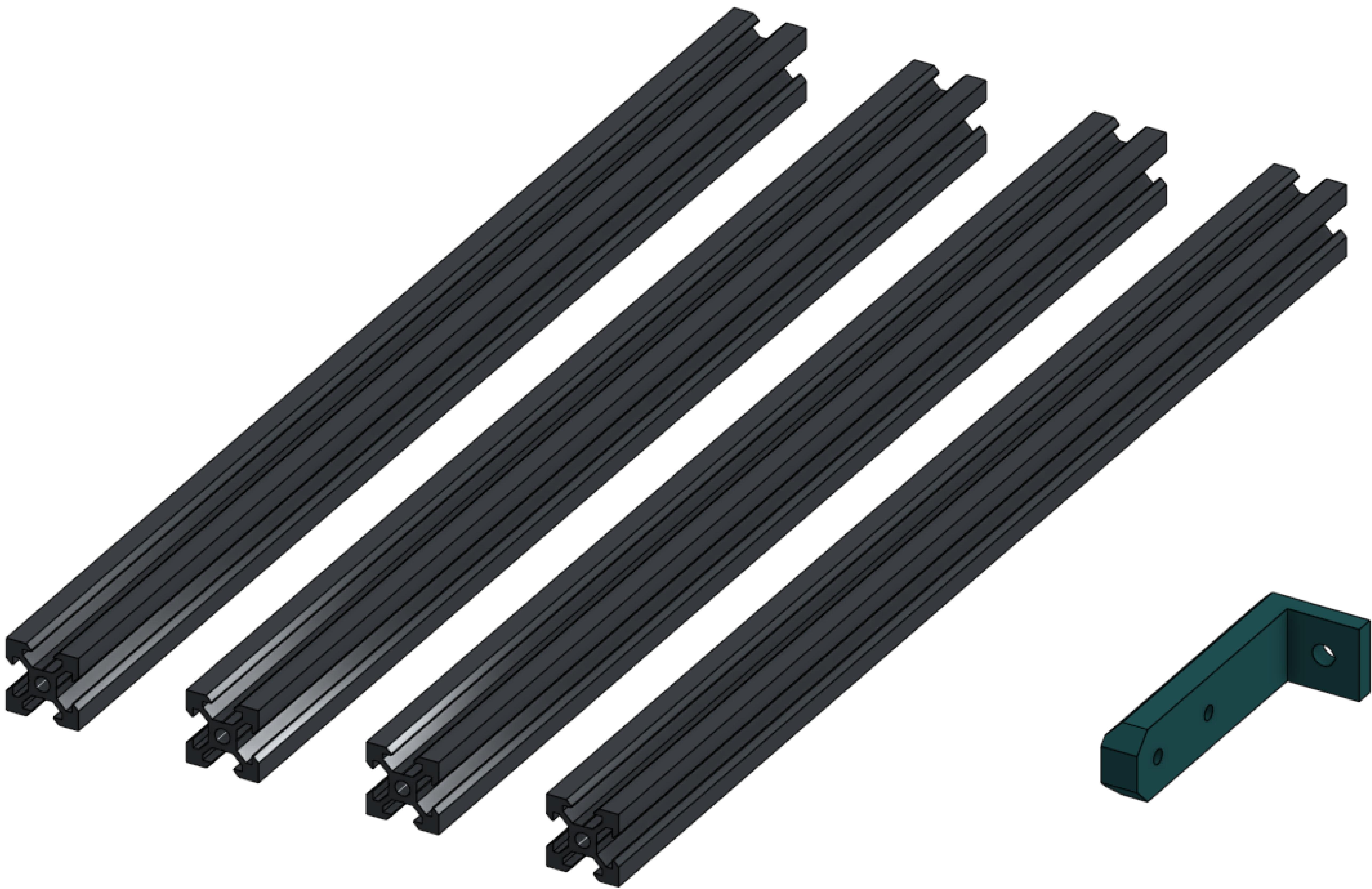
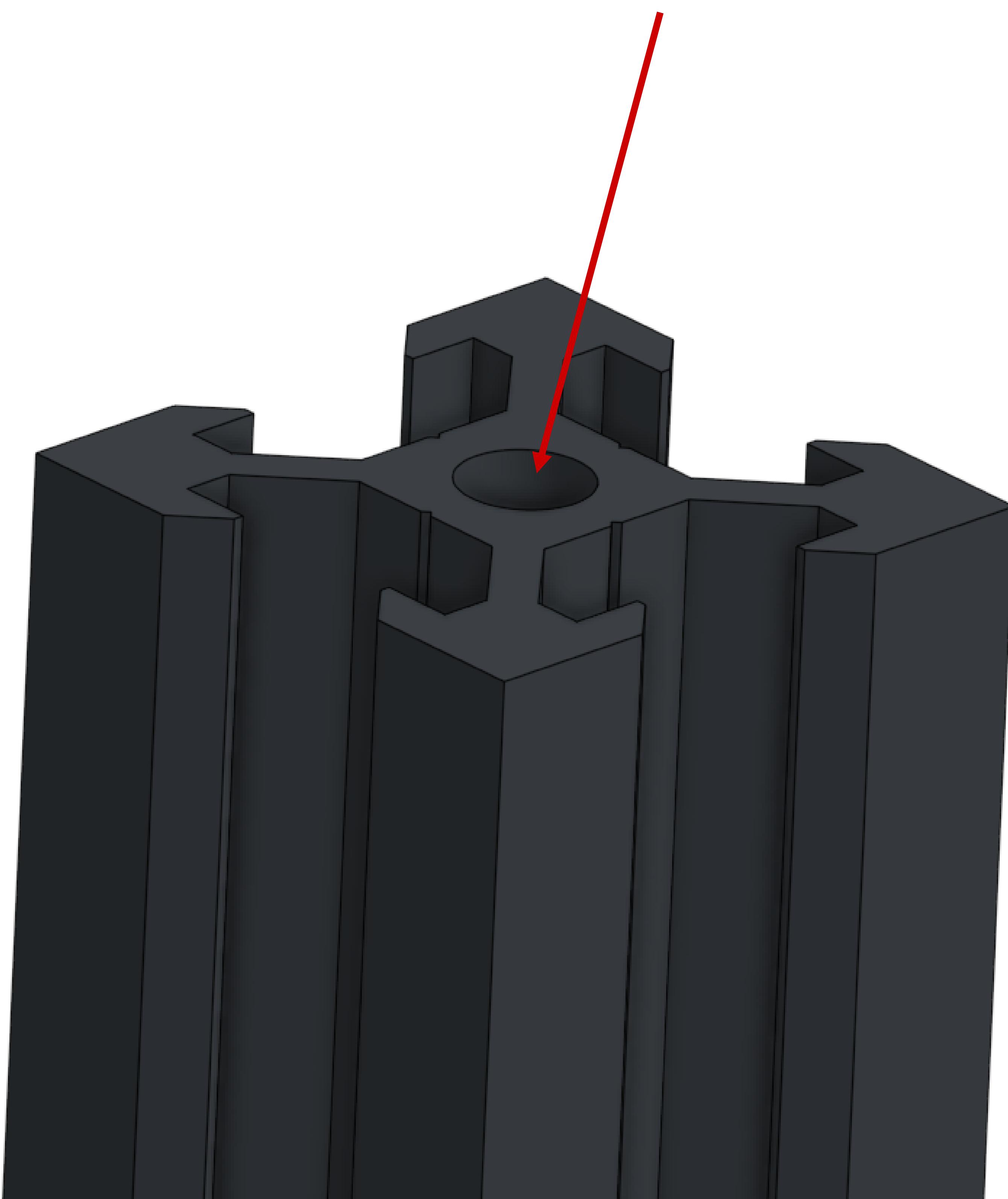
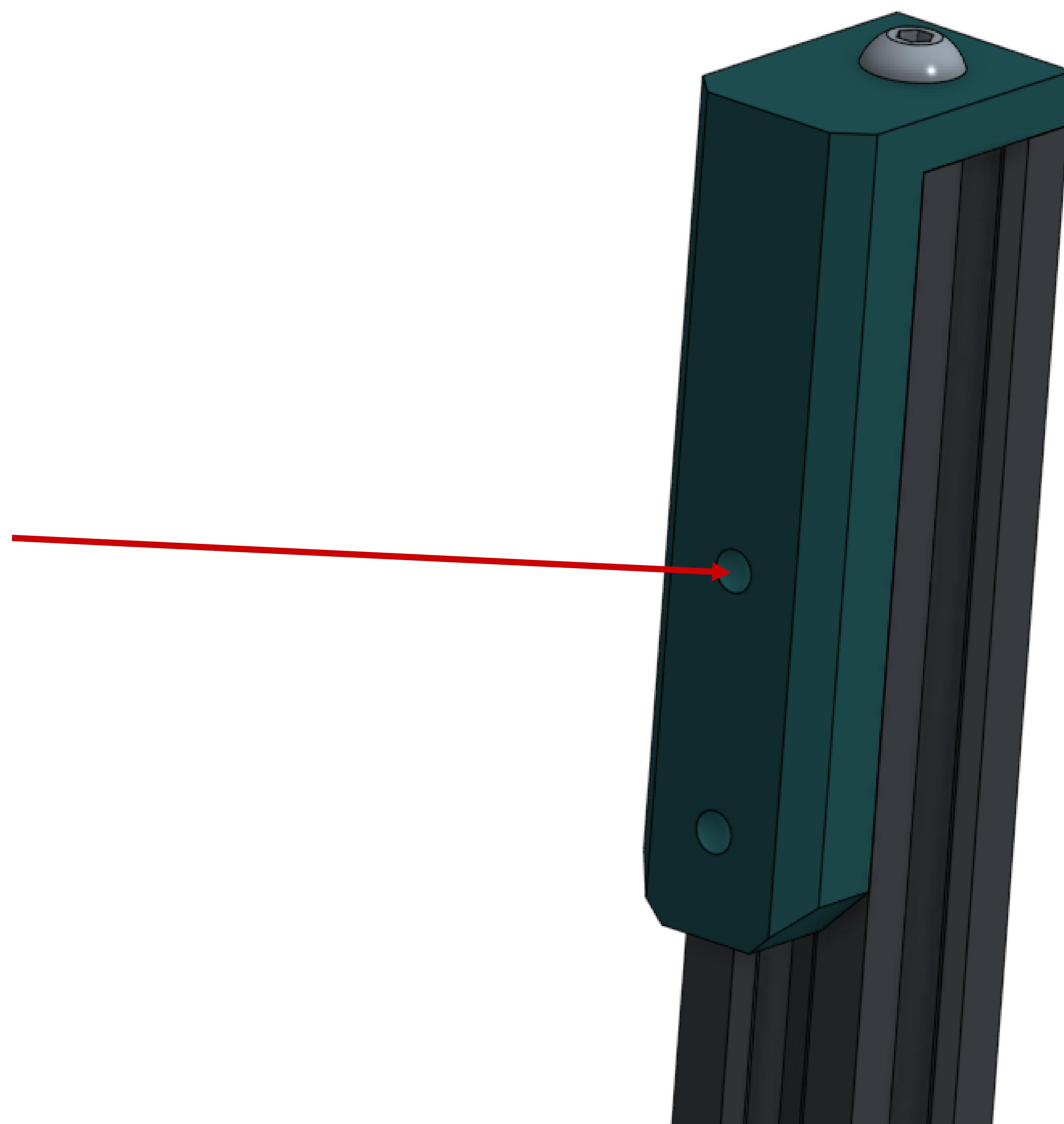

You're going to need to prep 4 extrusions before use. Find them, an M5 tap, a 3mm drill bit, and the drill jig.



