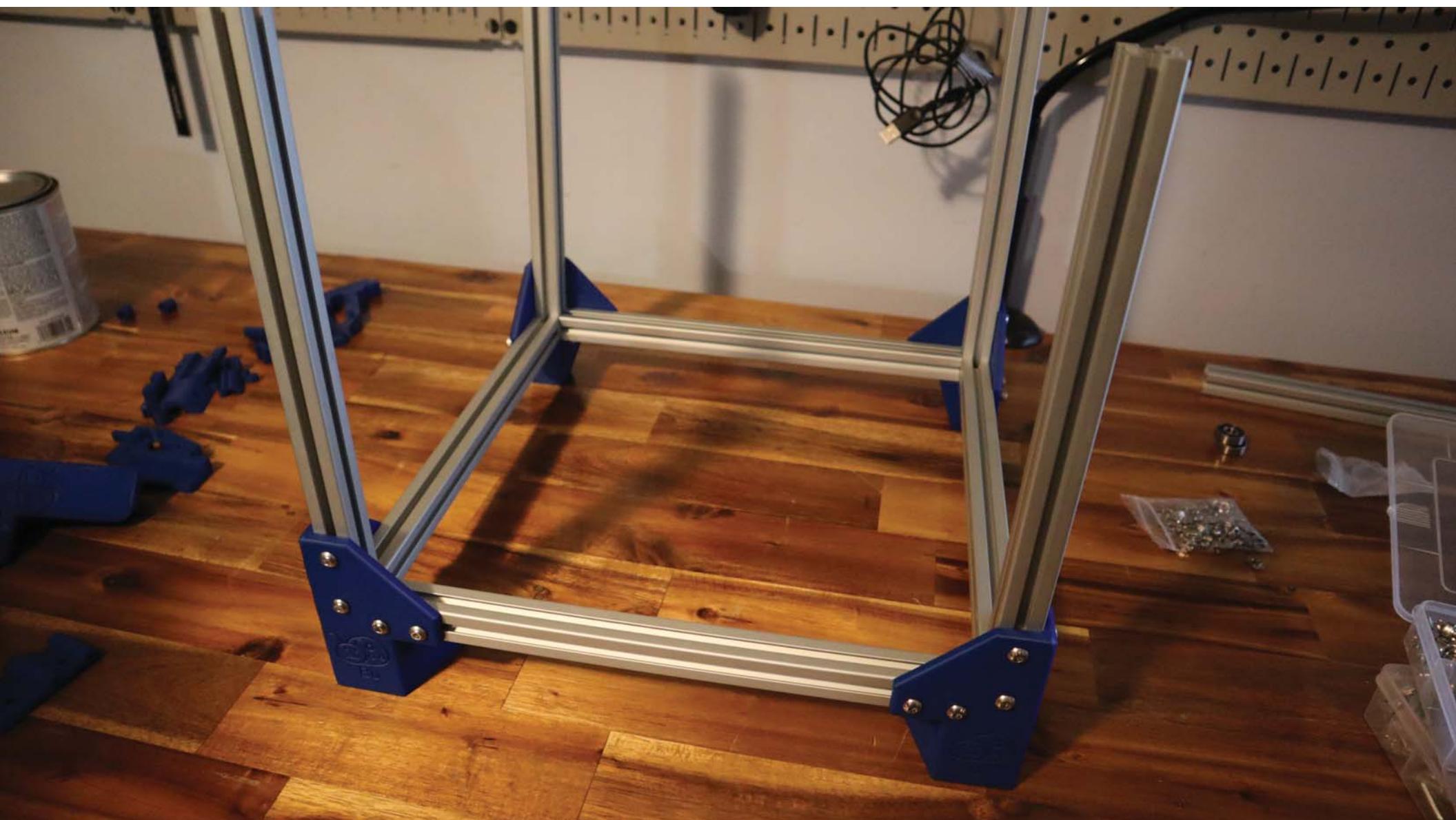
STEP 3:

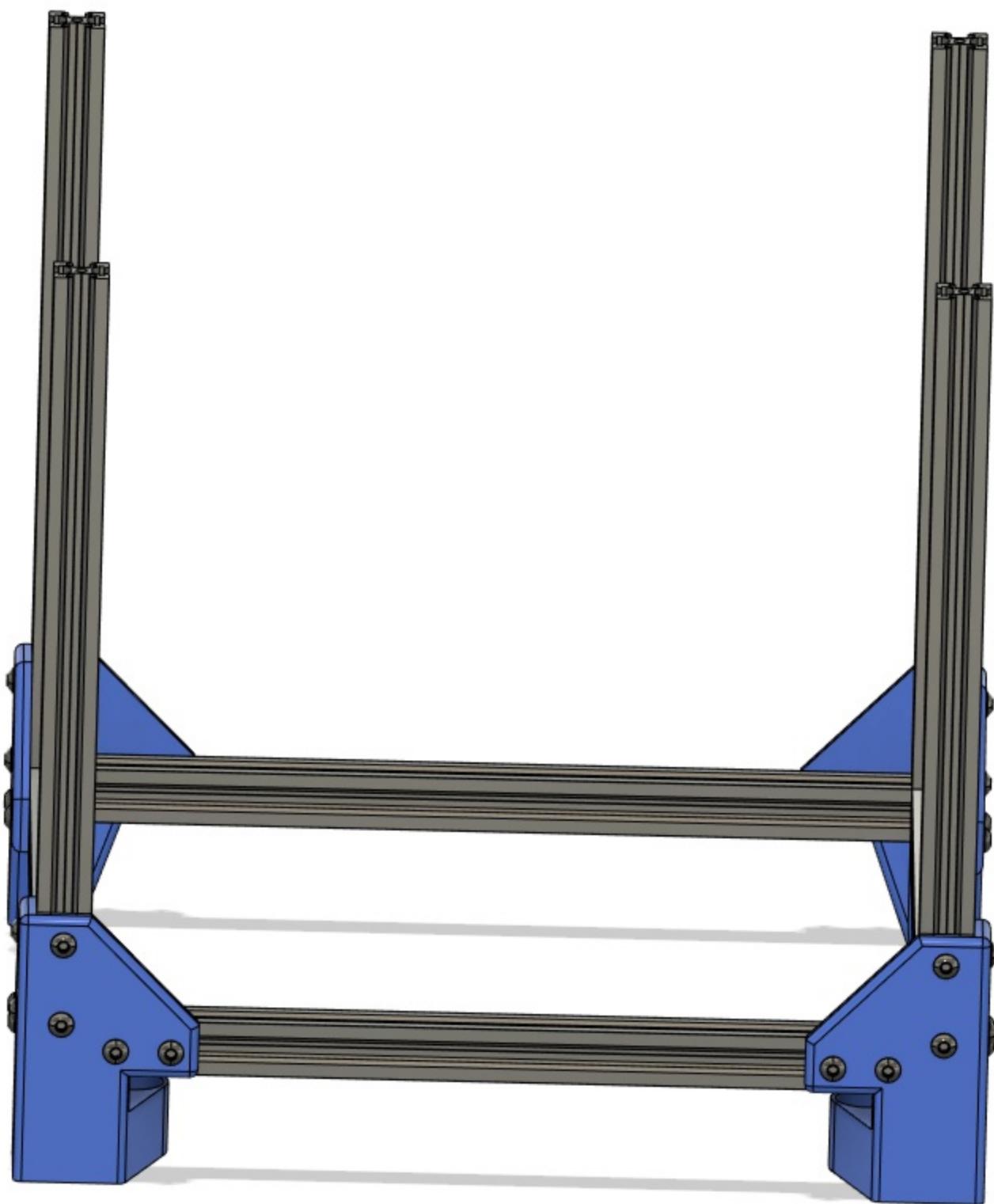


STEP 4:



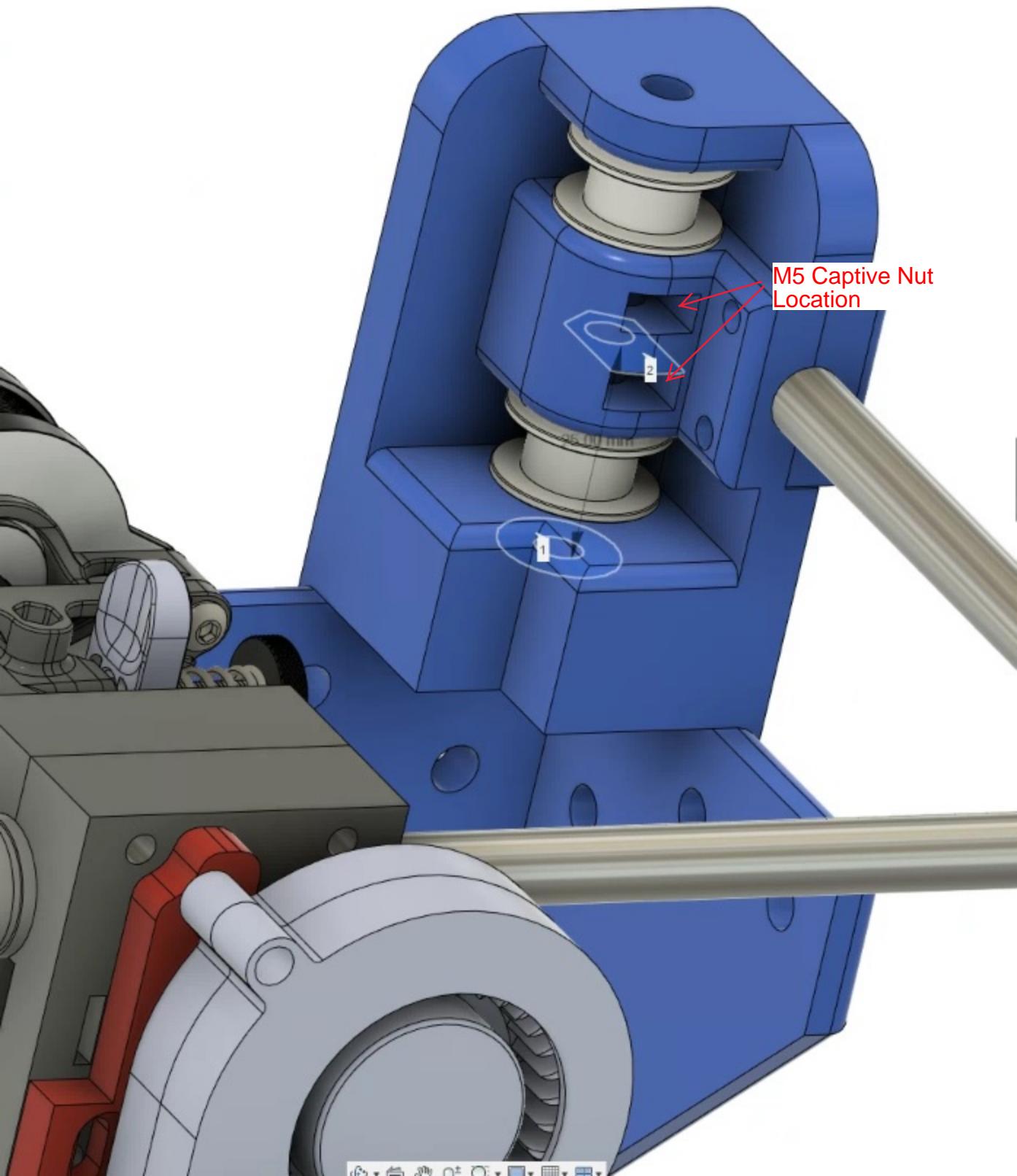
STEP 5/6:



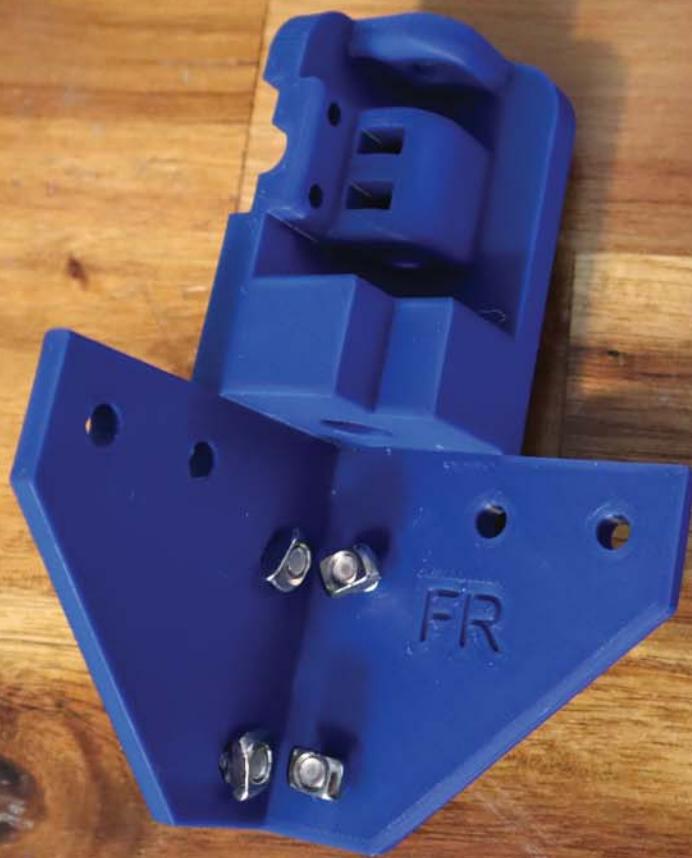




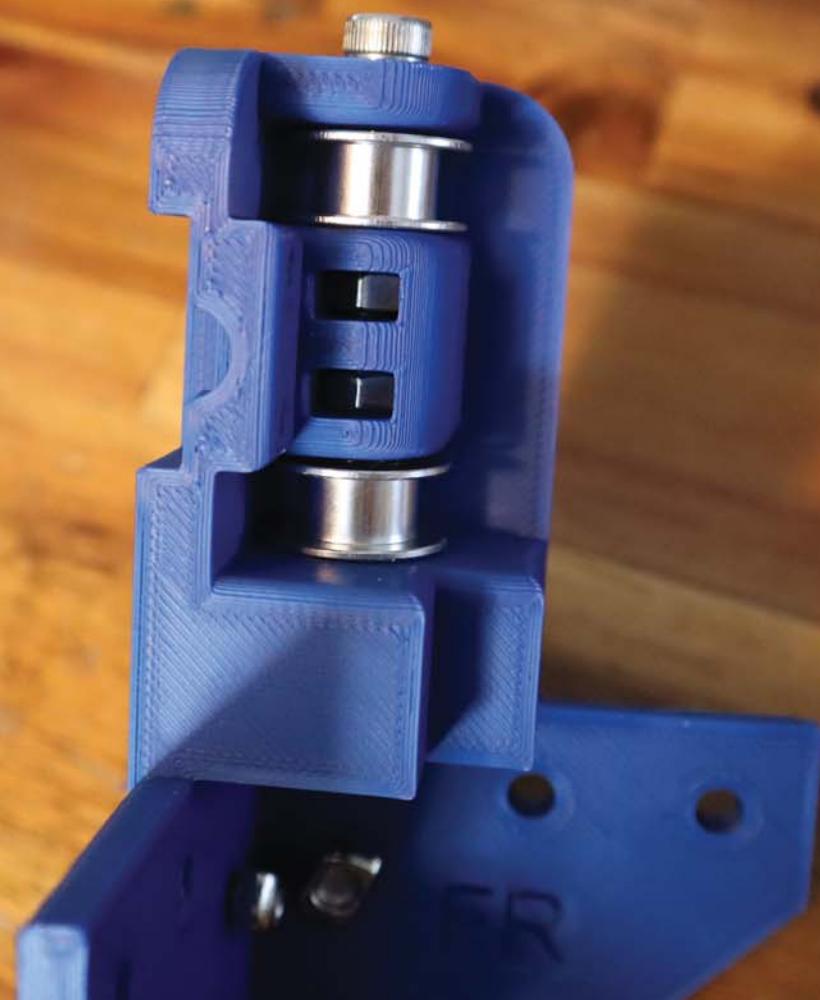
Prior to attaching the front idlers to the frame, the 20t gt2 idlers must be installed
Toothed or smooth idlers is fine, toothed is slightly more recommended
Using 2 M5 nuts per idler, insert into captive nut location
Use one M5x25 from bottom through idler and one M5x25 from top through
idler. Tighten bolts, do not over tighten.



STEP 7:

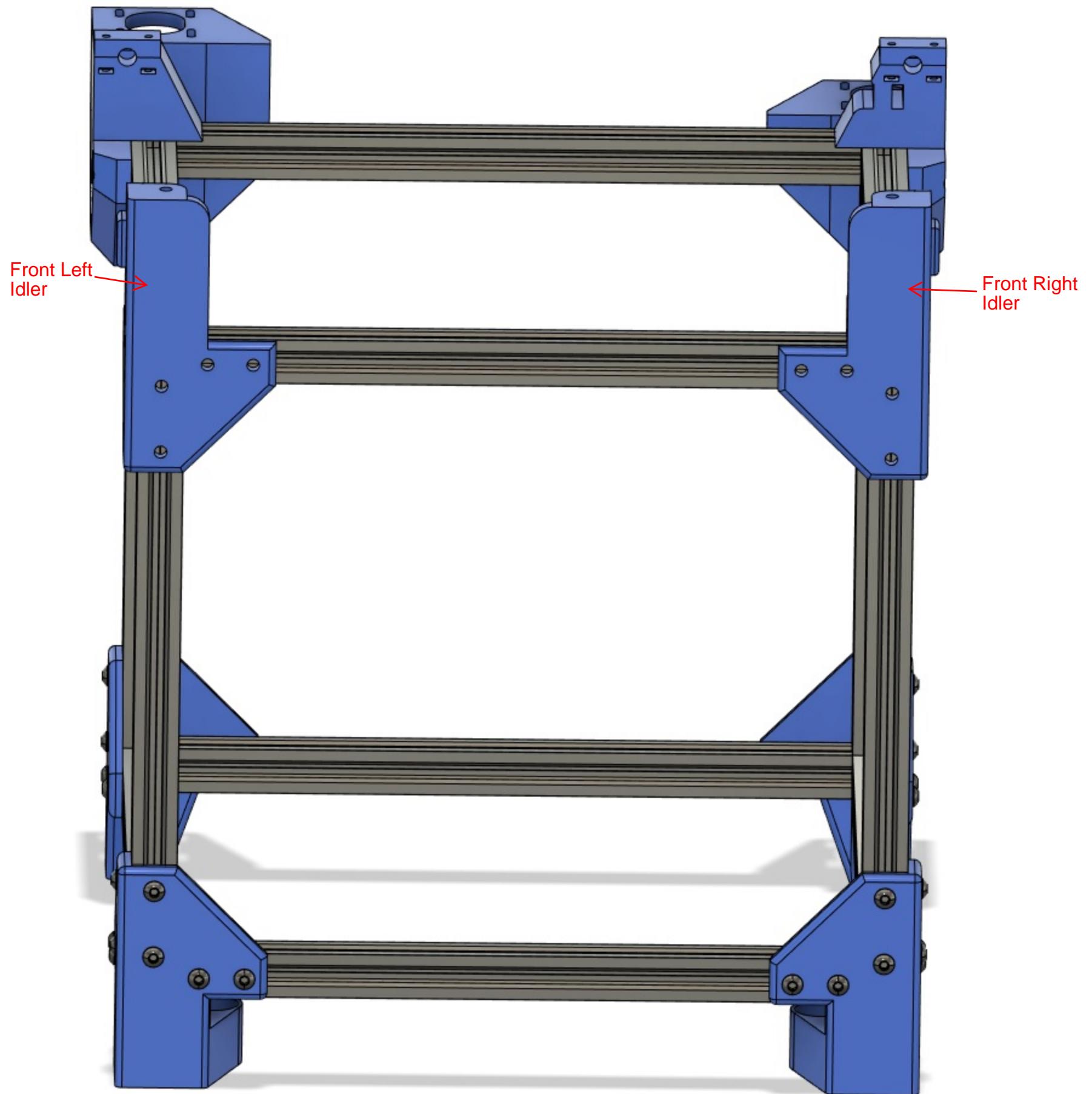


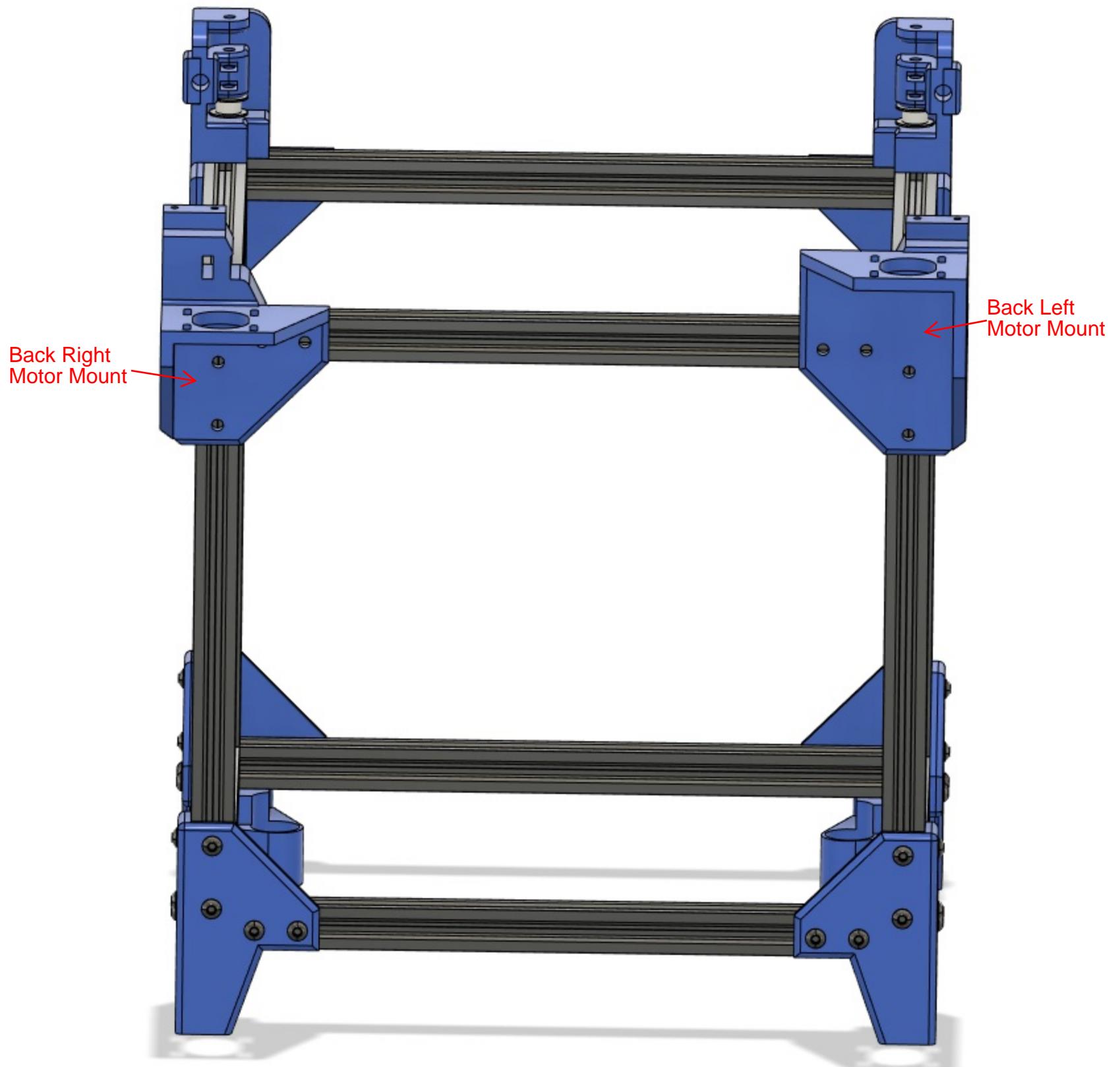
STEP 7:



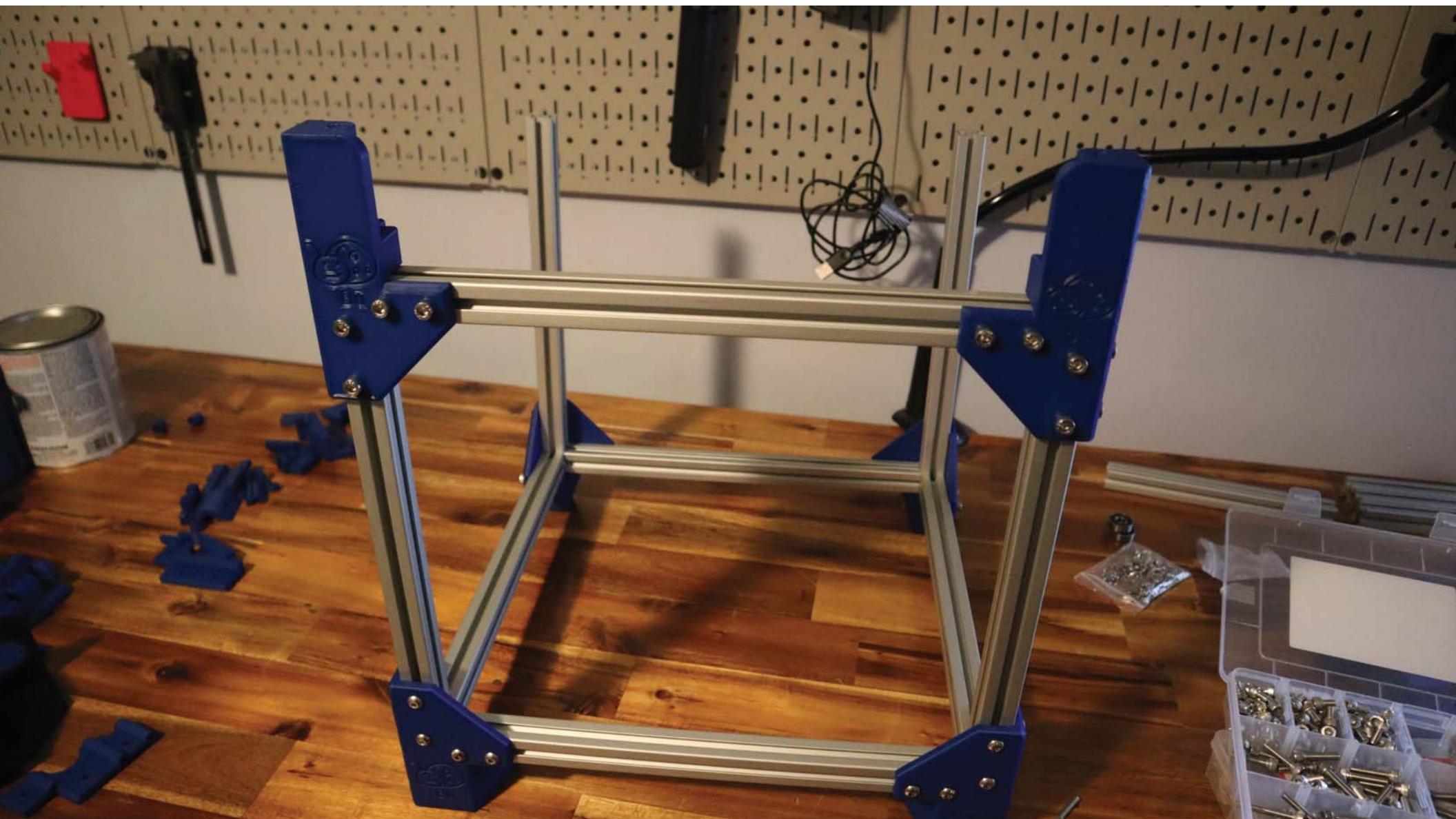
STEP 8/9:

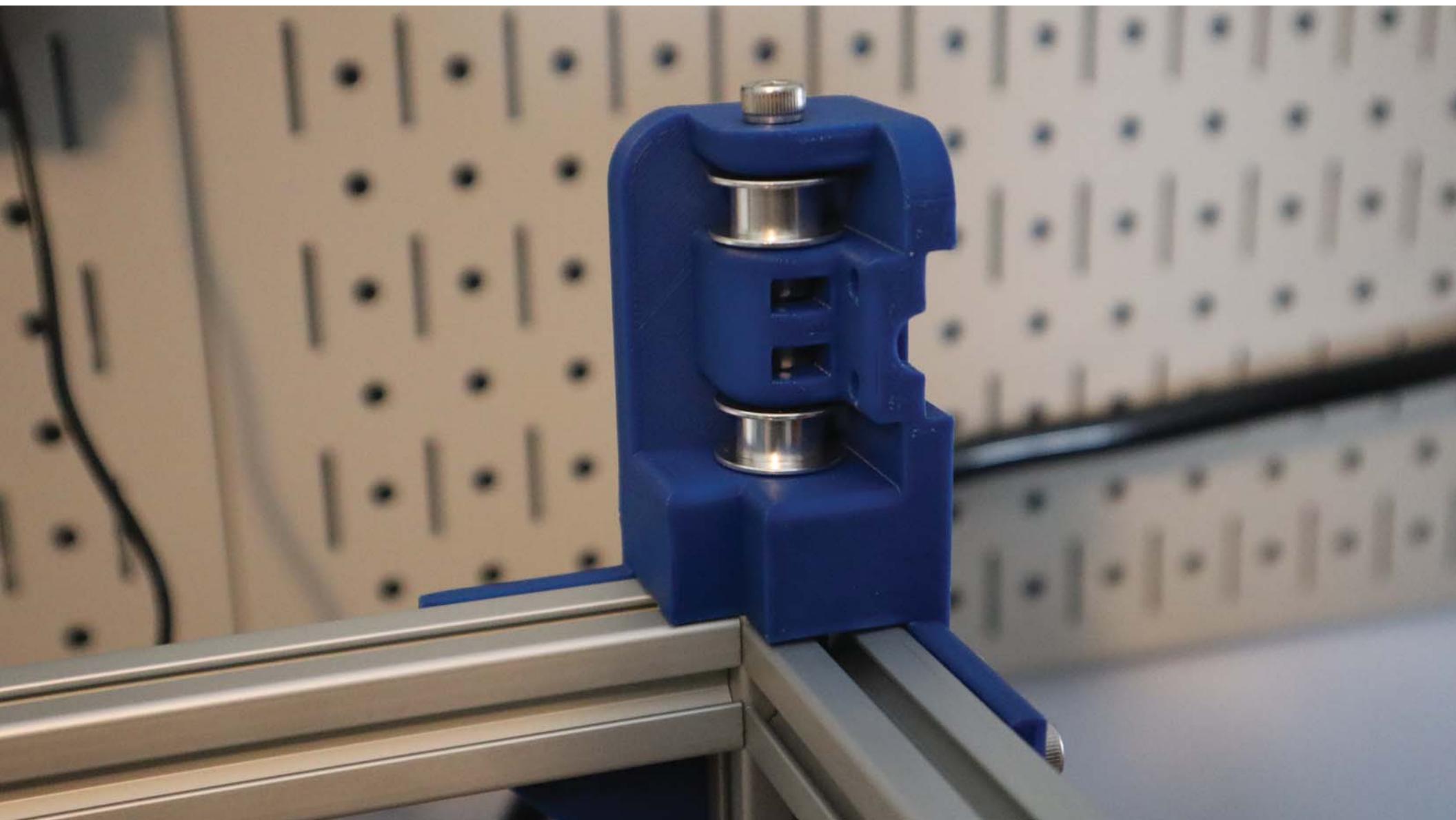






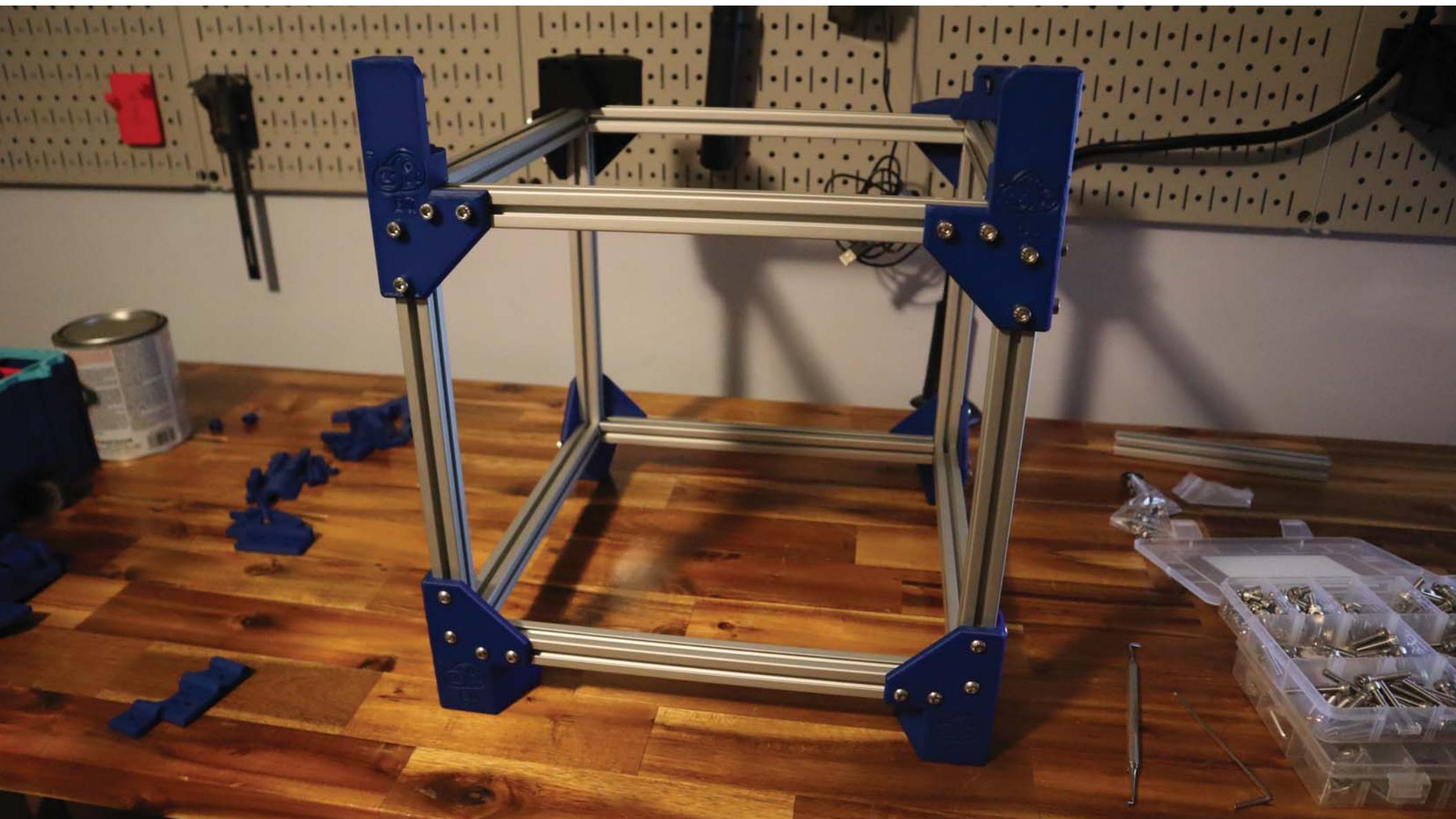
STEP 8/9



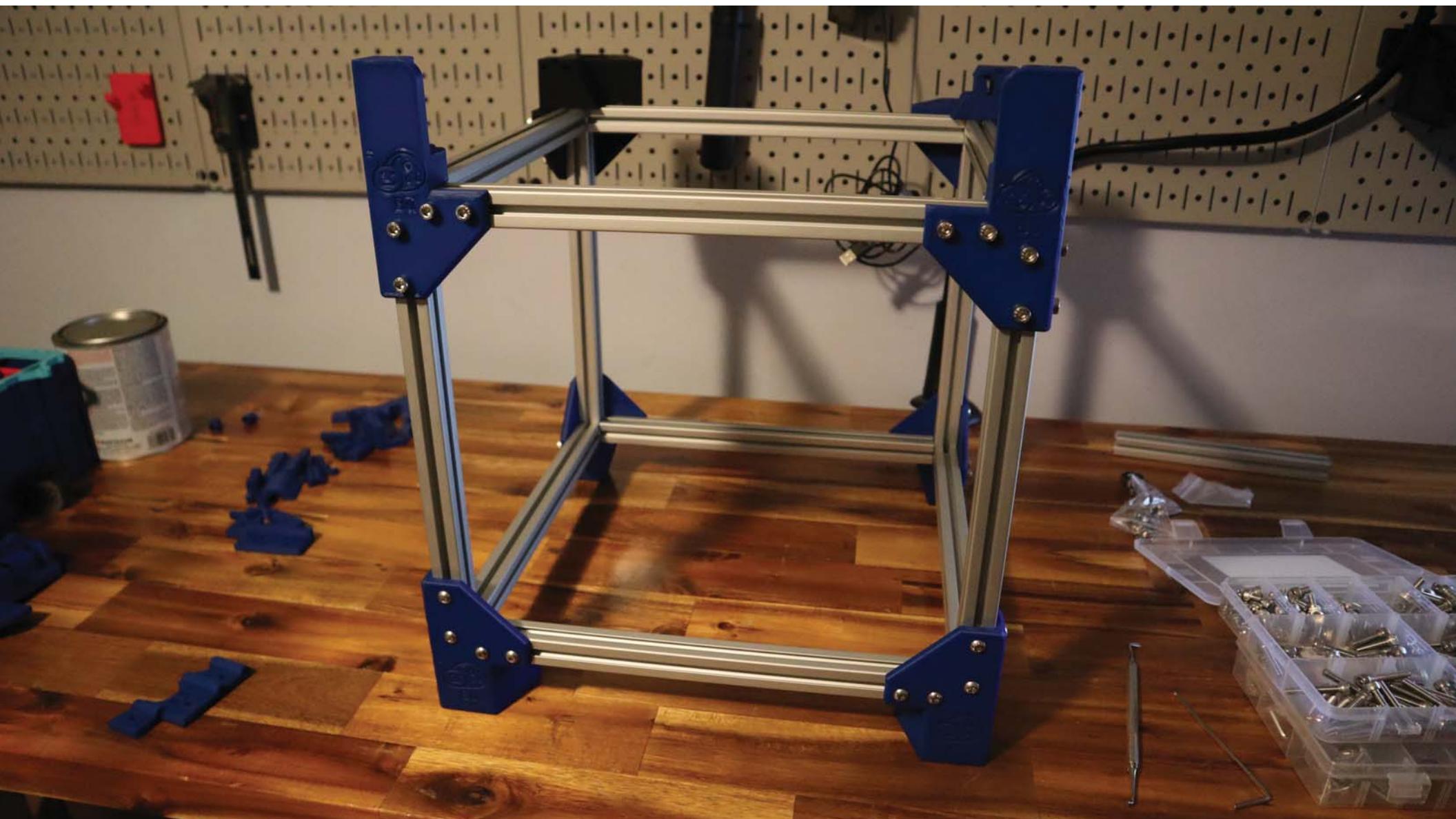




STEP 8/9



COMPLETED FRAME

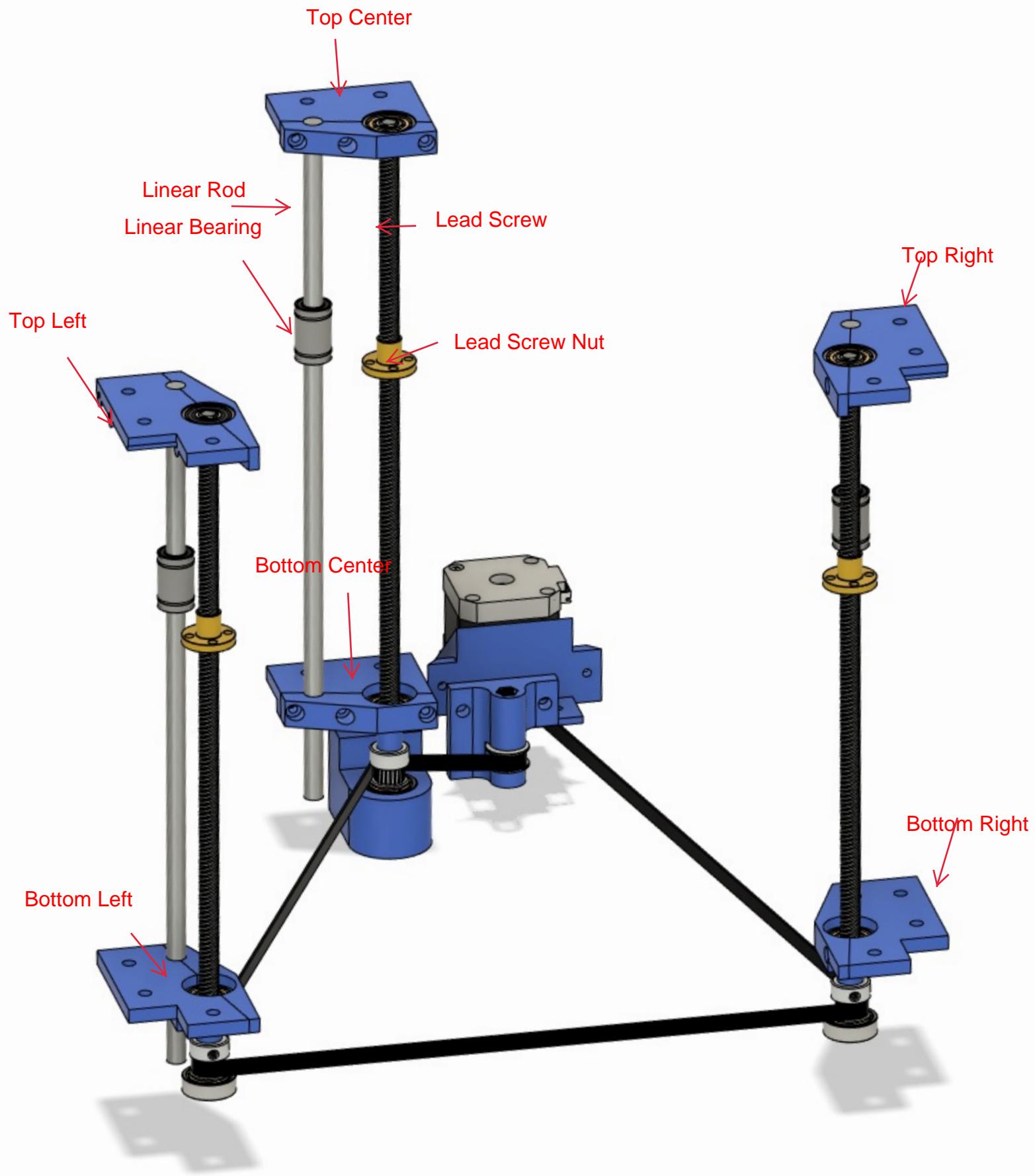


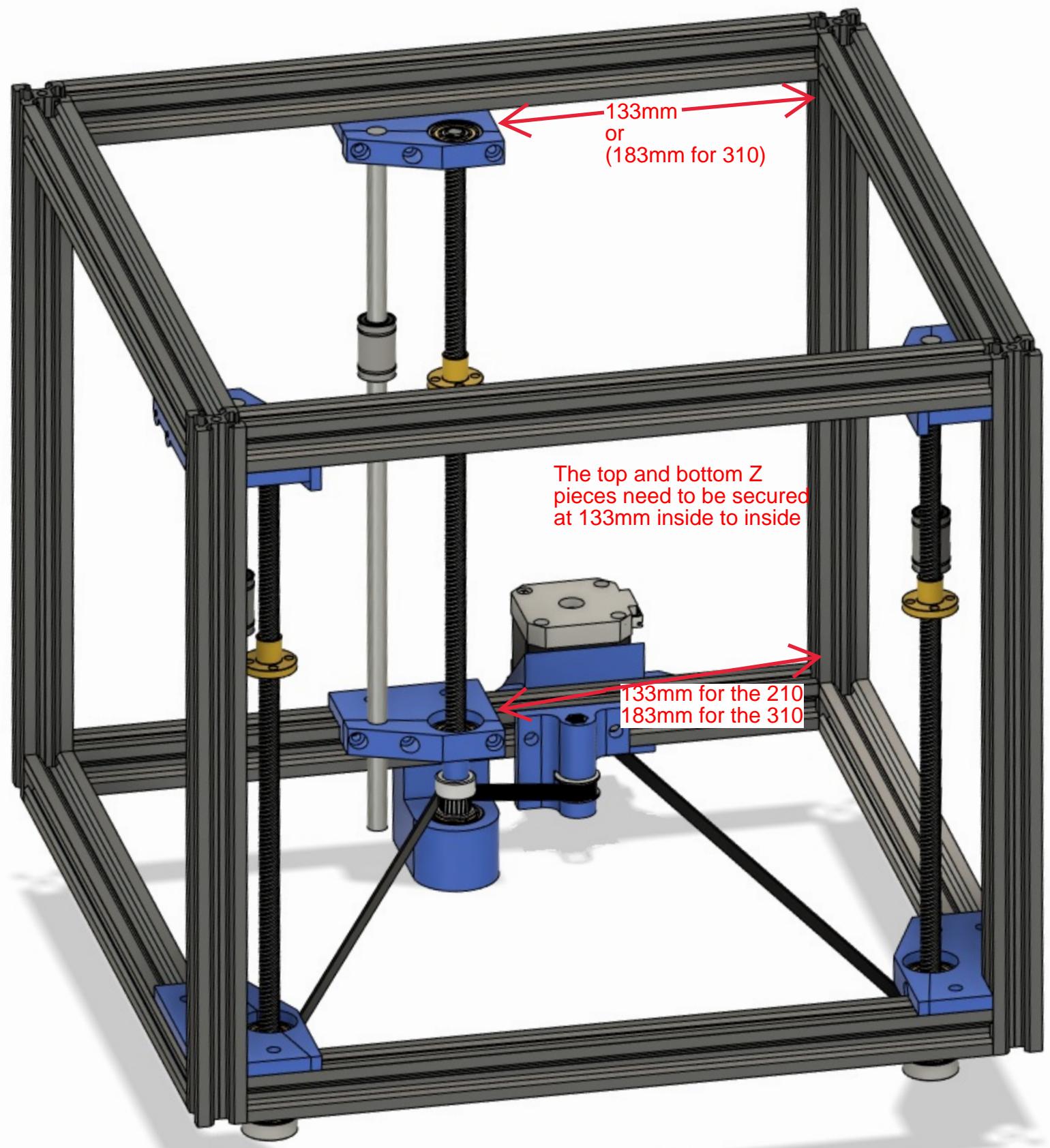
Section 2:

Z System

Components needed for this portion:

GT2 6mm Belt 1100 closed loop	x1
Skateboard Bearings (608-2RS 8x22x7)	x9
300mm x 8mm Linear Rod	x3
8mm Linear Bearing	x3
300mm x 8mm 4 start 8x8 Lead Screw	x3
Lead Screw Nut	x3
M5x12 (or 10)	x24
M5 T-nut	x24
M5x25	x1
M5 Nut	x1
M3x12 (or 10)	x18
20T GT2 Non-Toothed 5mm Bore Idler	x1
20T GT2 8mm Bore Pulley	x3



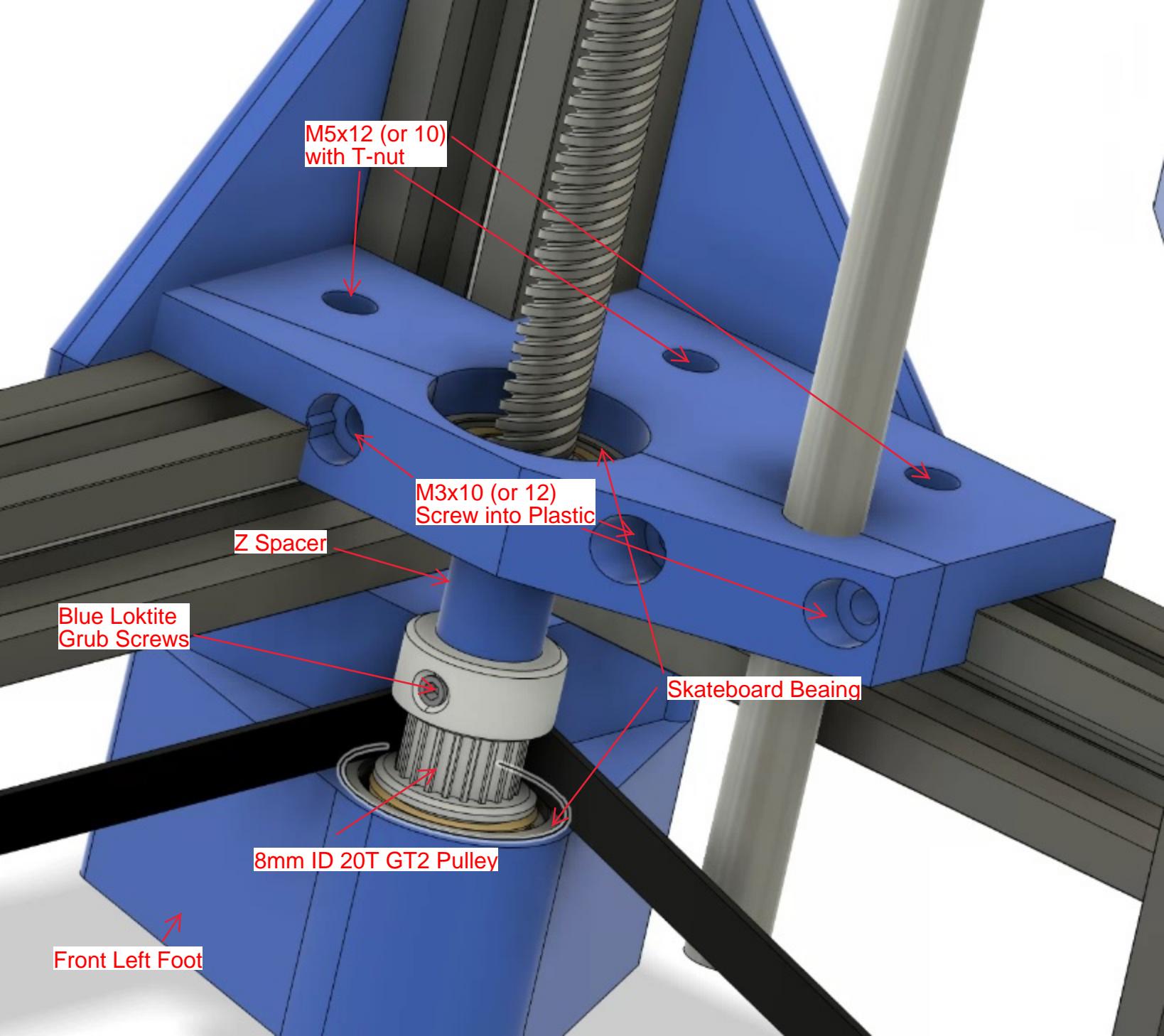


The Z

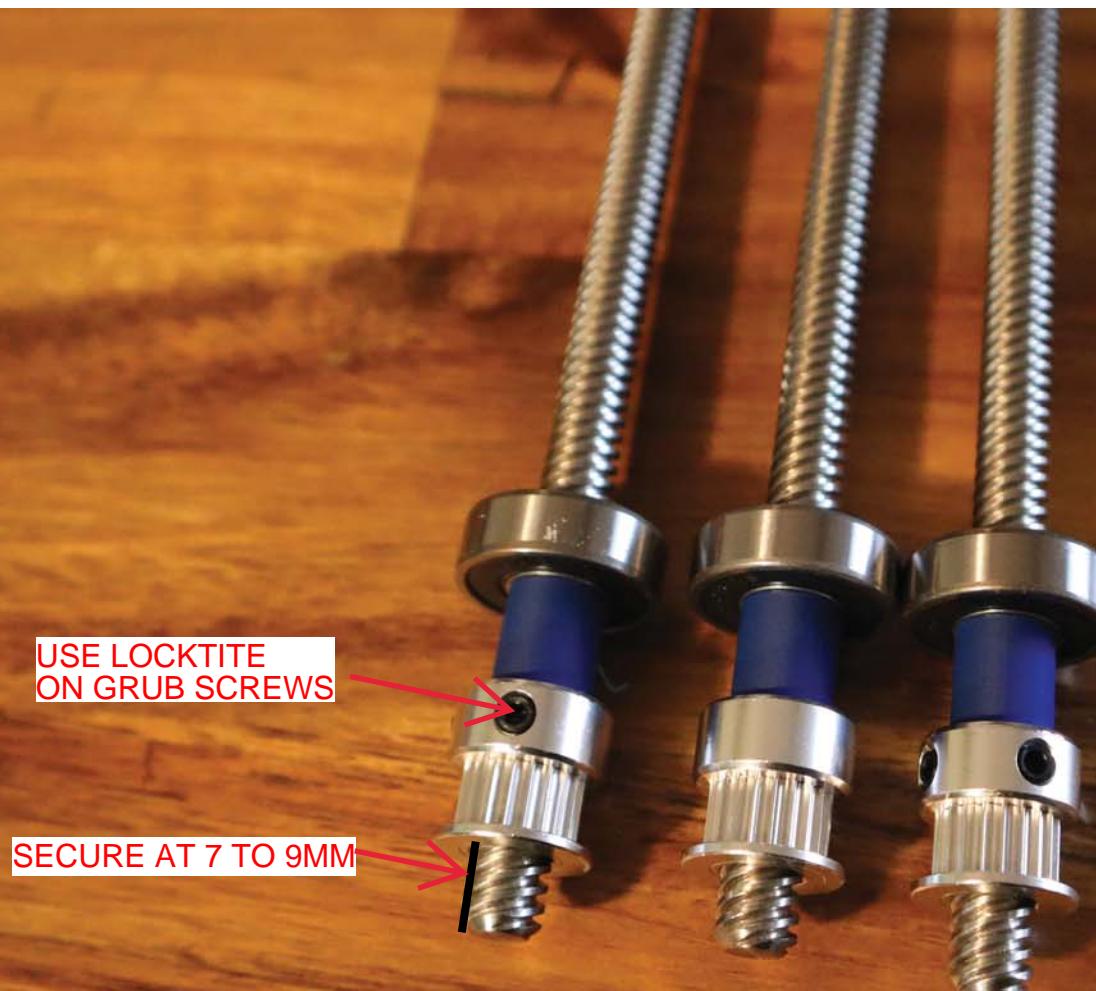
1. Secure the Bottom Z mounts to each front leg using 3 m5 T nuts and 3 m5x12 screws
2. Secure the top Z mounts to each front leg using 3 m5 T nuts and 3 m5x12 screws.
3. Place one 608 bearing in the base of each front Z mount.
4. Take 3 lead screws and slide up from the bottom 1 608 bearing, 1 spacer, and then 1 8mm g2 20T. Secure the pulley gear 7-9mm above the base of the lead screw.
5. Insert the bottom of the lead screw (with the bearing, spacer, and pulley) into the bottom Z mount.
6. Slide the Bed mount for that corner onto the lead screw.
7. Slide one linear bearing onto each linear rod.
8. Place a 608 bearing at the top of the lead screw.
9. Secure the lead screw with bearing and the linear rod to the Z axis with the top and bottom clamps. Each clamp will use 3 m3x10 (or longer) screws.
10. Secure the bottom of the rod and lead screw using the clamps and 3 m3x10 (or longer) screws each. This should clamp around the 608 bearing.
11. For the rear bottom center base, the base will be in the exact center of the extrusion. This attaches from the bottom using two m5 t nuts and 2 m5x12 screws.
12. Line up the bottom center mount with the bottom center base and mount it to the top of the extrusion using 2 m5 t nuts and 2 m5x12 screws.
13. Mount the Back Center Top mount to the center of the top extrusion in line with the Bottom and base. This will mount with 2 m5 t nuts and 2 m5x12 screws.
14. Insert 1 608 bearing into the center bottom base.
15. Complete the center bed mount assembly with z rod and lead screw the same as the front two.
16. Clamp the bed mount around the linear bearing on each of the 3 linear rods using 2 captive m3 nuts and 2 m3x16 screws

The Z Belt

1. Remove lower lead screw and linear rod clamp from all three points, this will allow you to slide each lead screw up to place the belt around the pulley's.
2. After routing the belt, reinstall the clamps to secure lead screws and linear rods
3. Secure the Z motor mount to back right of the frame using 4 – M5x12 (or 10) fasteners with t-nuts
4. Secure the z motor to the bracket using 4 M3x10, making sure the wiring faces towards center of frame/left side of printer
5. Assemble the tensioner using one M5 nut, one M5x25, and one 2GT 20T Non-Toothed idler. Secure the tensioner to the frame using 2 M5x12 and t-nuts
6. Route the belt around the motor pulley and tensioner. Move the motor out as far as the bracket will allow for tension, then use tensioner for remaining slack



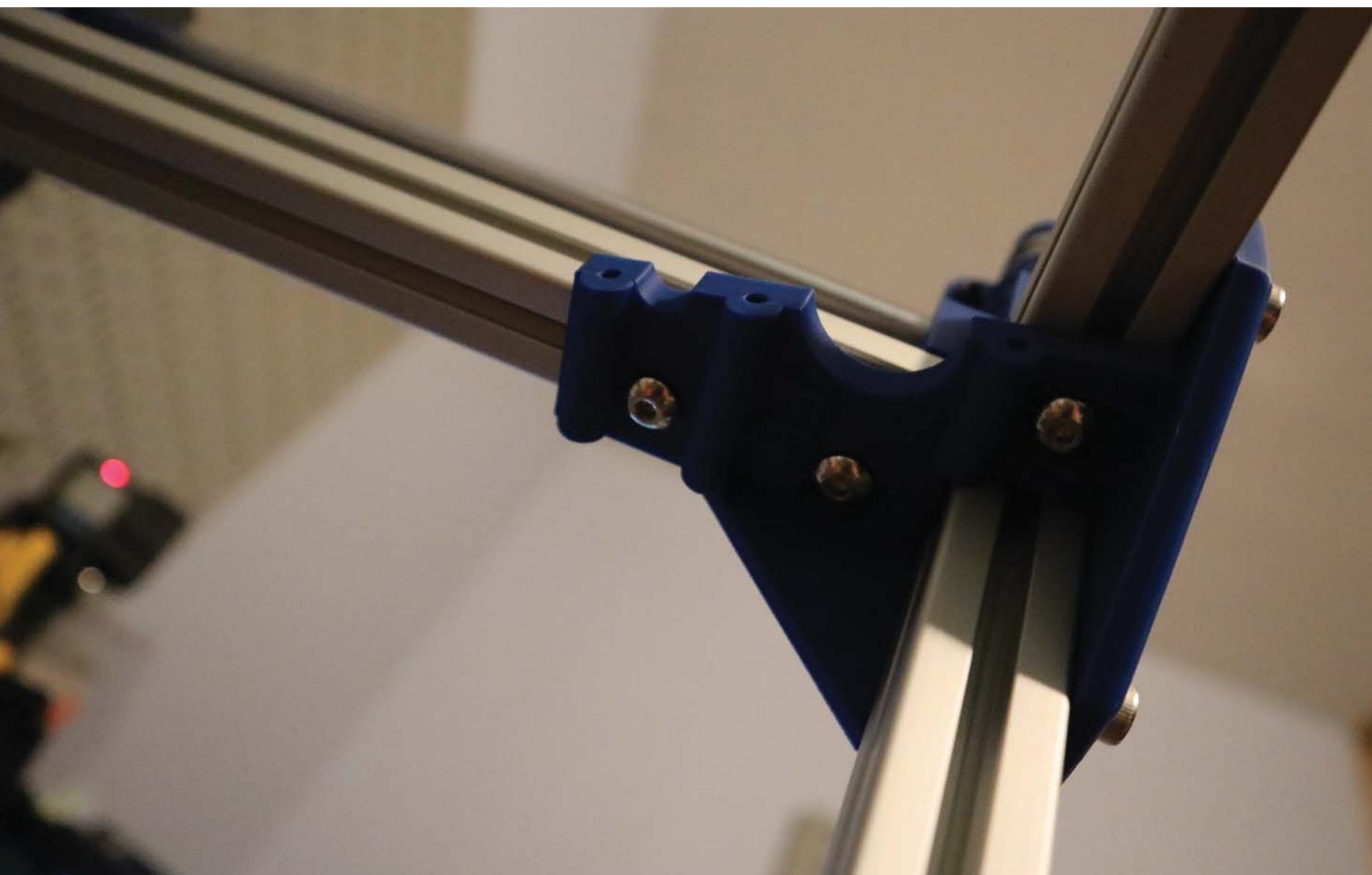
STEP 1, PREPARING YOUR LEAD SCREWS

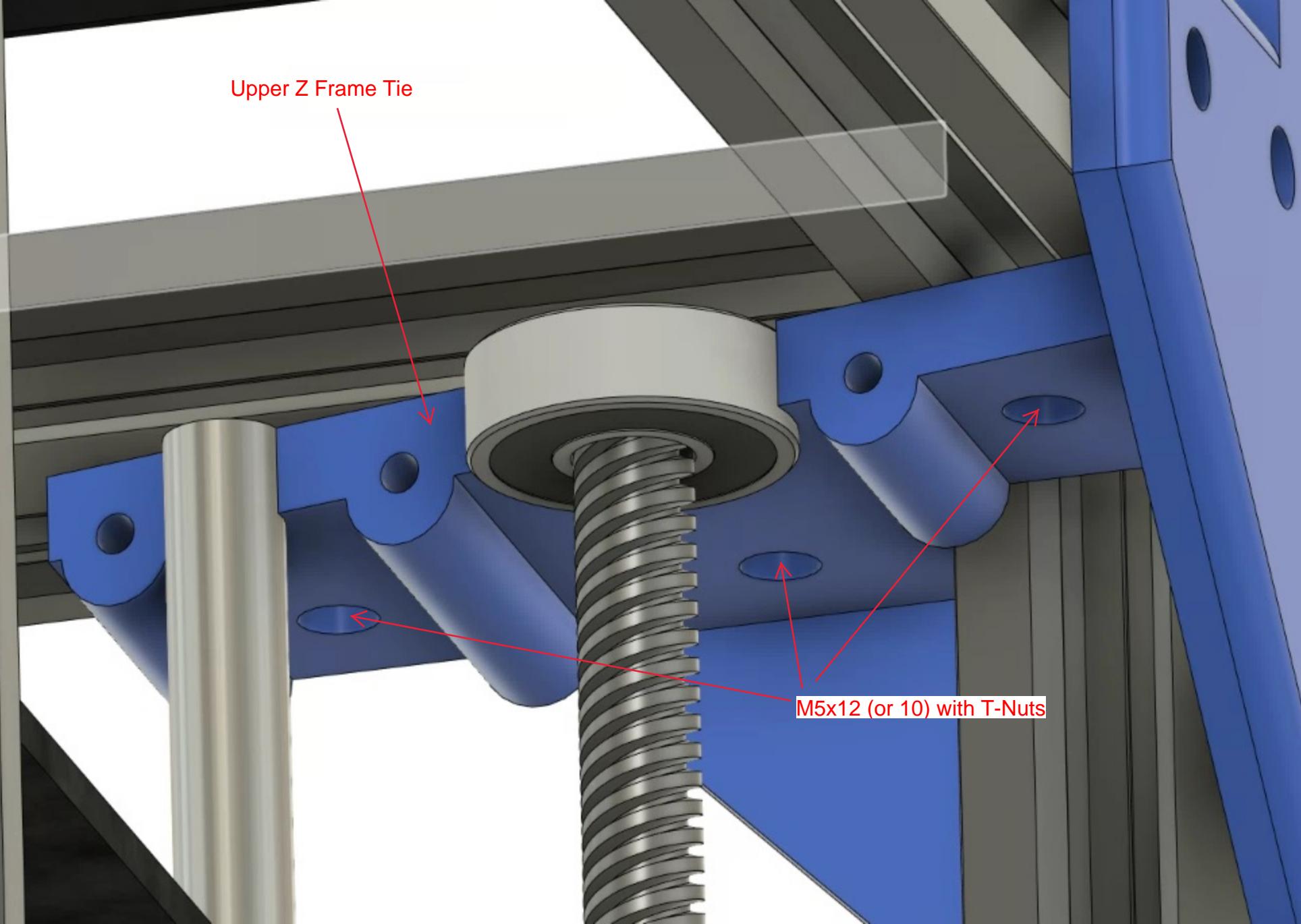


STEP 2



STEP 3







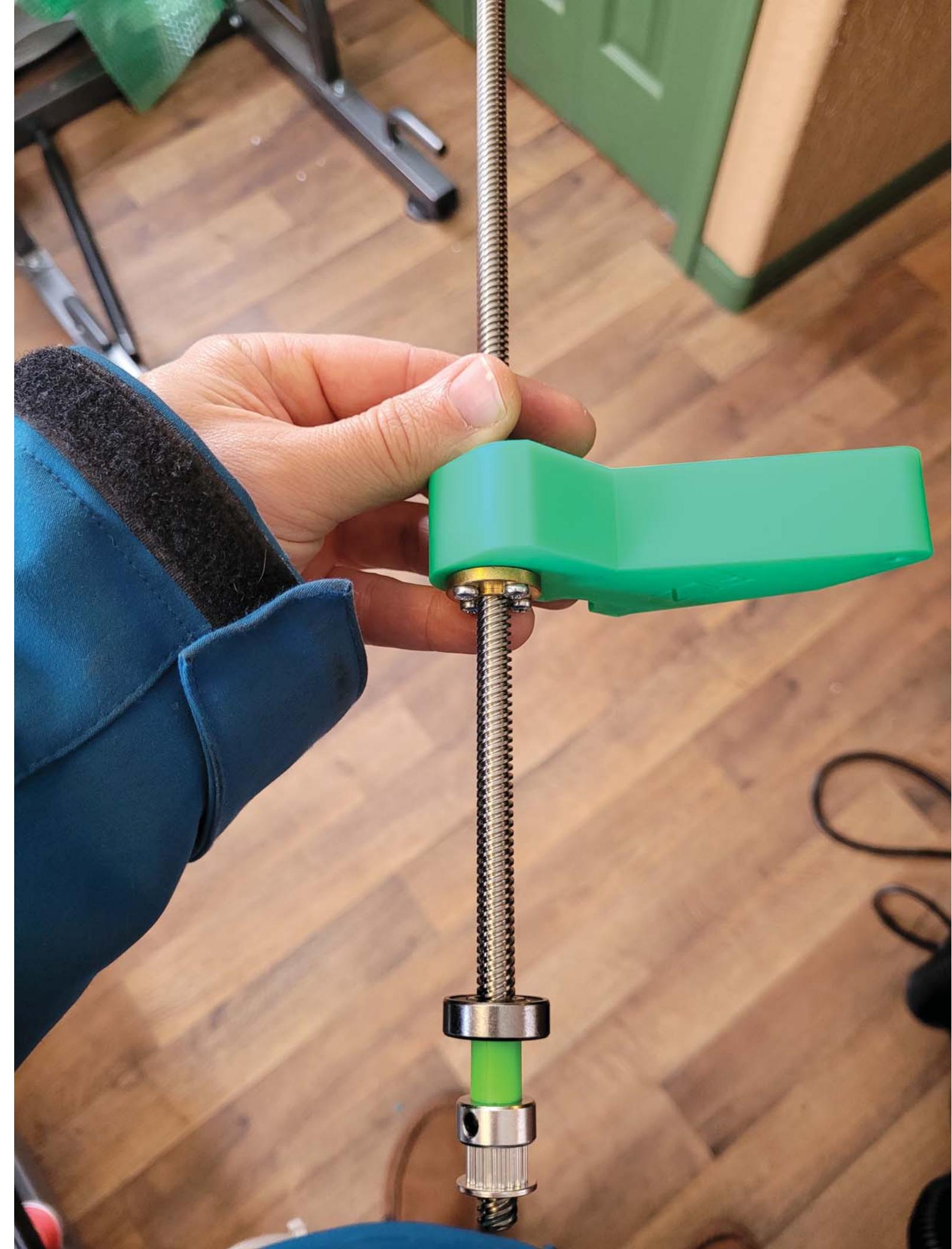
Insert captured nuts prior to putting on lead screw