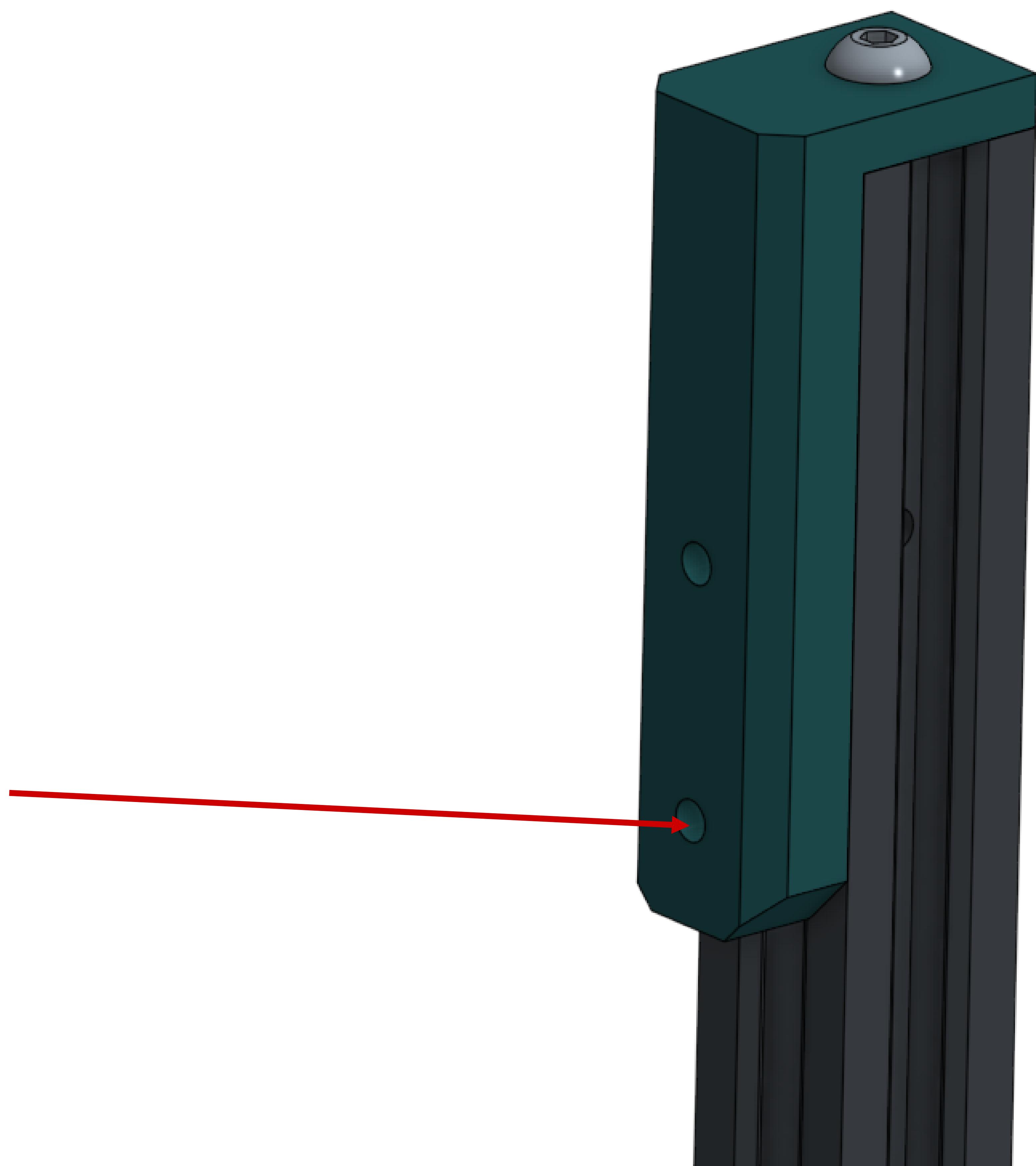
Tap the hole at the end. Repeat for the other 3.



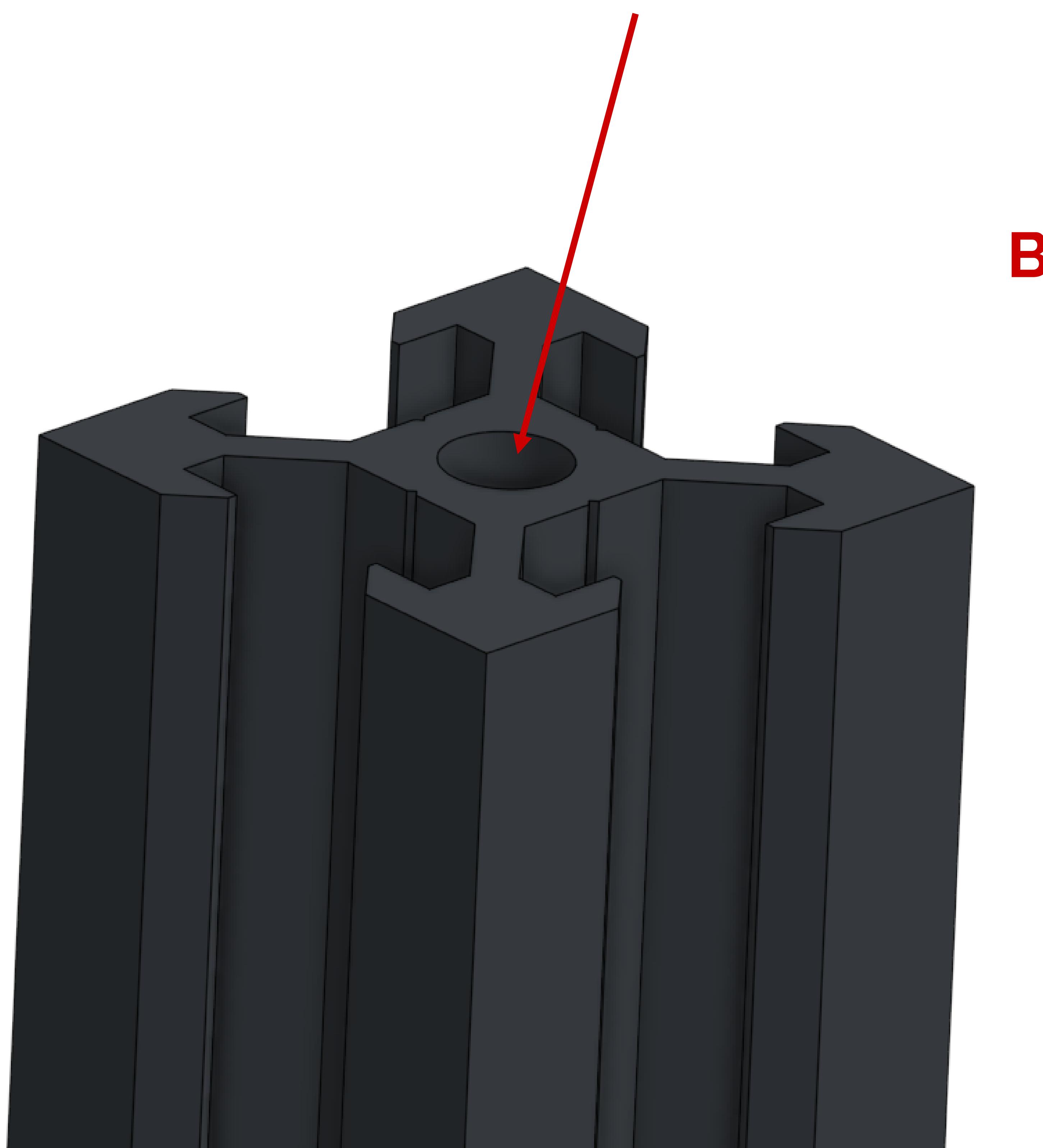
Attach the jig to the end of an extrusion and drill a hole using the top hole of the jig. Repeat for the other 3.



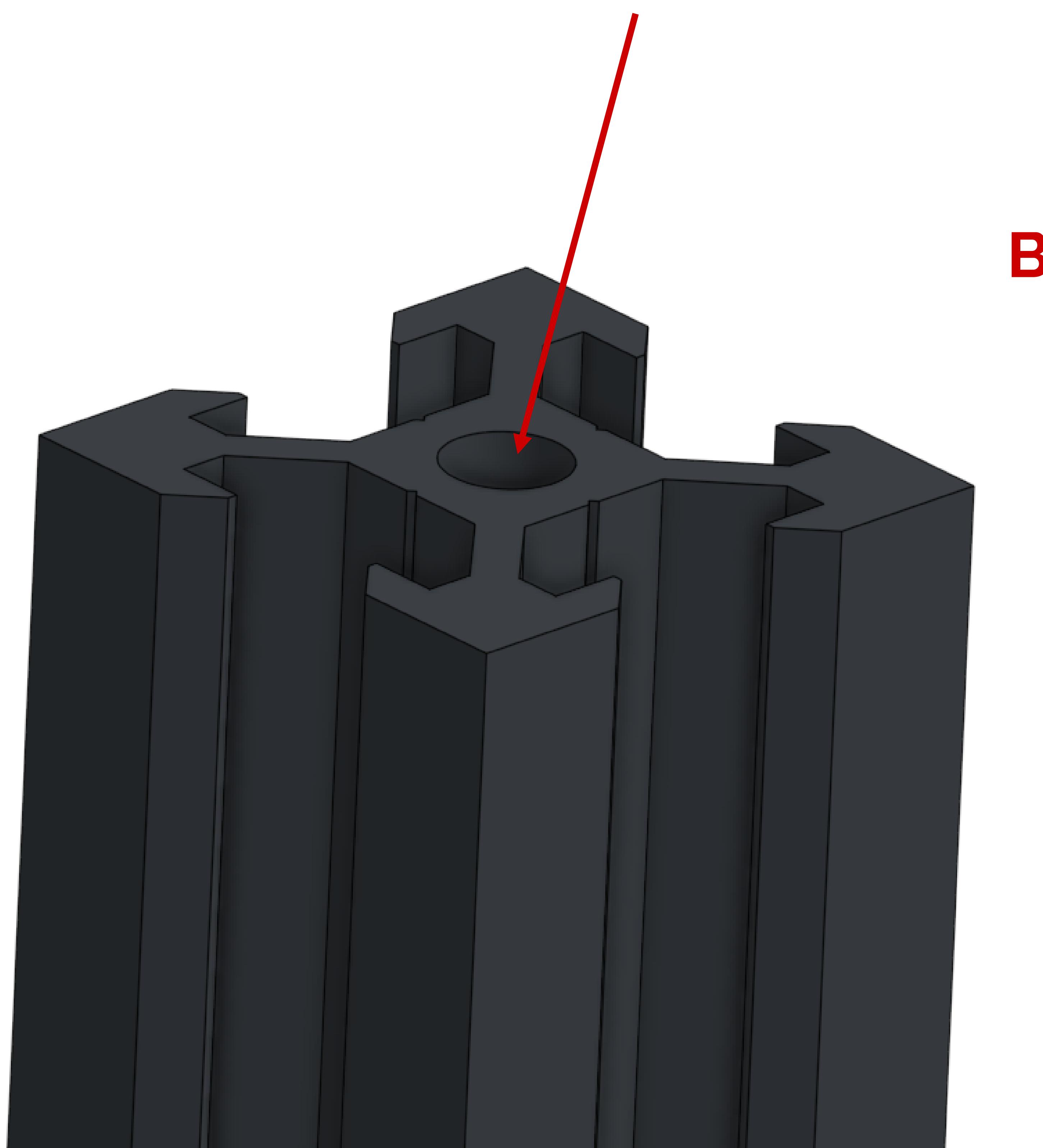
Attach the jig again at a 90 degree offset and drill through the bottom hole. Repeat for all 3.



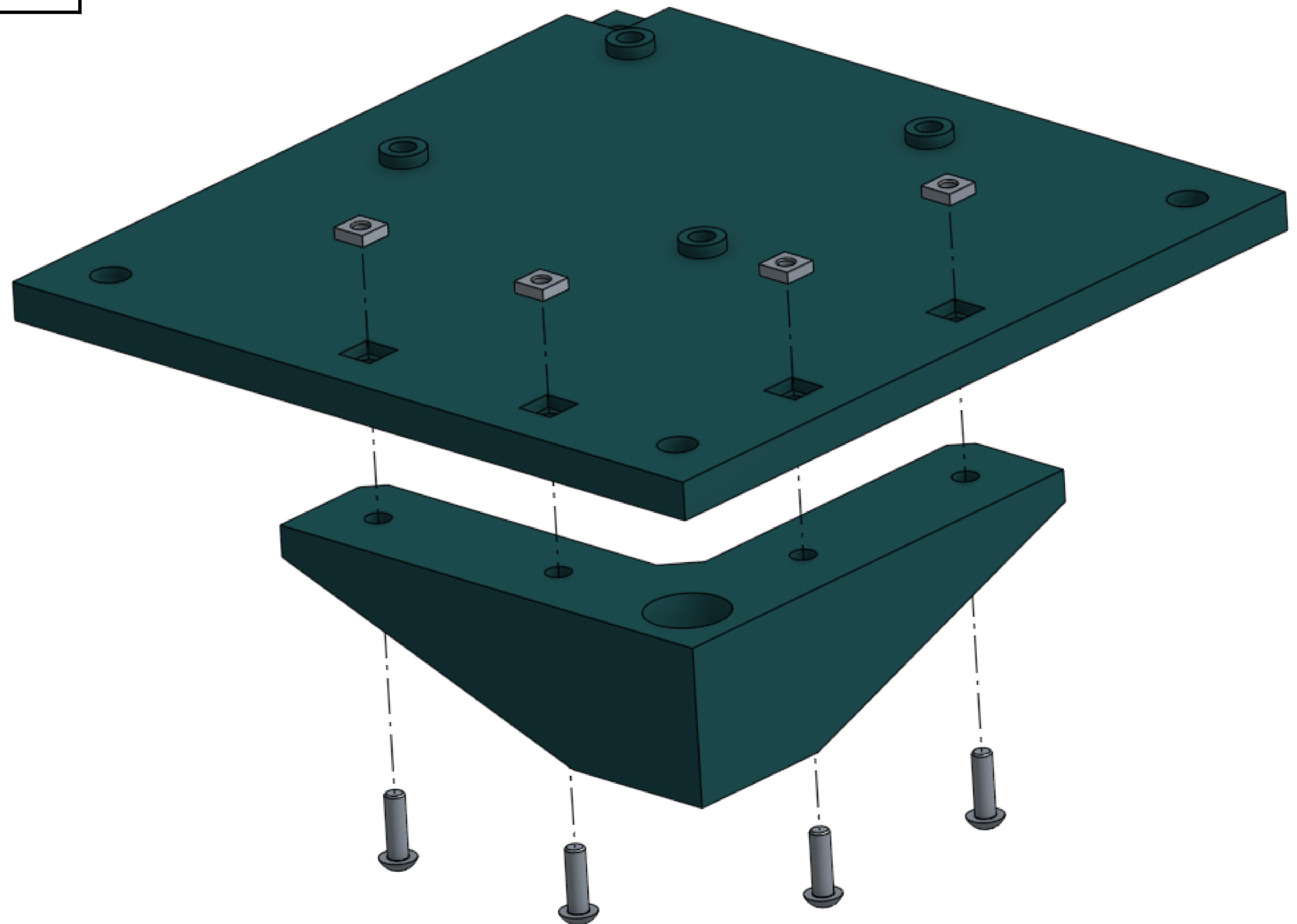
Mark 2 of your extrusions as "B" extrusions. The other 2 will be "A" extrusions. Take the B extrusions and tap the bottom holes.



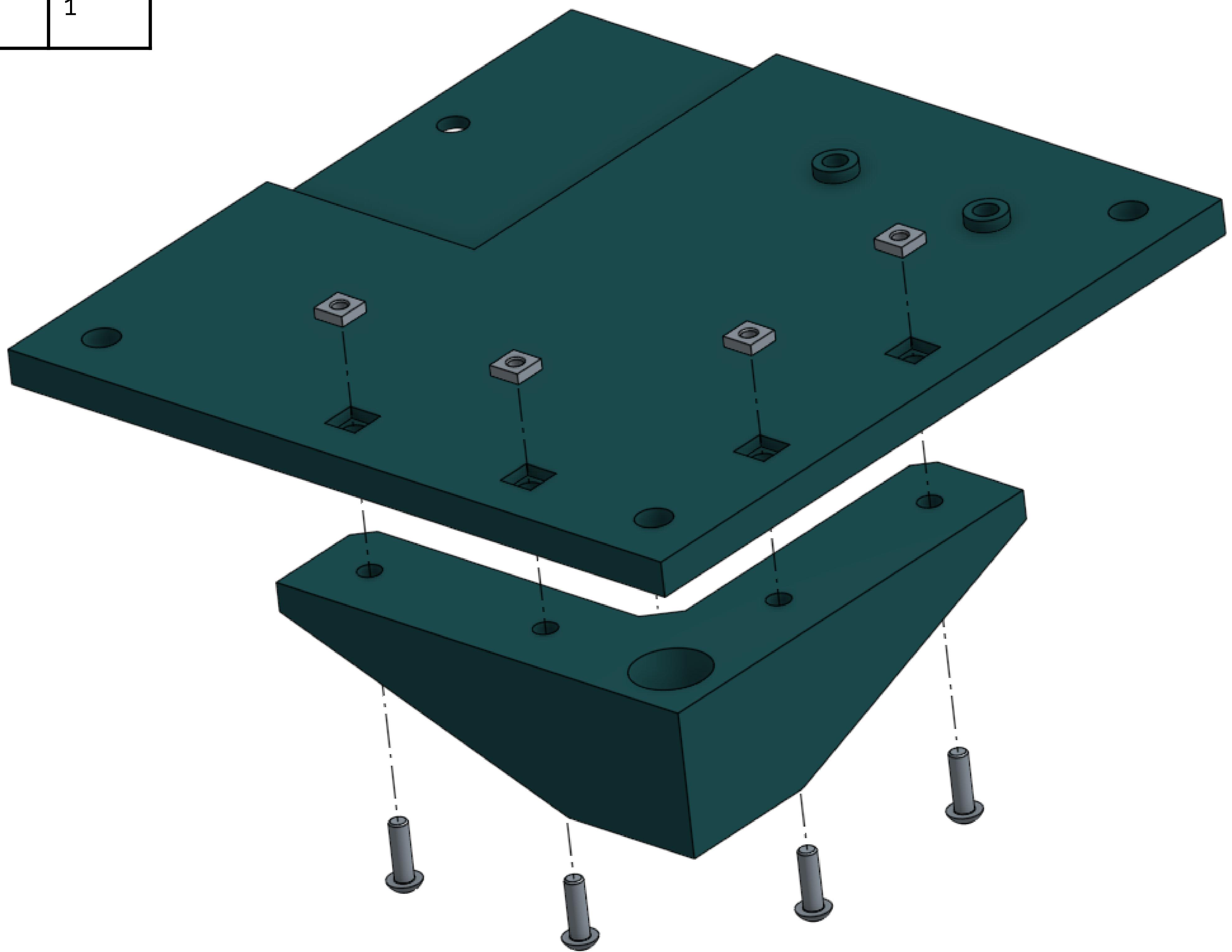
Mark 2 of your extrusions as "B" extrusions. The other 2 will be "A" extrusions. Take the B extrusions and tap the bottom holes.