Lead Screw Nut

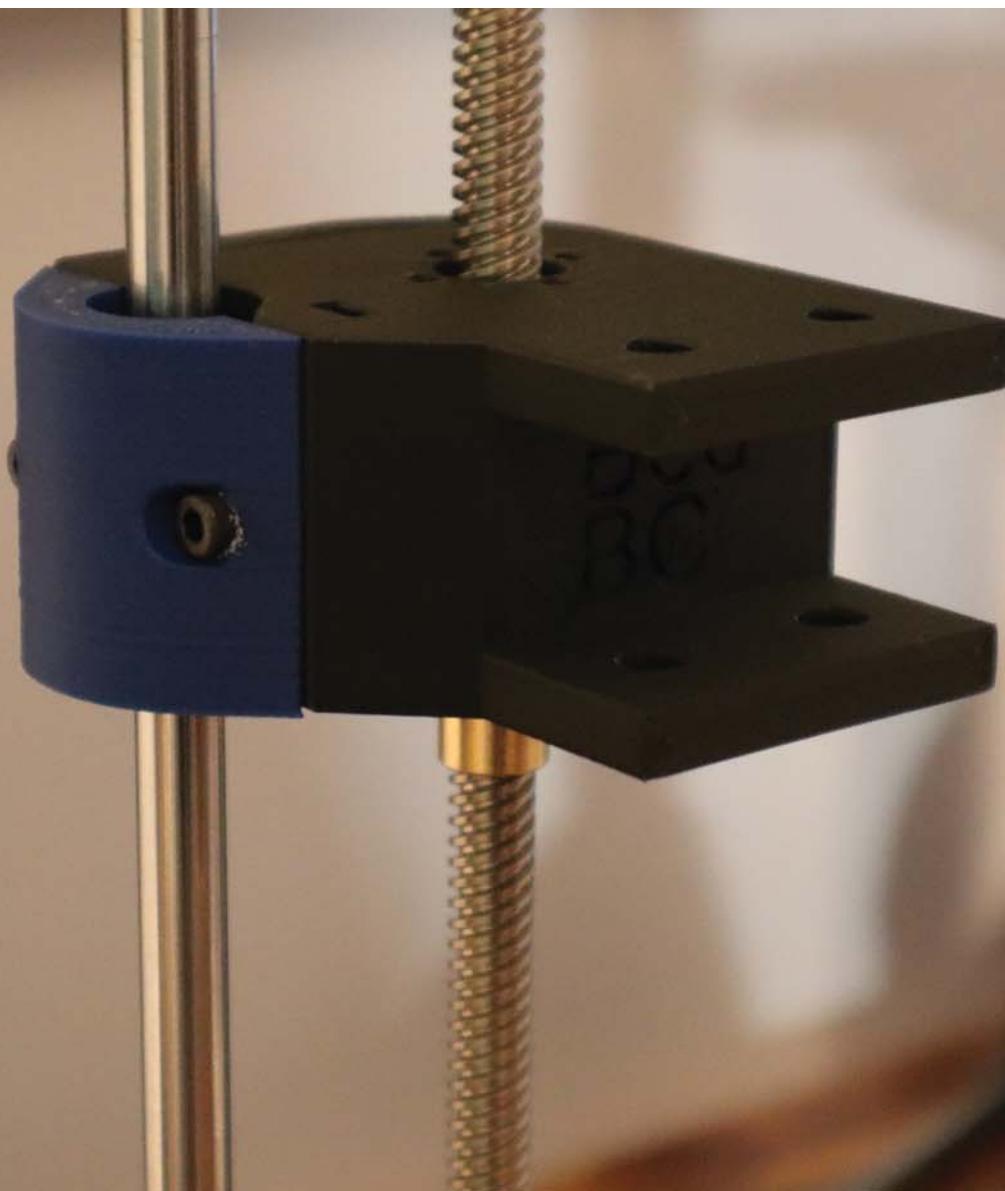
M3x8
Screwed into
plastic

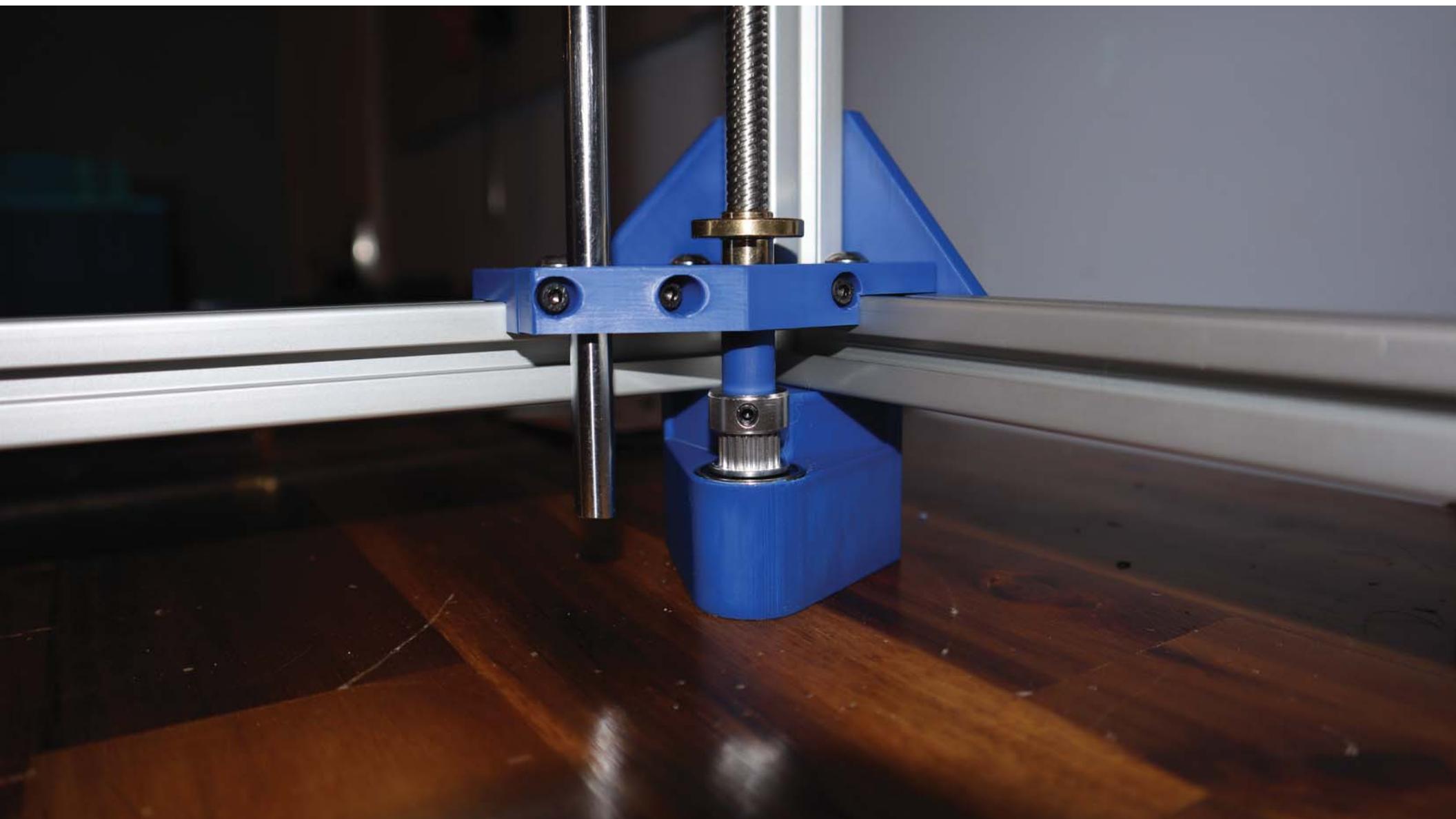


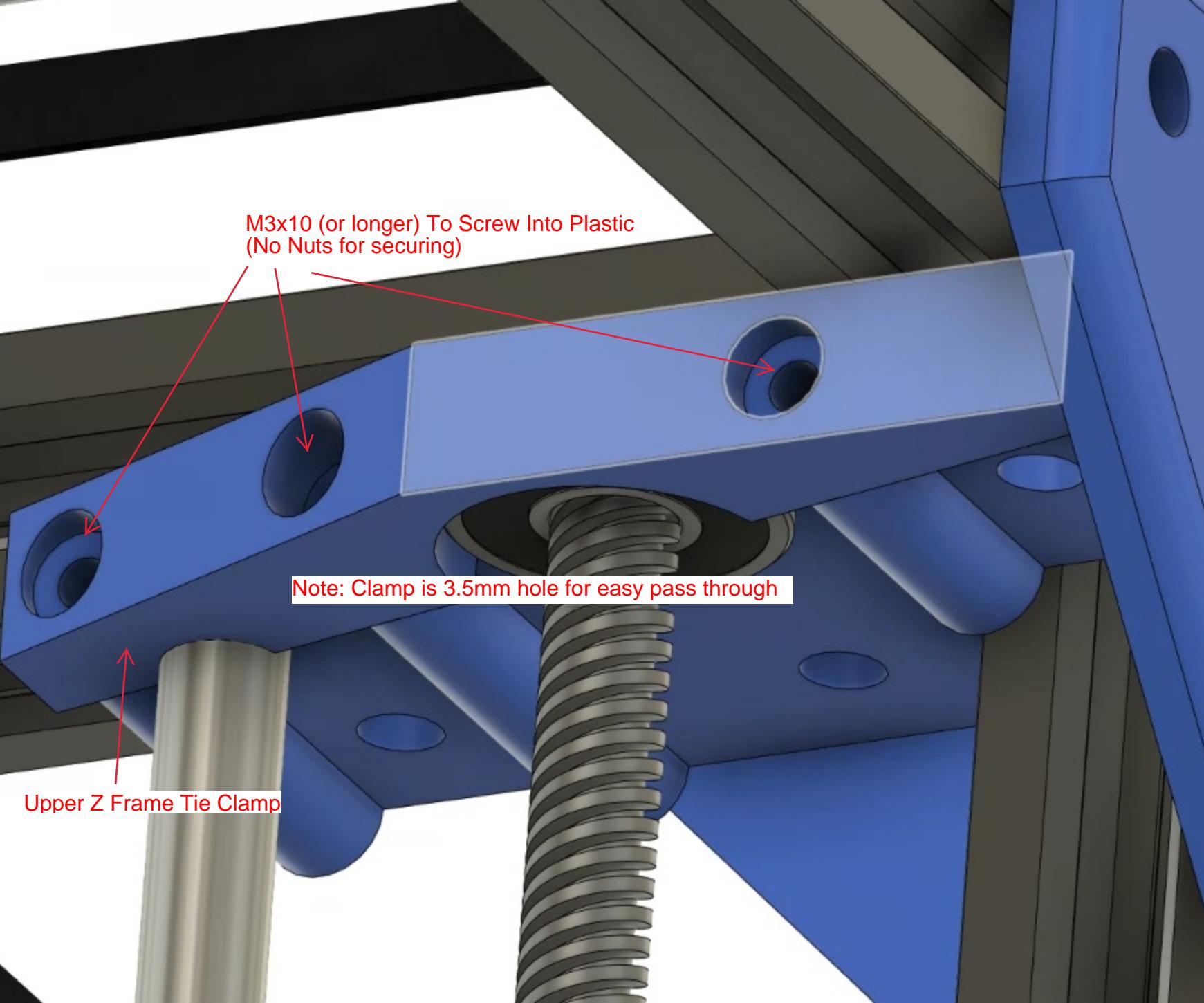


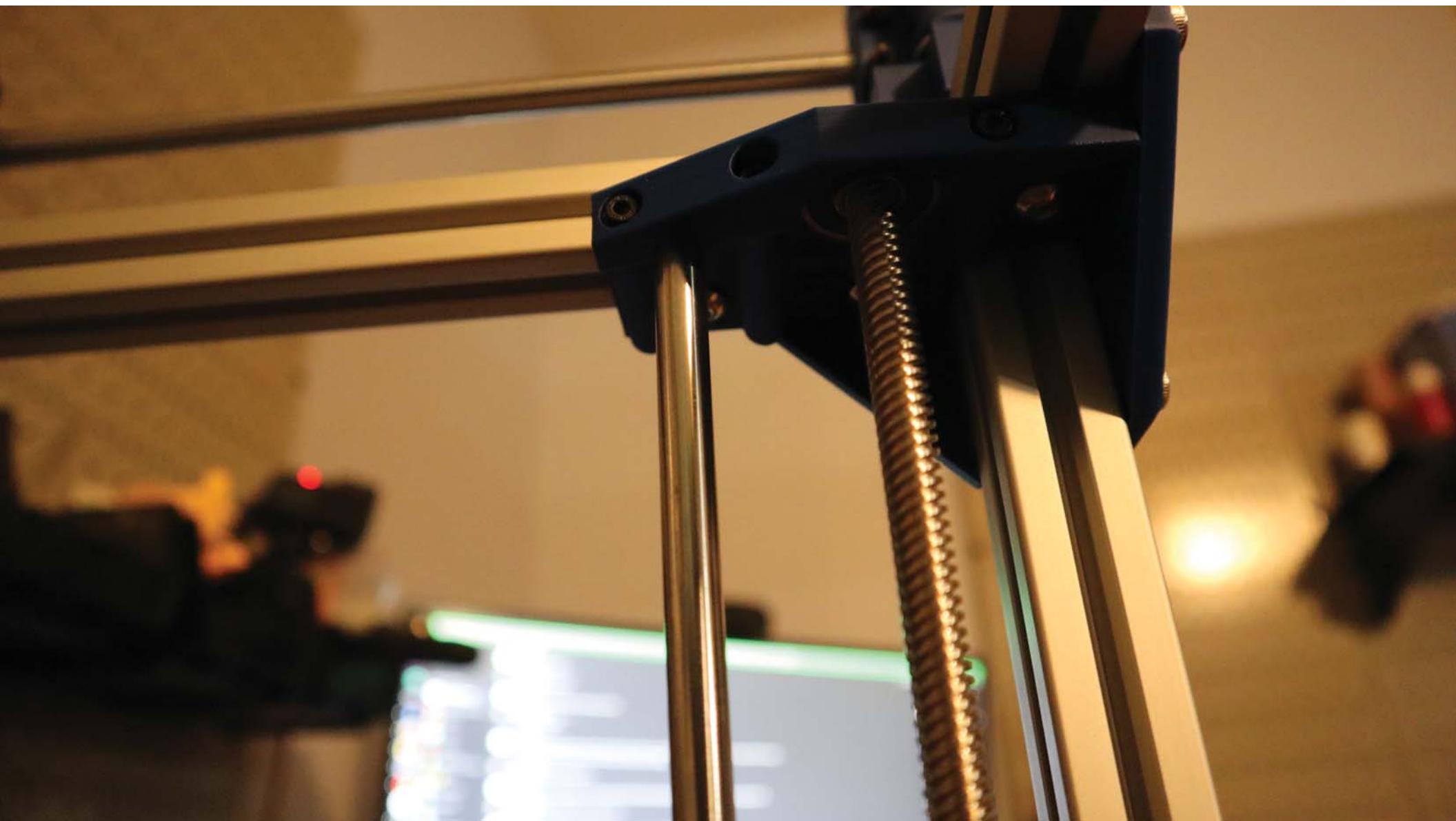


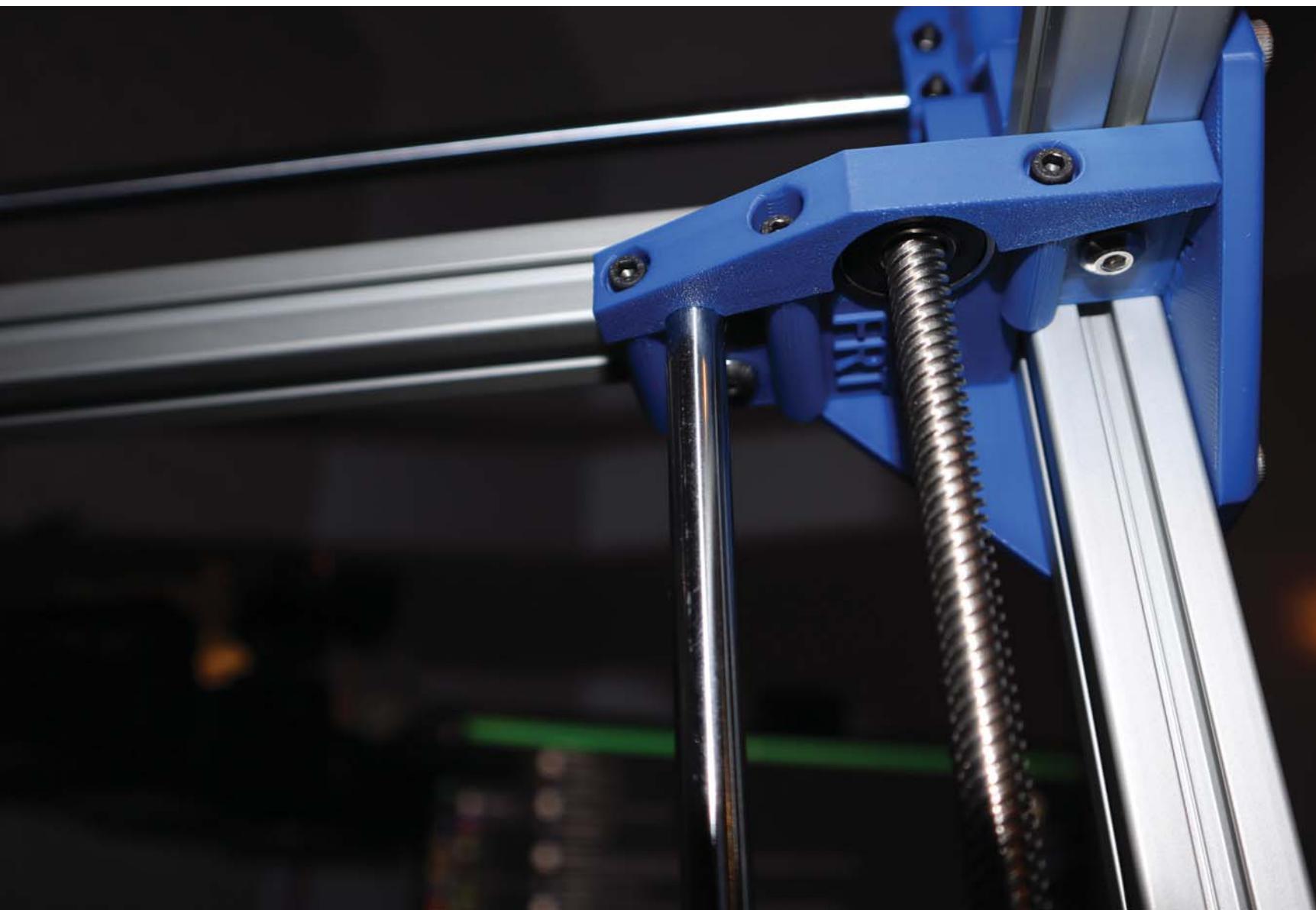












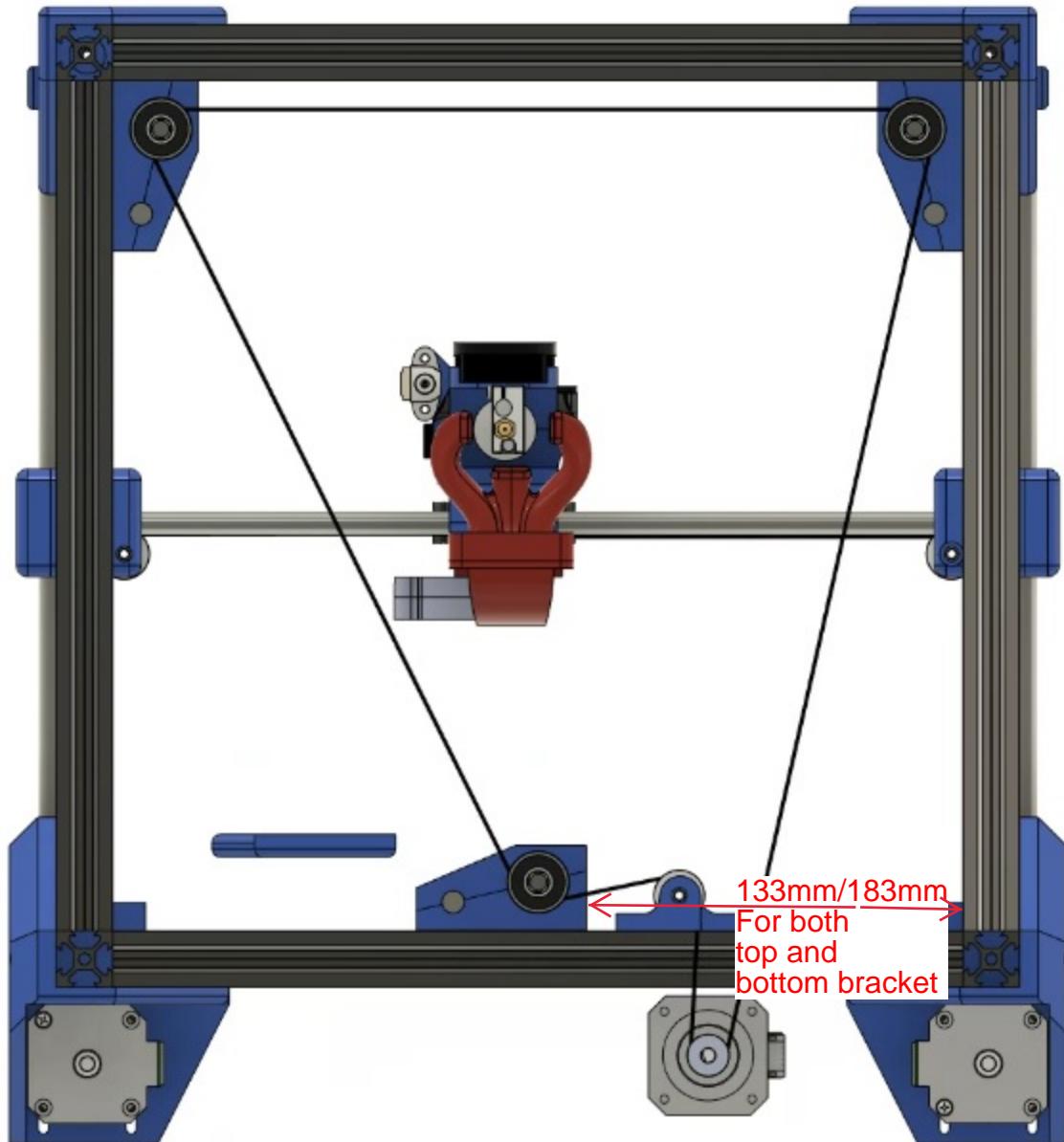


Lead screw and linear rod flush and capture at top
(should not stick up beyond bracket top)

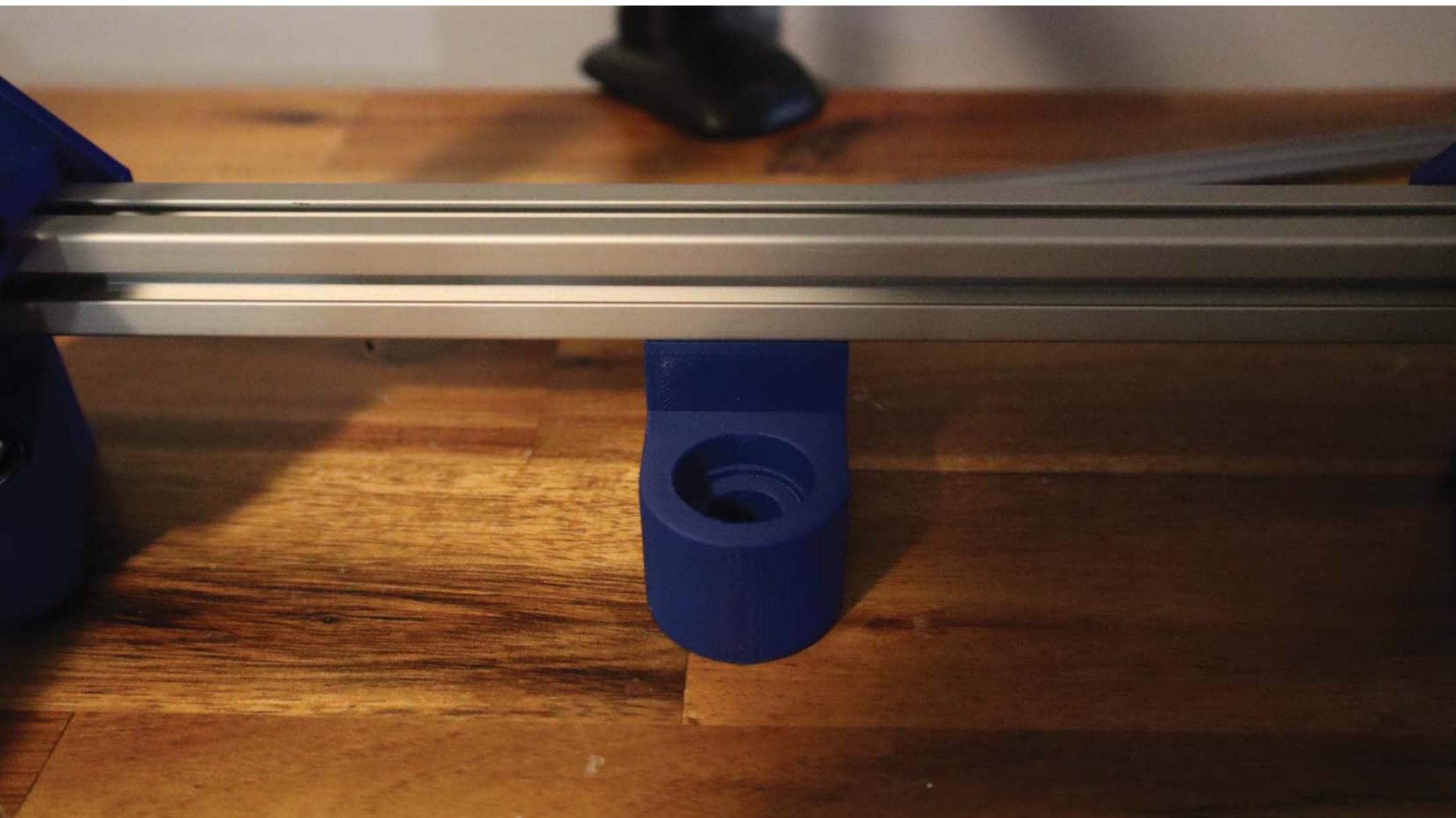


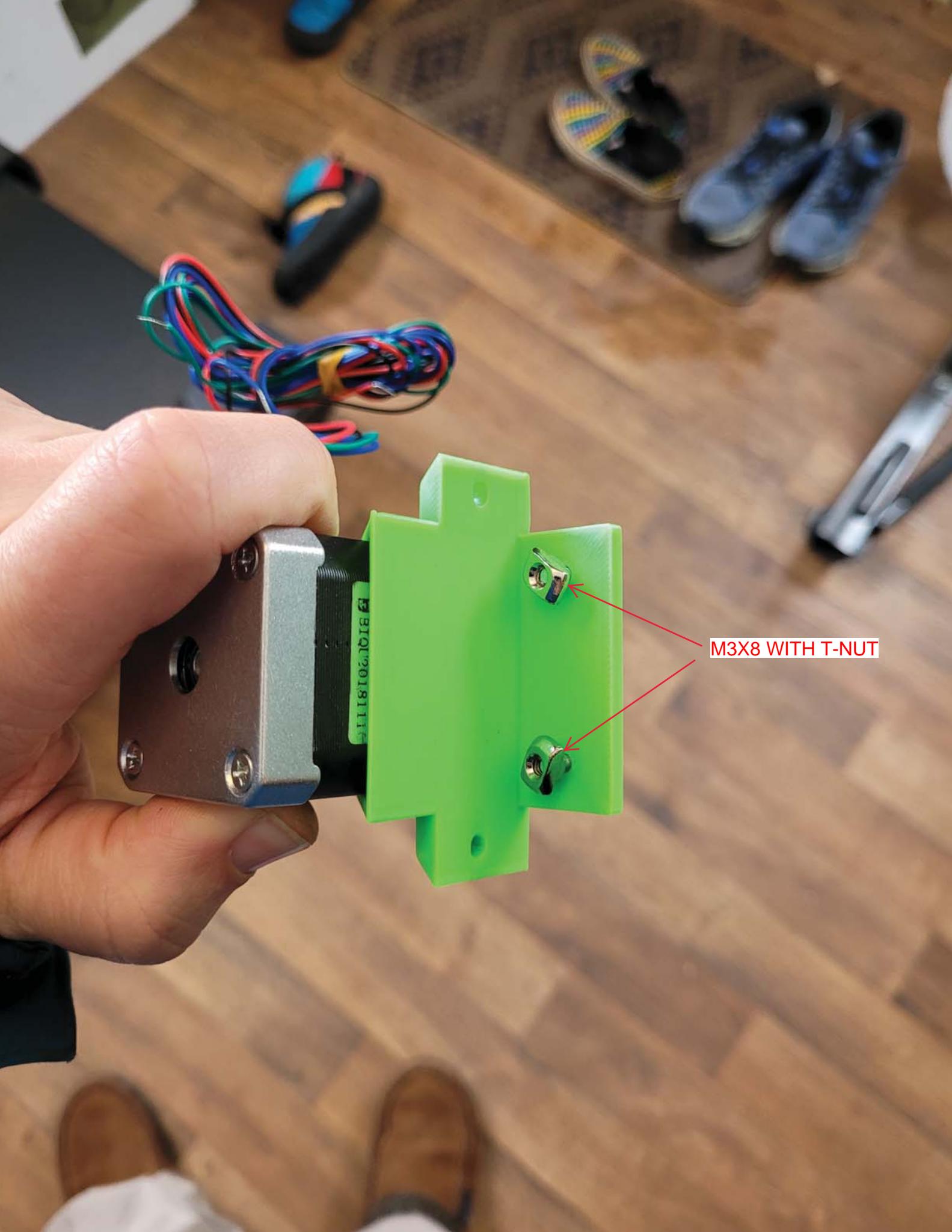
Lead screw and linear rod
flush and capture at top
(should not stick up beyond
bracket top)

MEASUREMENT FOR BACK CENTER BRACKET
133MM for 210 & 183MM for 310,
FROM INSIDE OF 2020 TO INSIDE OF BRACKETS

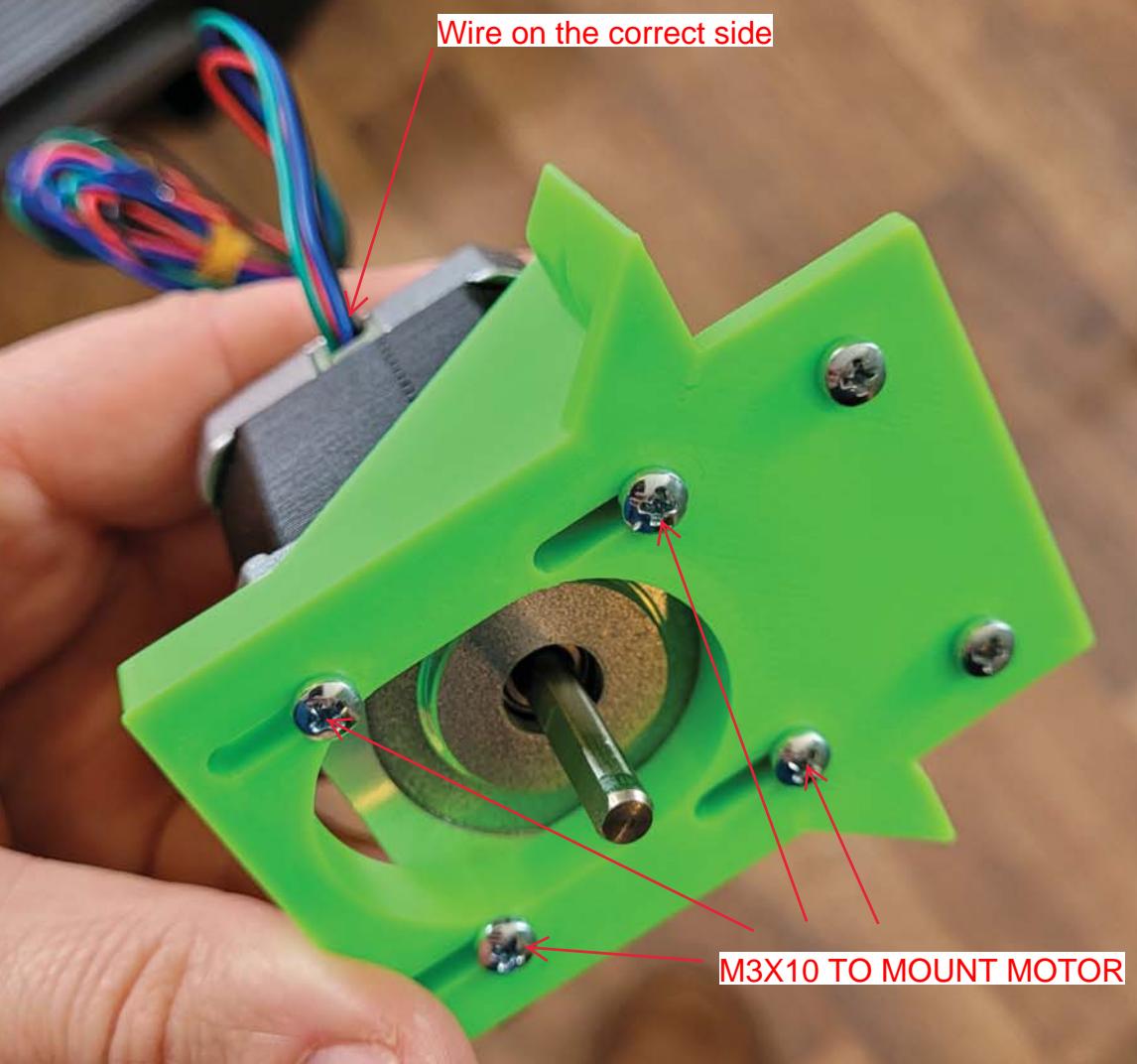


BACK CENTER SECURED





M3X8 WITH T-NUT



Idler Assembly



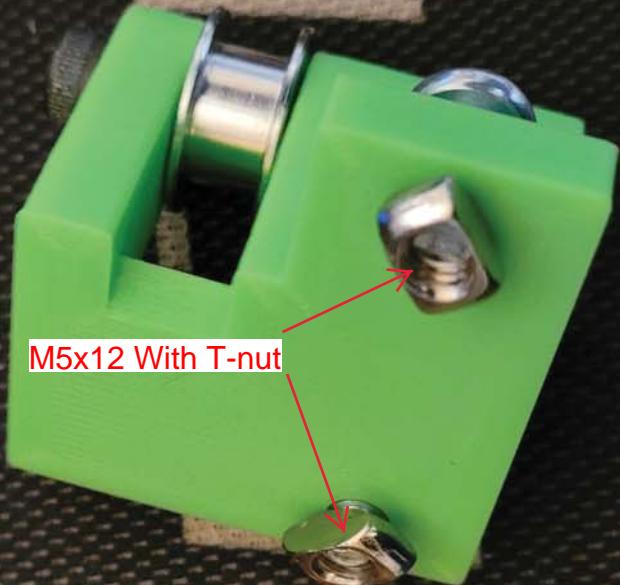


M5 Nut





T



N

B

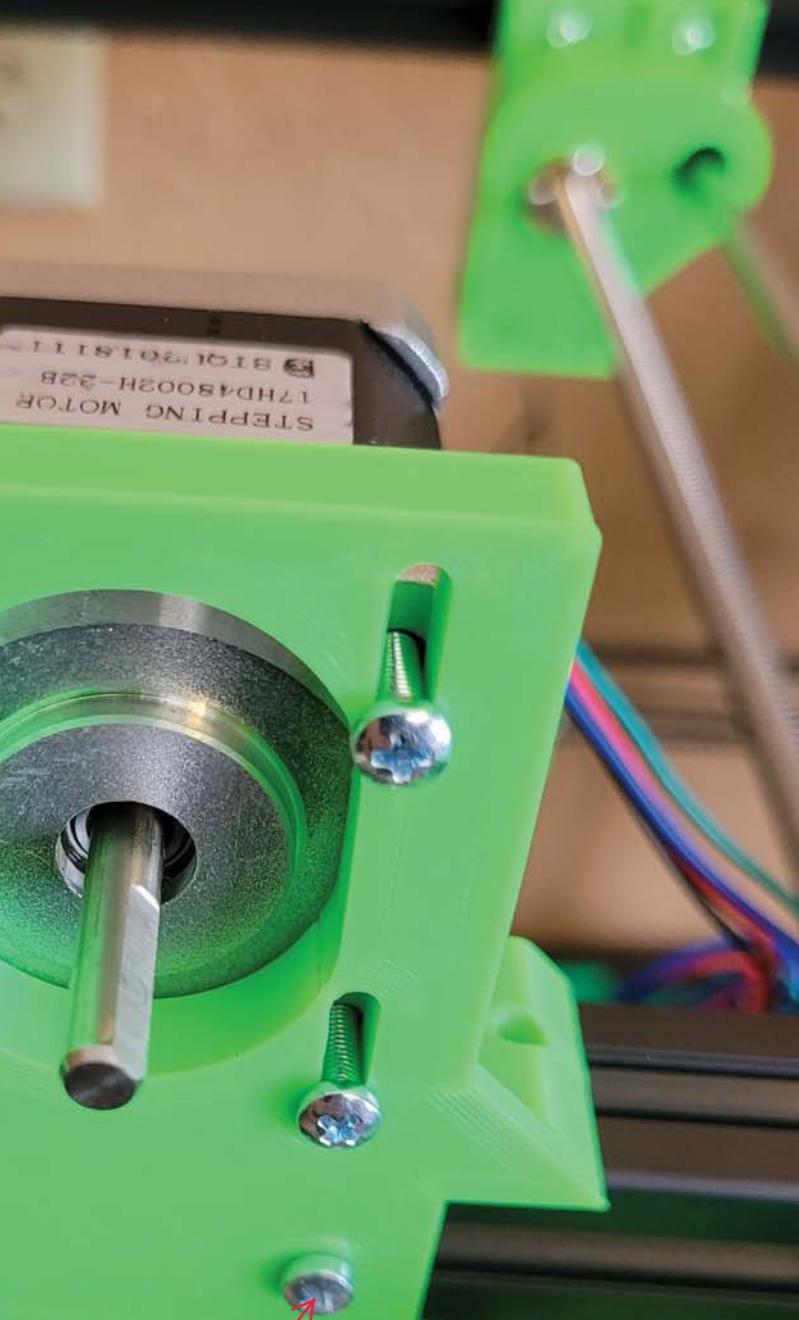
Frame Back

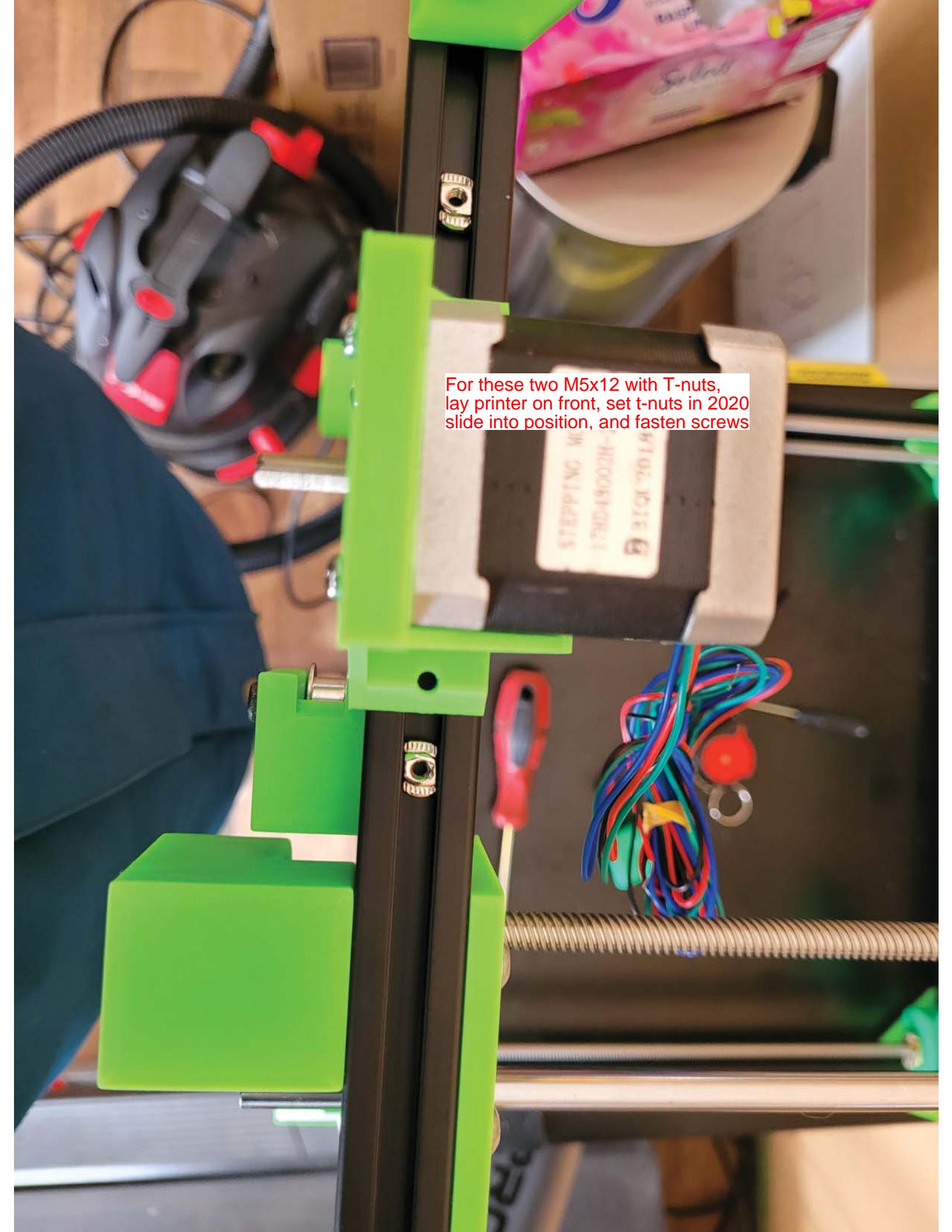


Frame Bottom

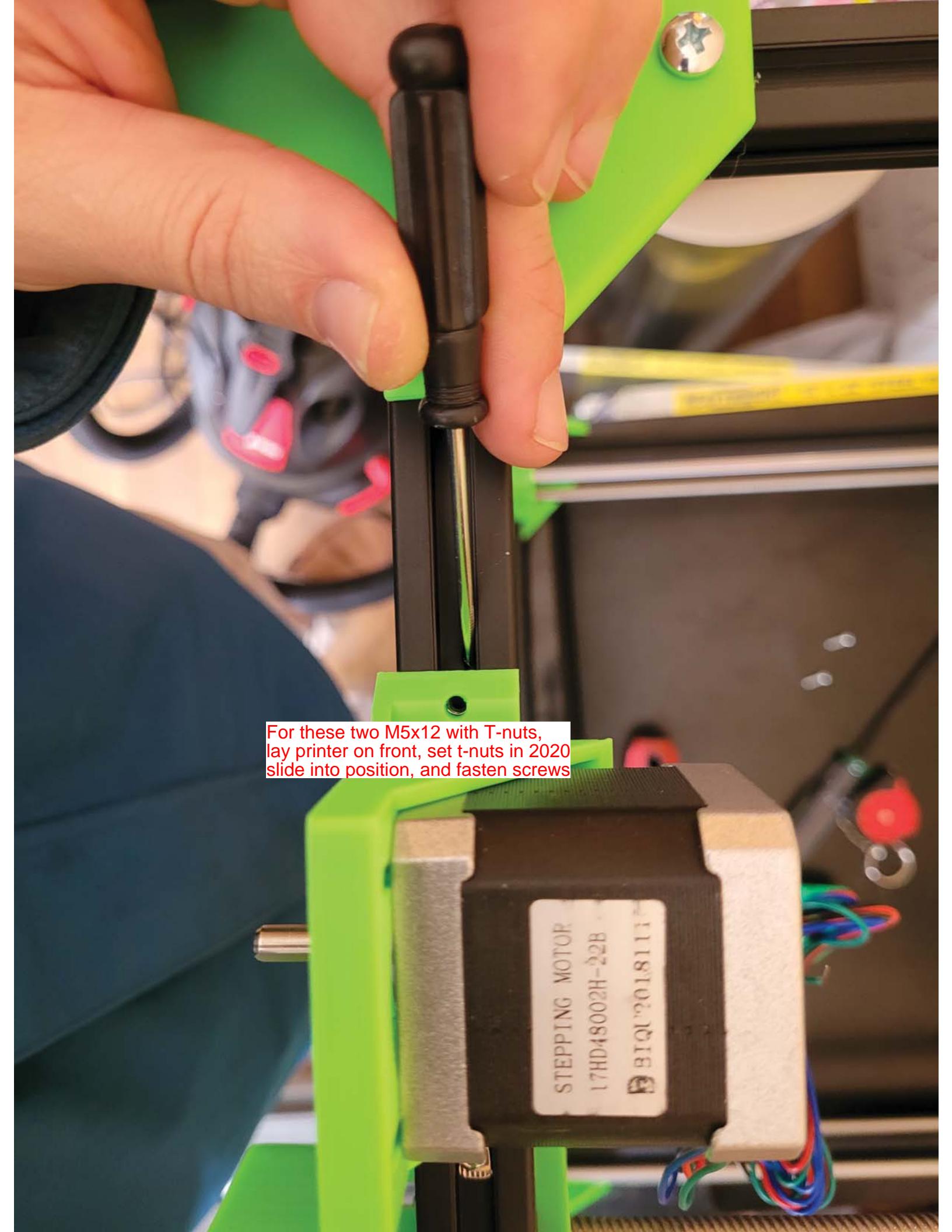


M5x12 (or 10) With T-nuts





For these two M5x12 with T-nuts,
lay printer on front, set t-nuts in 2020
slide into position, and fasten screws



For these two M5x12 with T-nuts,
lay printer on front, set t-nuts in 2020
slide into position, and fasten screws

STEPPING MOTOR
17HD48002H-22B
B1Q1U?018111

For these two M5x12 with T-nuts,
lay printer on front, set t-nuts in 2020
slide into position, and fasten screws

STEPPING MOTOR

17HD48002H-22B

BTQI '20181117

Z Motor Mount Secured

STEPPING MOTOR
17HD48002H-22B
HITACHI 20181111

STEPPING MOTOR

Install so pulley
is offset only
partially from mount

4 to 5 mm
Install 2GT 20T
5mm ID Pulley

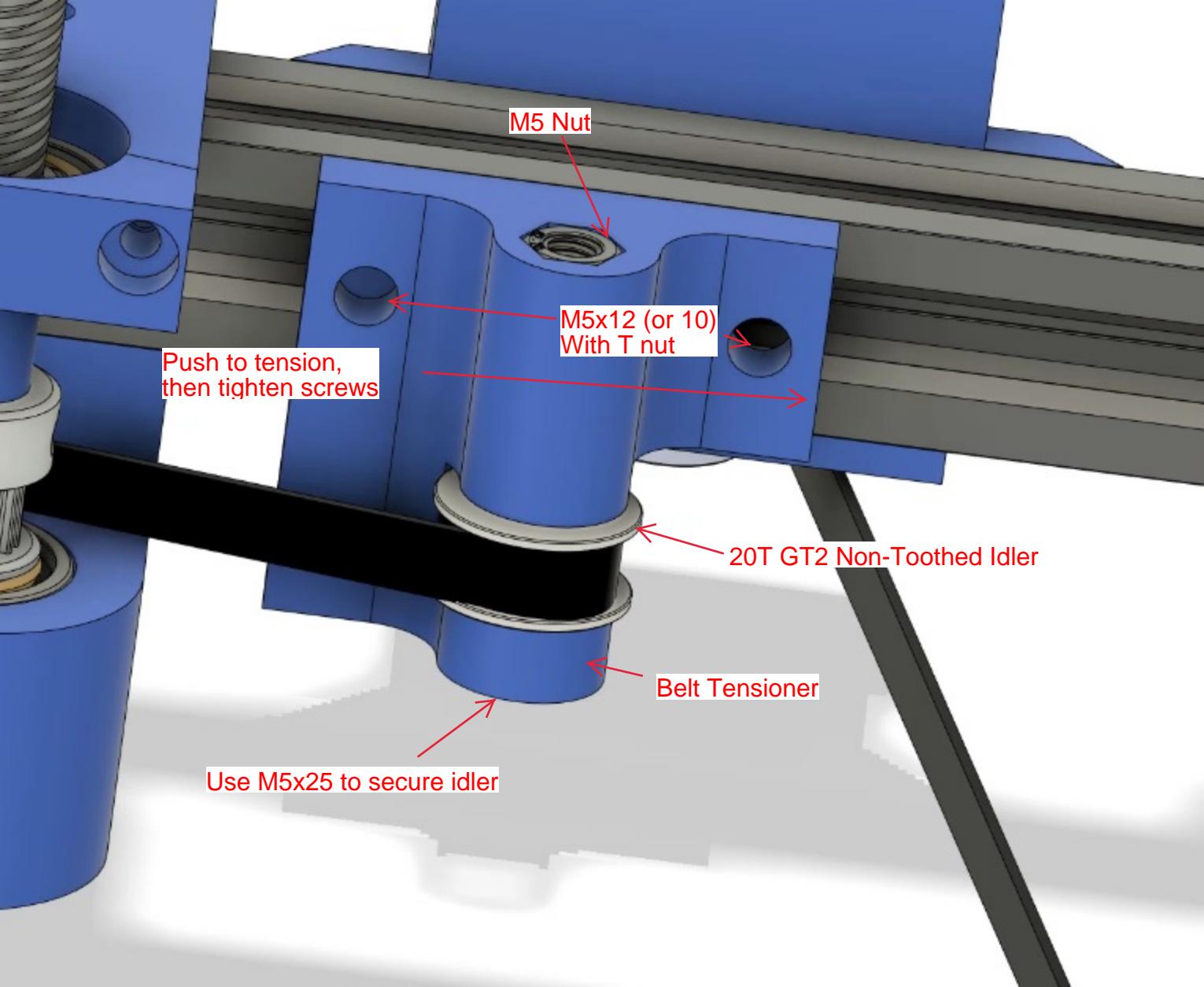
Locktite
Grub Screws

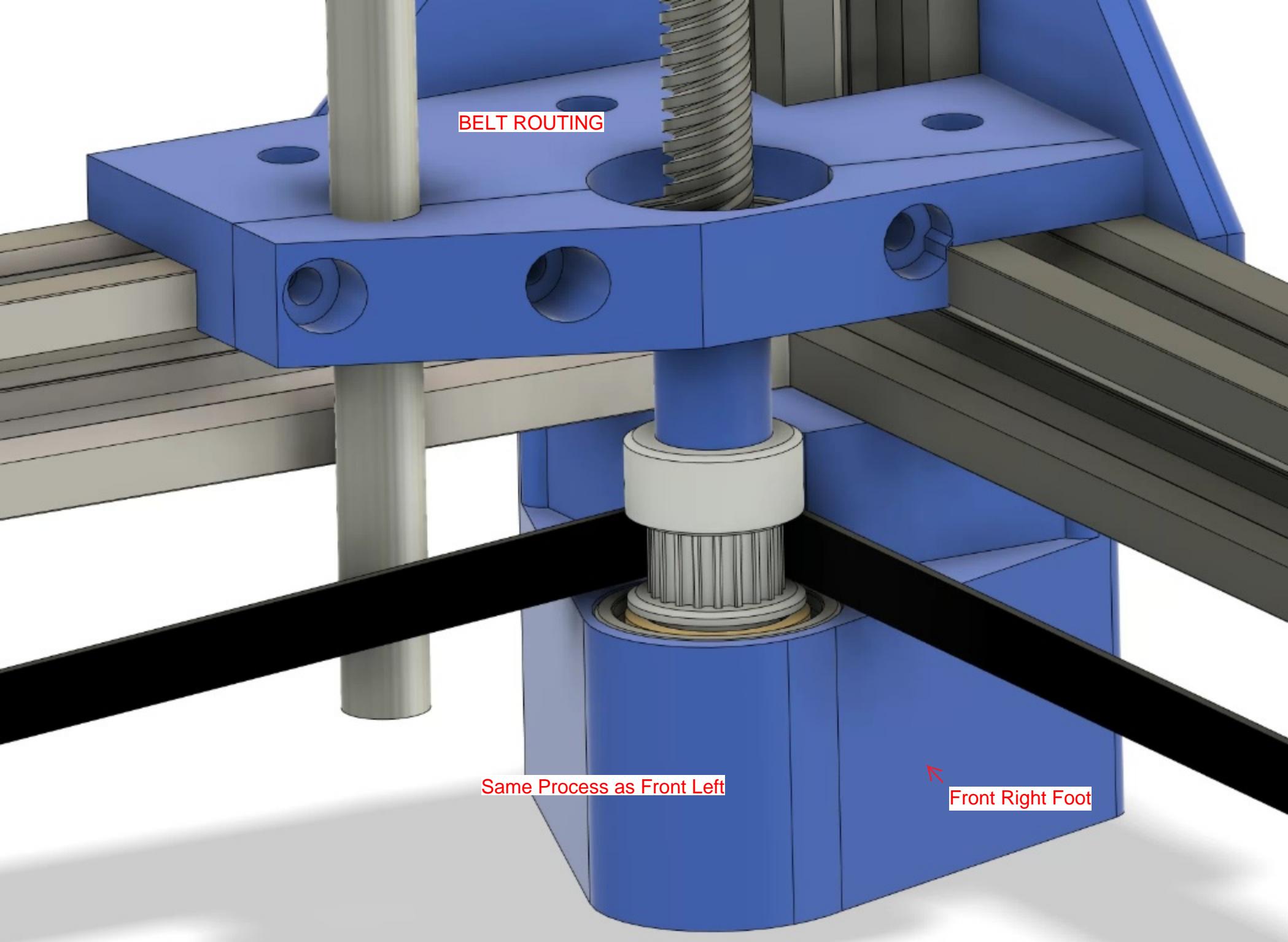
Z motor and mount location

This image shows a close-up of a 3D printer's Z-axis assembly. A grey metal Z-motor is mounted on a green plastic frame. A multi-colored ribbon cable connects the motor to the electronics. In the background, a pink spool of filament is visible.

Tensioner Installed

This image shows a close-up of a green plastic tensioner installed on a 3D printer's Z-axis. It features two silver mounting holes and a central threaded hole. The tensioner is secured to a black metal frame.