M3 square nut	4
M3x10 screw	4
Rear left bottom plate	1
Rear foot	1



M3 square nut	4
M3x10 screw	4
Rear right bottom plate	1
Rear foot	1



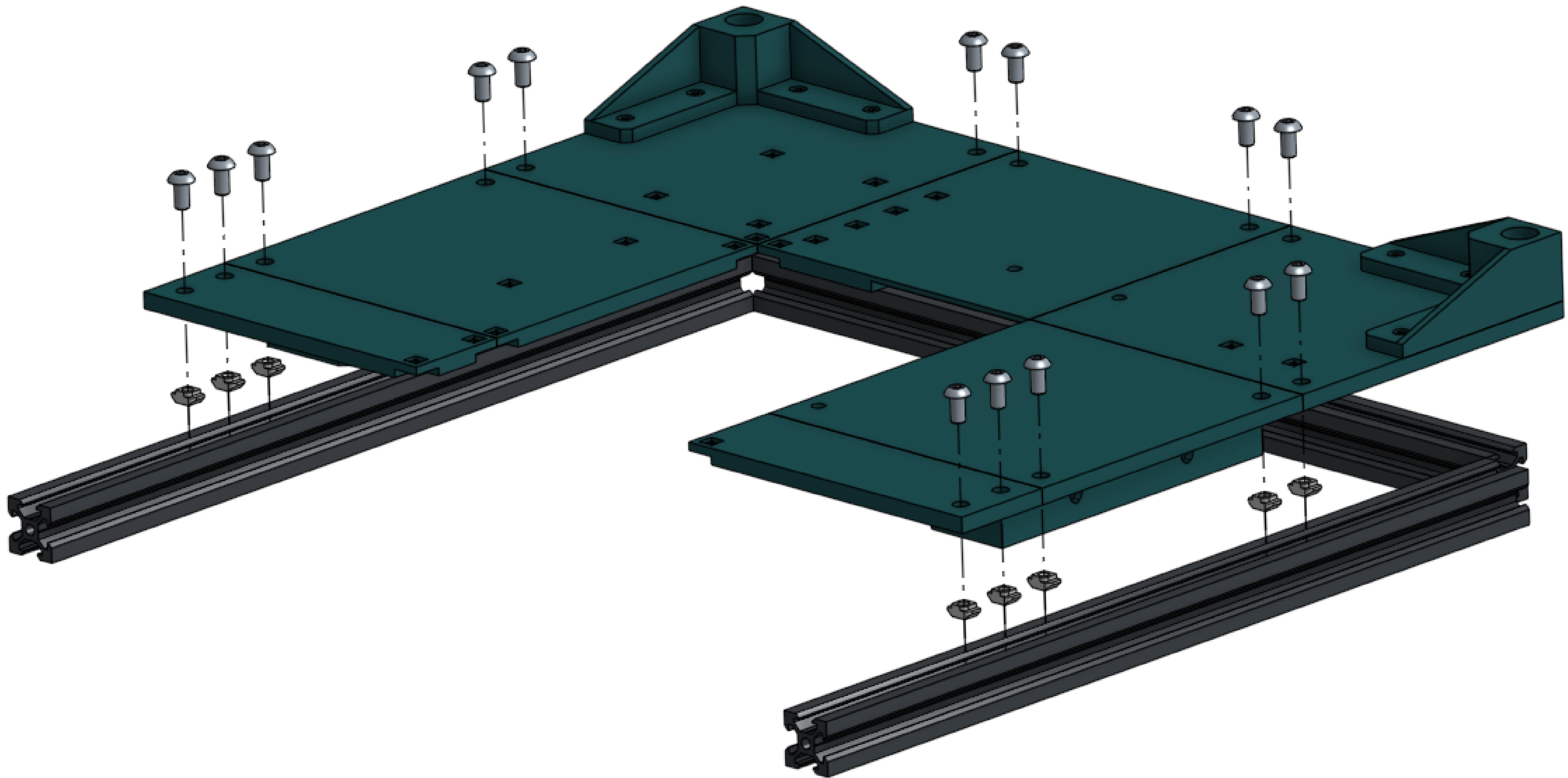
2020 extrusion

4

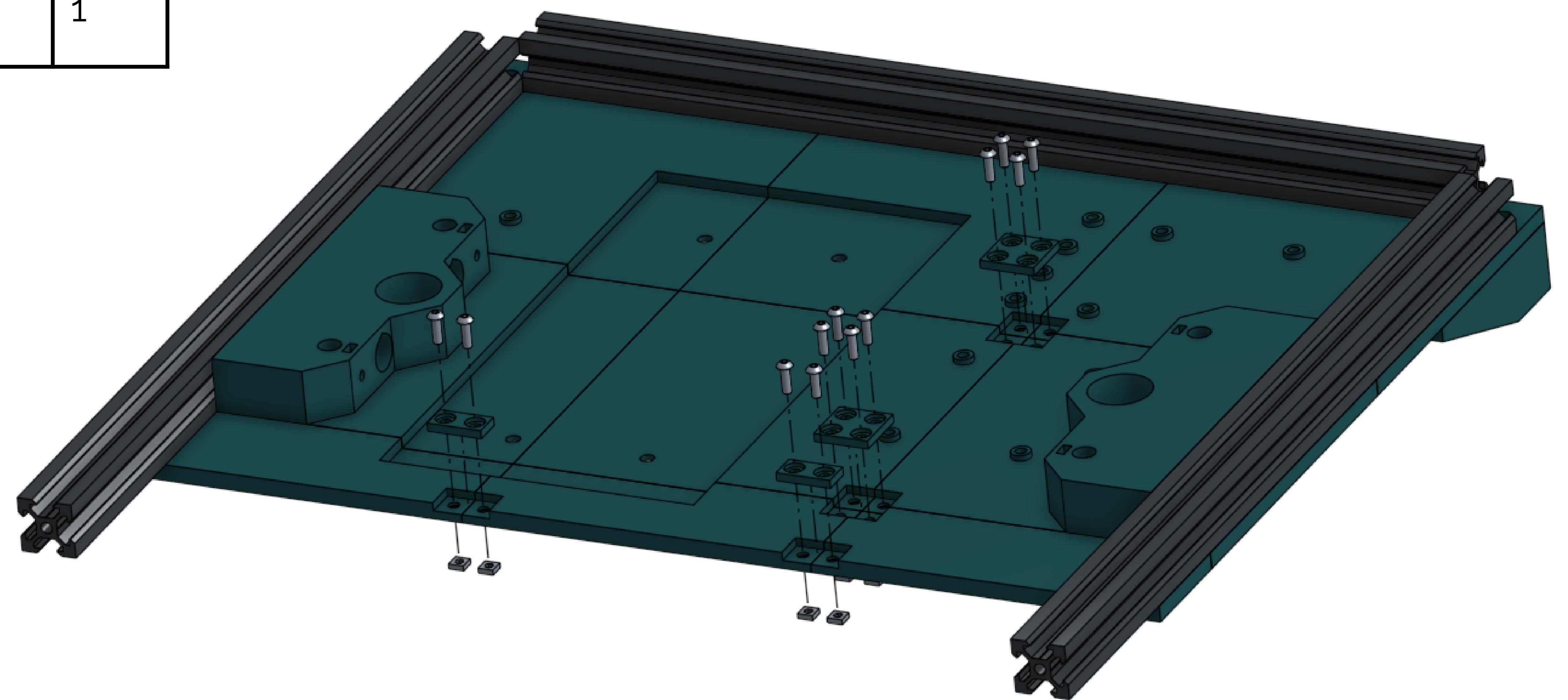
Arrange 3 extrusions edge to edge on a flat surface in this orientation.



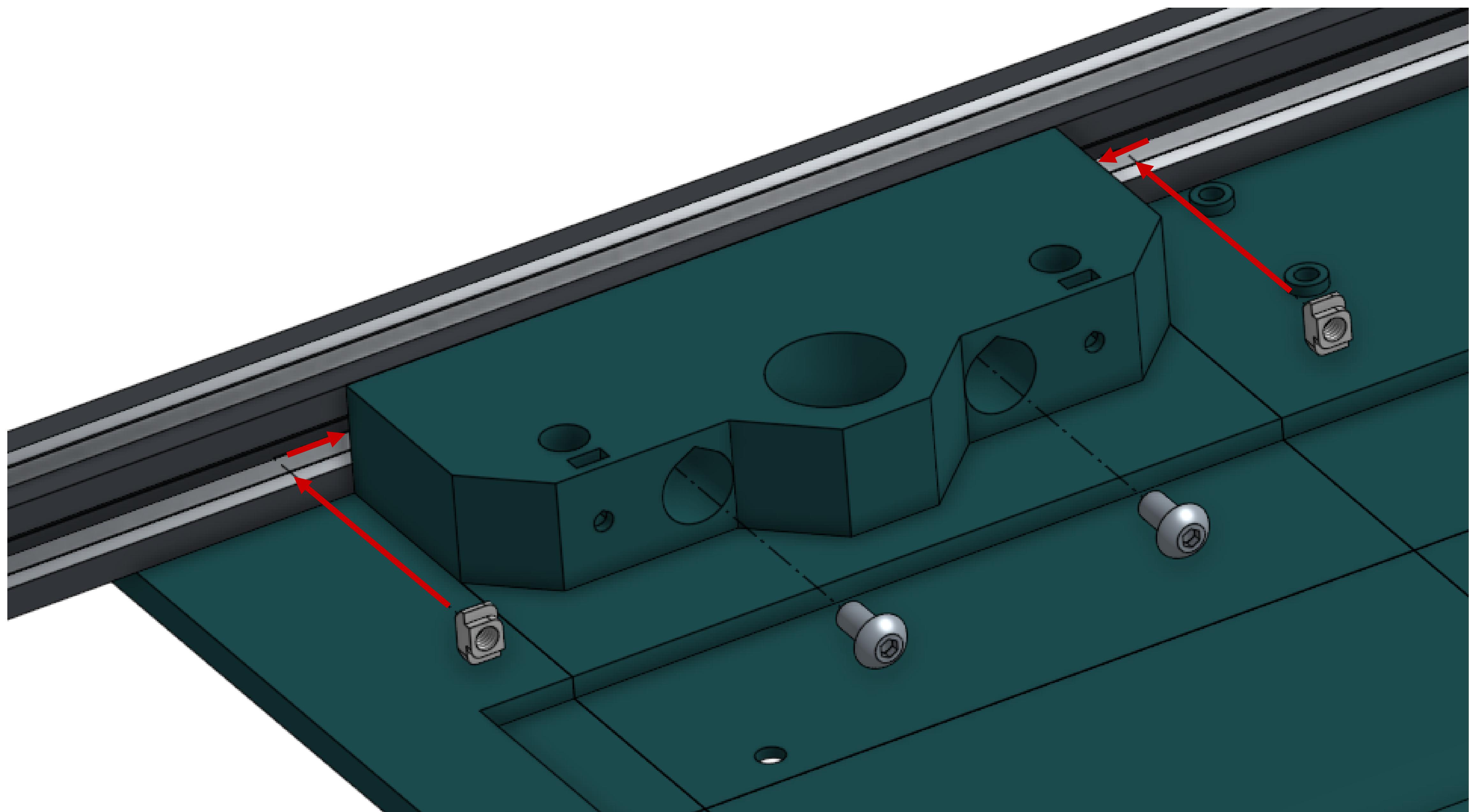
All bottom panels	X	Fasten all panels to the extrusions. You are currently working on the bottom of the printer. Ensure the corners of the frame are square.
M5x10 screw	16	
M5 T-nut	16	



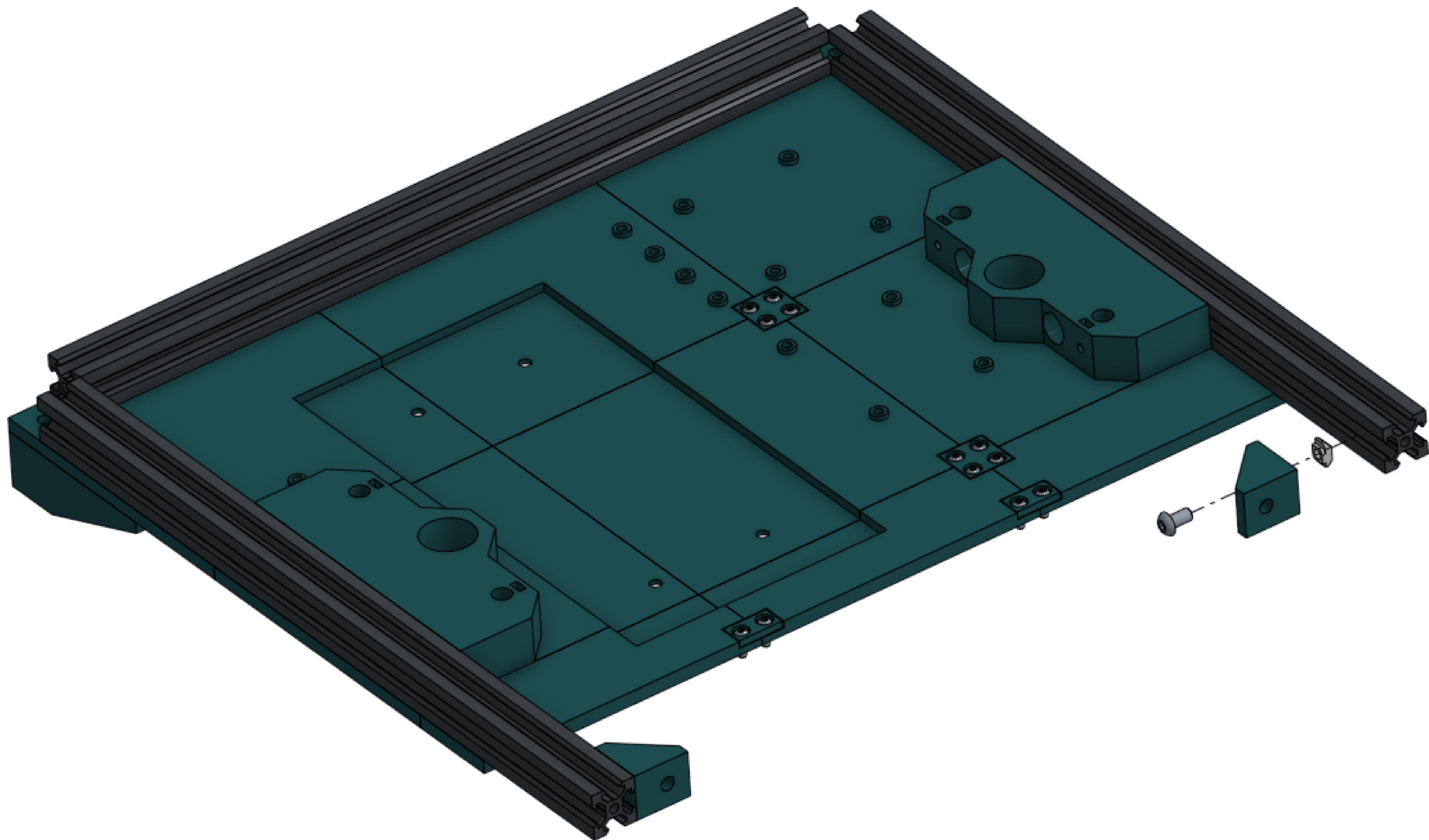
M3x10 screw	12	Using the screw plates, fasten the center bottom plate and front bottom plate to the rest of the array of plates.
M3 square nut	12	
2x1-4mm screw plate	2	
2x2-4mm screw plate	2	
Center bottom plate	1	
Front mid bottom plate	1	



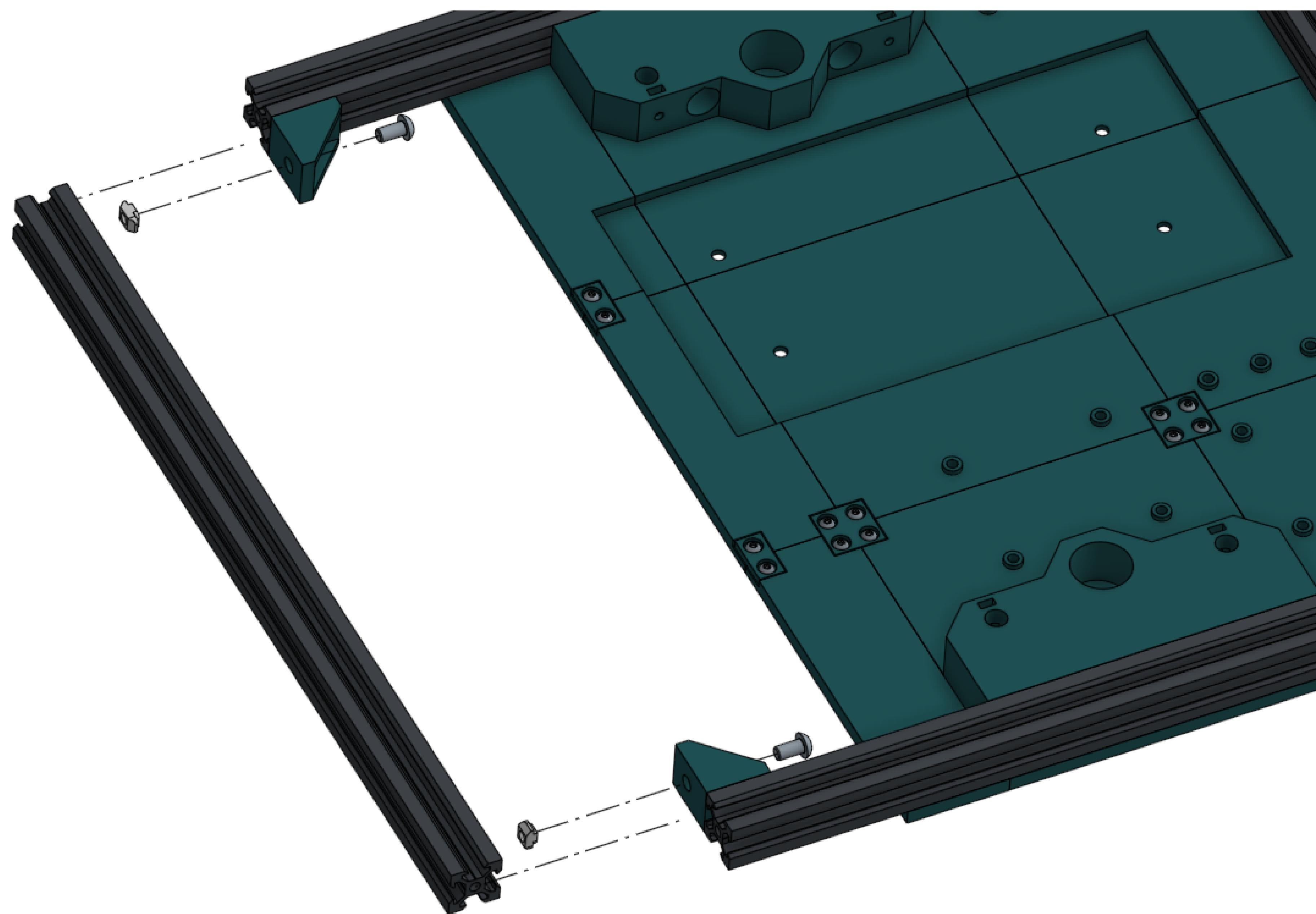
M5x10 screw	4	To fully fasten the bracket plates, slide T nuts into the extrusion channels behind them and tighten screws into the nuts inside the large counterbores in the side. This needs to be done on both sides.
M5 T nut	4	



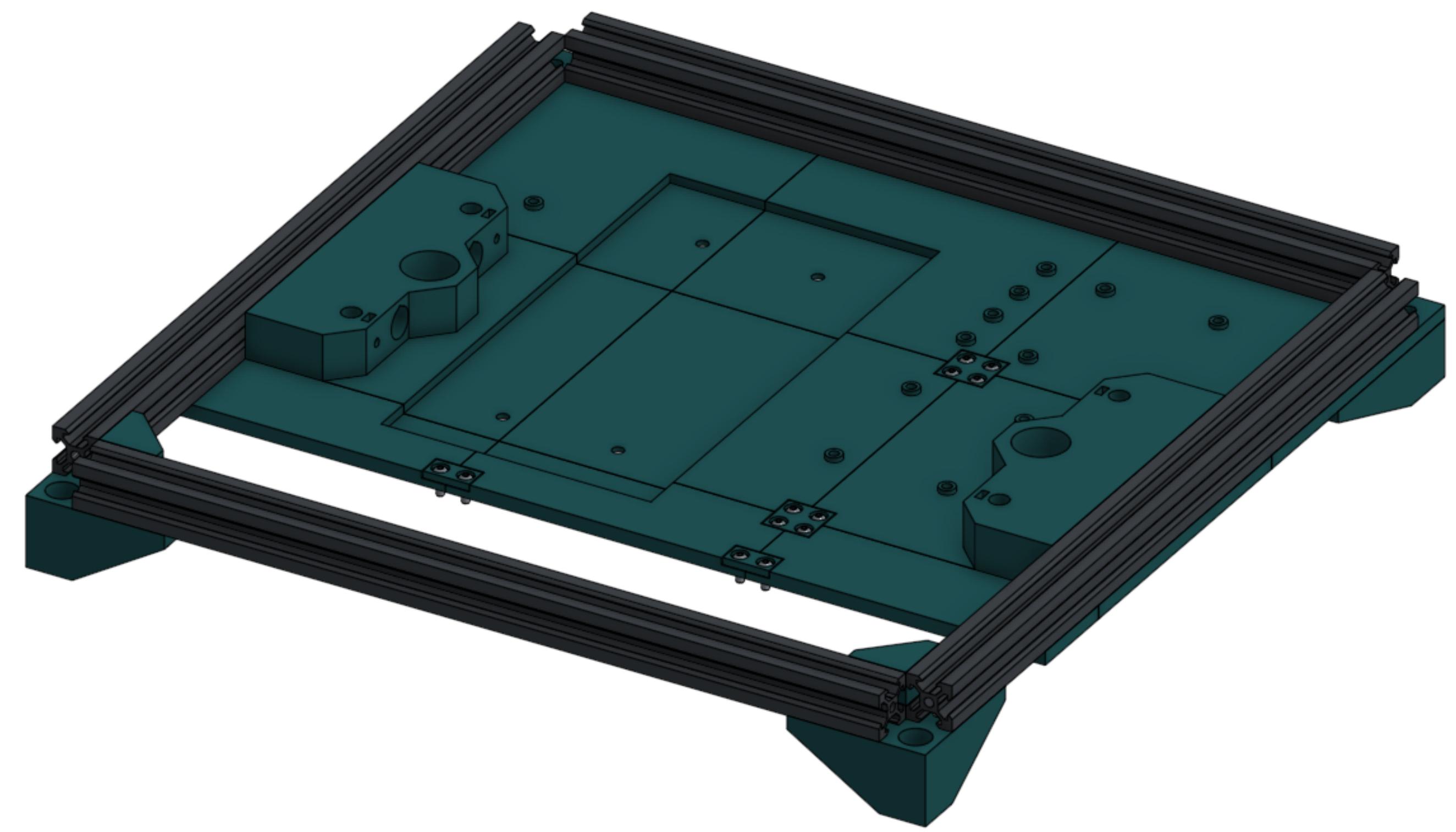
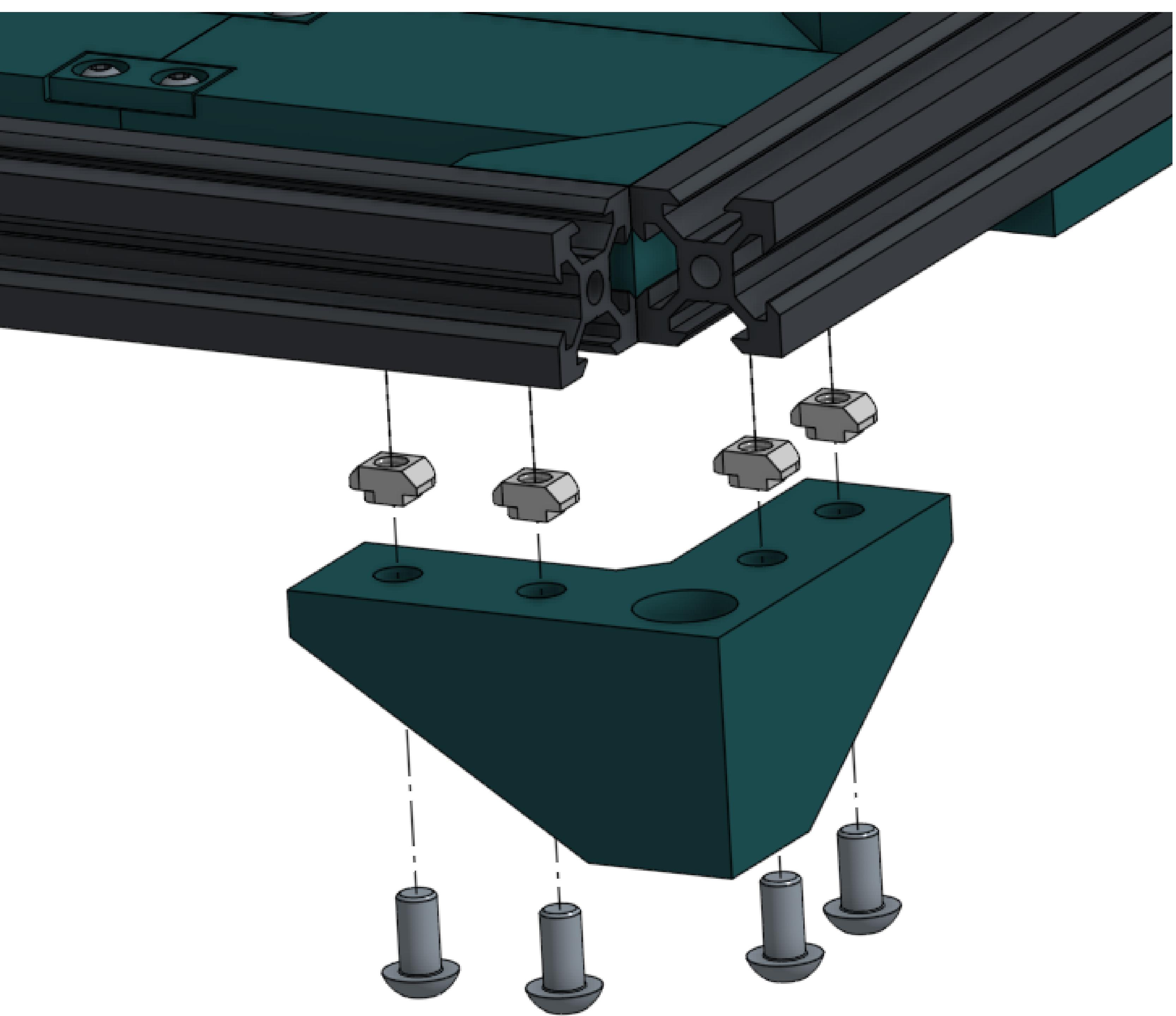
2020 corner bracket	2
M5x10 screw	2
M5 T nut	2