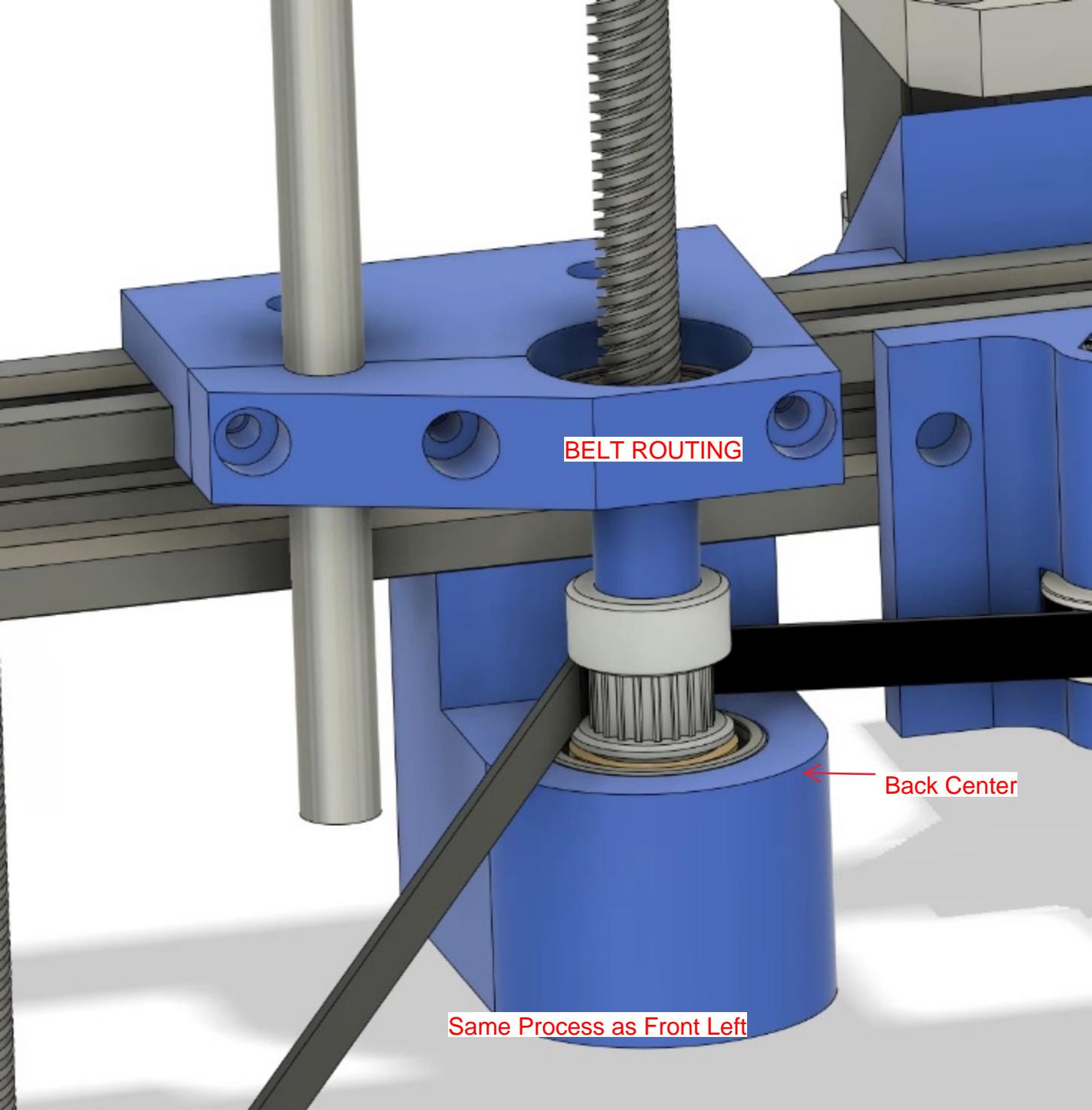




BELT ROUTING

Same Process as Front Left

Front Right Foot



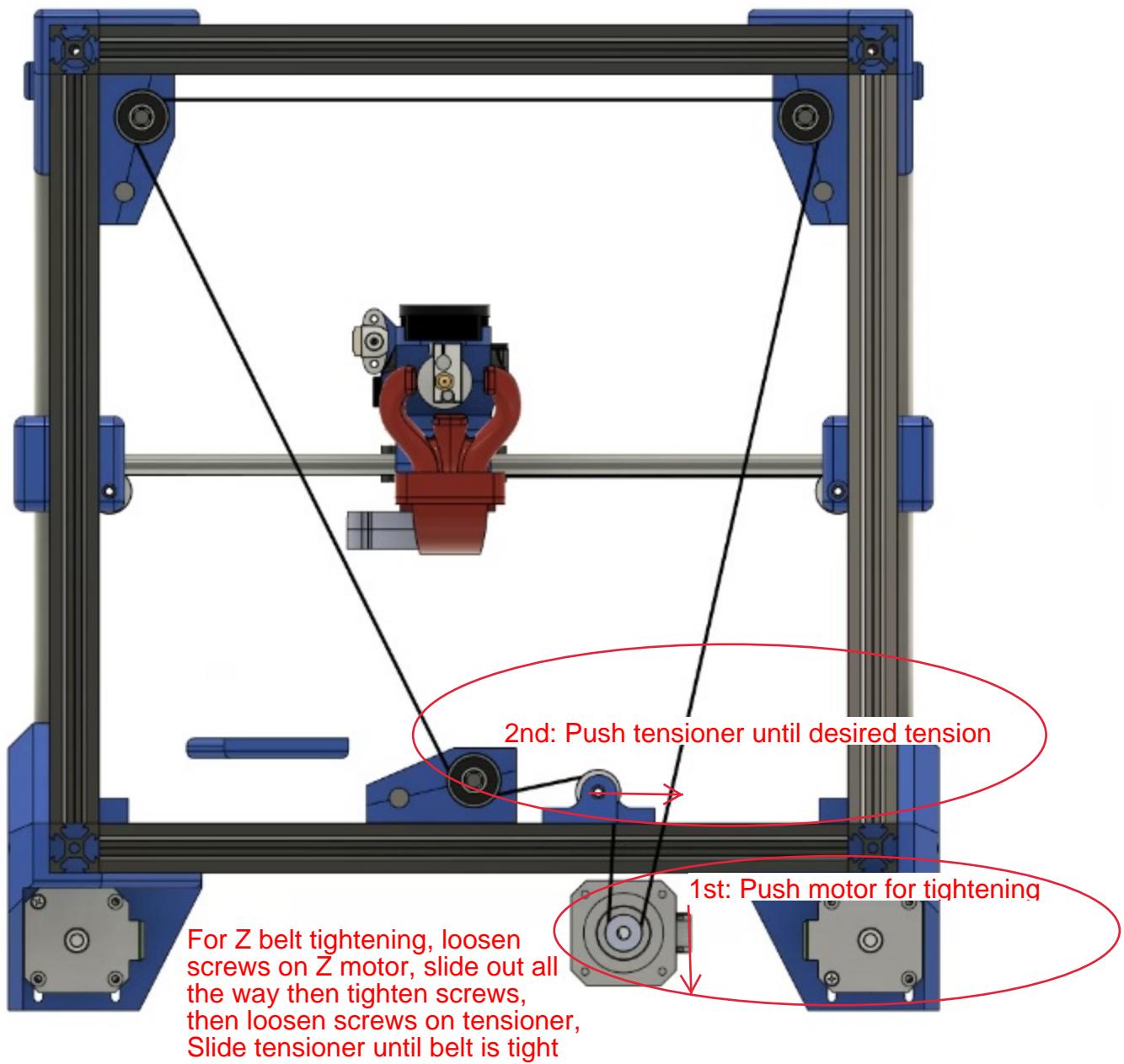
A 3D CAD rendering of a mechanical assembly. It features a blue base plate with three circular holes. A vertical silver cylindrical shaft is mounted on the left side. A black belt is wrapped around a blue cylindrical pulley at the bottom. A blue rectangular component labeled "BELT ROUTING" is positioned above the pulley, with a belt running over its top surface. To the right, another blue component is shown with a central hole, labeled "Back Center" with a red arrow pointing to it. The background shows other parts of the machine, including a blue frame and a grey base.

BELT ROUTING

Back Center

Same Process as Front Left

Z Belt Routing



Section 3:

Print Bed System

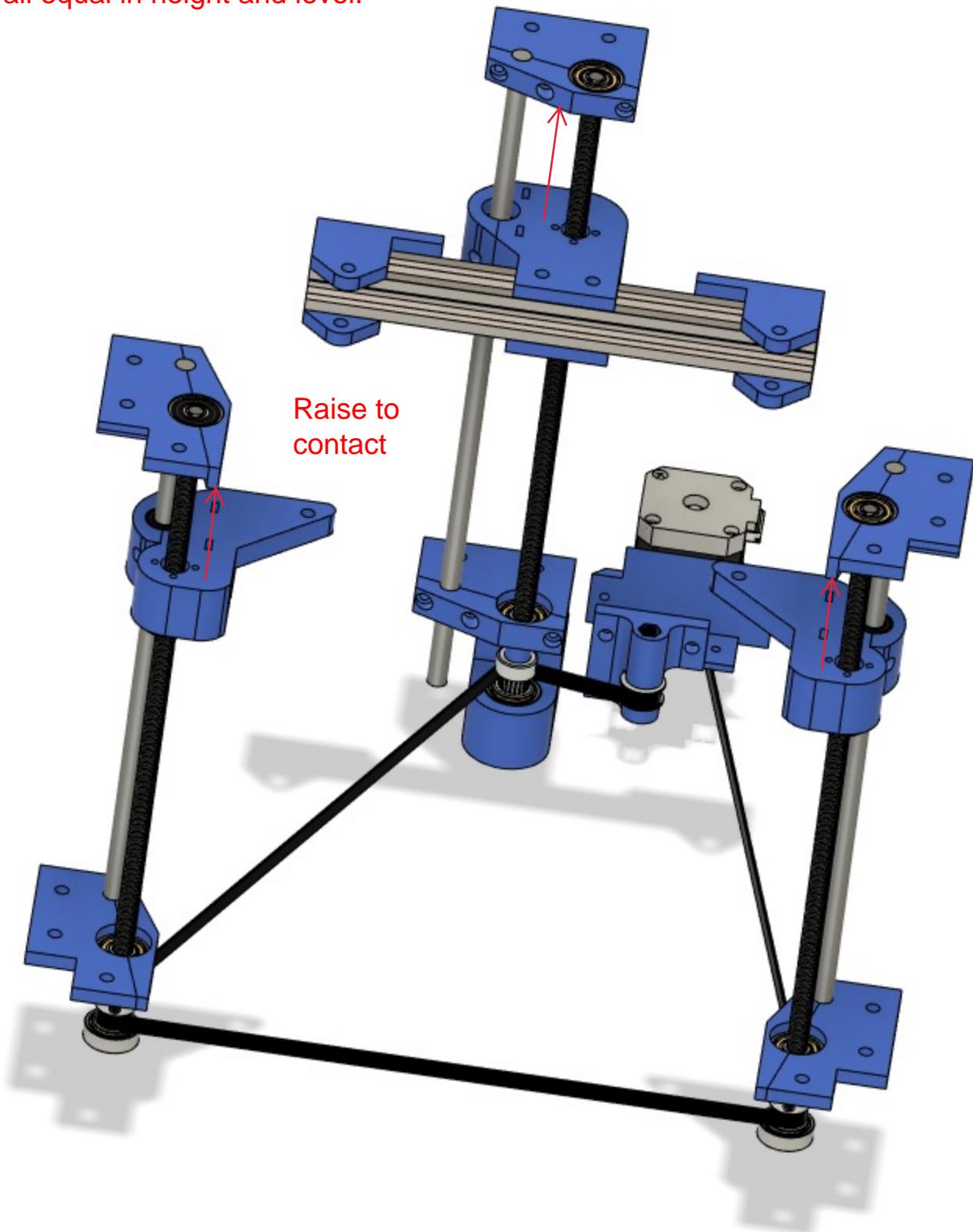
Components needed for this portion:

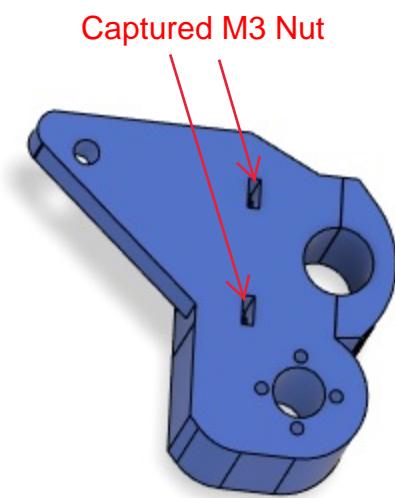
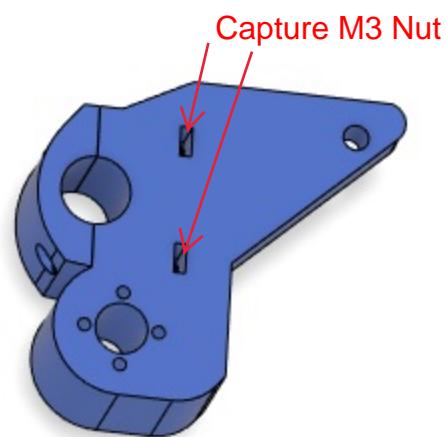
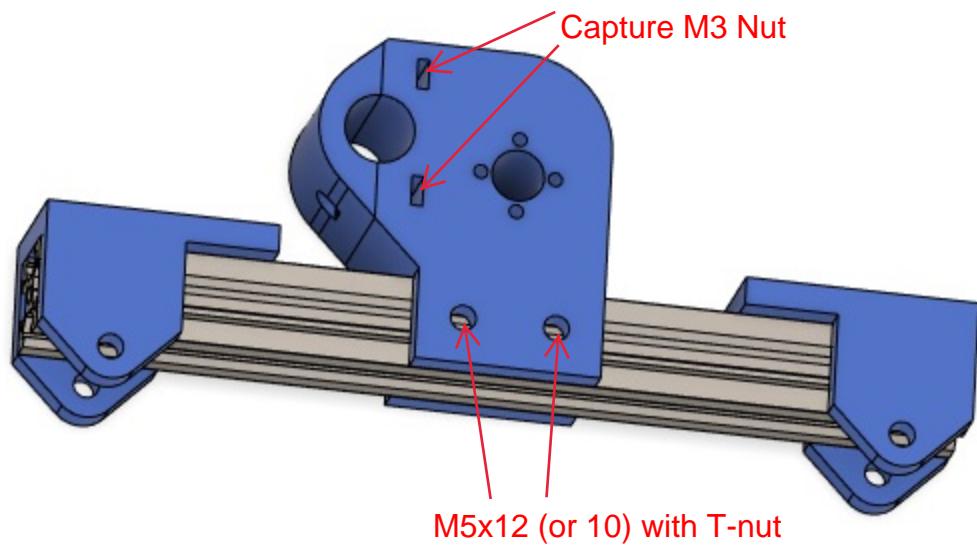
235x235 Ender 3 Heated Bed	x1
M3x30	x6
M3 Nut	x6
M3x12 (or 10)	x12
M5x12 (or 10)	x8
M5 T-nut	x8
M4x40 Recessed Head	x4
M4 Nut	x4
Print Bed Spring	x4

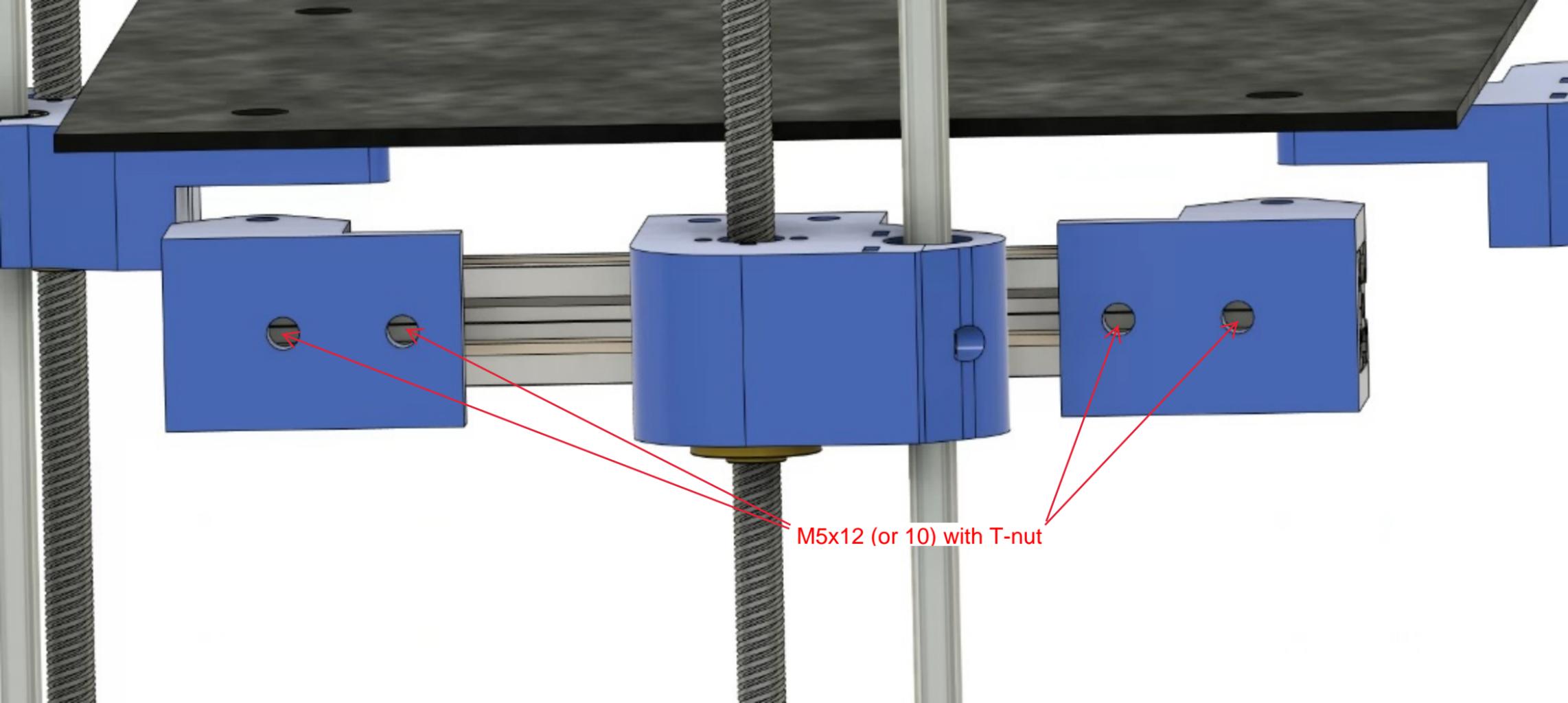
The M4's can be shorter if Rigid Mounted, approximately M4x25

Users can use either springs, silicone compressions, rigid tube spacers, or 3 nuts at all 4 attachment points. This guide will show springs and rigid mount using 3 nuts for reference.

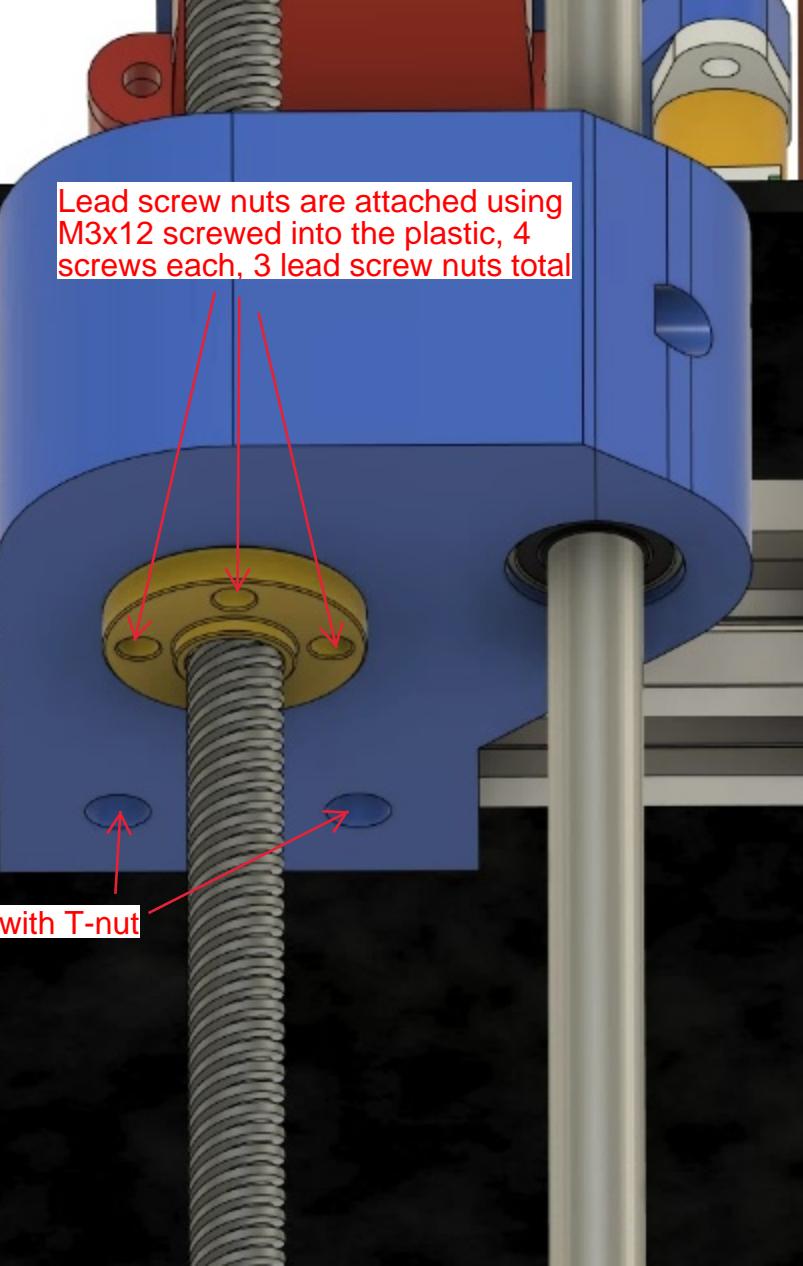
Prior to mounting bed after completing Z assembly, turn lead screw to raise bed mounts all the way up to contact top linear rod/lead screw clamp. This will insure the bed mounts are all equal in height and level.





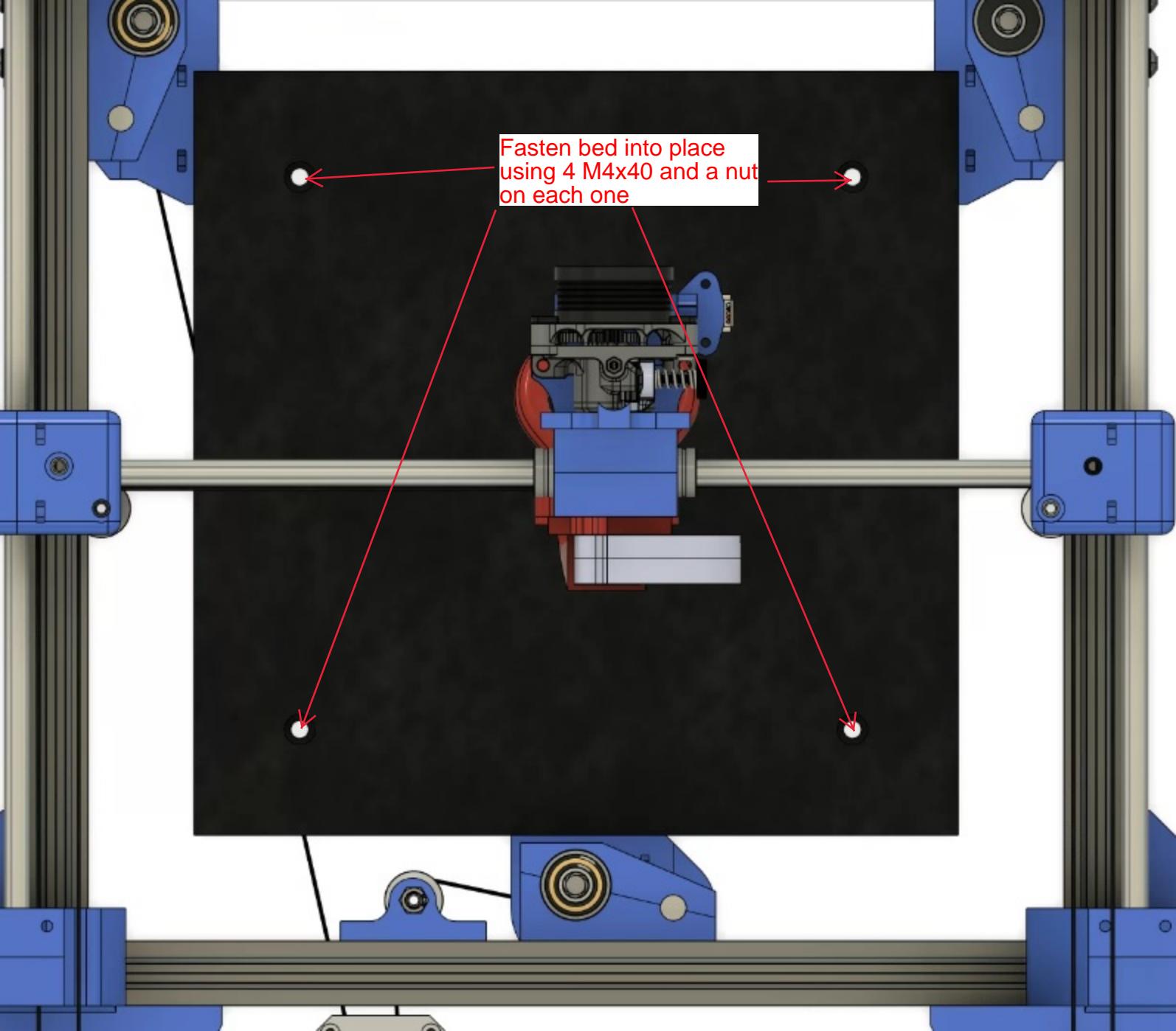


M5x12 (or 10) with T-nut



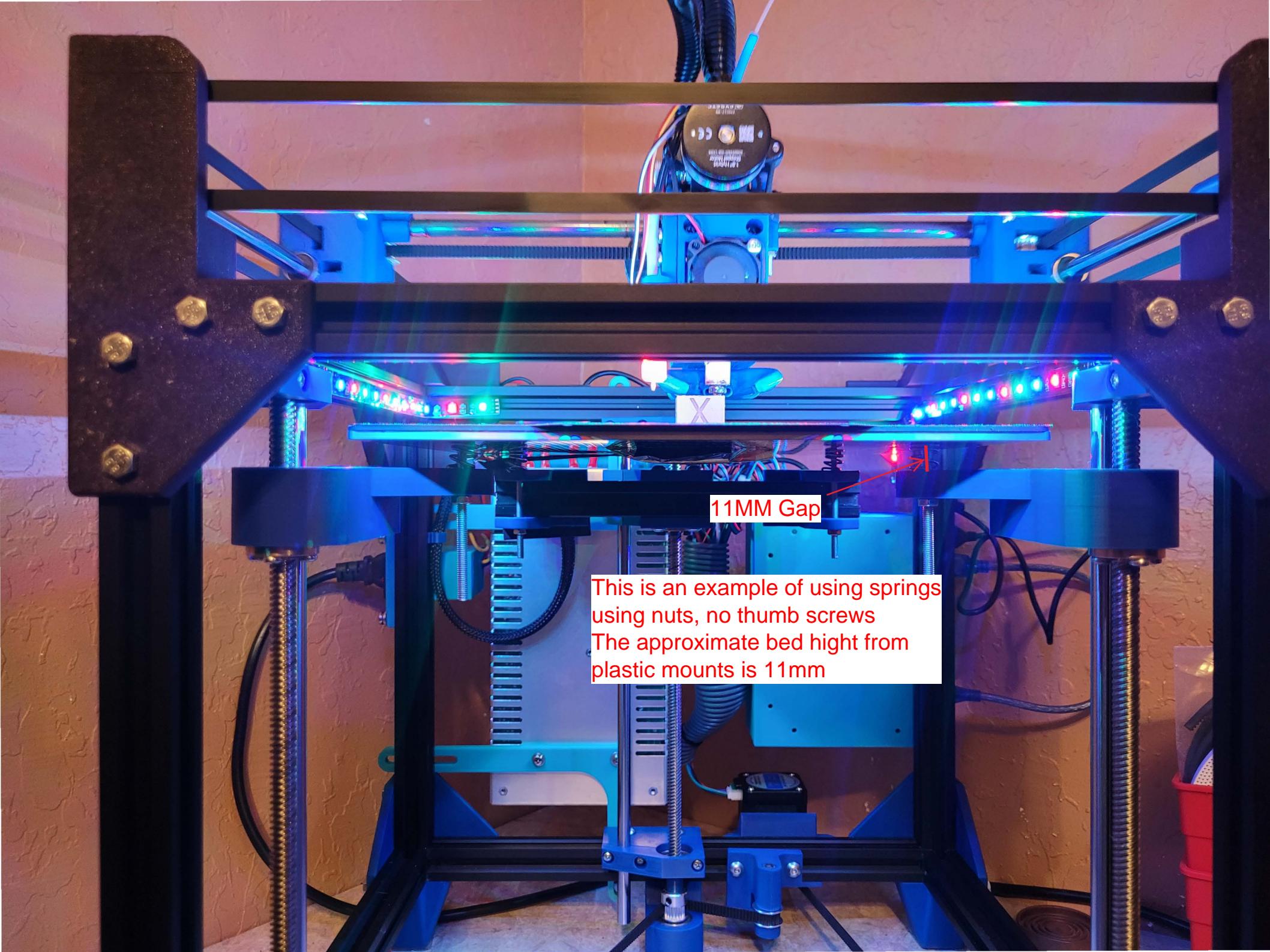
Lead screw nuts are attached using M3x12 screwed into the plastic, 4 screws each, 3 lead screw nuts total

M5x12 (or 10) with T-nut



Fasten bed into place
using 4 M4x40 and a nut
on each one

The diagram shows a black rectangular bed plate mounted between two vertical blue frame structures. A horizontal grey rod passes through the center of the bed plate. Four circular mounting holes are visible on the top surface of the bed plate, two on each side of the central rod. Red arrows point from a text box to these four holes. A blue extruder assembly is mounted on the bed plate, centered over the rod. The text box contains instructions for securing the bed plate to the frame.



11MM Gap

This is an example of using springs
using nuts, no thumb screws
The approximate bed height from
plastic mounts is 11mm

Triple Nut Method for rigid mount

Nut to tighten to secure bed
Rigid Mount

One net below plastic
and one above to secure
bolt to plastic

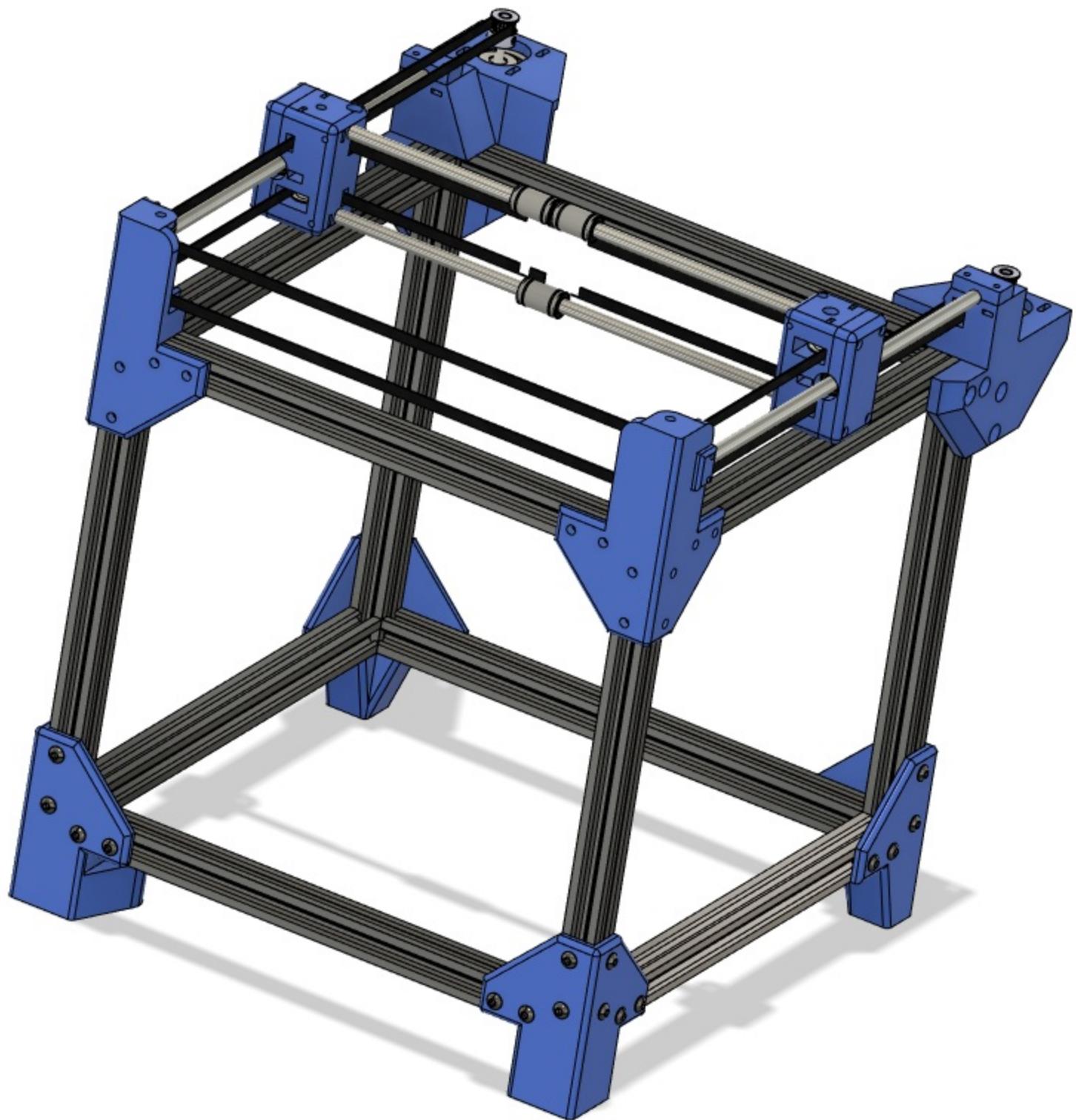
11MM Gap

Section 4:

Gantry Assembly

Components needed for this portion:

M3x8	x8
M3x16	x8
M3x20	x20
M5x35	x4
M3 Nuts	x28
M5 Nuts	x4
300mm Linear Rods	x4
8mm Linear Bearings	x4
20t GT2 idlers	x4
Nema 17 Stepper Motor	x2
5mm Bore 20T GT2 Pulley	x2



The X/Y Gantry

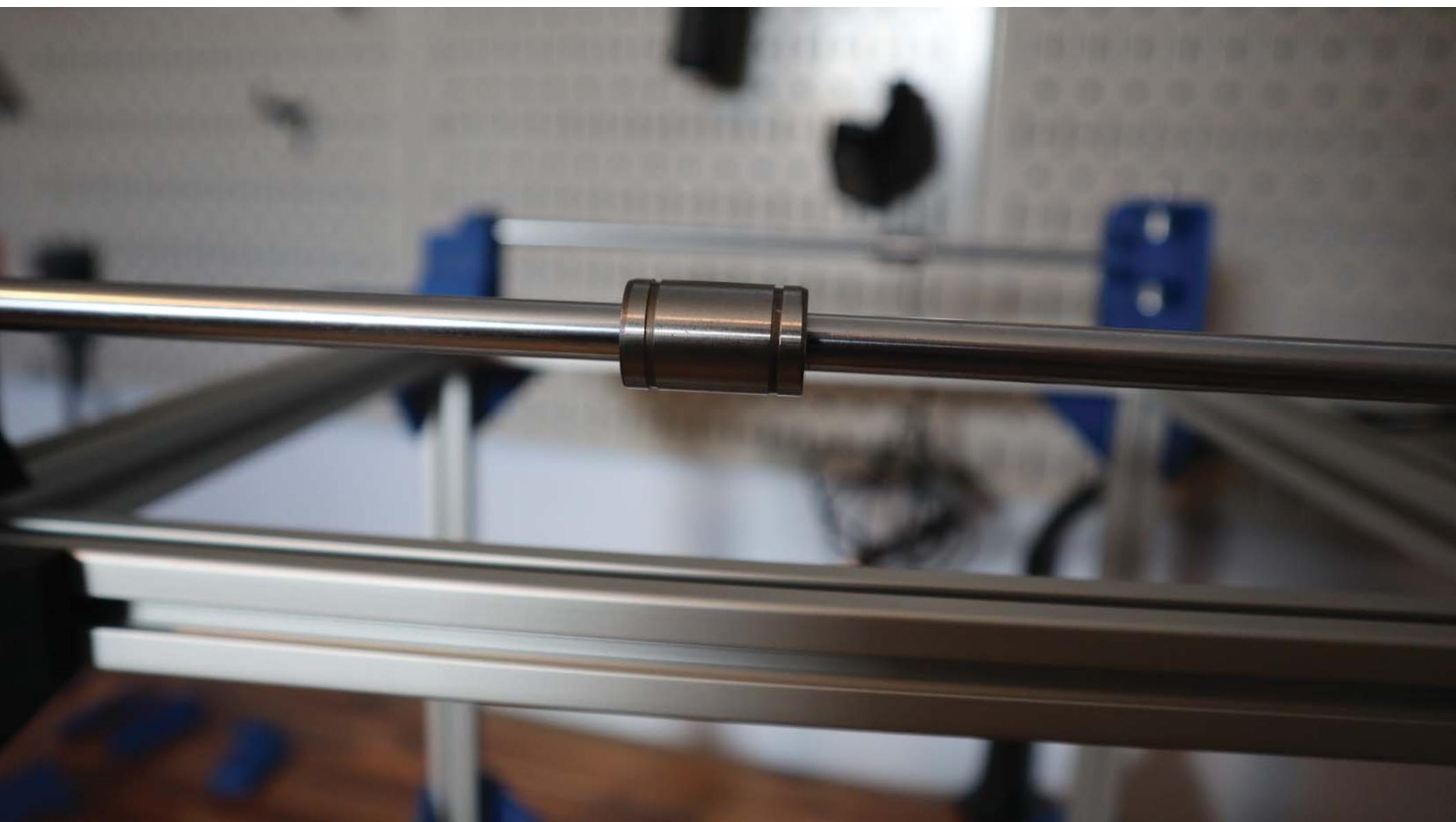
1. Place one linear bearing on each of the Y gantry linear rods.
2. Assemble the left and right Linear rods by attaching them to the corner brackets with the mount and 2 m3x20 bolts and nuts in the front, and 2 m3x16 bolts and nuts in the rear.
3. Attach the motors to the rear motor mounts using 4 m3x8 bolts each. Ensure that the connector on each motor is facing in.
4. Using 2 m5x35 bolts and nuts, insert the captive m5 nuts into the holes on the X gantry mount. Insert the gt2 toothless idler into the recess and slide the m5x35 bolt through and screw into the captive nut. Repeat for the bottom. Do not over tighten, as this will cause binding on the idlers.
5. Repeat for the other side of the X gantry.
6. Place two linear bearings on top linear rod, one linear bearing on bottom rod. **Install linear rods in gantry blocks prior to fastening to the Y rails!** Using 4 captive m3 nuts and 4 m3x20 bolts, secure the two halves of the X gantry mount to the linear bearing. Be sure to keep the large half toward the center, and use the correct mount on the left and right side.
7. Repeat the previous step for the opposite side.
8. Insert an m3 nut into the captive slot next to the linear rod slot. Insert the linear rods into one side of the X gantry and secure with an m3x16 bolt. Do not over tighten.
9. Place one linear bearing on each linear rod.
10. Remove the front mount from the opposite X linear rod. Move the X gantry all the way forward and line up the Y gantry rods with the holes in the opposite mount. Slide the linear rods into the holes and secure with two captive m3 nuts and 2 m3x16 bolts. Do not over tighten.

NOTE: Use caution when flipping the printer around once gantry is assembled prior to the X/Y belt being installed. Once gantry is installed, it can move quickly when moving or flipping the printer prior to the belts being installed which can cause pinch or impact to use causing harm. Designer cannot be held liable for building of this printer as each user does so at their own risk.