2020 extrusion	1
M5x10 screw	2
M5 T nut	2

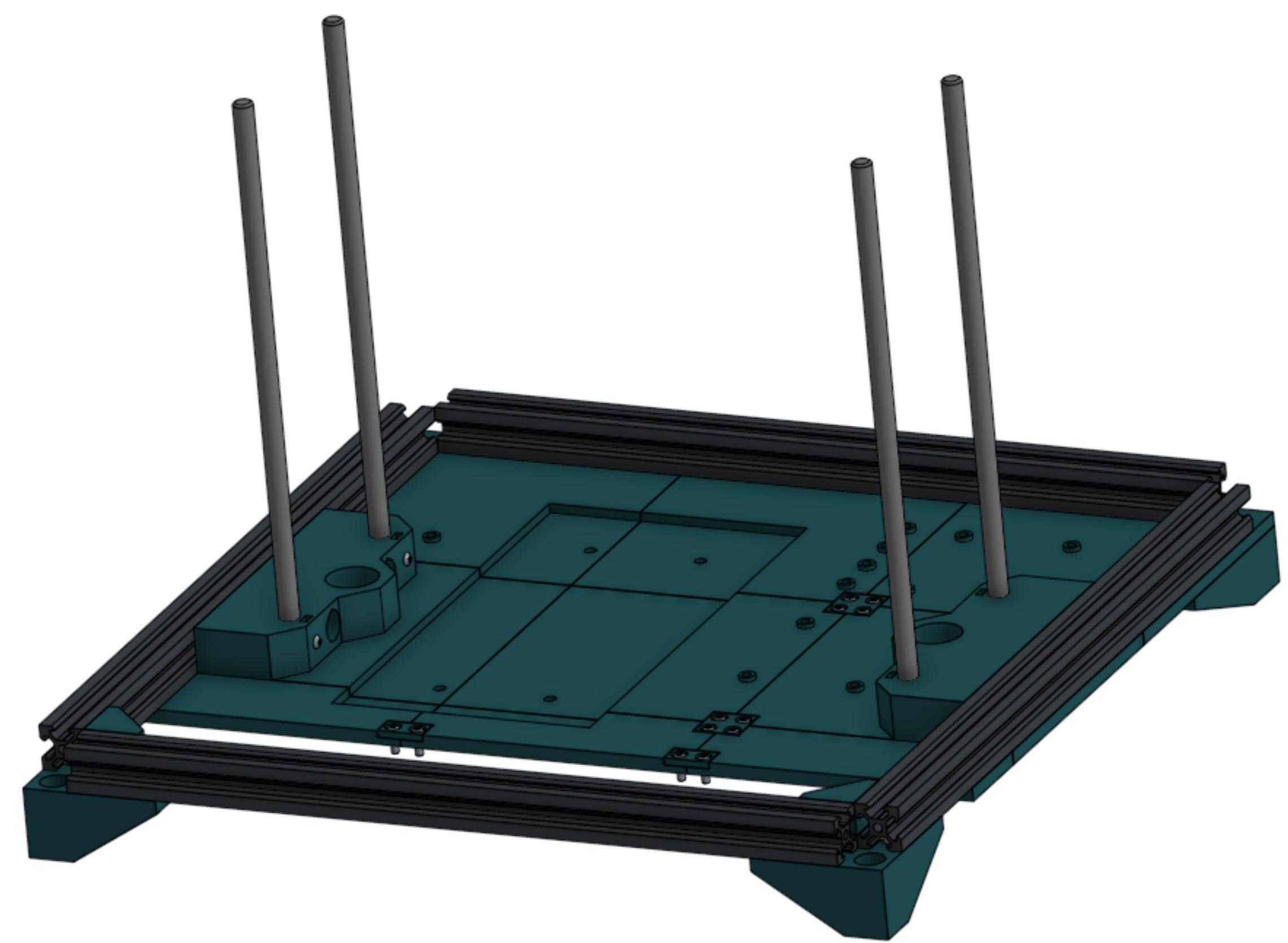
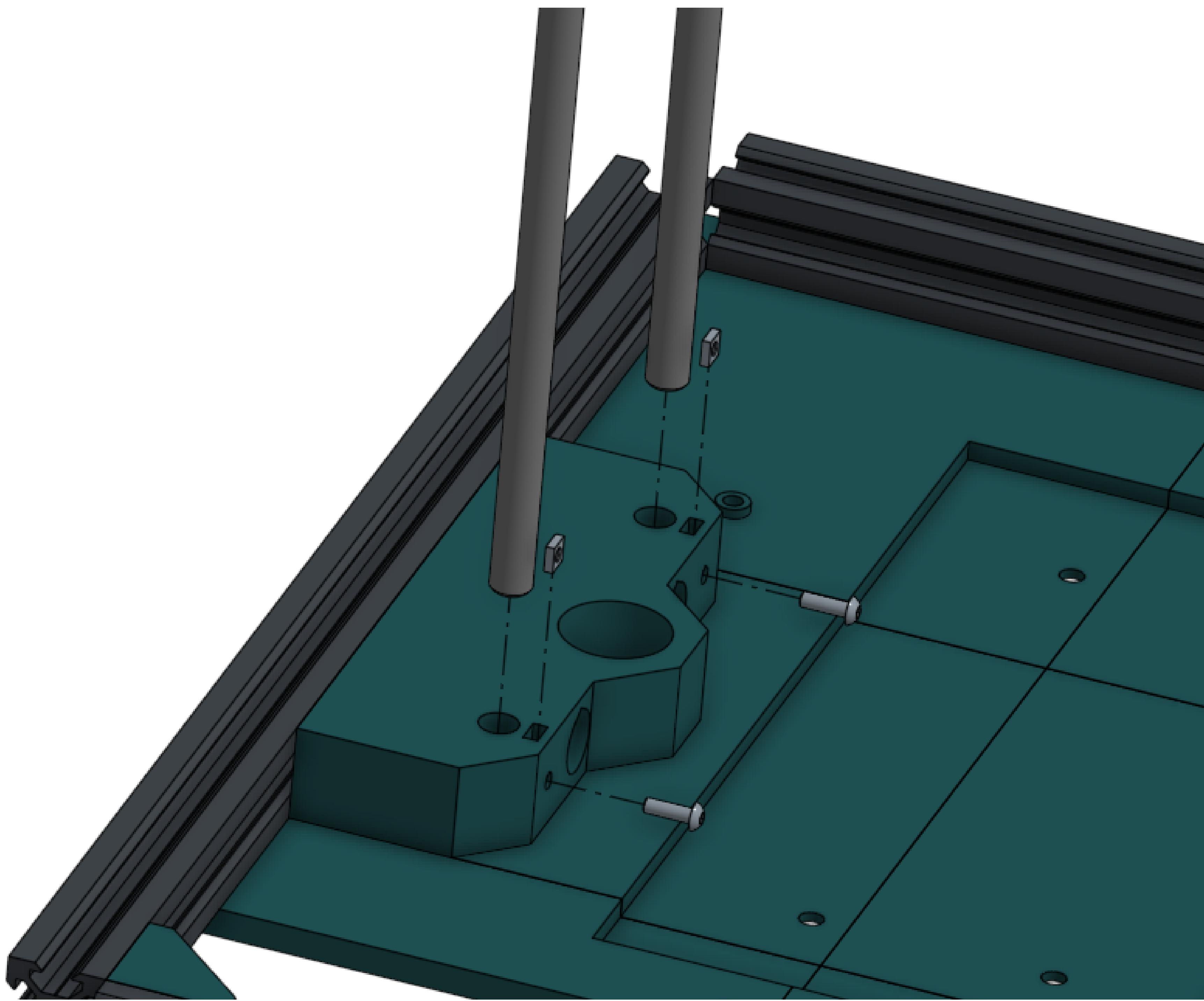