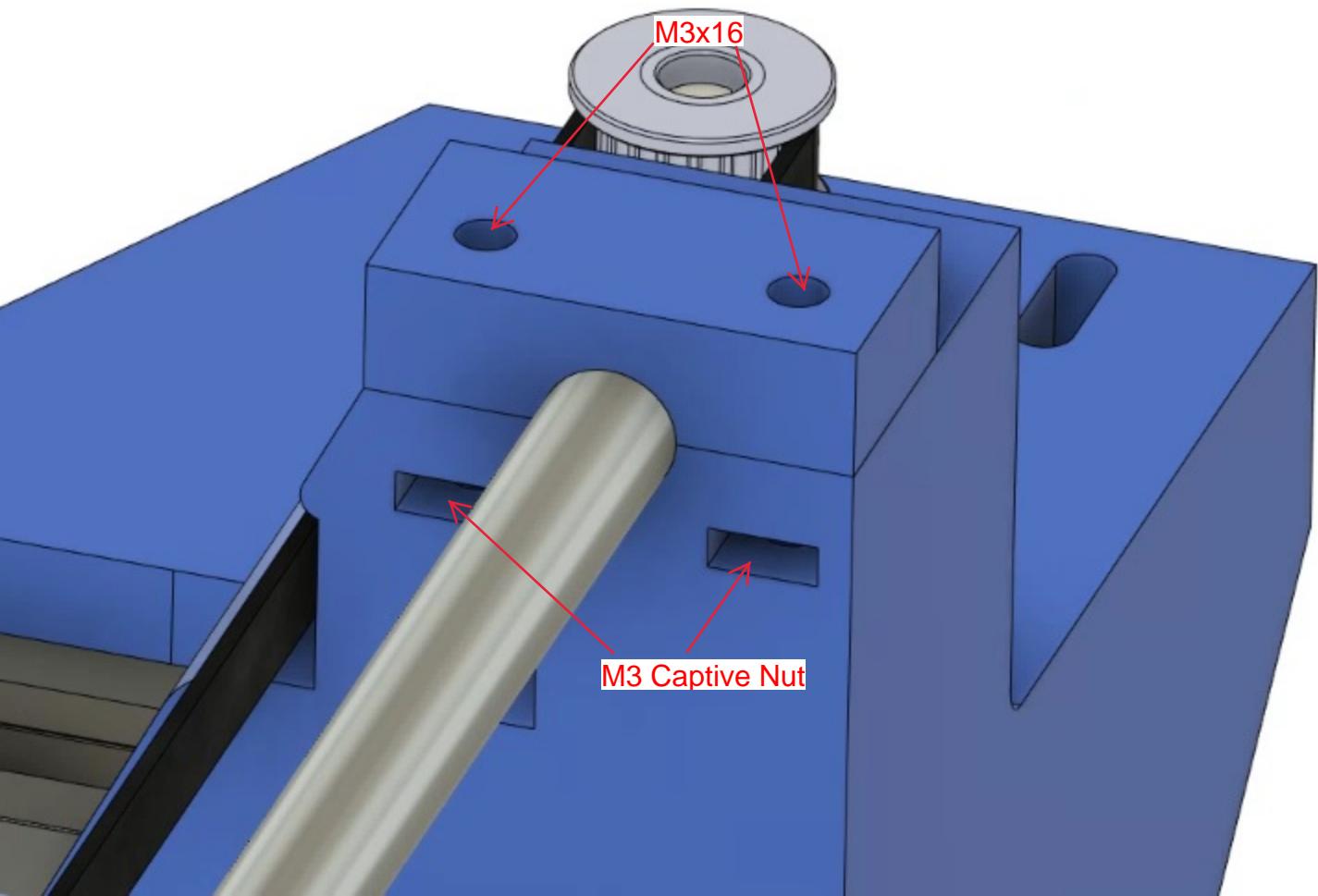
STEP 1



STEP 1



STEP 2

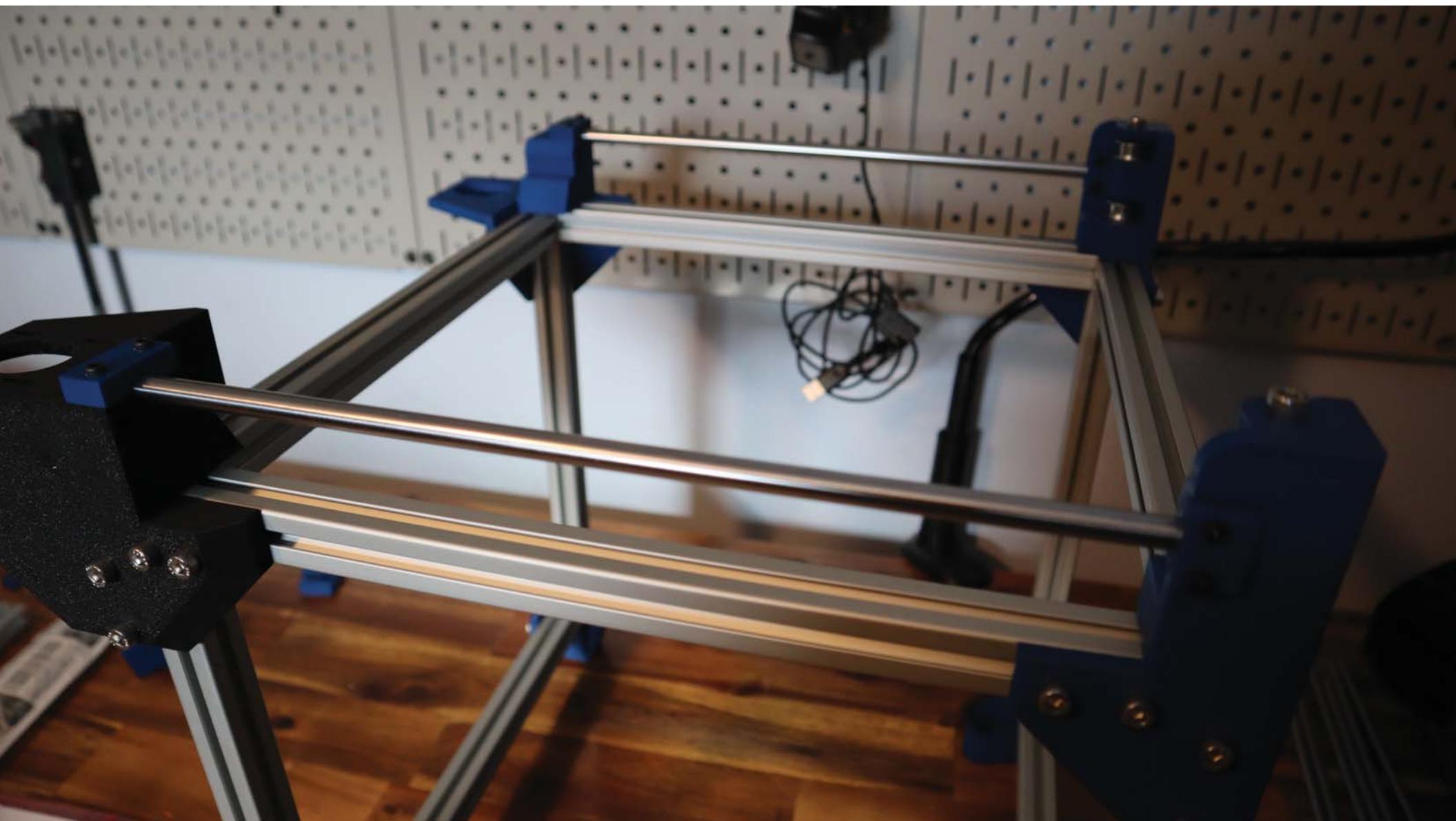


STEP 2

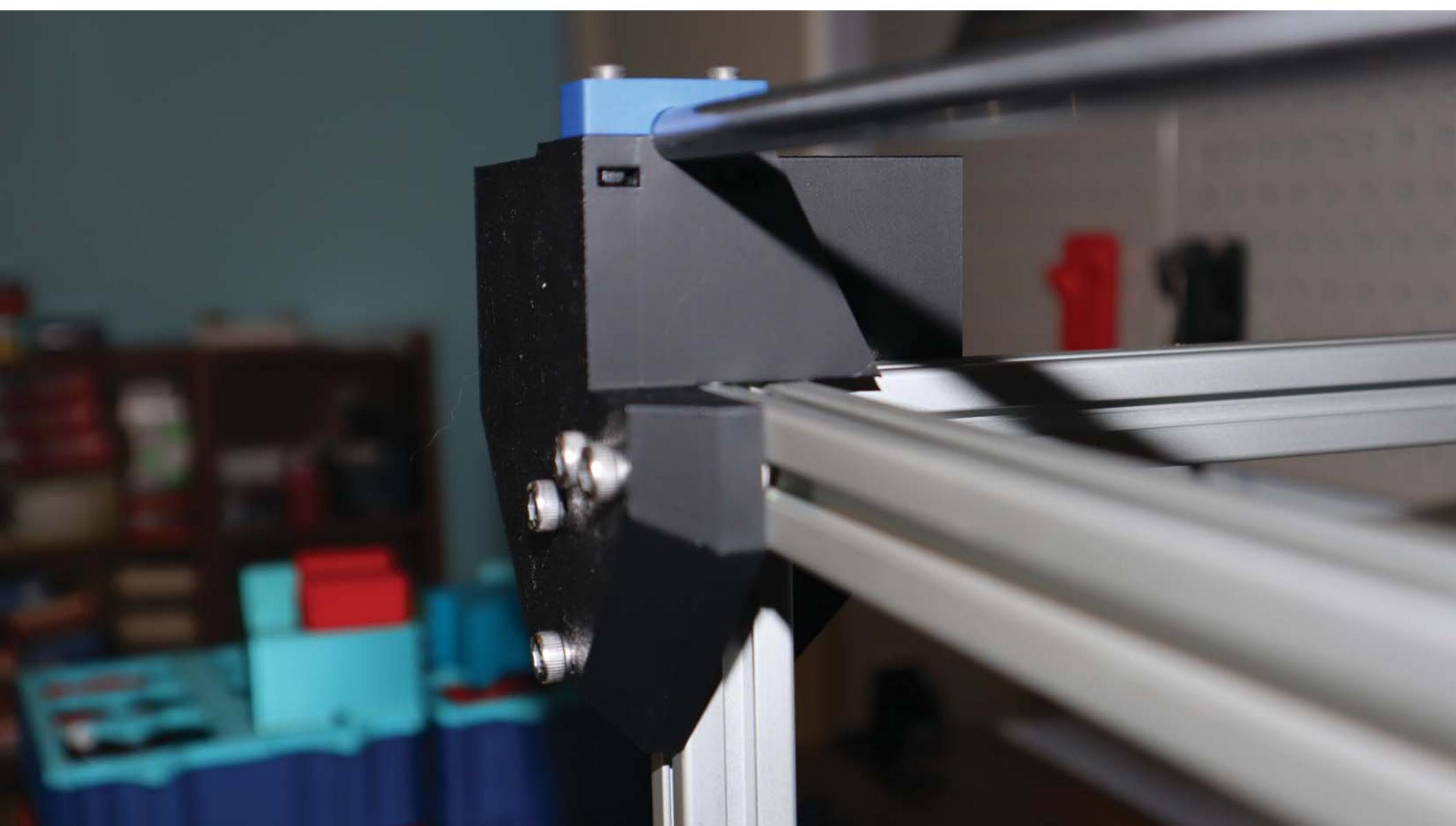
Use exposed M3 nut on inside for this clamp
These will not interfere with belt path

M3x20

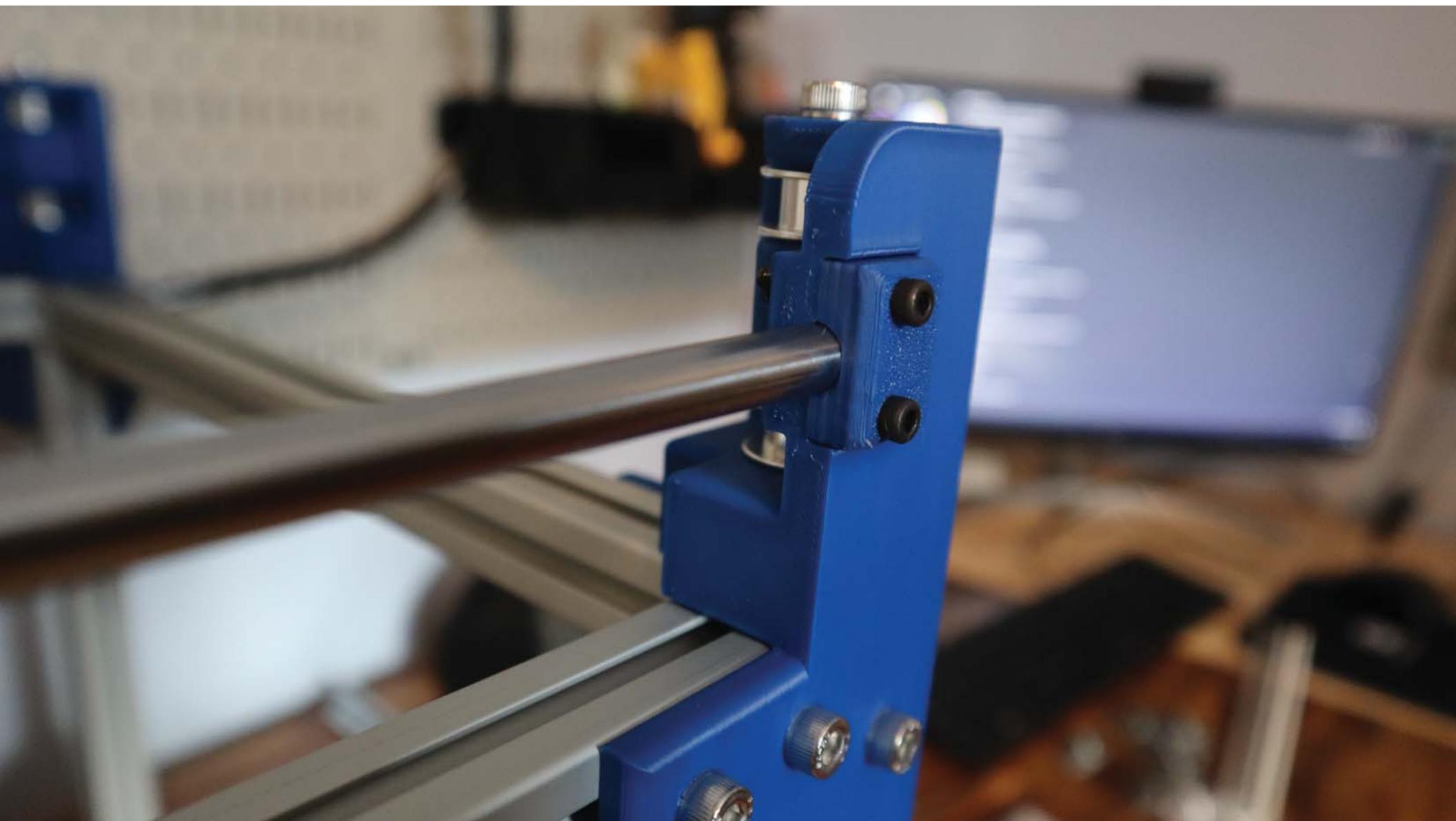
STEP 2



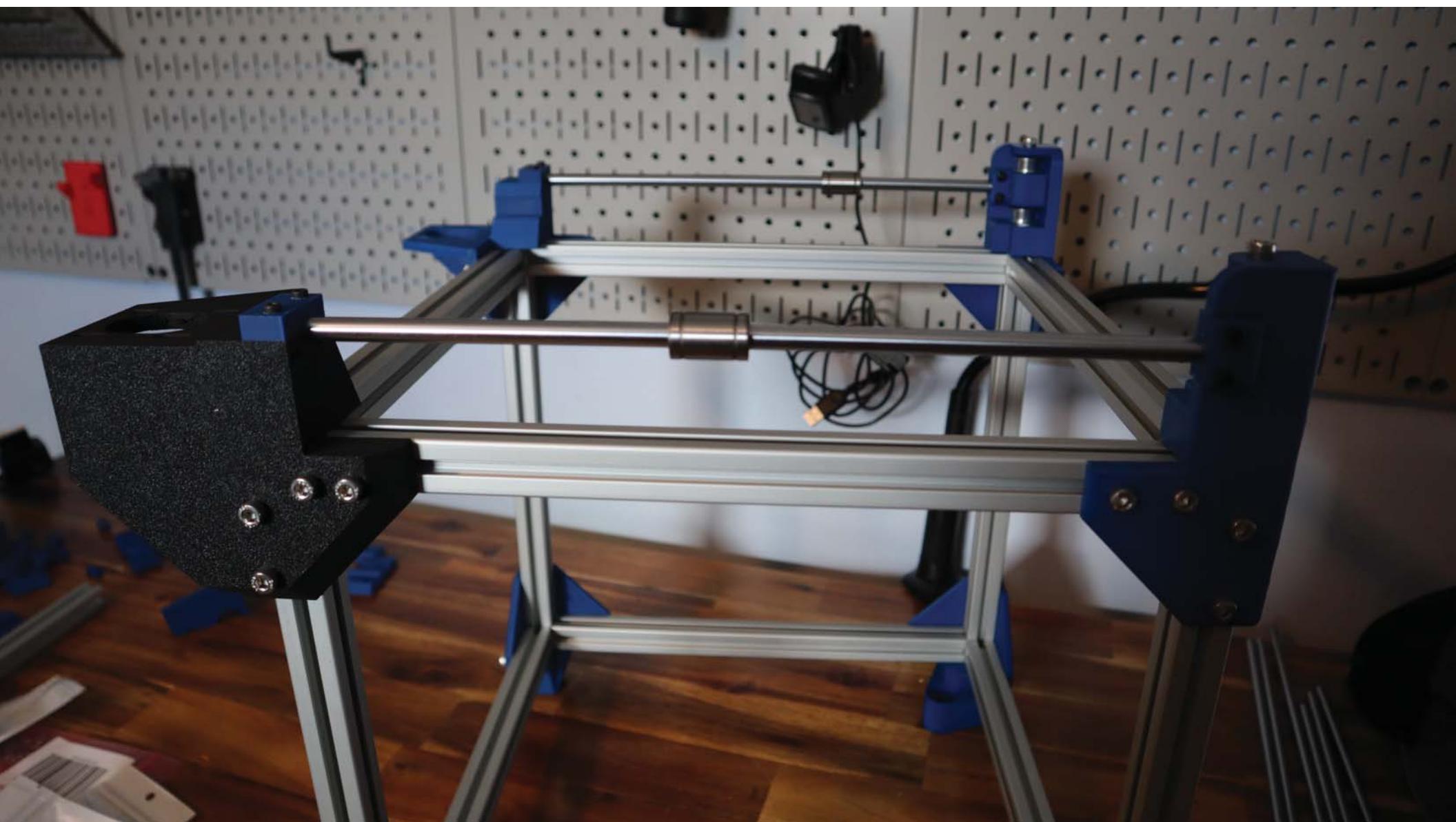
STEP 2



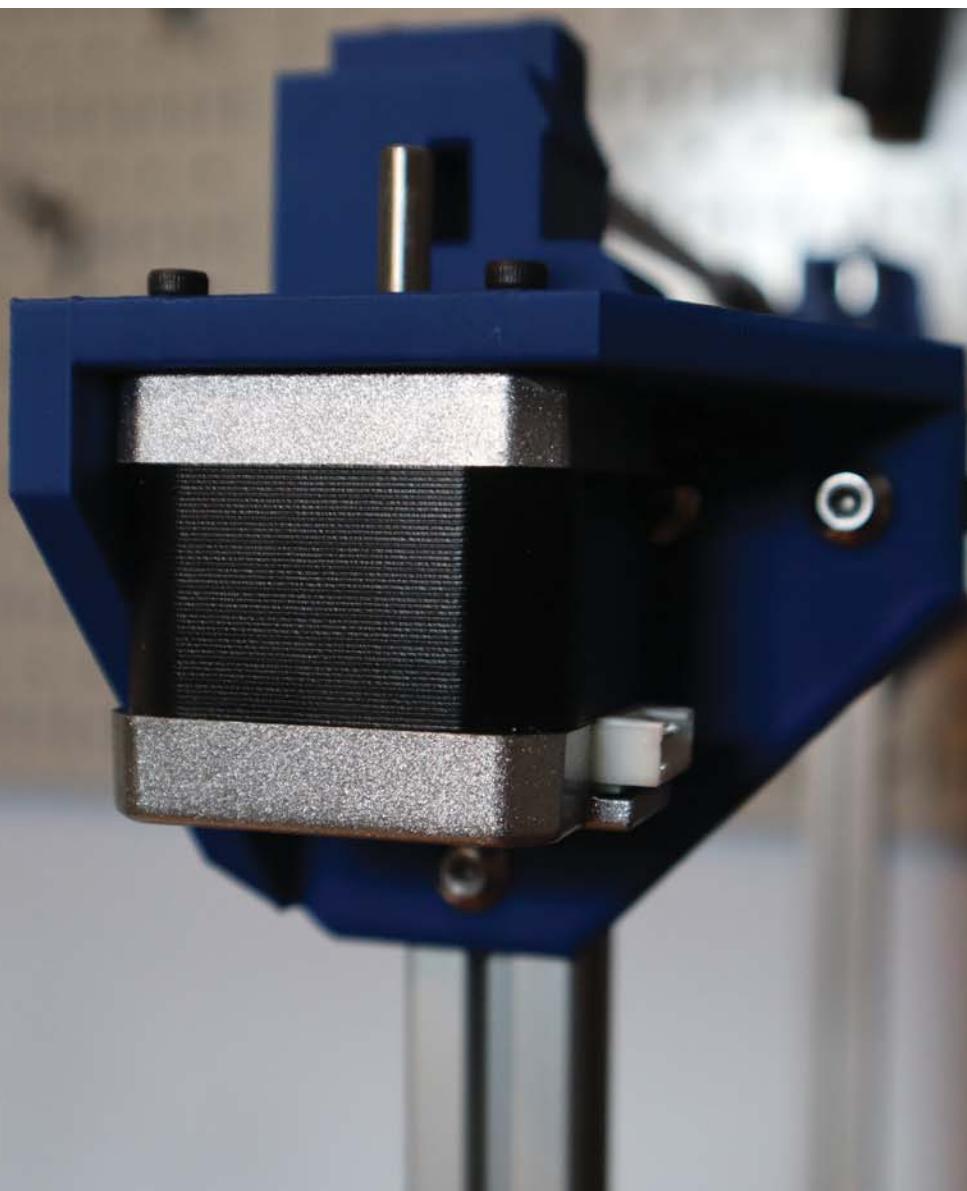
STEP 2



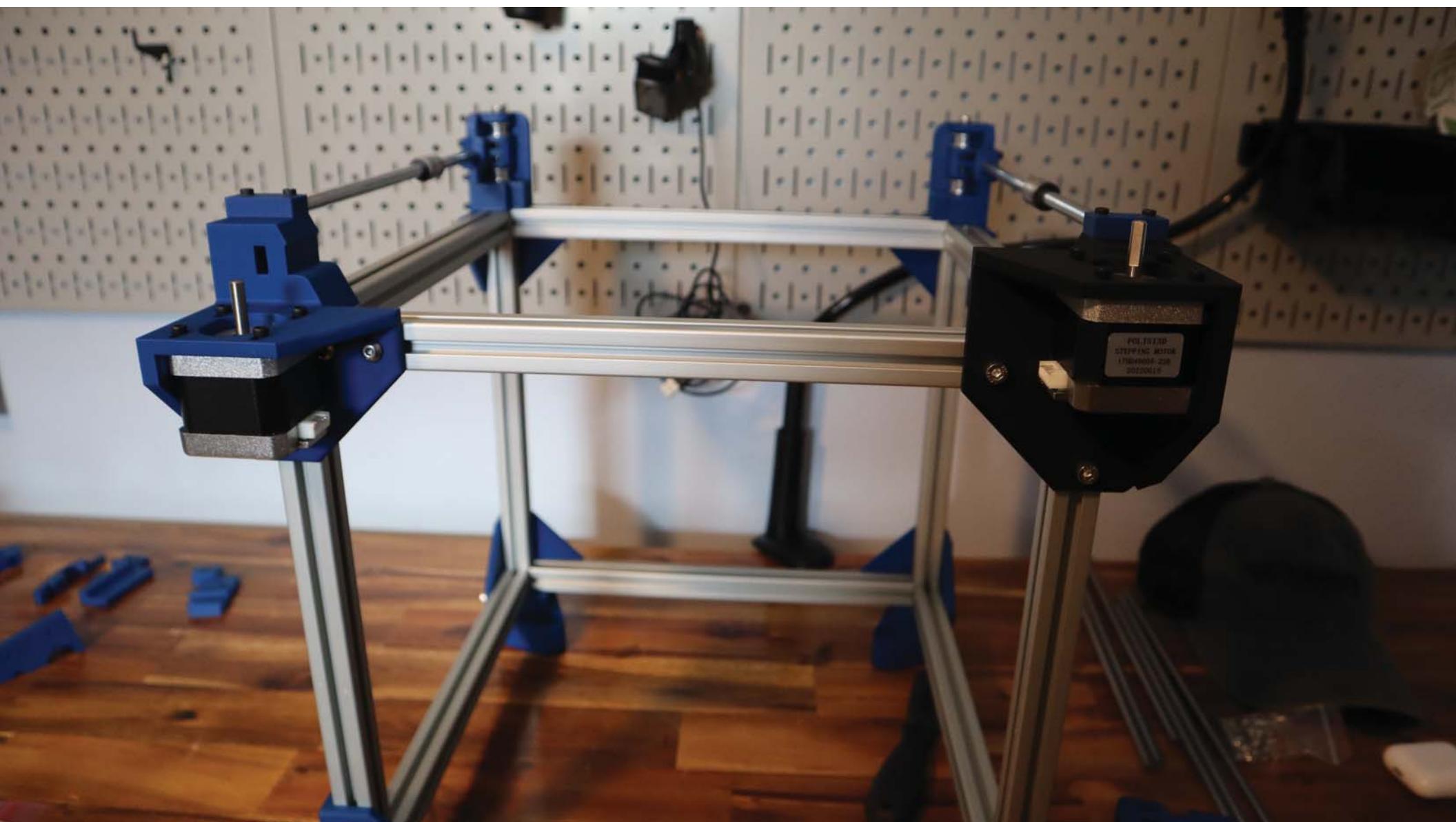
STEP 2



STEP 3



STEP 3



STEP 3

Motors attach with 4 - M3x8

Approximately 9.5mm

5mm bore 20T GT2 Pulley mounts
to stepper motor shaft
(use blue loctite on grub screws)

Approximately
10.5mm

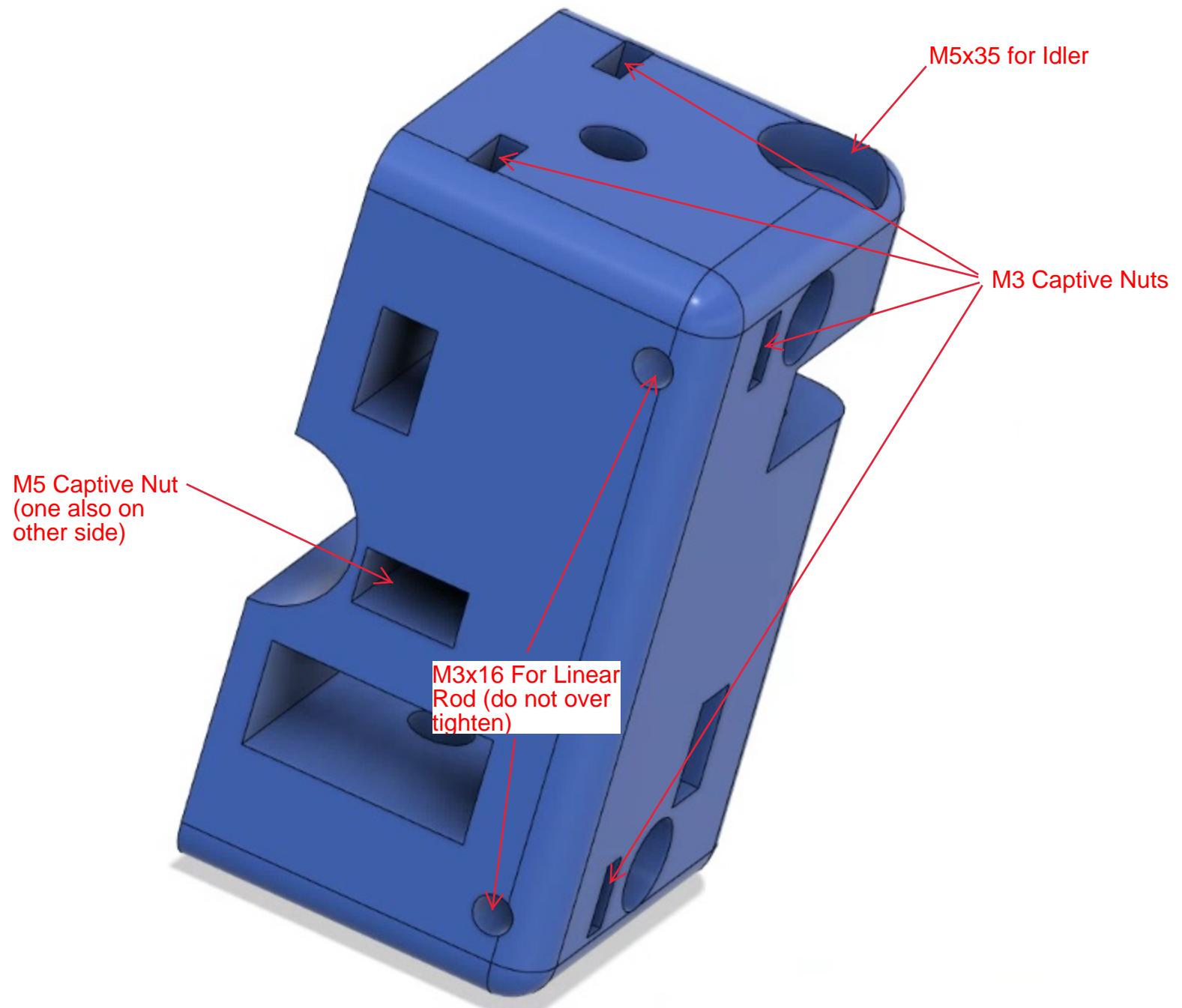
STEP 4/5

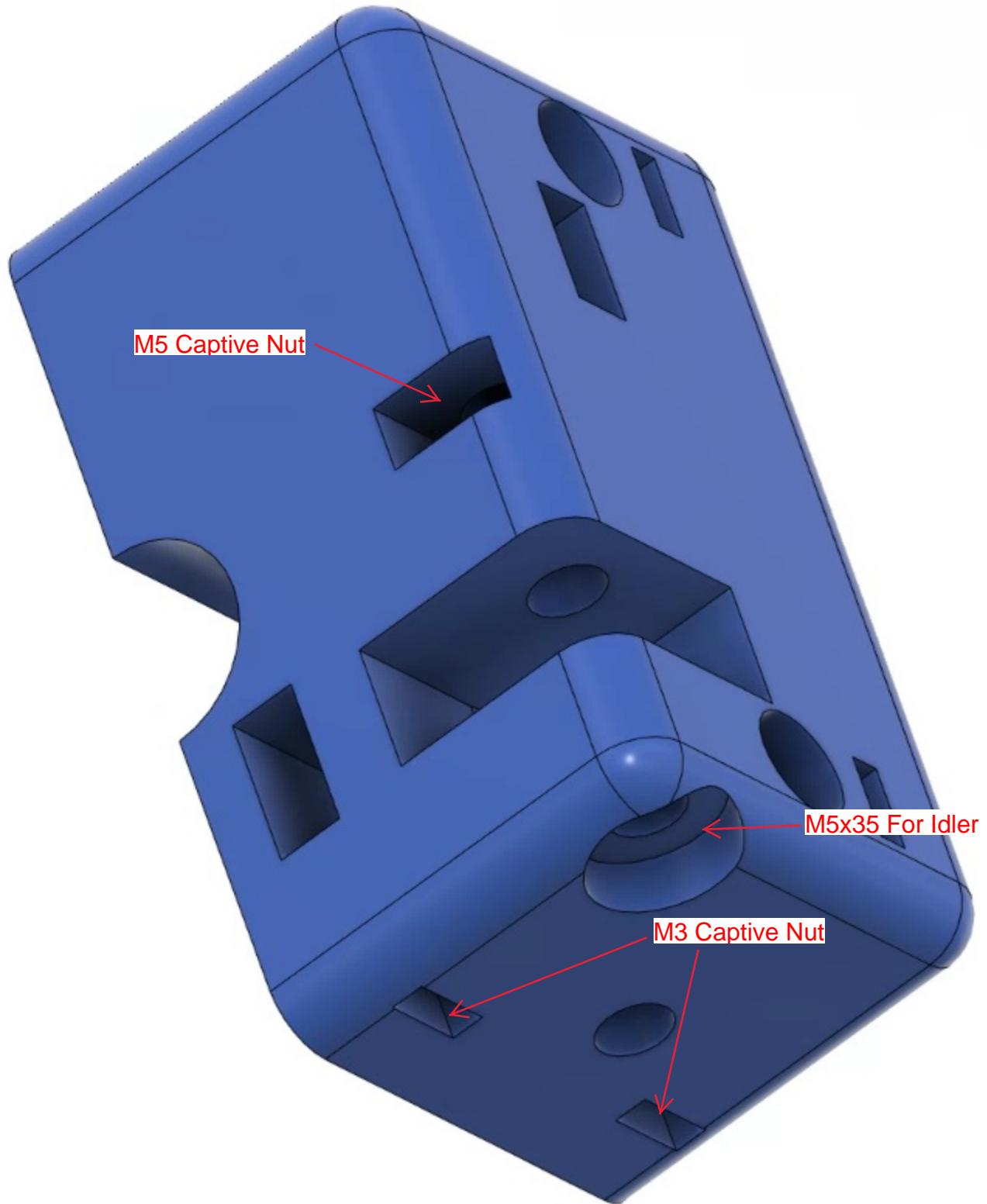


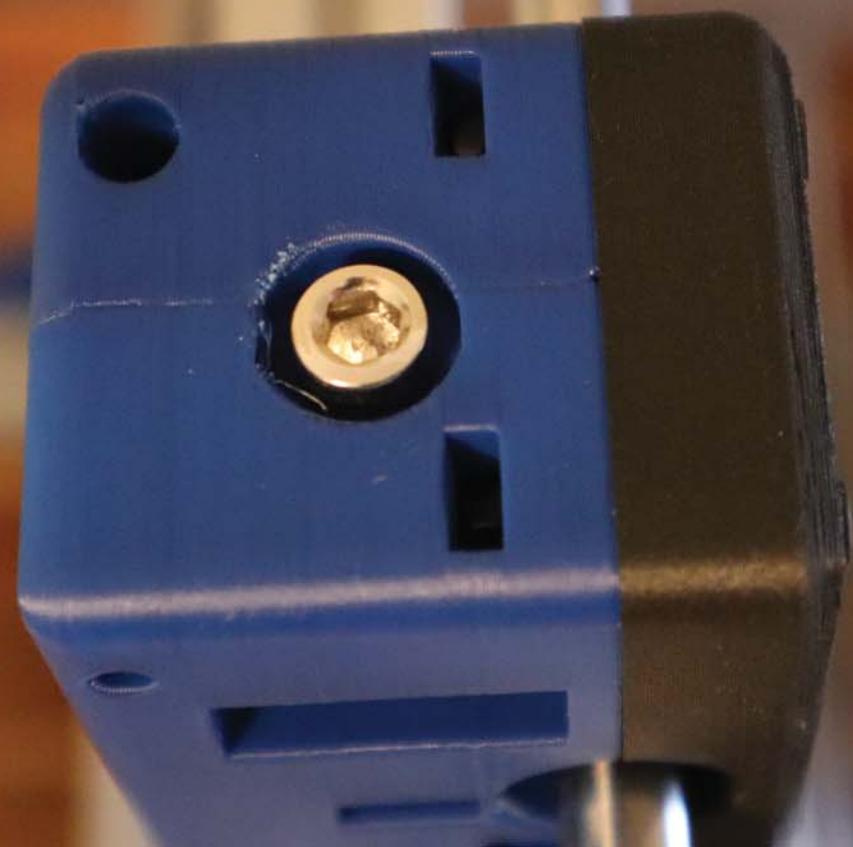
STEP 4/5



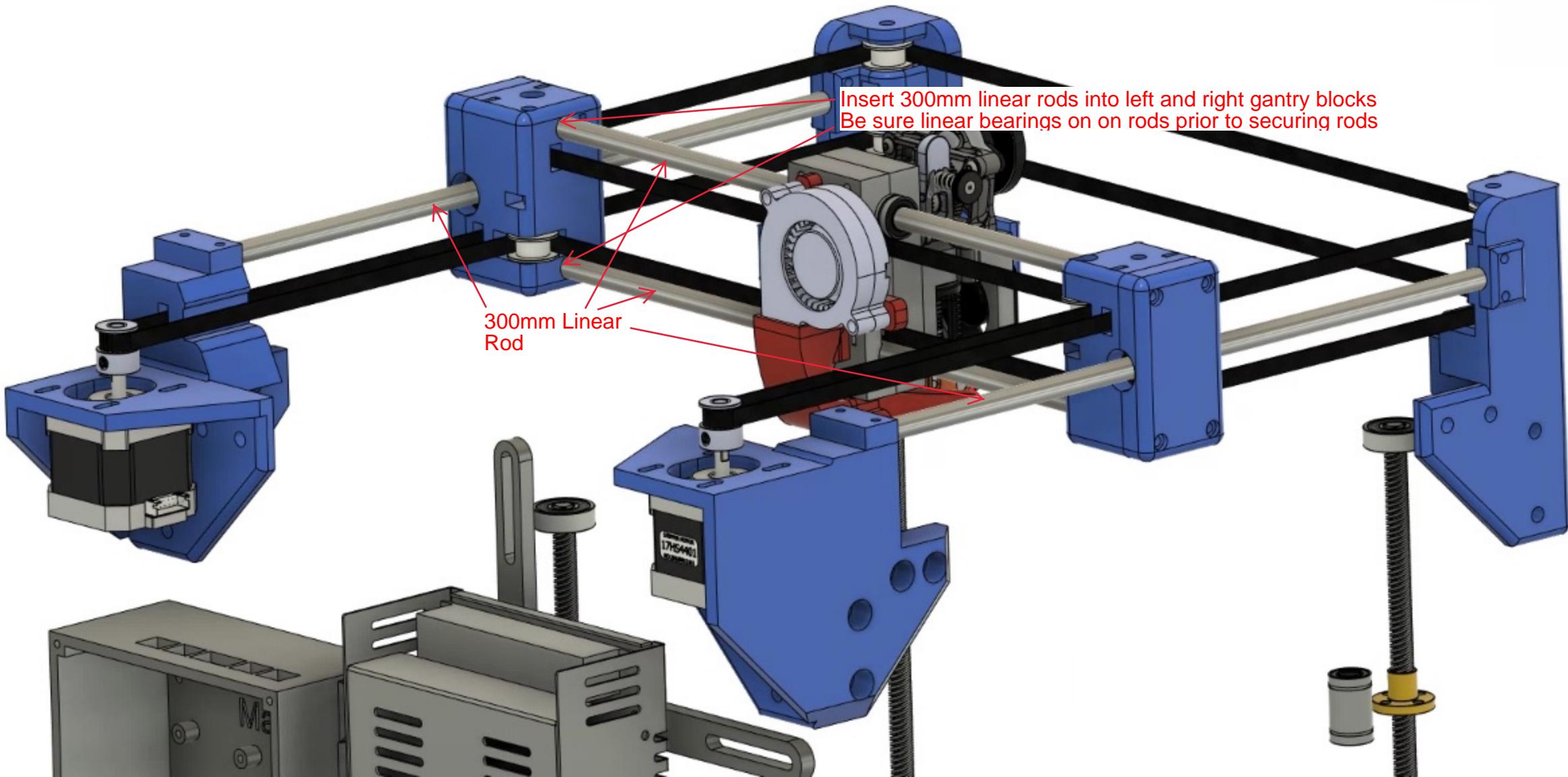
There are 6 M3 Captive Nuts on each gantry block and 2 M5