Front foot	2
M5x10 screw	8
M5 T nut	8

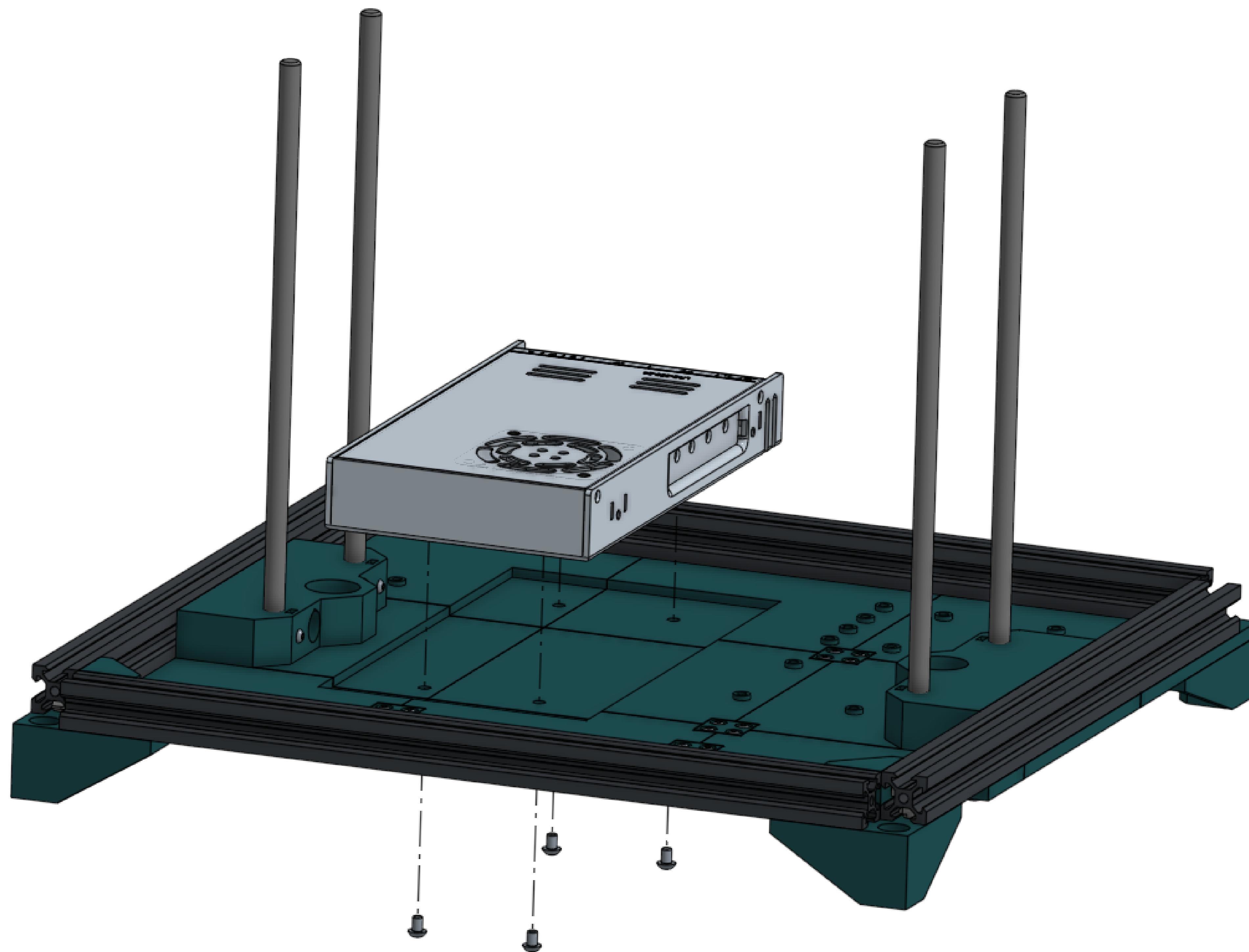


250mm rod	4
M3x10 screw	4
M3 square nut	4

Rods must be inserted before clamping hardware.

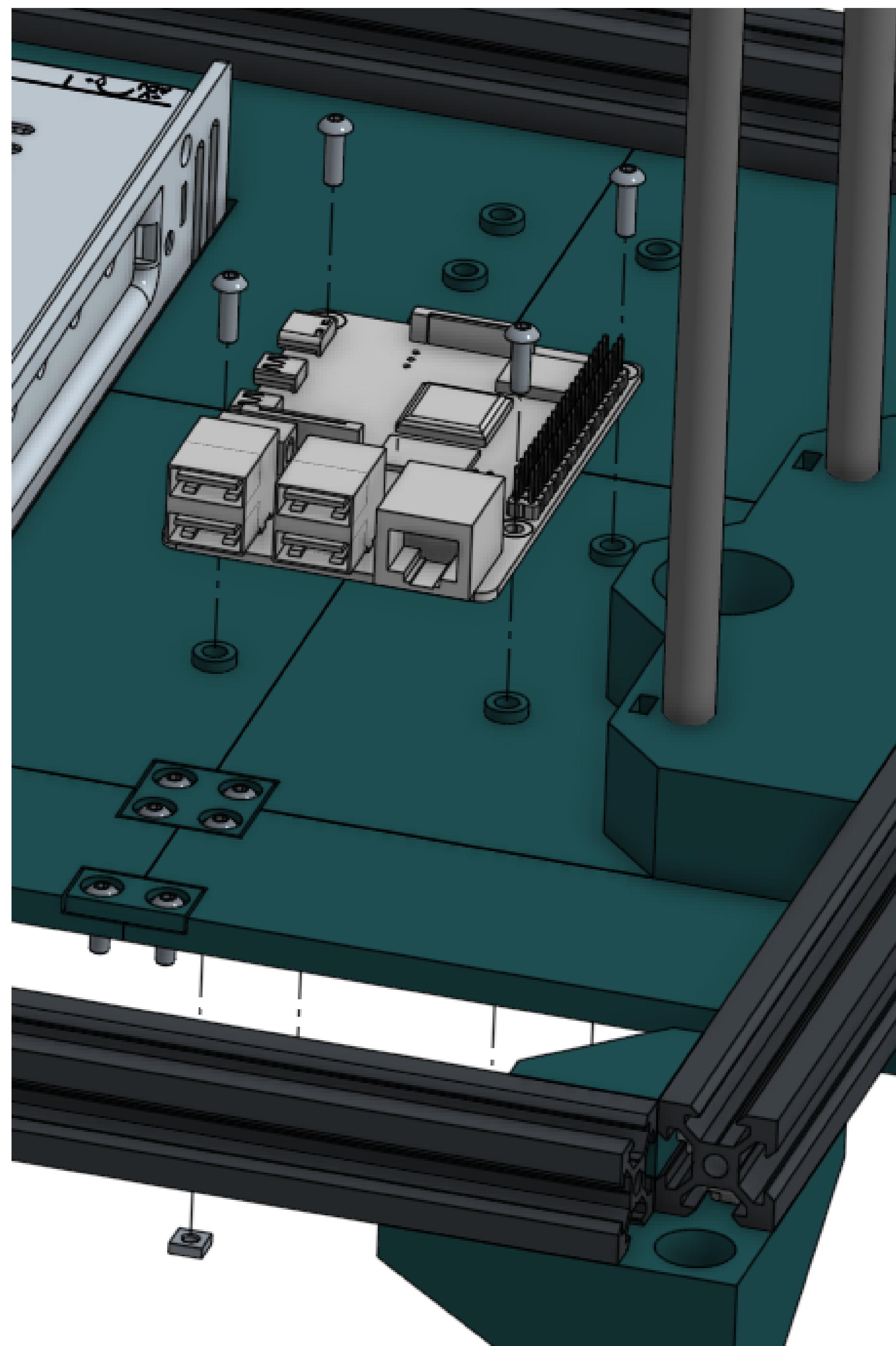


Power supply	4	Terminals should face toward the back of the printer.
M4x6 screw	4	



Parallel adapter	2
Mainboard	1
Pi	1
M3x10 screw	12
M3 square nut	12

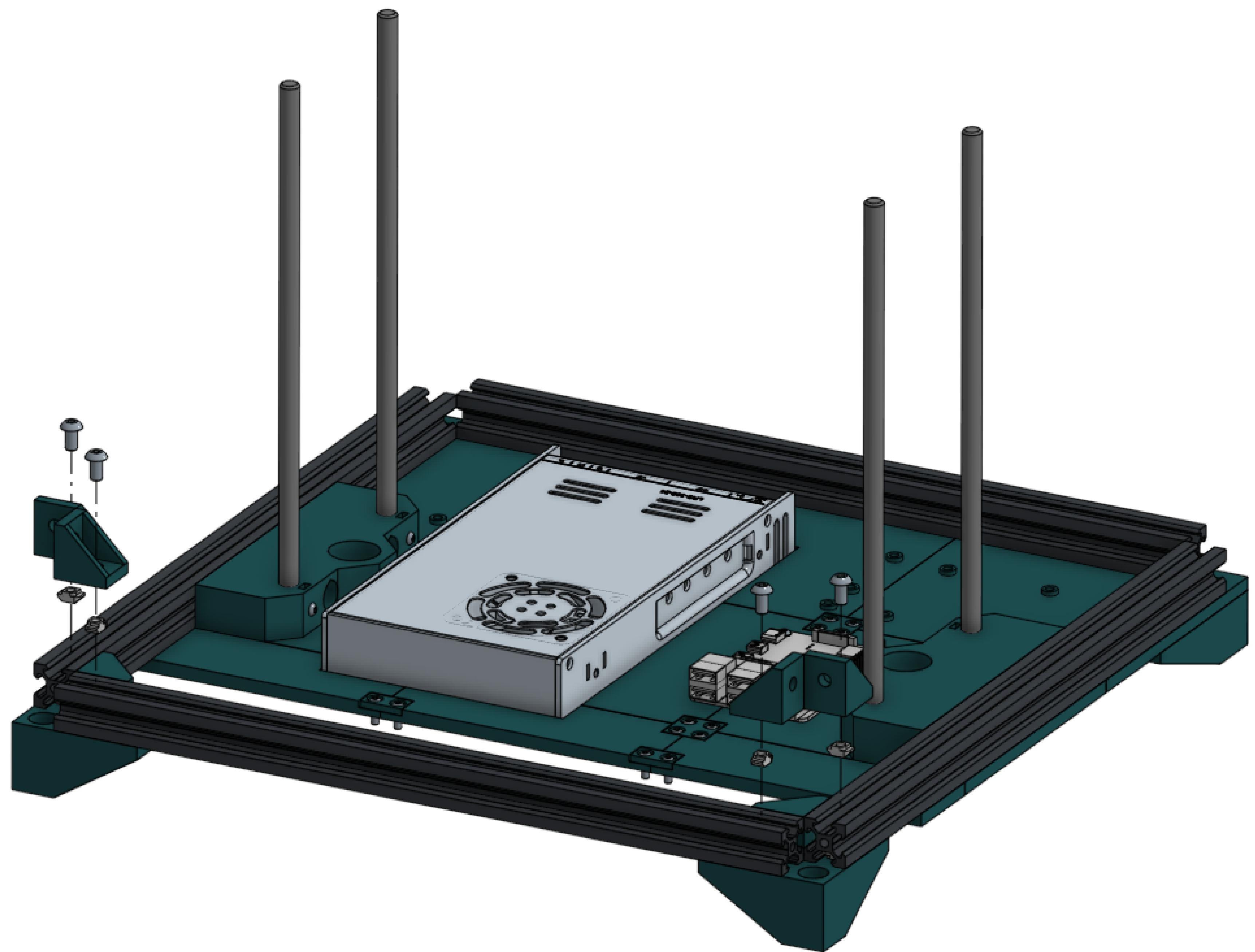
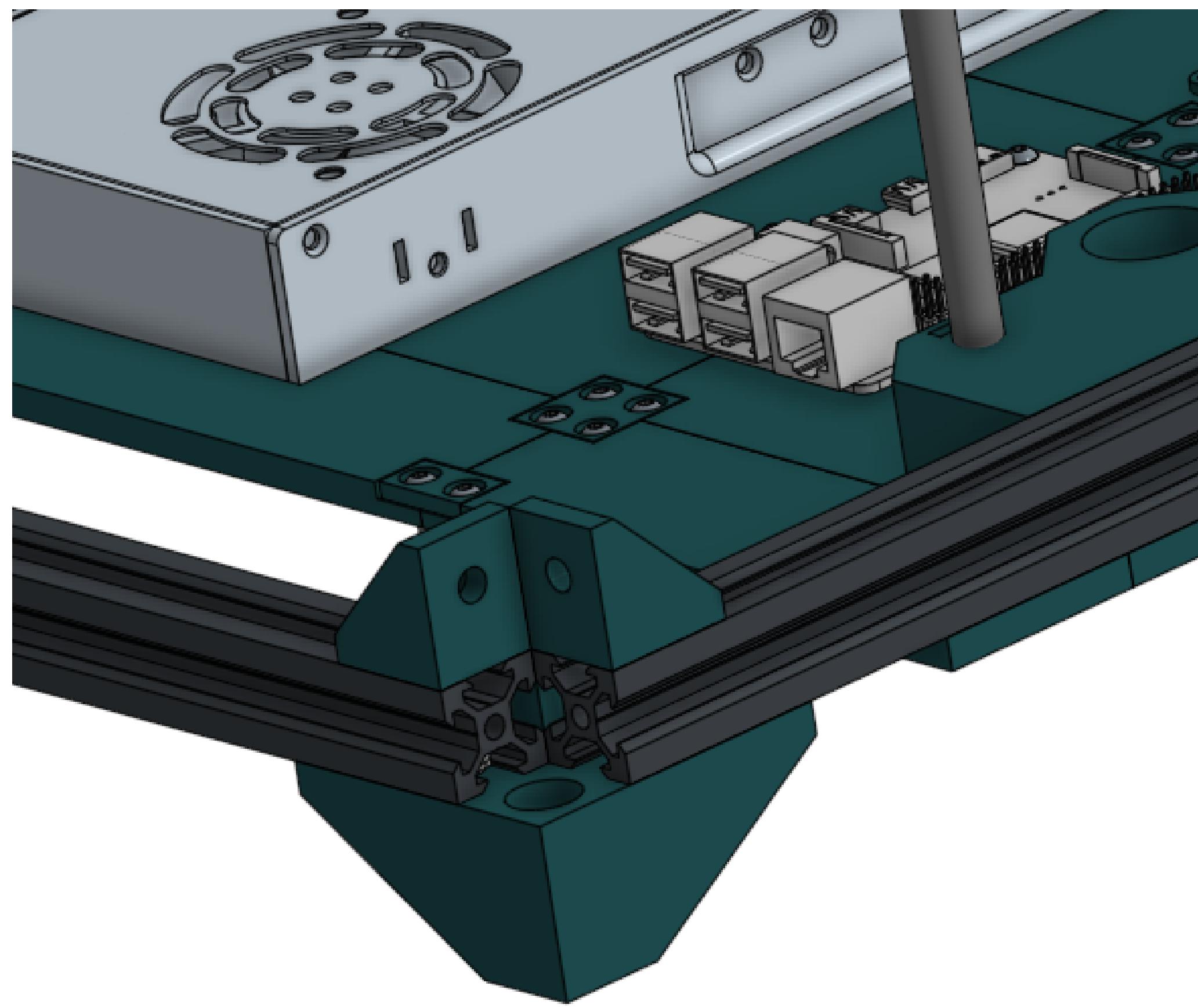
All listed electronics should be attached. Only the Pi is pictured here. There are recesses for nuts on the bottom.