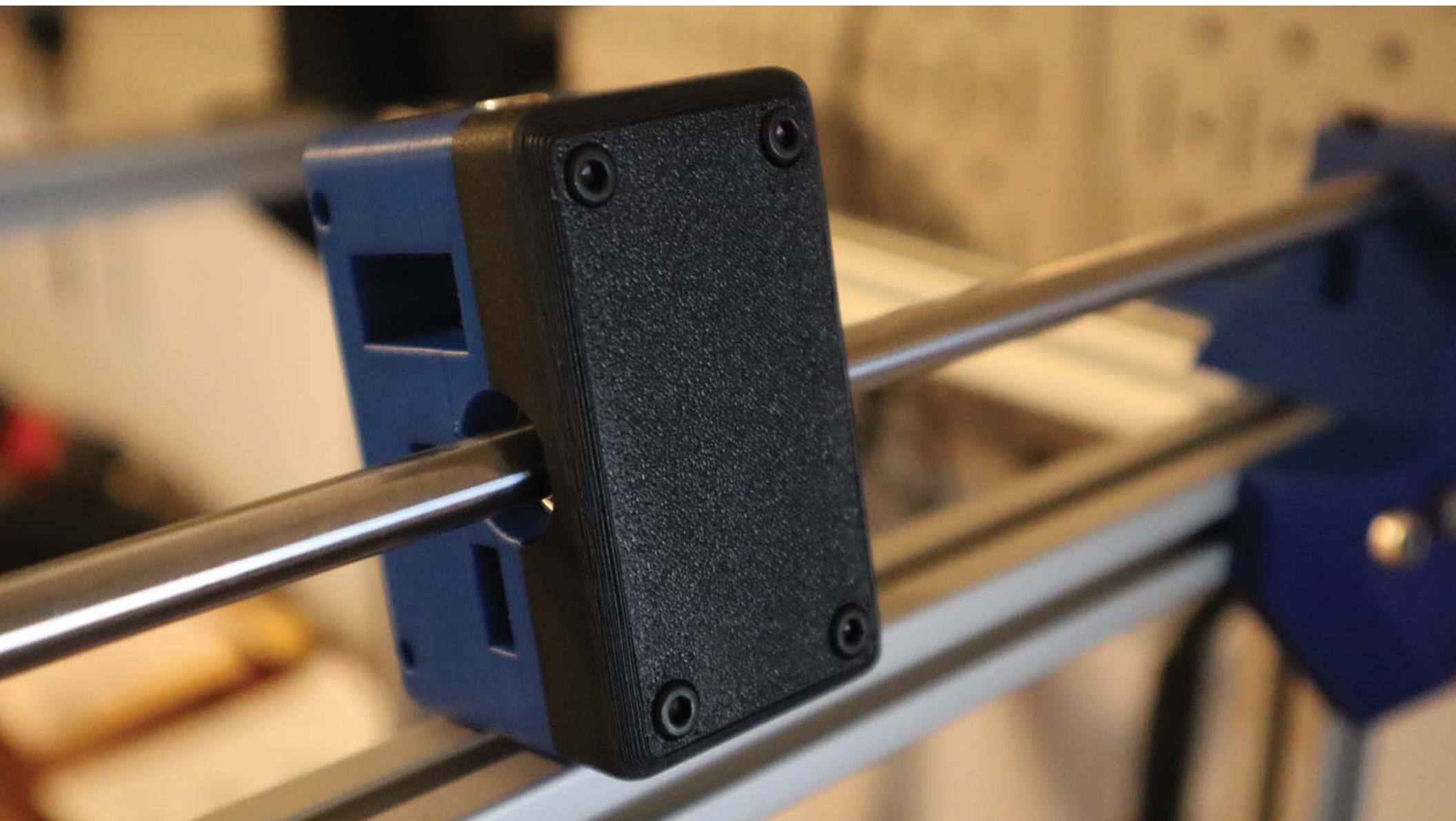
Gantry System

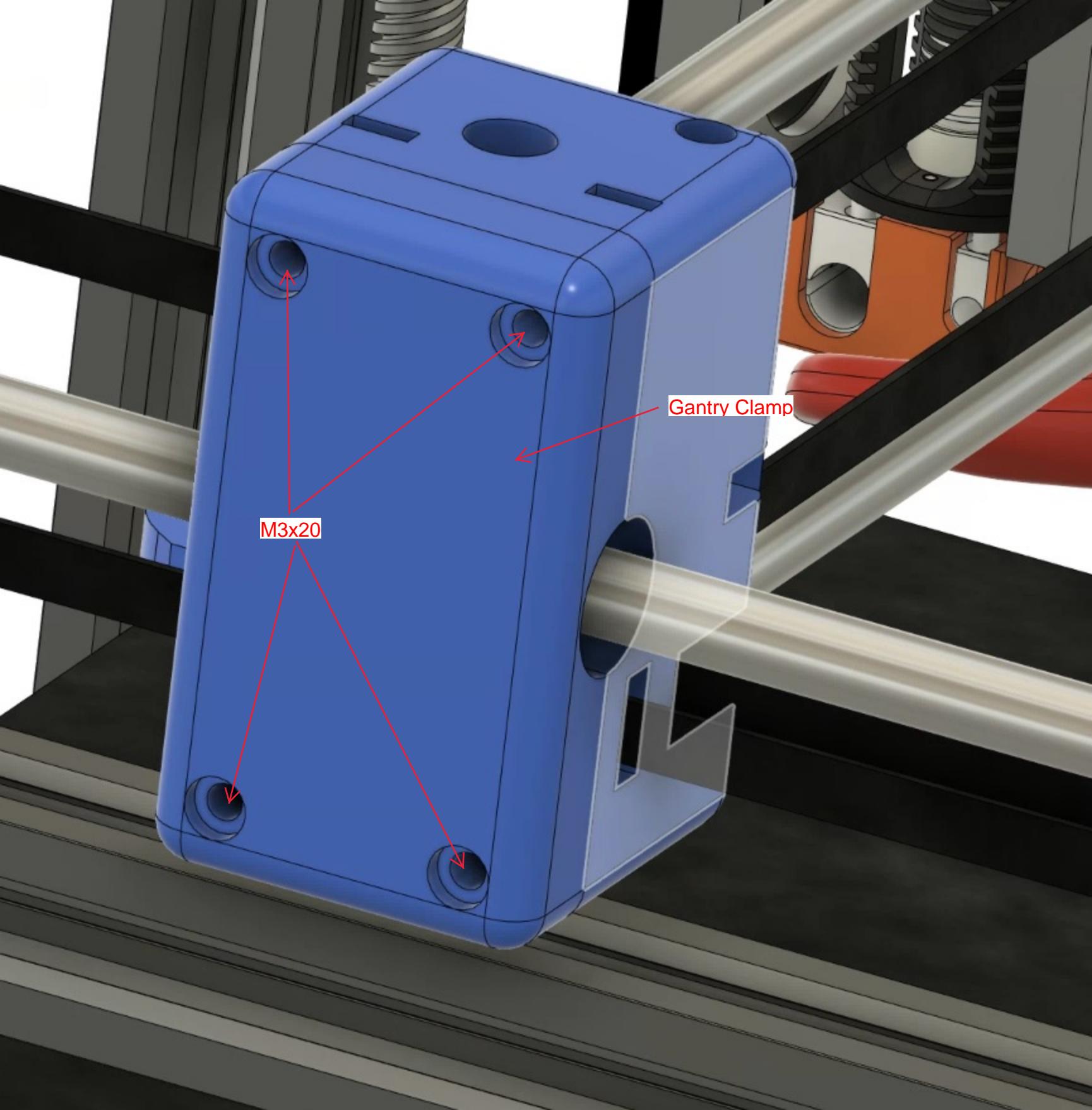


STEP 6
NOTE: INSTALL RODS PRIOR TO MOUNTING BLOCKS



STEP 6/7
NOTE: INSTALL RODS PRIOR TO MOUNTING BLOCKS

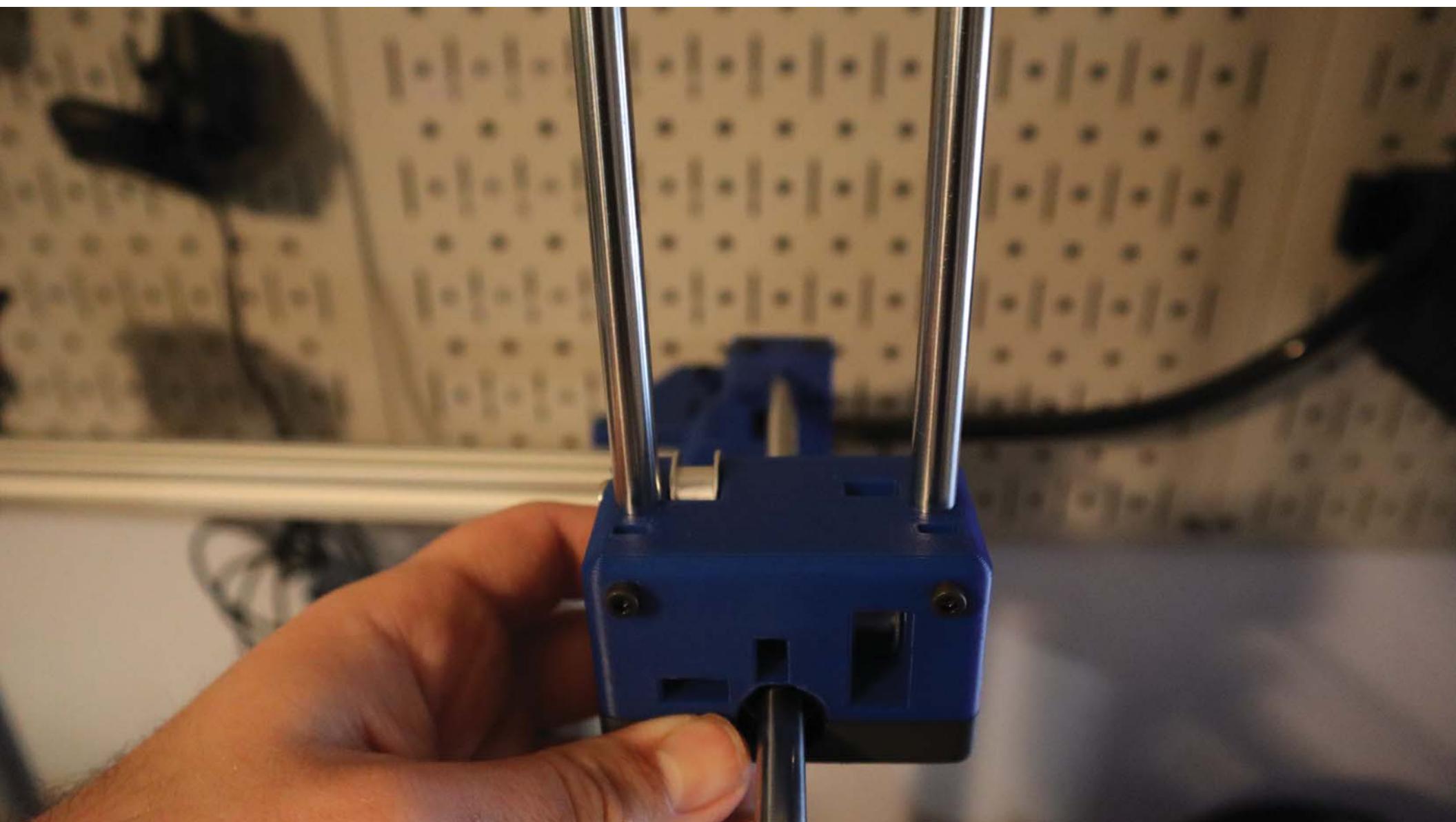




M3x20

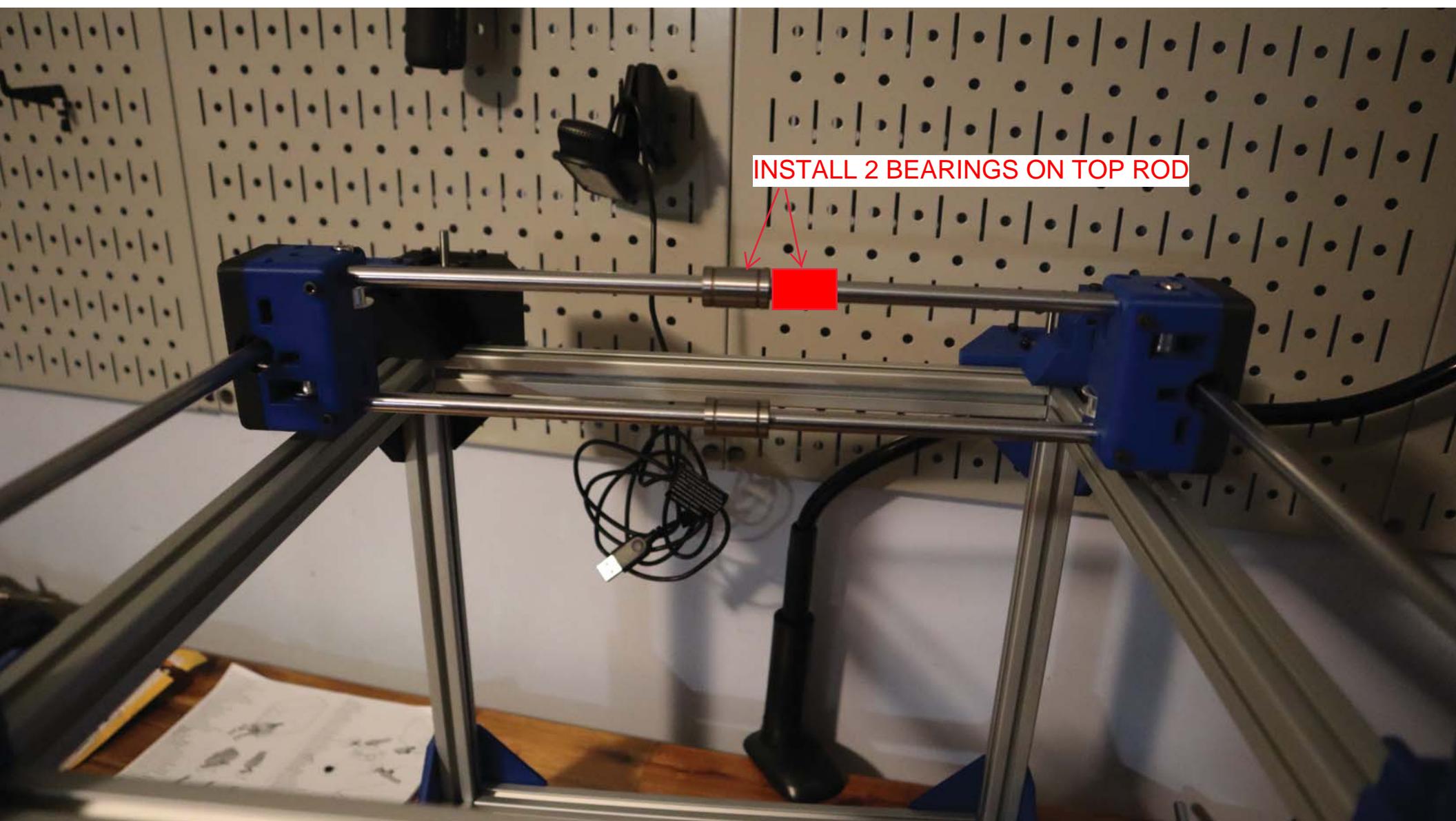
Gantry Clamp

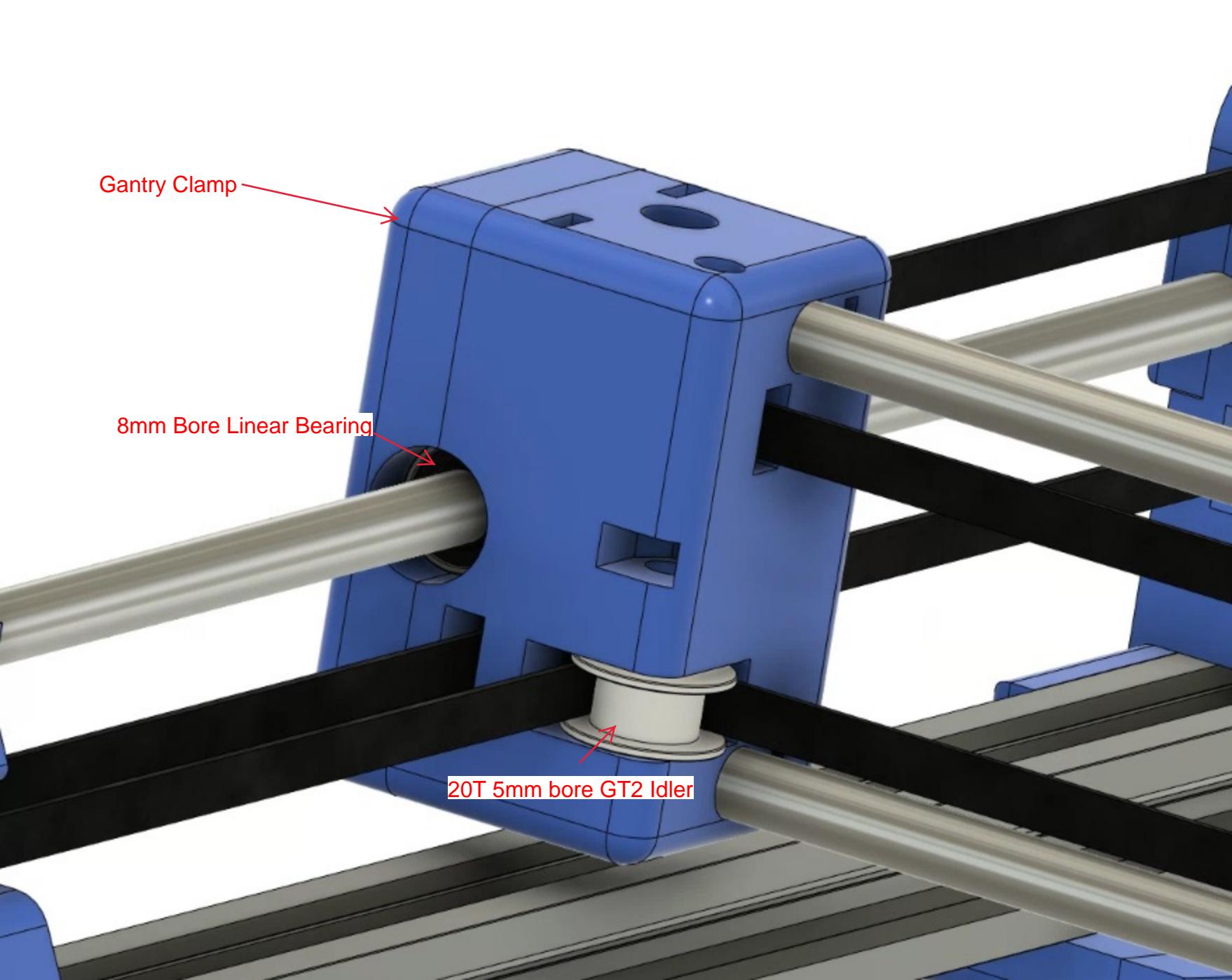
STEP 8/9/10



STEP 8/9/10

INSTALL 2 BEARINGS ON TOP ROD

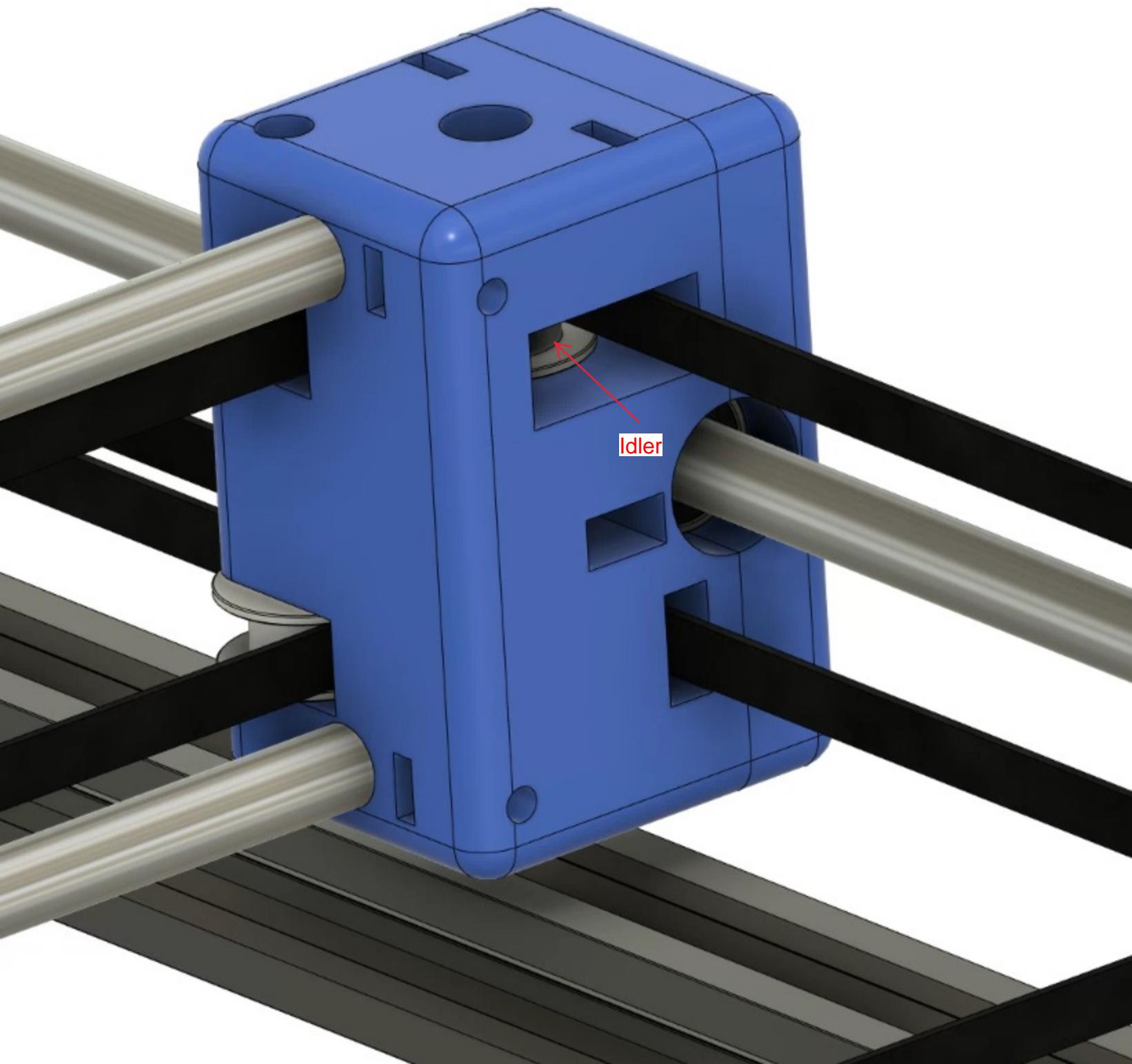




Gantry Clamp

8mm Bore Linear Bearing

20T 5mm bore GT2 Idler



Idler

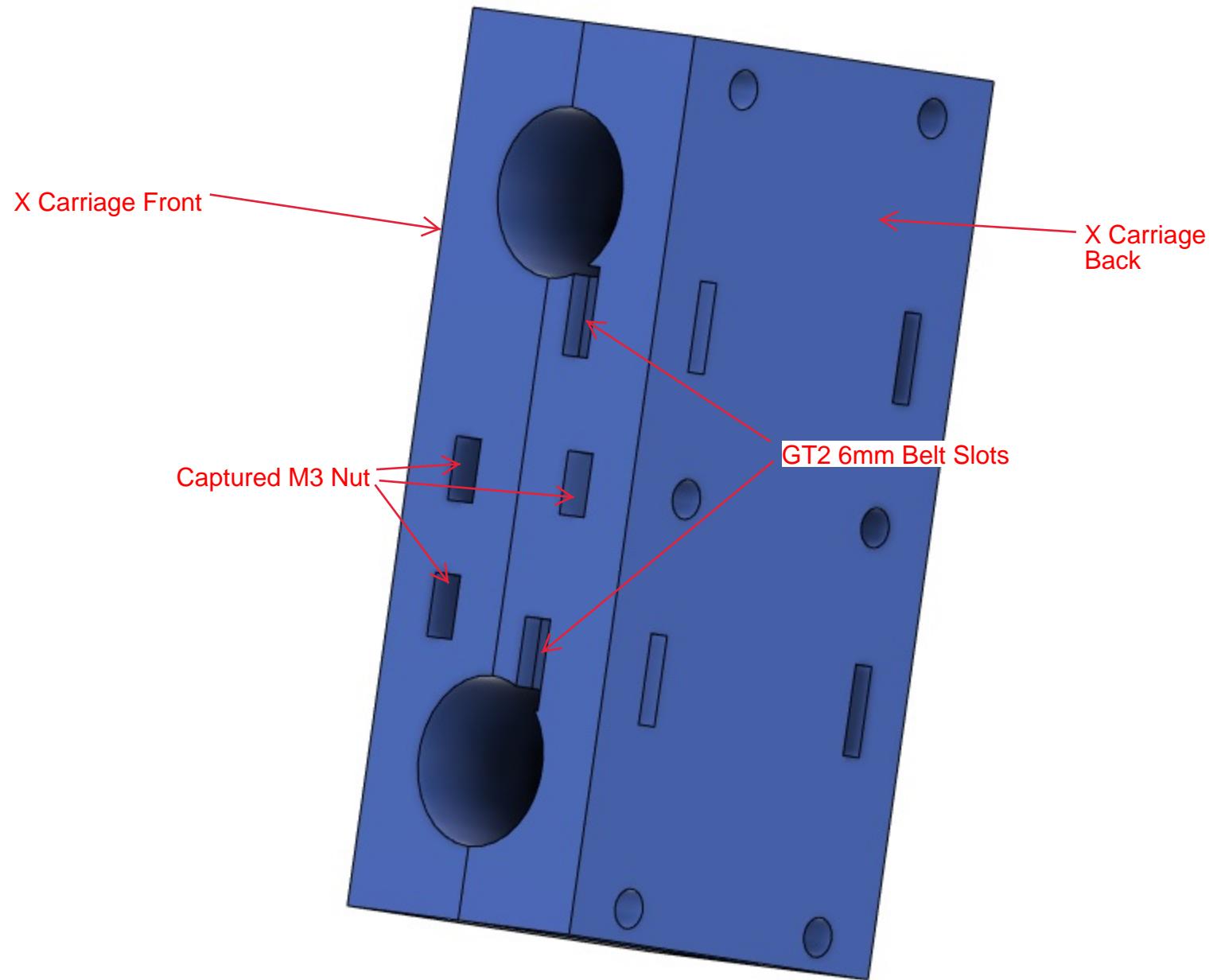
Section 5:

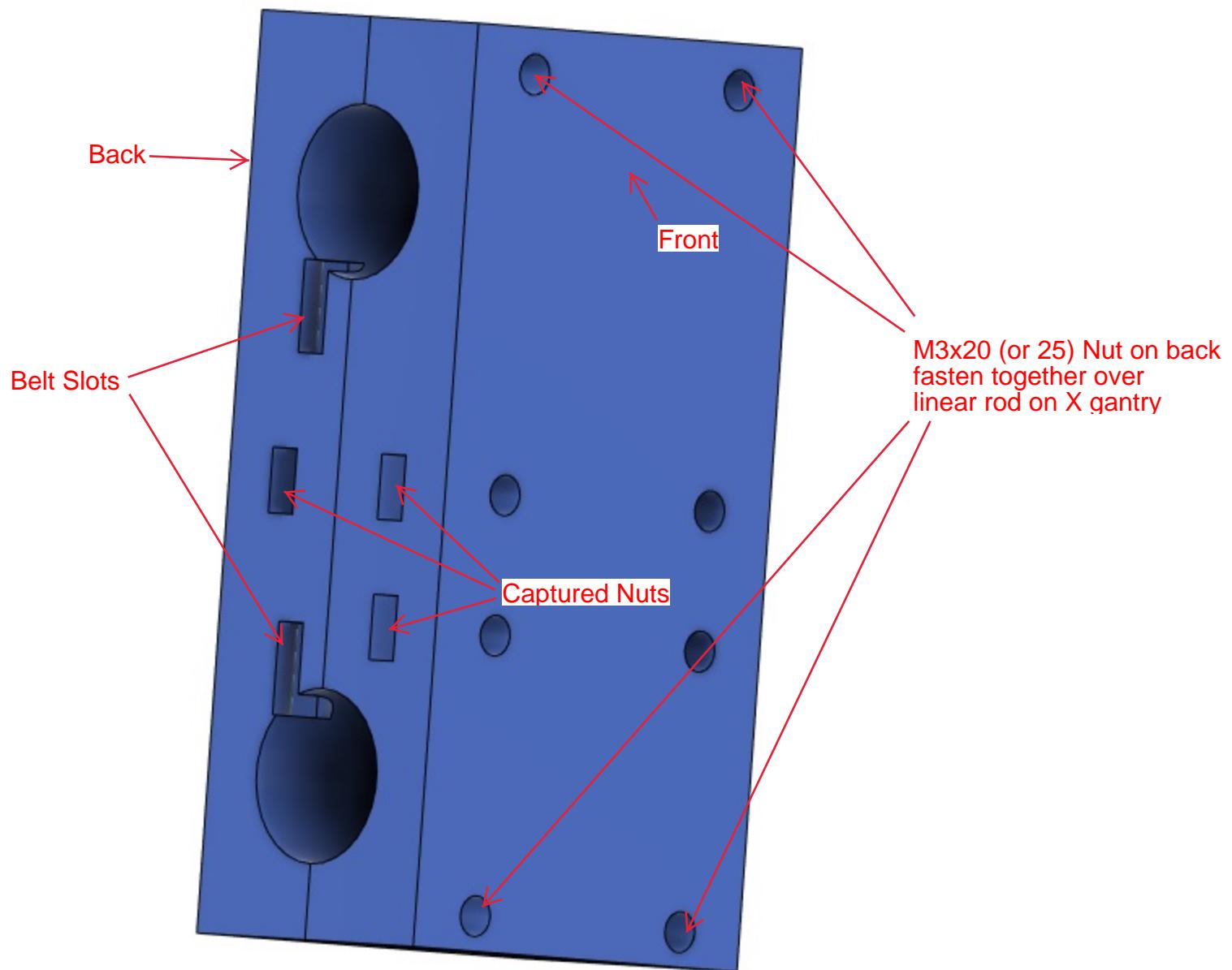
Print Head & X/Y Belt

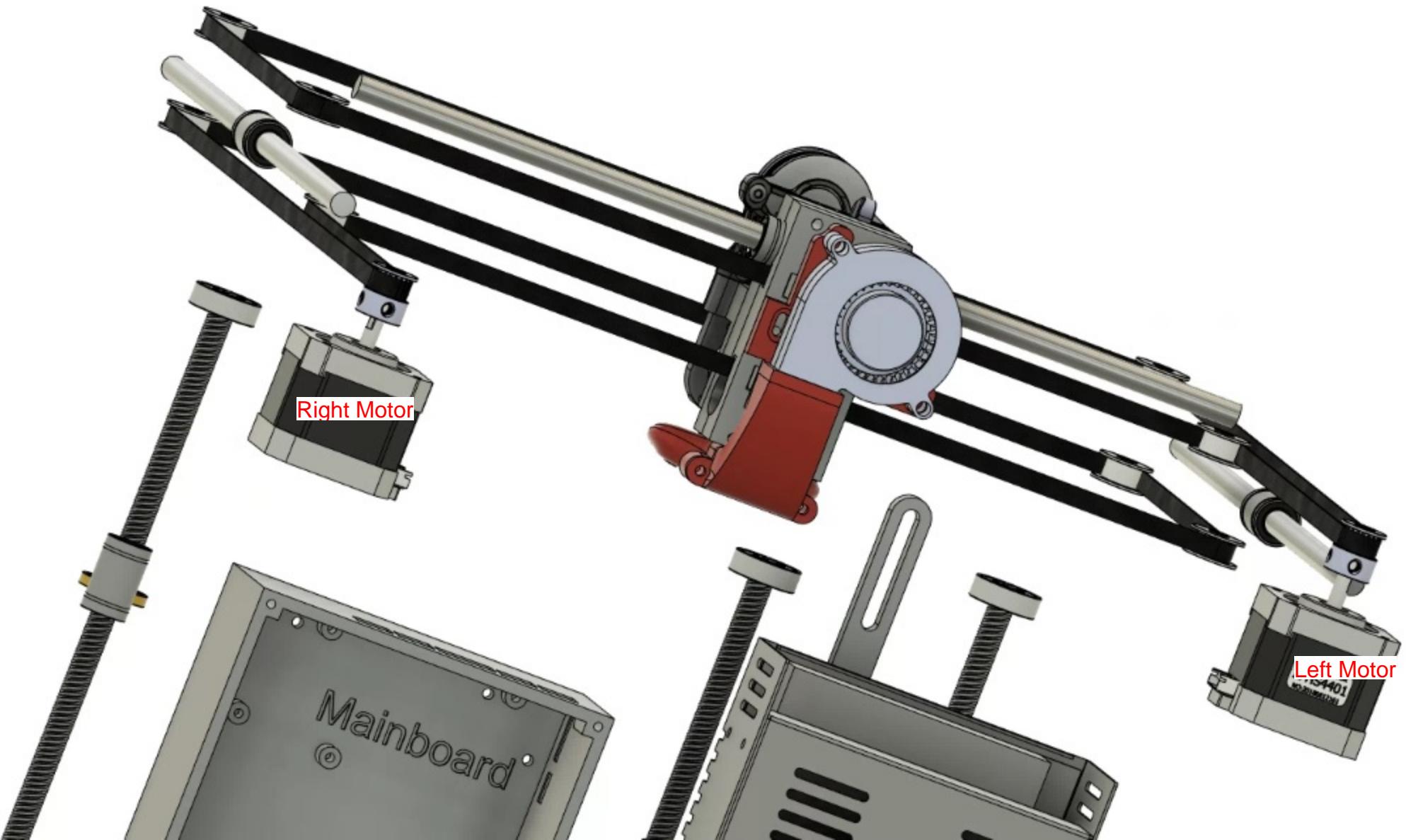
Components needed for this portion:

M3x16	x6
M3x20 (or 25)	x7
M3x25	x2
M3x12	x6
M3x10	x2
M3 Nut	x16
3010 24V Fan	x1
5015 24v Blower Fan	x1
J-head (V6) Hot End	x1
Sherpa Mini Extruder	x1
BLTouch	x1
GT2 6mm Belt Approximately 5m	x1

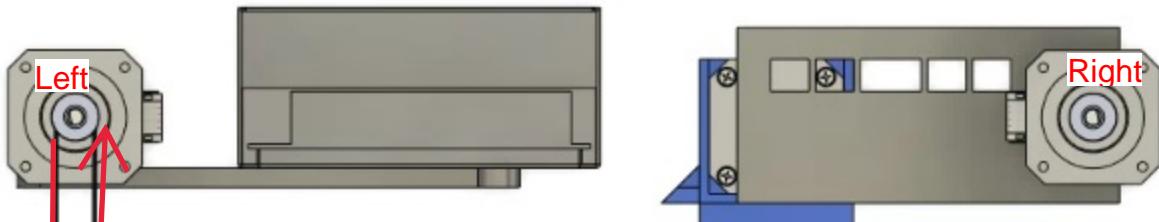




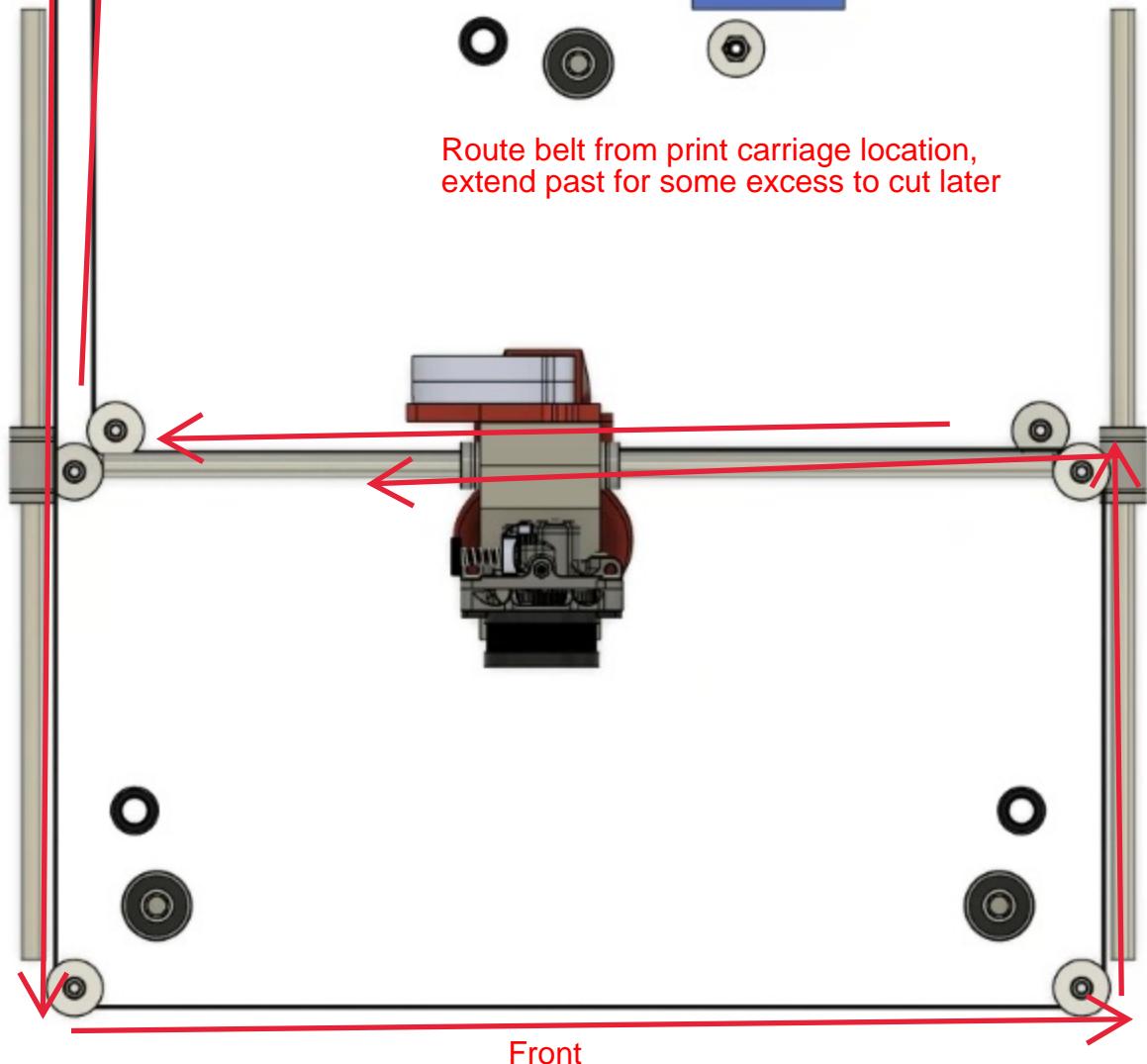




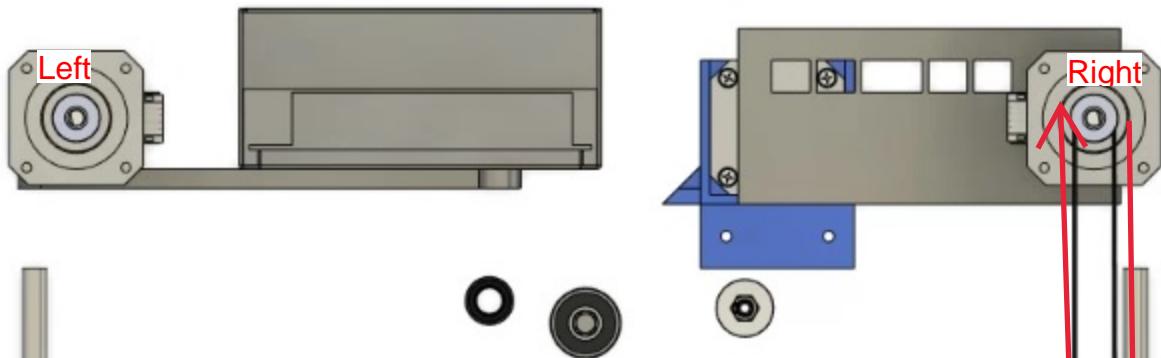
Back



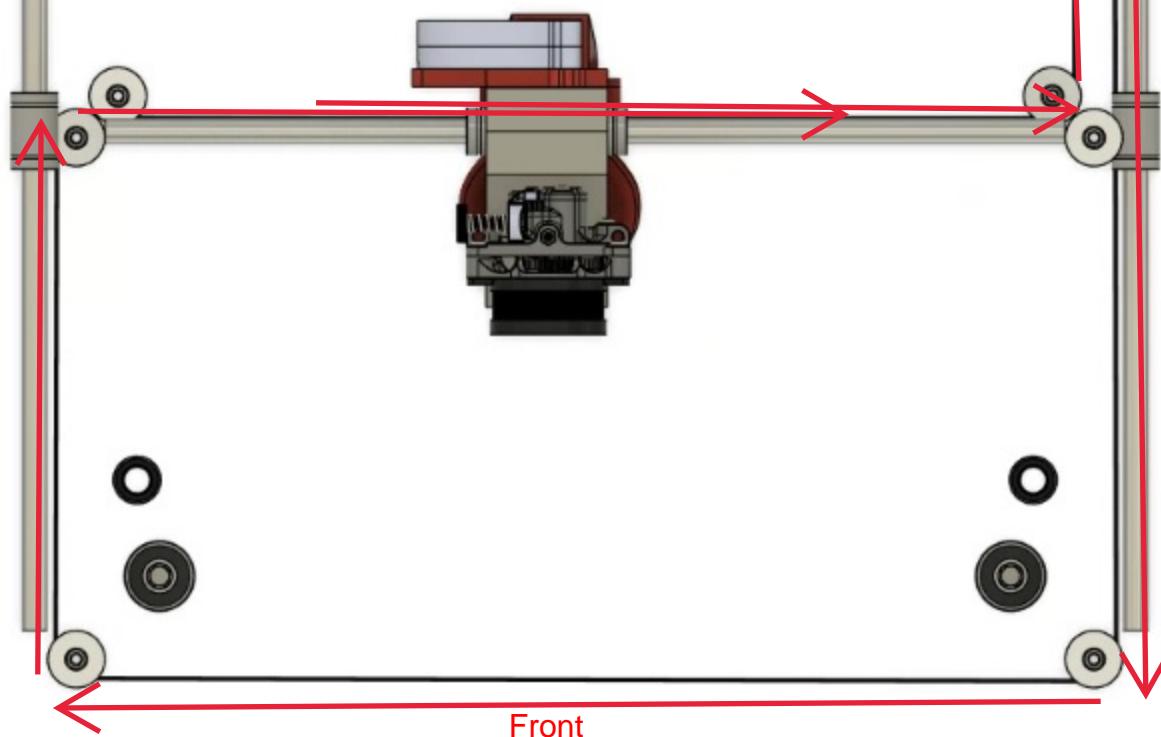
Route belt from print carriage location,
extend past for some excess to cut later



Back



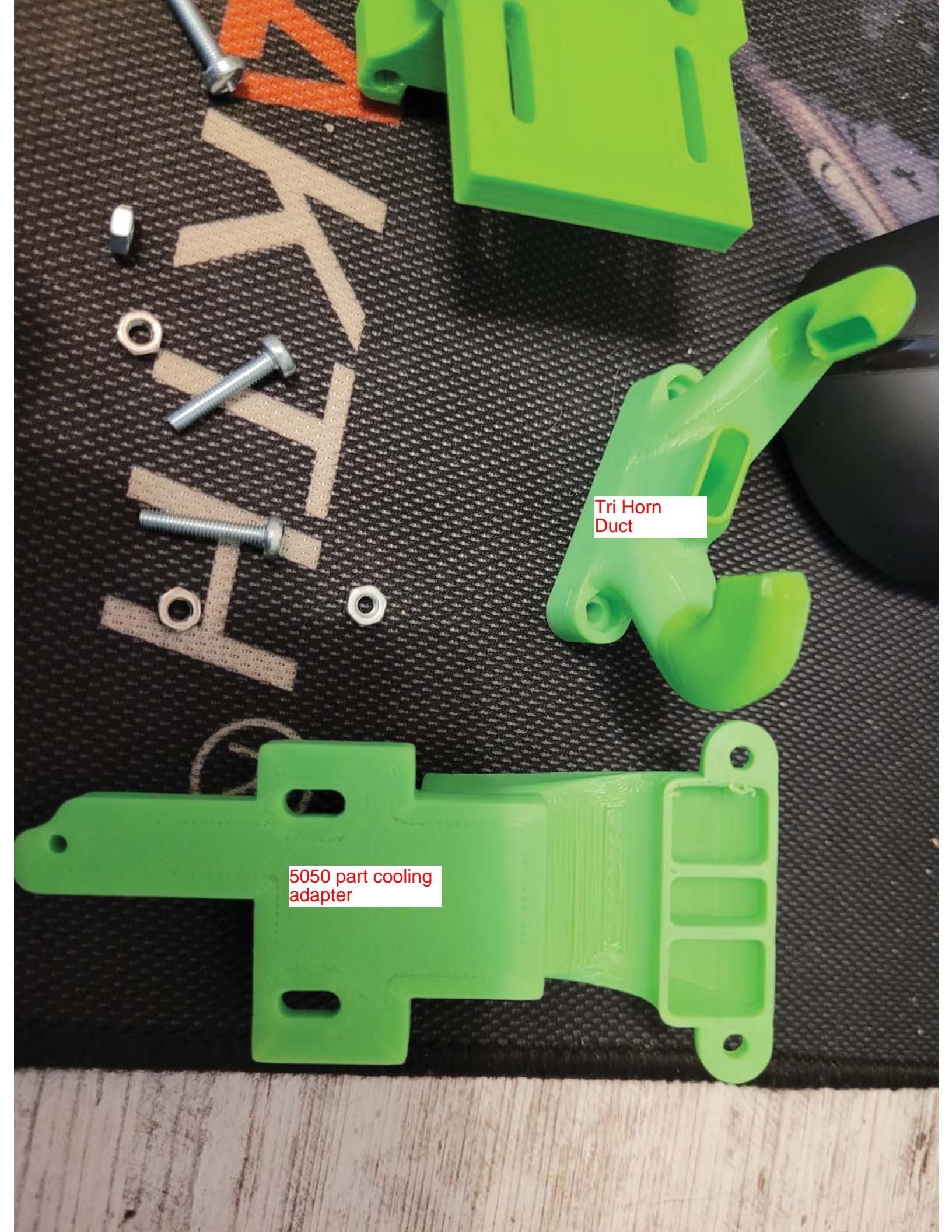
Route belt from print carriage location,
extend past for some excess to cut later





Use the 4 GT2 Belt Clips to secure
routed belt

If you use "expansion compensation"
in your slicer, you will need to shrink
clips to 99% to avoid slipping, otherwise
standard profile will work

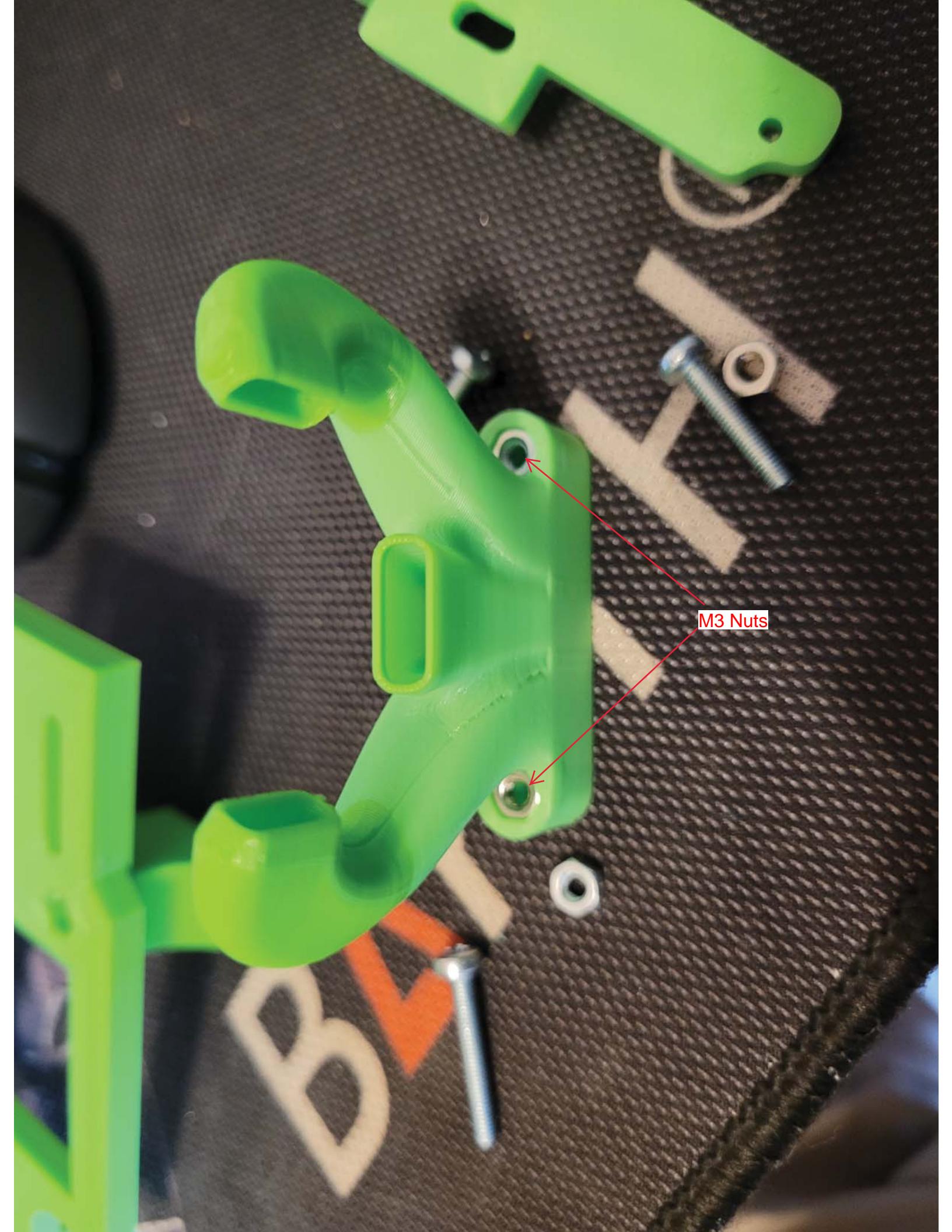


Tri Horn Duct

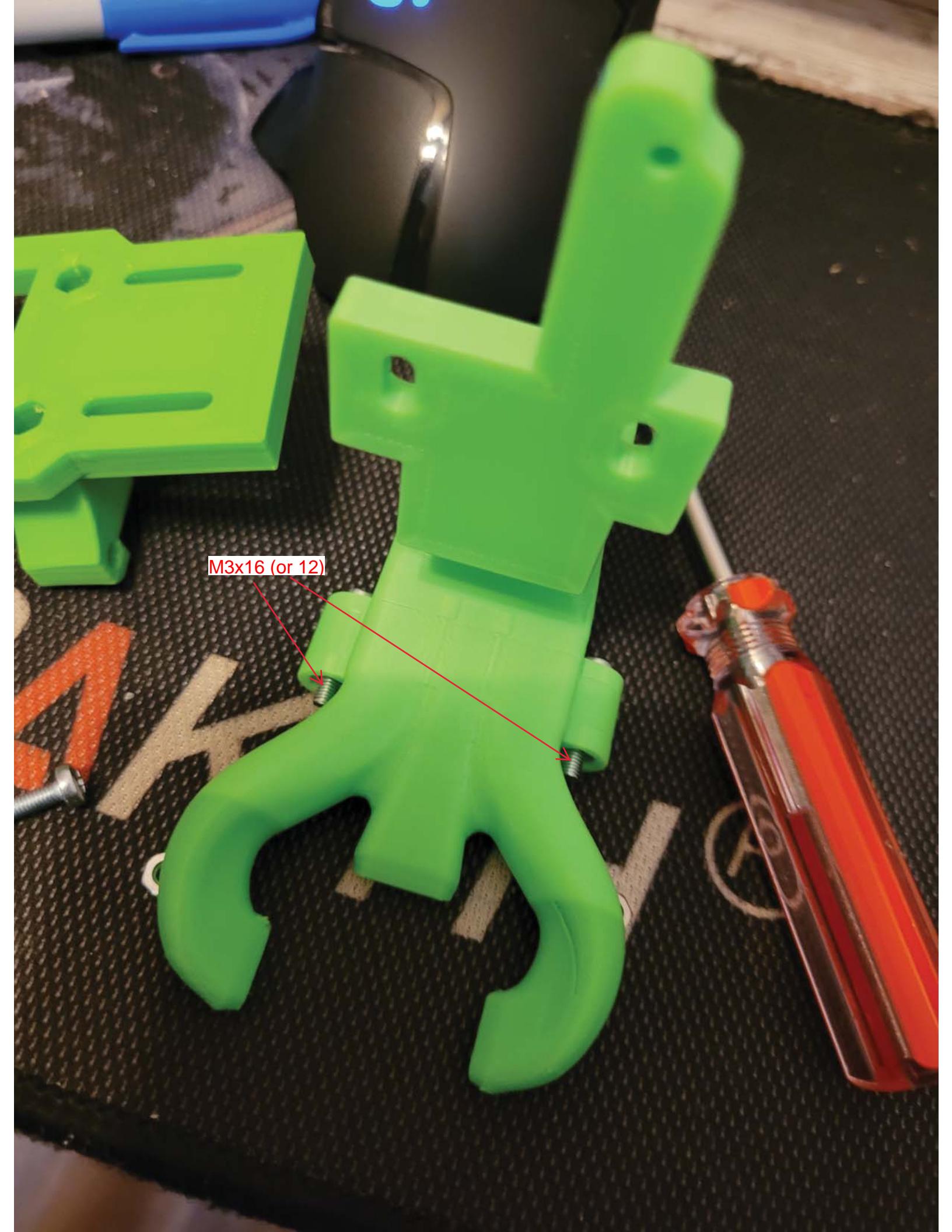
5050 part cooling
adapter



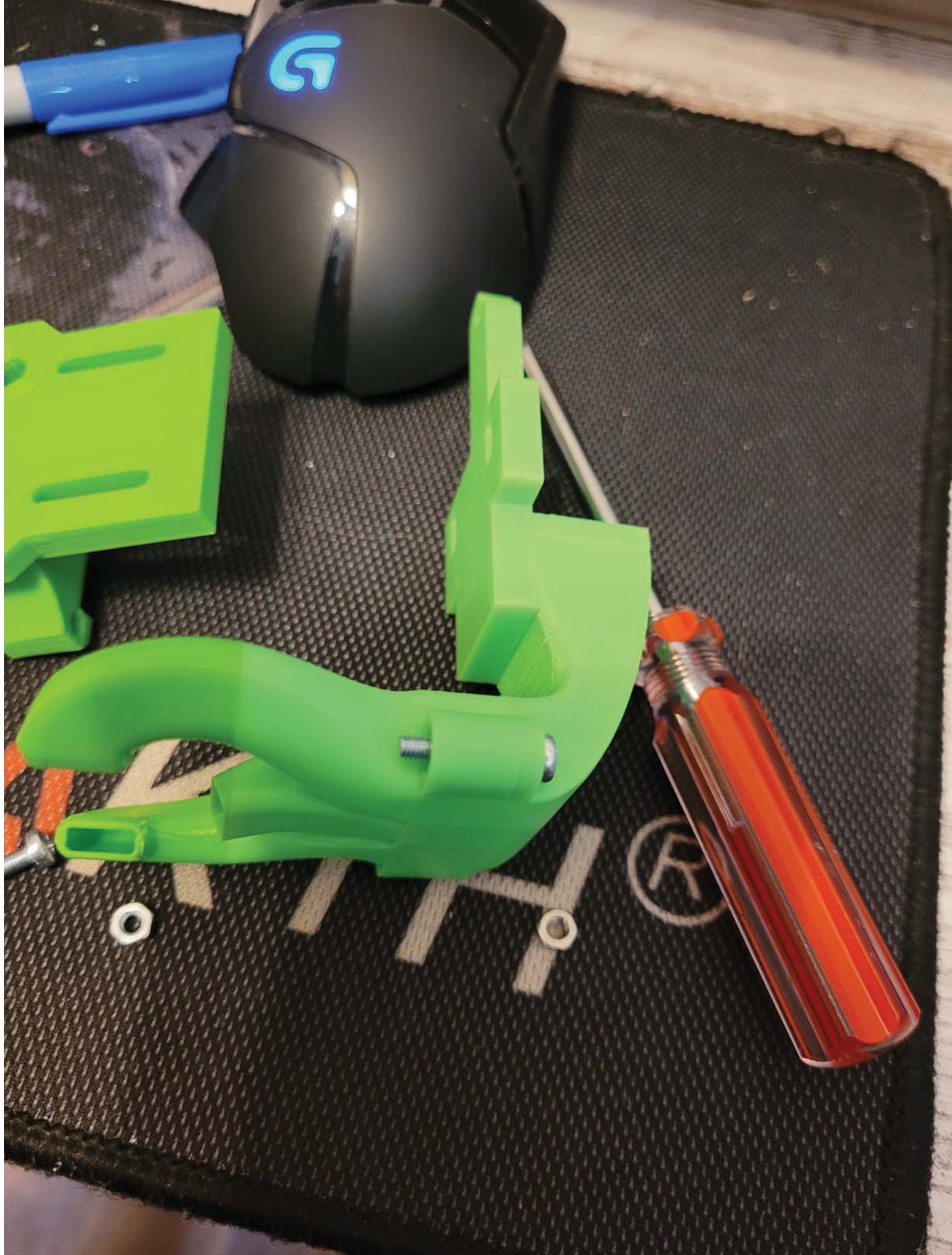
Hotend/Extruder
Plate

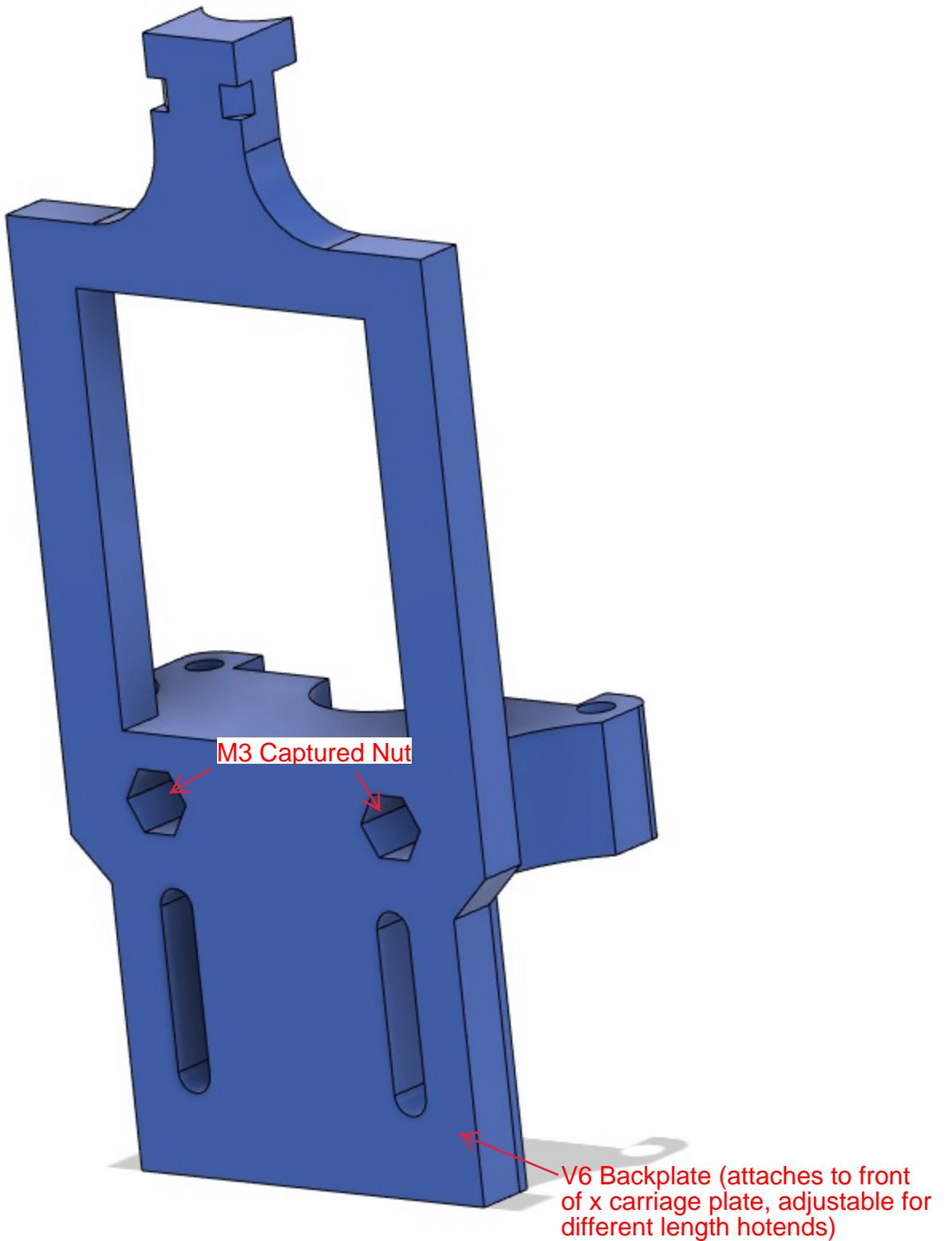


M3 Nuts



M3x16 (or 12)







M3 Nuts

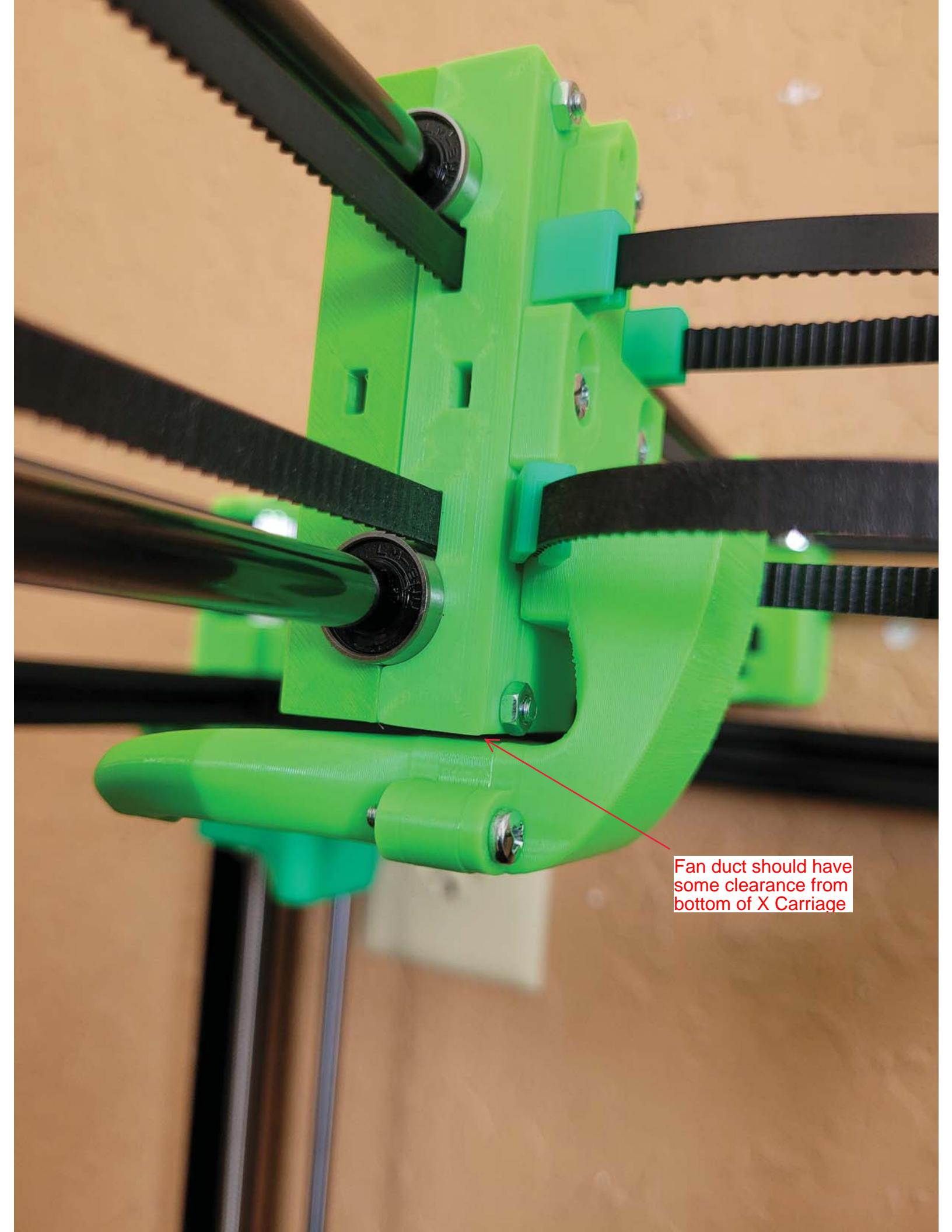
Set in place,
use m3x20 to cleanly
pull the nuts all the
way into the slots

G

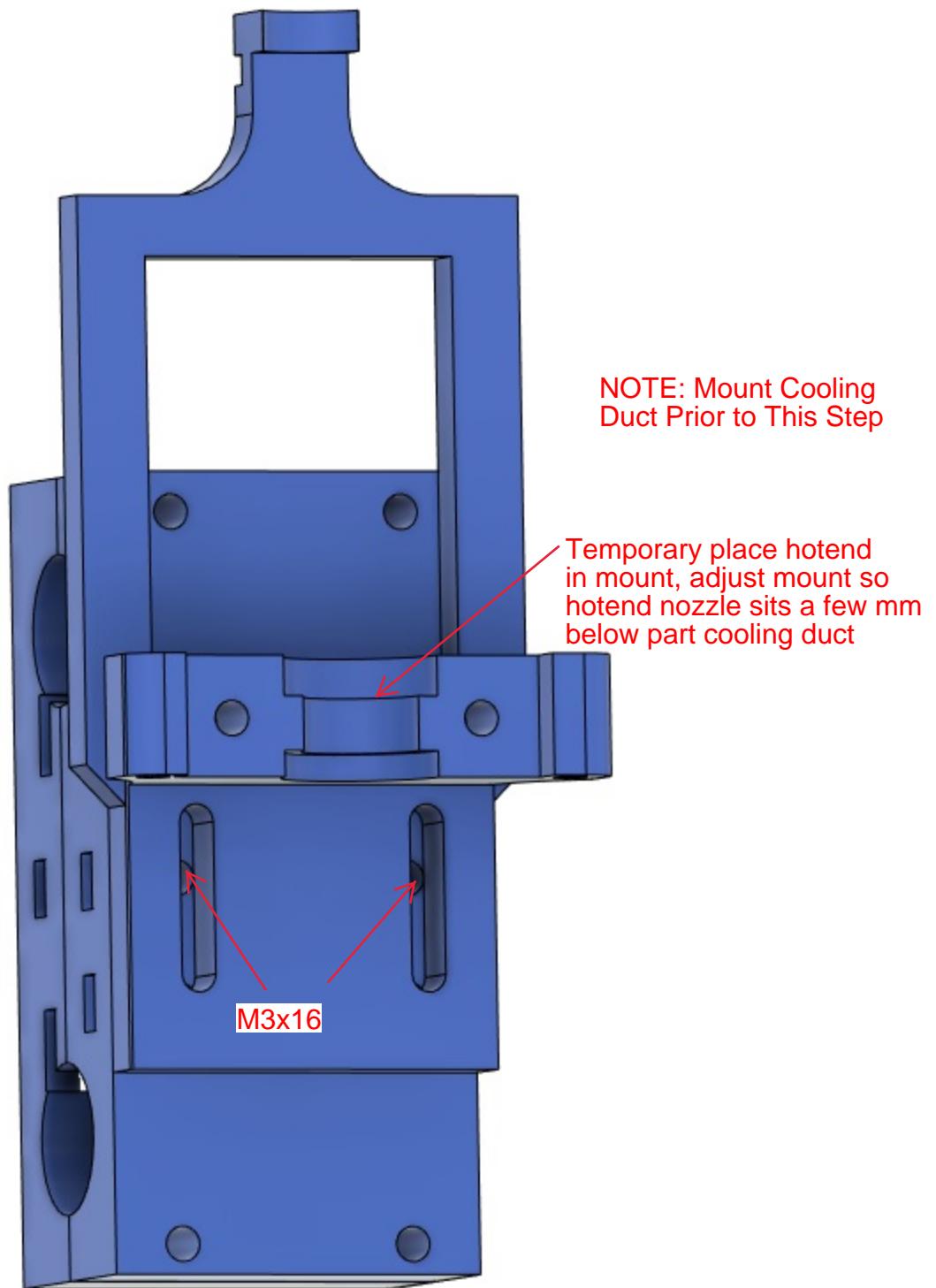
BATHT

NOTE: You will need to
bend this belt cap to install
as show here

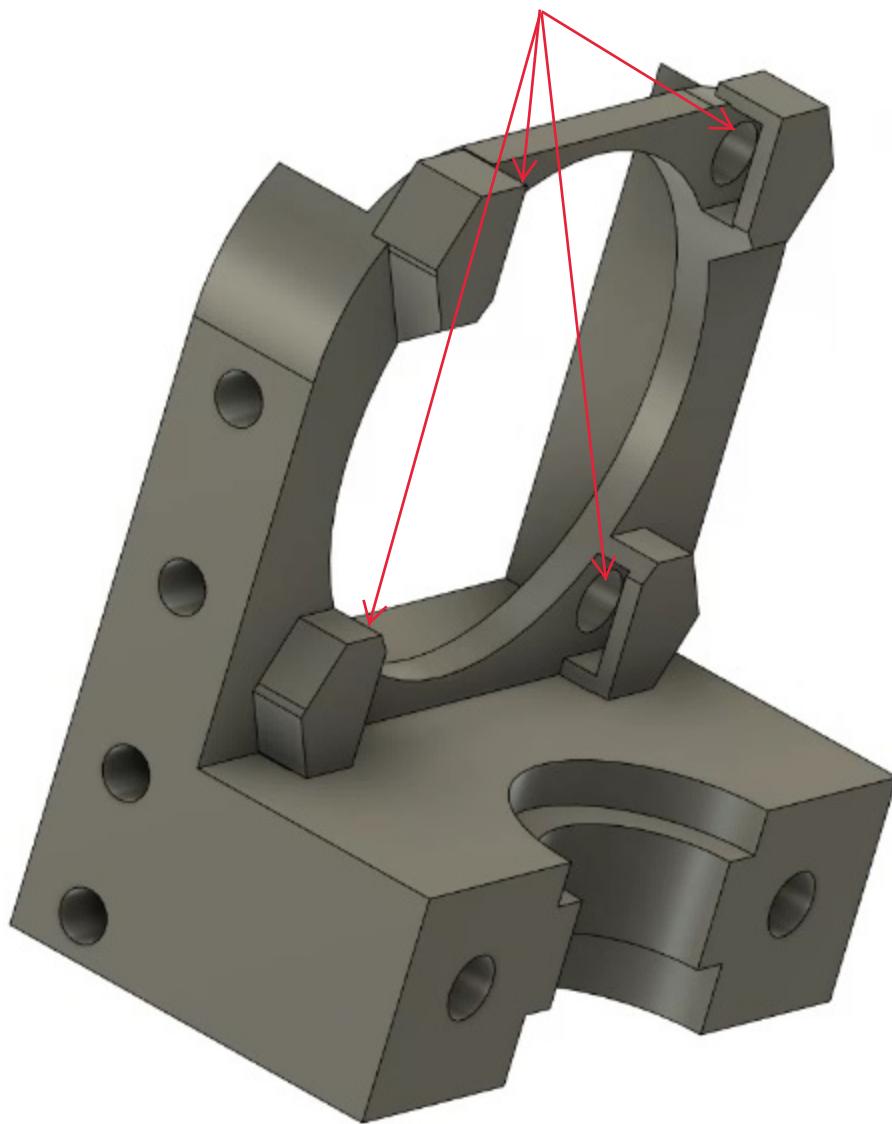
Mount 5015 Adapter with
2 M3x16 screwed into
captive M3 Nuts

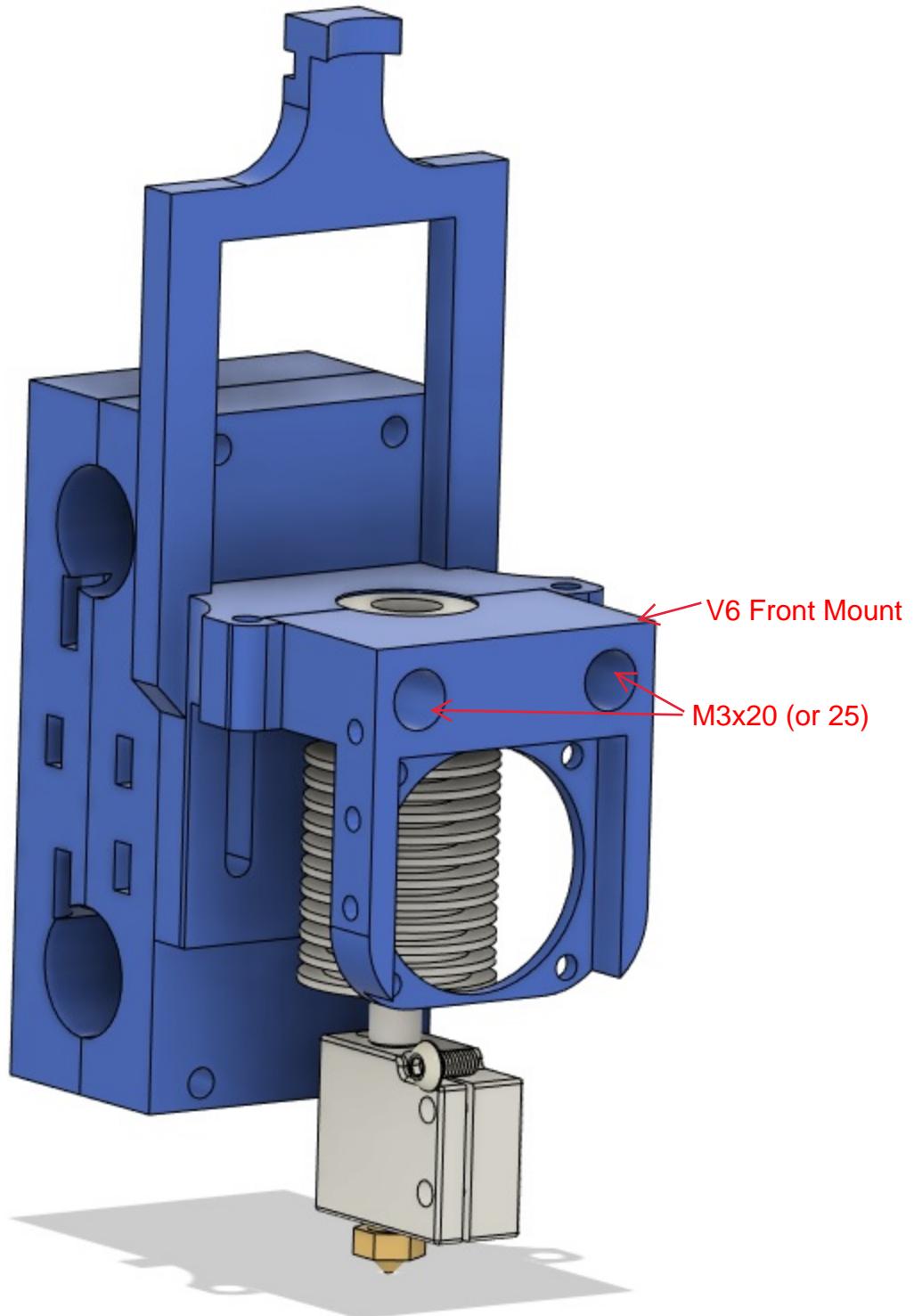


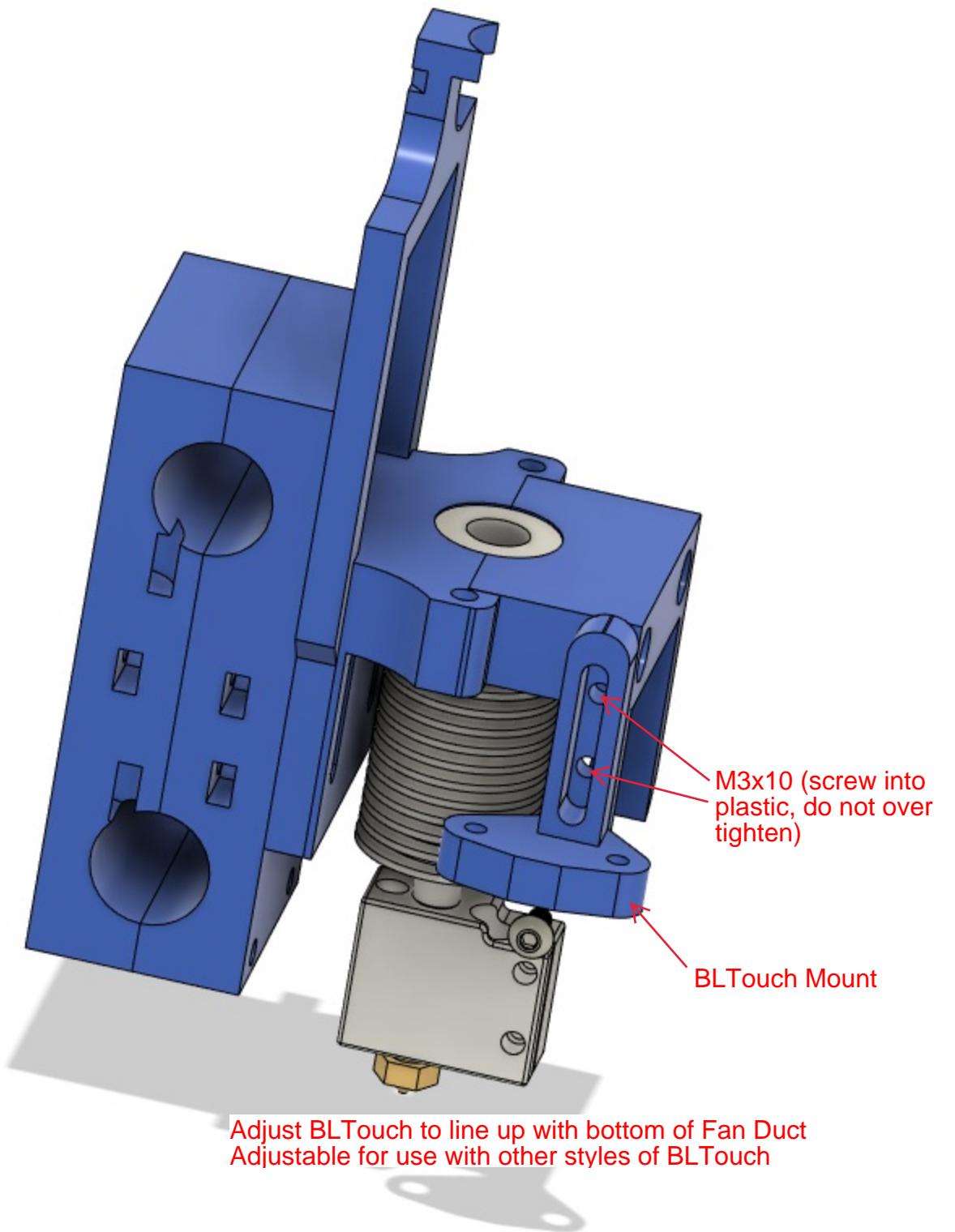
Fan duct should have some clearance from bottom of X Carriage

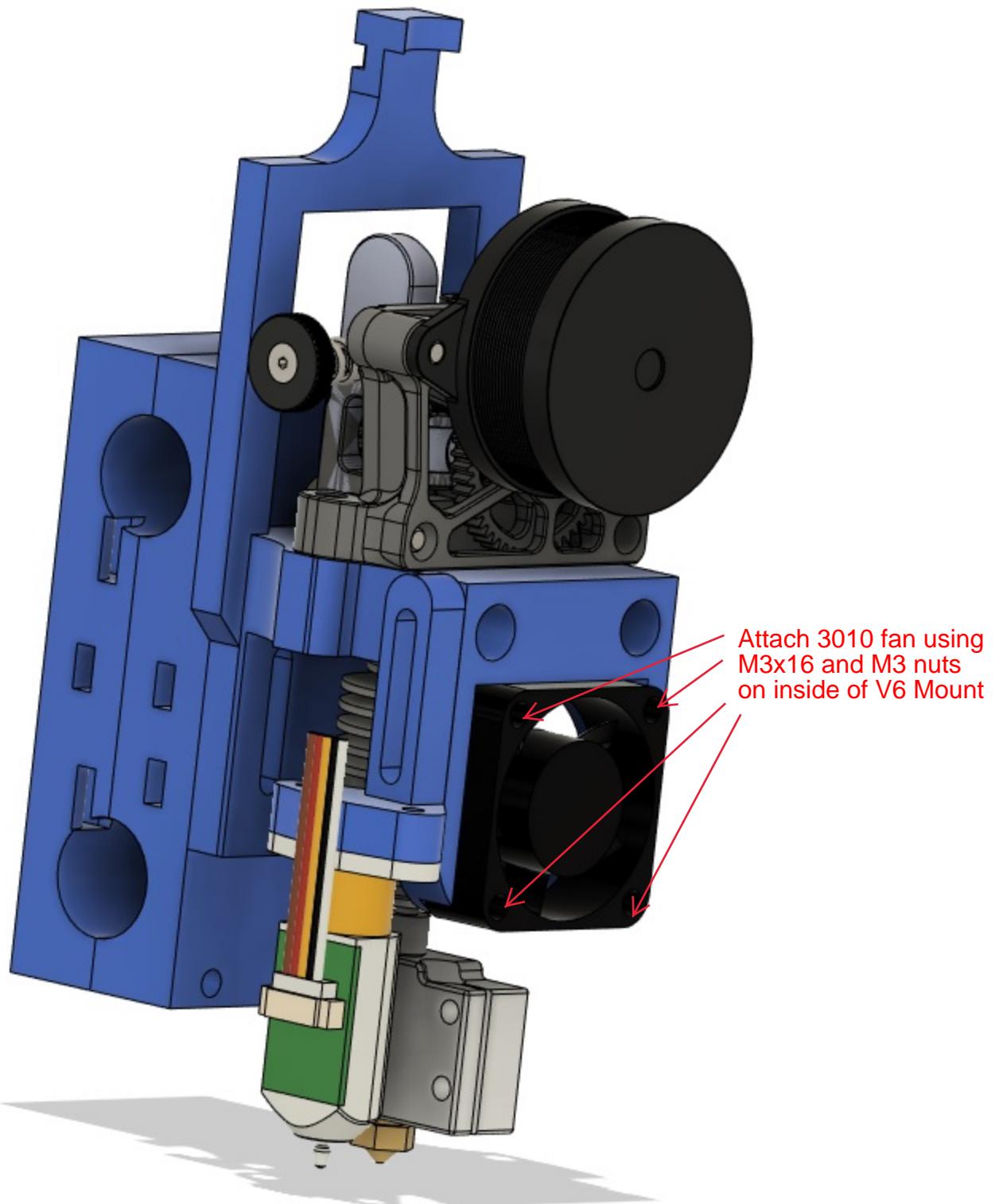


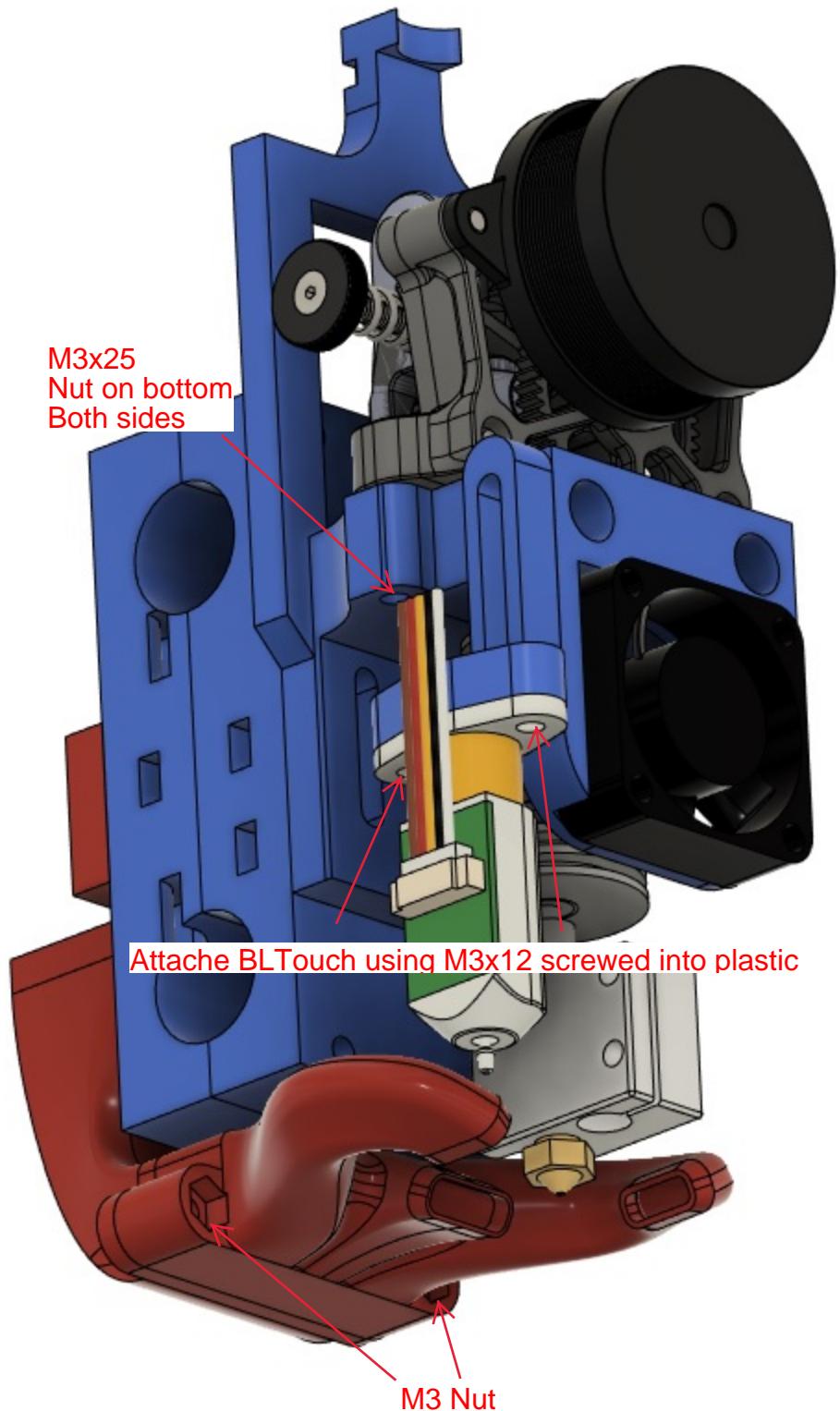
Insert captured M3 nuts prior to mounting

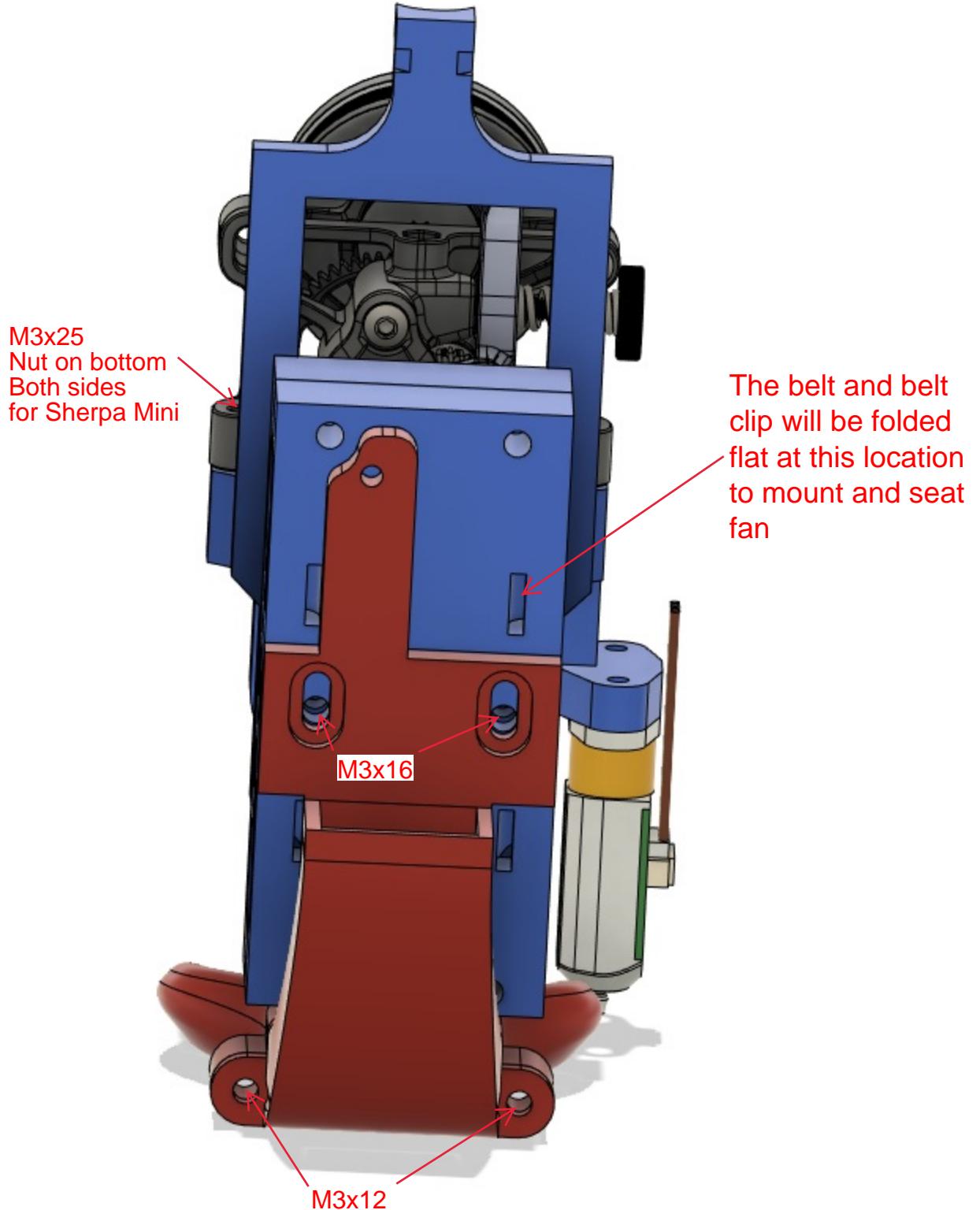


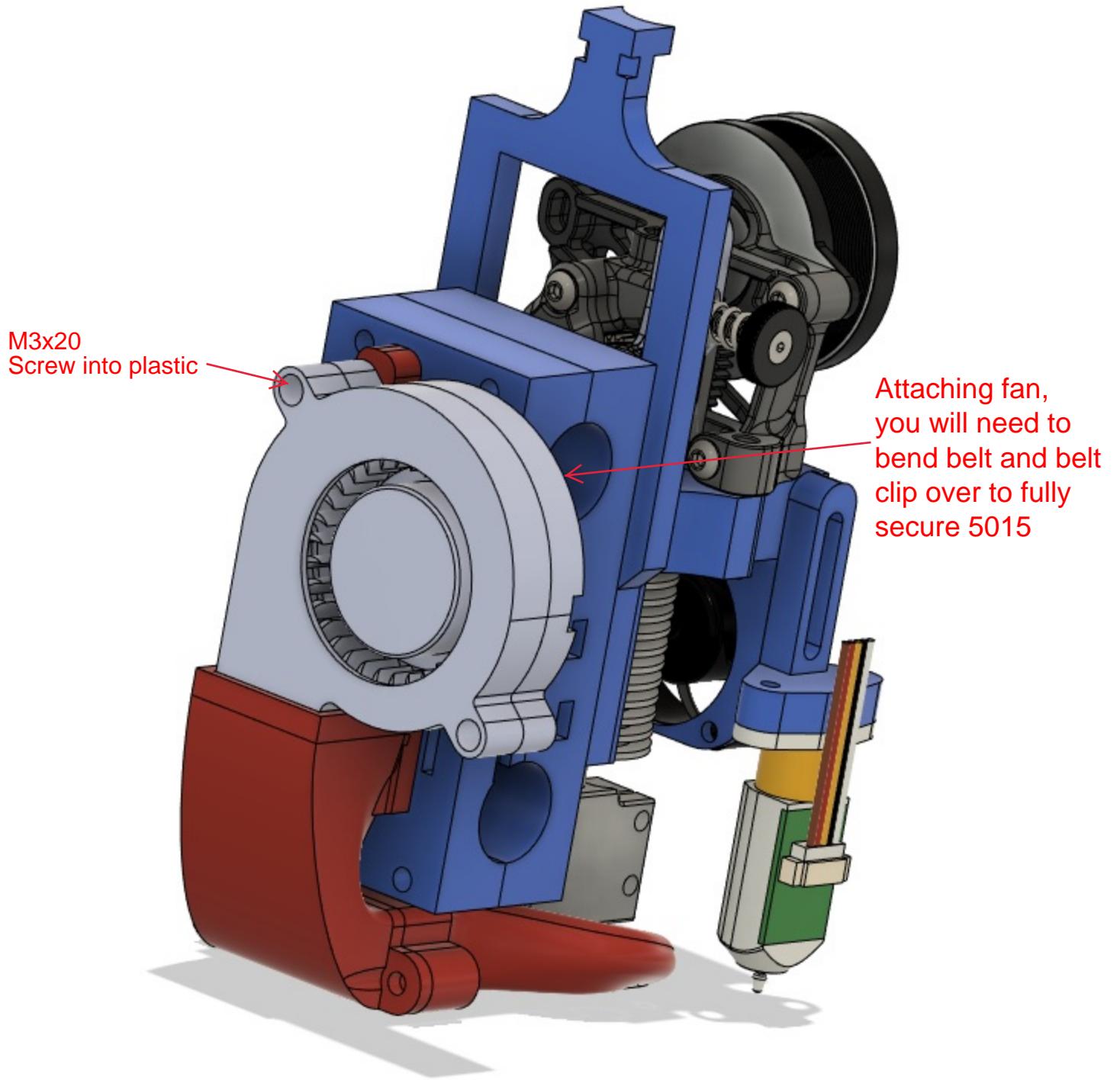












LINEAR ROD SPACERS

Shortest spacers to the back of the Y rods
and right side of X rods

Next longest spacers on left of X gantry
linear rods

After printhead is assembled,
install the linear rod spacers
by simply snapping them on
the linear rods

Longest spacers go up front of Y rods
on left and right

LINEAR ROD SPACERS

Shortest spacers to the back of the Y rods
and right side of X rods

Longest spacers go up front of Y rods
on left and right

Section 6:

Electronics Mounting

Components needed for this portion:

M5x12 (or 10) **x8**

M5 T-nut **x8**

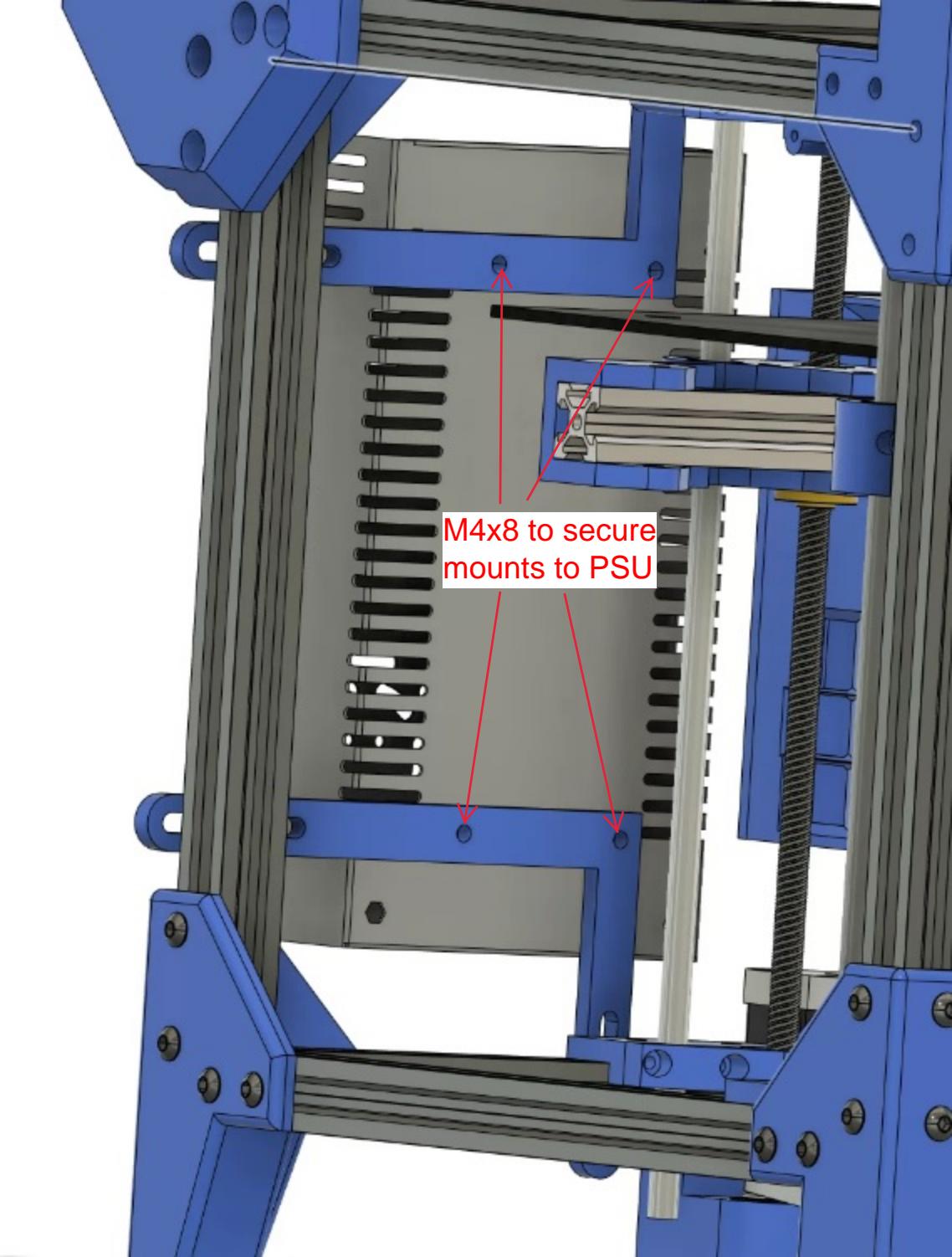
M3x8 **x2**

M4x8 **x4**

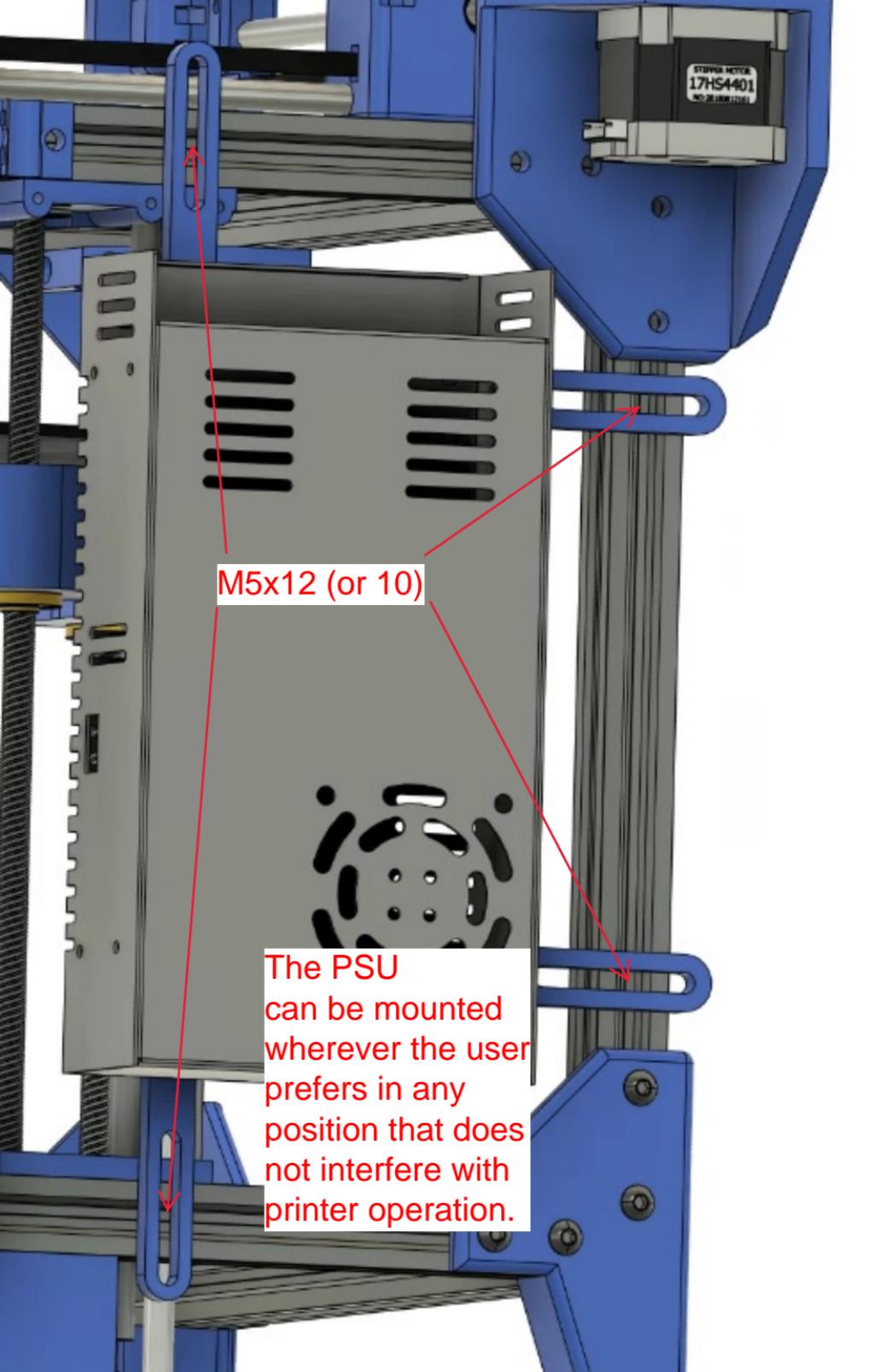
PSU

Power Rocker Switch

Electronics Backpack



M4x8 to secure
mounts to PSU

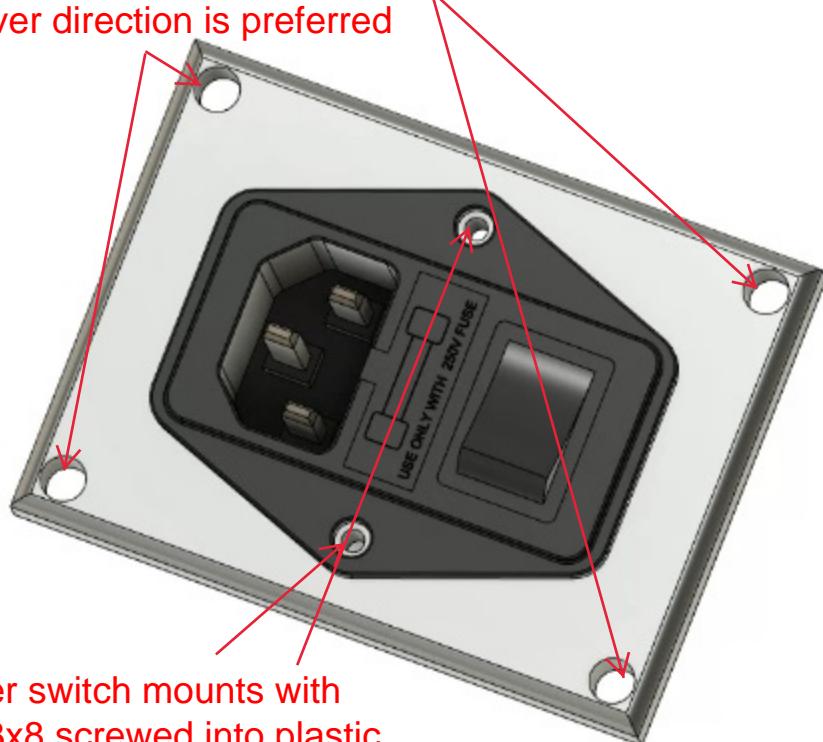


M5x12 (or 10)

The PSU
can be mounted
wherever the user
prefers in any
position that does
not interfere with
printer operation.

The electronics backpack
is designed to mount in
any configuration wherever the
user chooses and in the direction
of choice.
Install backpack prior to electronics
Mount using 2 - M5x12 (or10) with t-nuts

The rocker switch mount, like the electronics backpack is designed to mount in the location of the users choosing so long as it does not interfere with printer operation. It attaches using 2 - M5x12 (or 10) with t-nuts facing whichever direction is preferred



Rocker switch mounts with
2 - M5x12 screwed into plastic

Section 7:

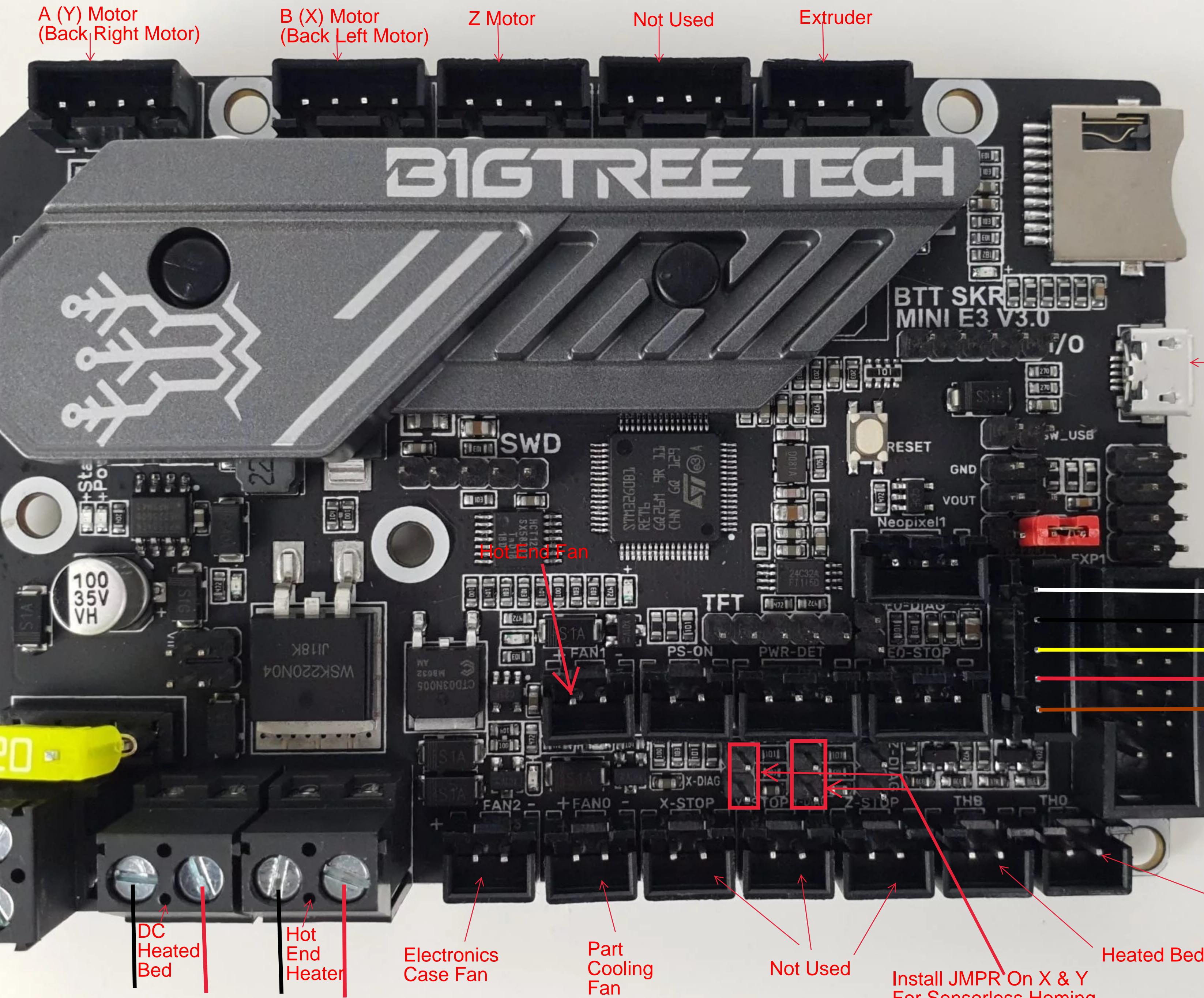
Mainboard Wiring Diagram

Components needed for this portion:

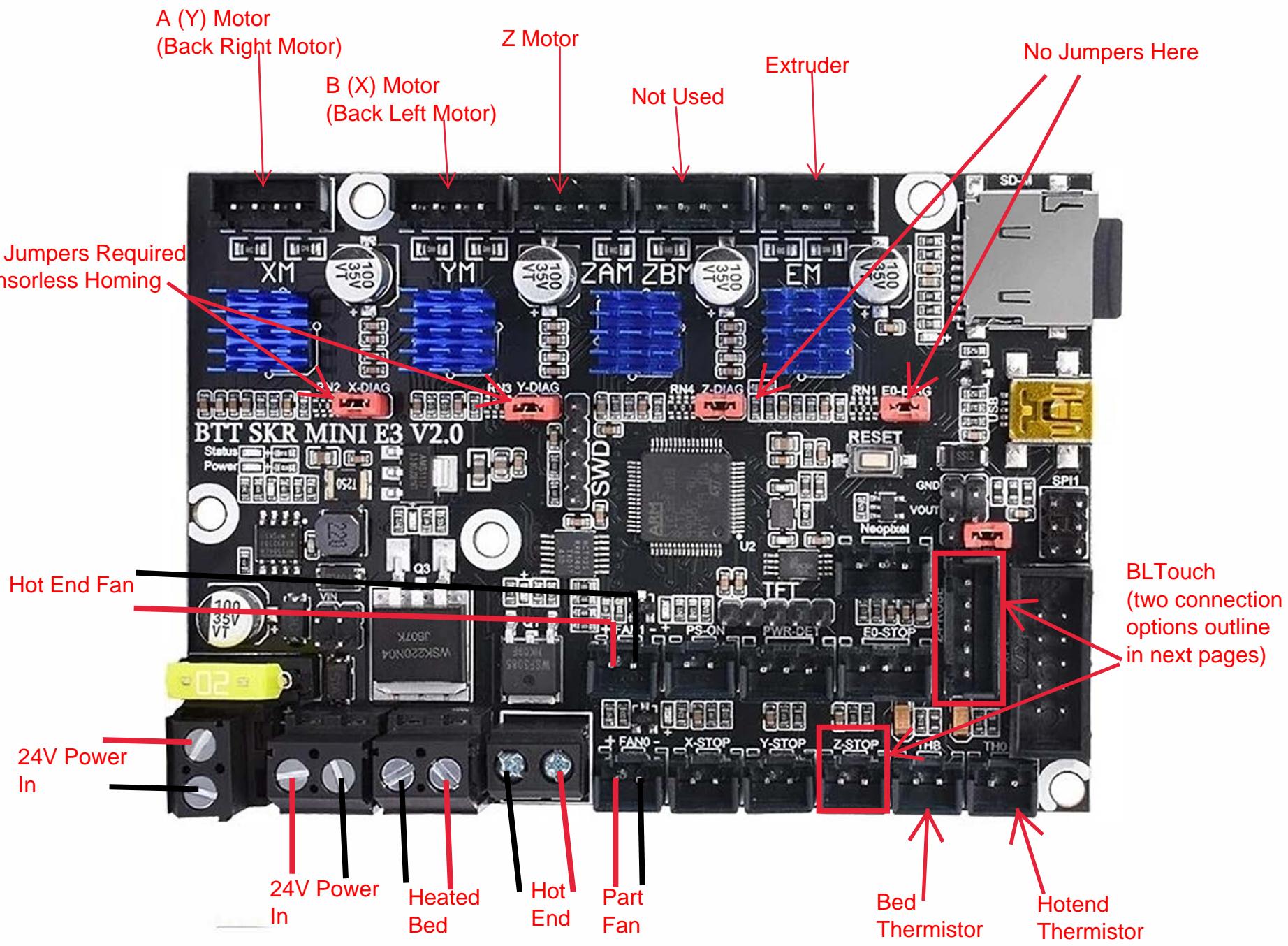
Bigtreetech SKR Mini E3 V3

OR

Bigtreetech SKR Mini E3 V2

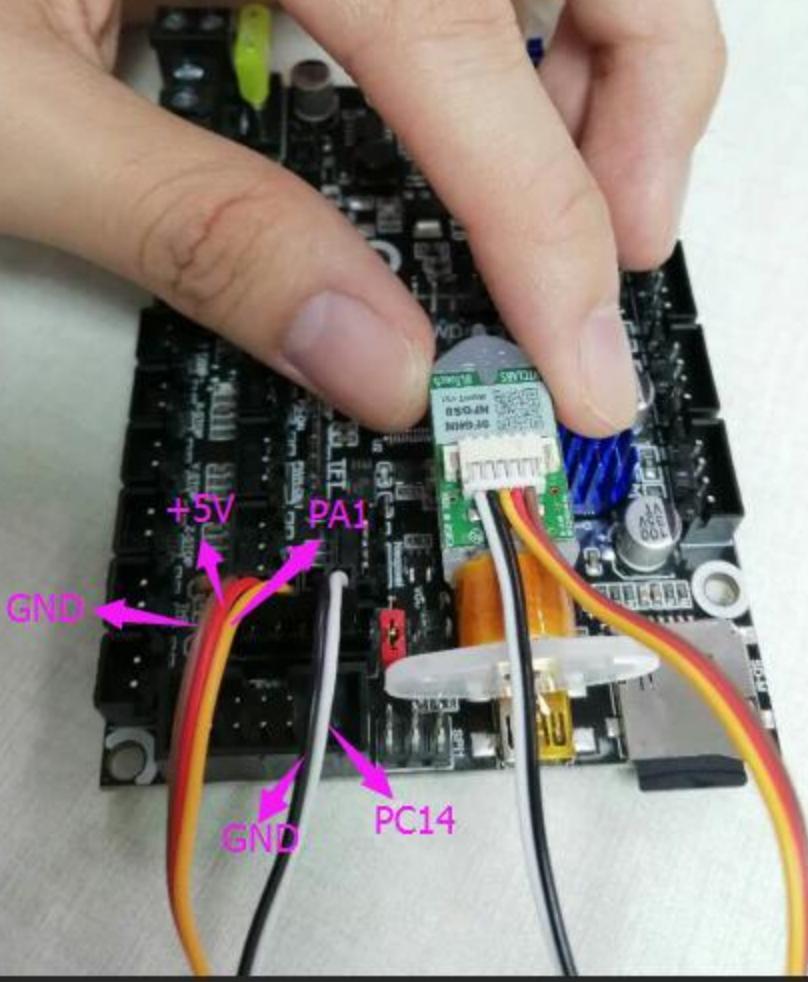


Bigtreetech SKR Mini
E3V3

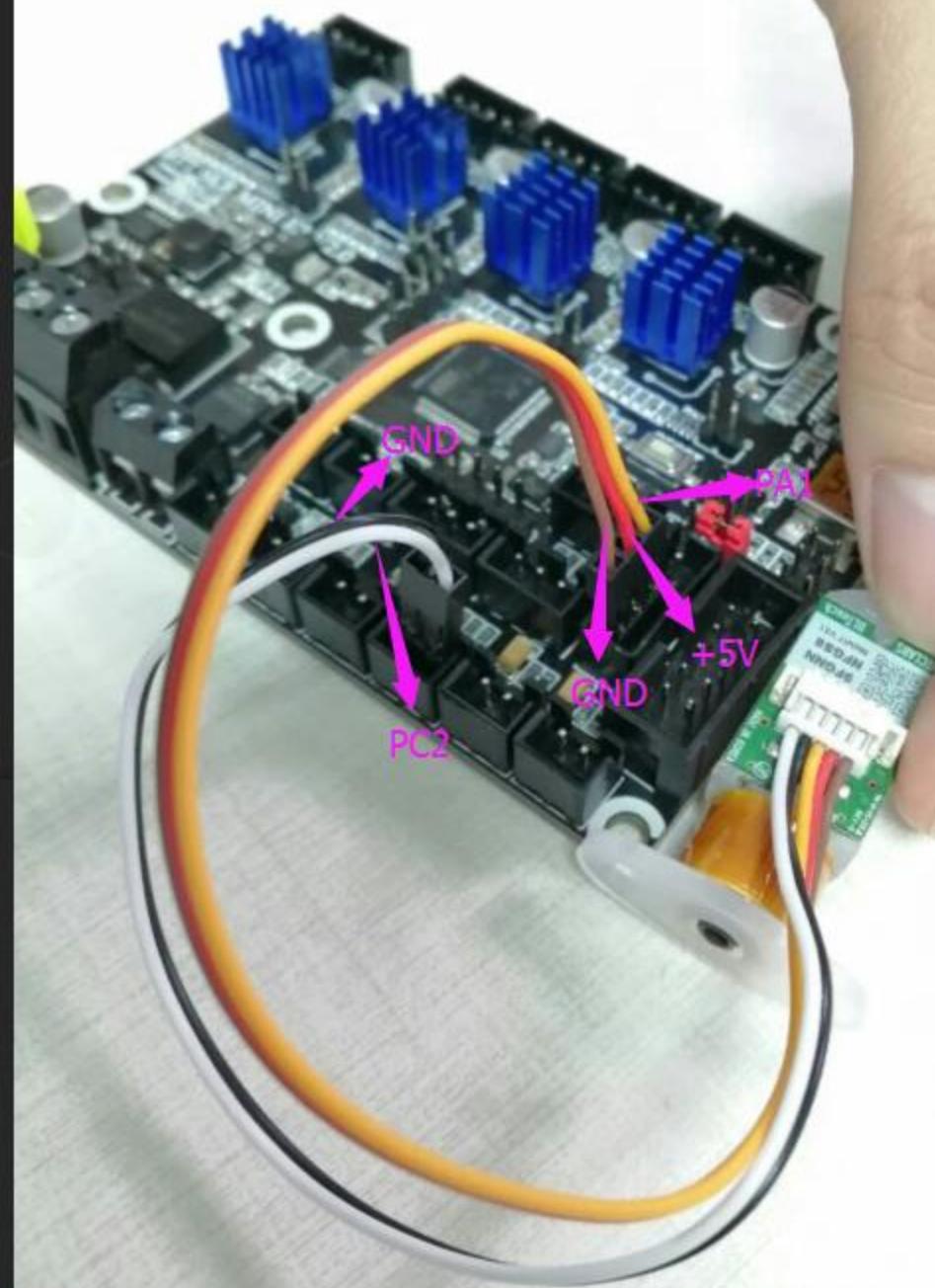


Bigtreetech SKR Mini E3V2

BLTouch/3Dtouch Option 1



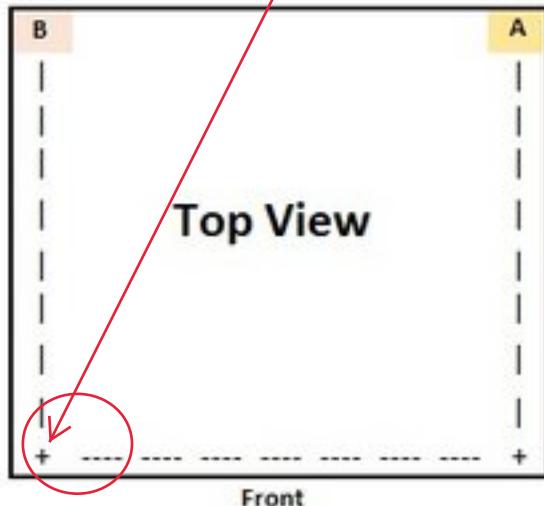
BLTouch/3Dtouch Option 2



Print head should home to here

When Home_All, X will home first to the left, Then Y will home to the front, any deviation of this is incorrect. If deviation from this, it is either Dir_pin or swapped motors.

Visual Motor Configuration Guide

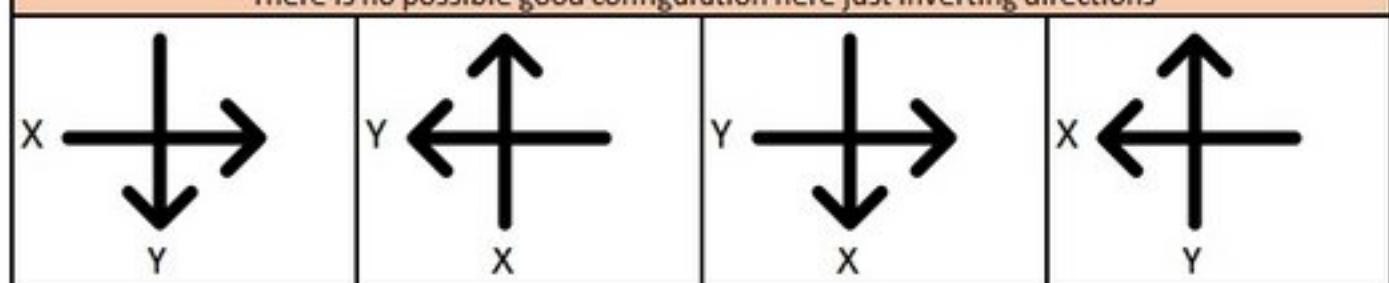


You can invert the direction of a motor by turning its connector 180 degrees or toggling the inverted flag (!) for the motor in the firmware. The arrows indicate the positive direction for move commands.

Motor B	Motor A	Motor B	Motor A	Motor B	Motor A	Motor B	Motor A
OK	OK	OK	Inverted	Inverted	OK	Inverted	Inverted

Motors are swapped, swap X and Y connectors

There is no possible good configuration here just inverting directions



Section 8:

Pi Setup and Firmware Install

Components needed for this portion:

Micro SD for Pi, and Micro SD for Firmware Flash

Computer and Micro SD Reader for Computer

Internet Access

While I'm sure everyone would love to read 100 or more pages on this, please just use the following YouTube setup guide to walk you through the process of Klipper on your Pi, and flashing your mainboard:

https://www.youtube.com/watch?v=FjMZzW_WVQ8

Section 9:

Initial Startup

Components needed for this portion:

Completed Printer, Pi setup and operational, and you PC

[**https://gadgetangel.org/build/startup/index#initial-startup-checks**](https://gadgetangel.org/build/startup/index#initial-startup-checks)

Yes, another link.... Why, because Voron has done an excellent job laying out the information in a step by step fashion for easy initial startup. PLEASE NOTE: The Voron guide calls to PID tune your bed to 100c, this is not recommended. Recommended PID tuning temps are 60c for the bed, and 220c for the hotend. Outside of that, please follow the Voron guide.

Once the operation is confirmed and operational, use the following link to perfectly tune your new 3d corexy printer.

[**https://ellis3dp.com/Print-Tuning-Guide/**](https://ellis3dp.com/Print-Tuning-Guide/)

LAST PAGE!!!!

Congratulations!

You now have completed your BugBu, and are hopefully getting great prints, at fast speeds, and smiling ear to ear!

If you made it this far, and you thought the information was informative and the project was fun, please consider donating.... SOME OF YOUR TIME.... Helping others get the same enjoyment.

Remember, we are a community built upon a foundation of experimentation and idea sharing, so please consider helping others on their journey, and always know, no one began as a professional, and everyone including me and you started at the beginning as the annoying new guy. So please also be respectful.

Sincerely,

Rolls17, Chewy2420, & Computermedic78