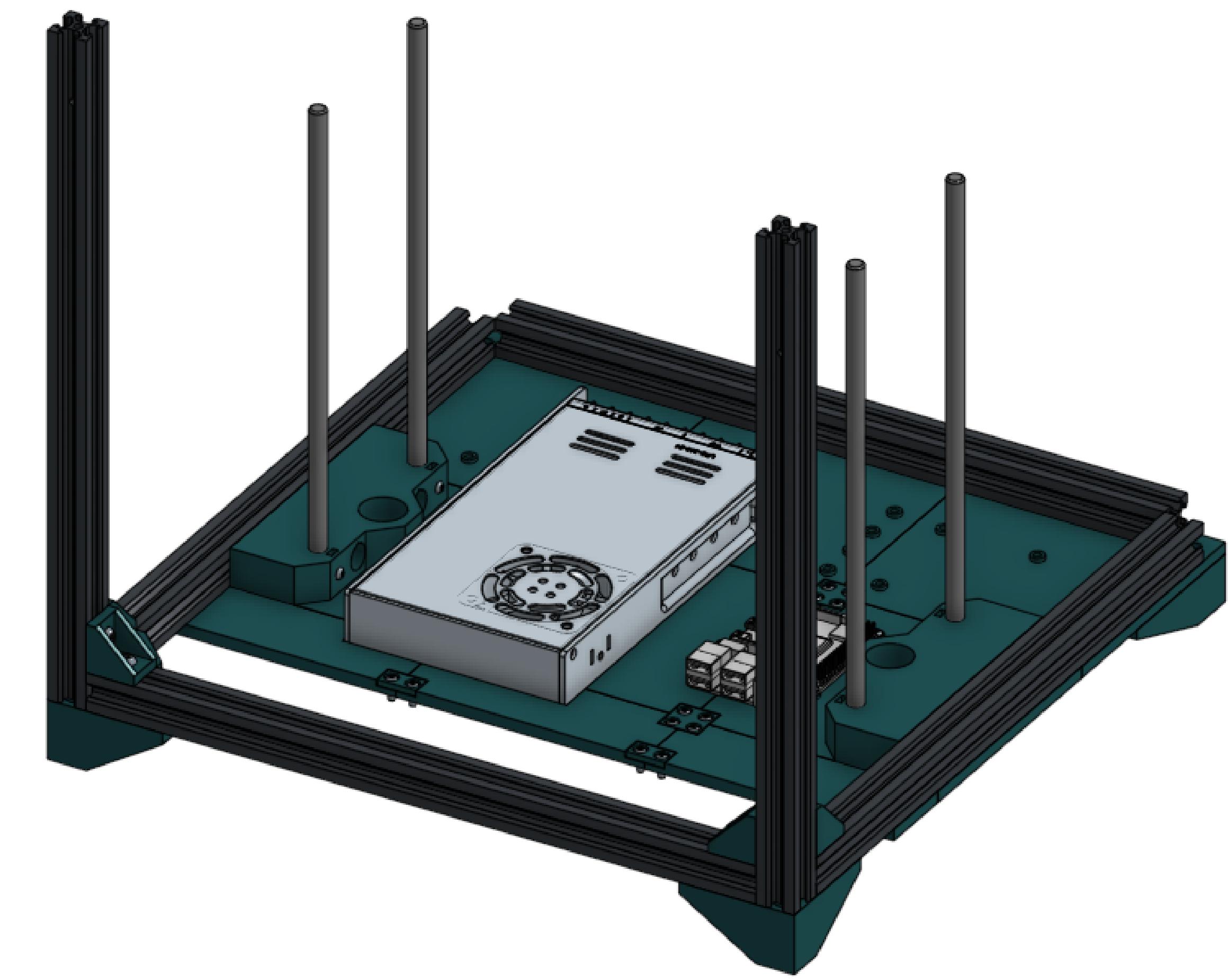
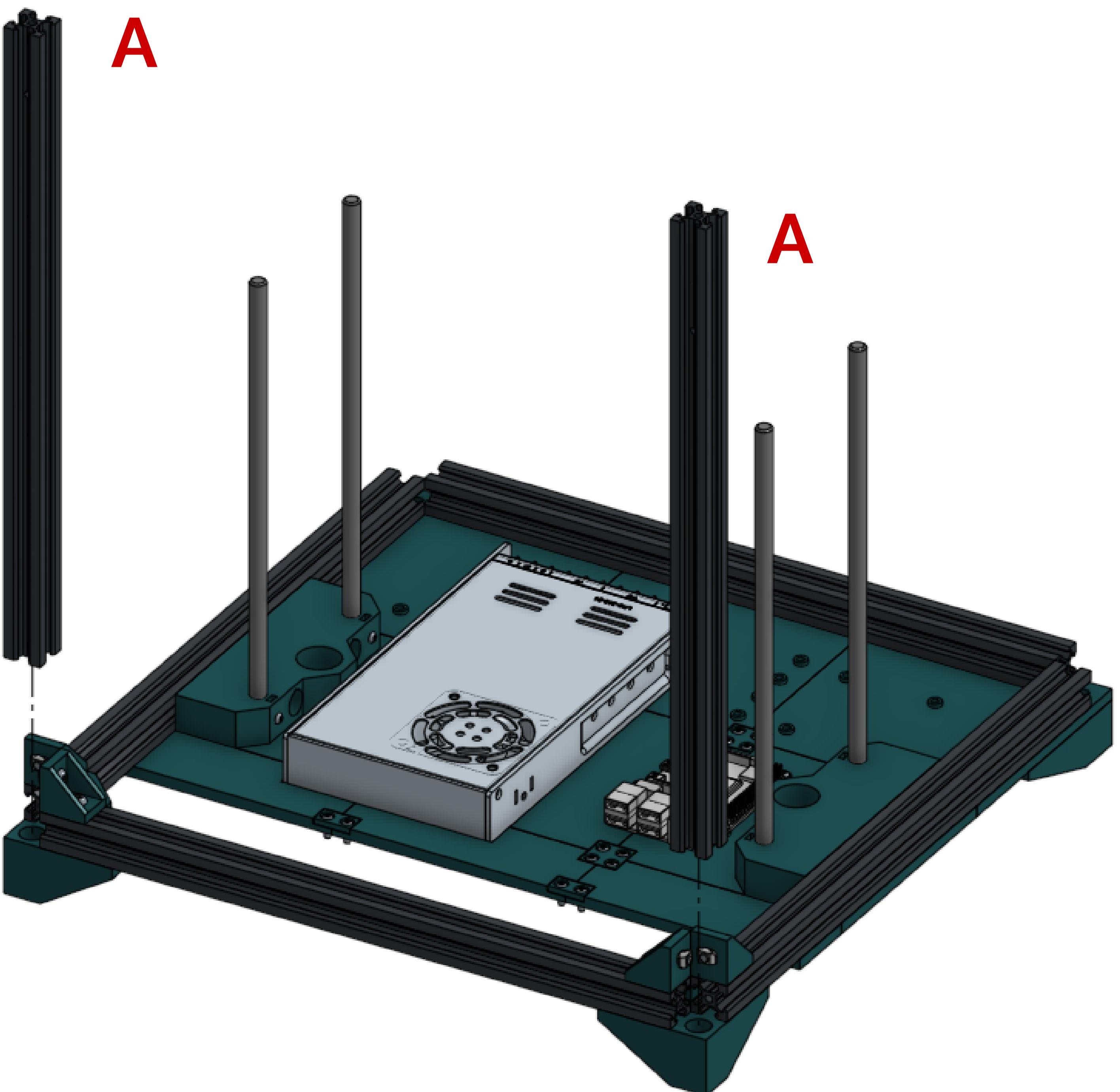
Tiny parallel adapter cable	2	Step 12.5: At this time, connect the mainboard to the Pi using the mainboard cable.
Mainboard cable	1	Unfortunately, the cable will not fit underneath the electronics enclosure lid by default. You will need to either install a right-angle header on the Pi, or bend the pins off to the side. The method I used was to plug the connector into the Pi and then bend the pins by pushing on the connector. This ensures an even bend, and helps ensure stable electrical connection.
Assorted 16awg wire	X	Also at this time connect the mainboard to the stepper adapters using the tiny included cables, and wire up the power system with the exception of attaching the power socket (simply attach loose cables to the power input on the power supply). Plug in all stepper cables, all toolhead cables, and all bed wires.

At the end of this step, everything except the power socket, stepper motors, and electronics fan should be wired up. The bed and the toolhead should be laying off to the side. Refer to step 12.5 in the wiring guide for assistance.

Corner bracket	4	Small corner brackets may also be substituted for large corner brackets at the cost of twice as many nuts and bolts. This will improve rigidity.
M5x10 screw	4	
M5 T nut	4	

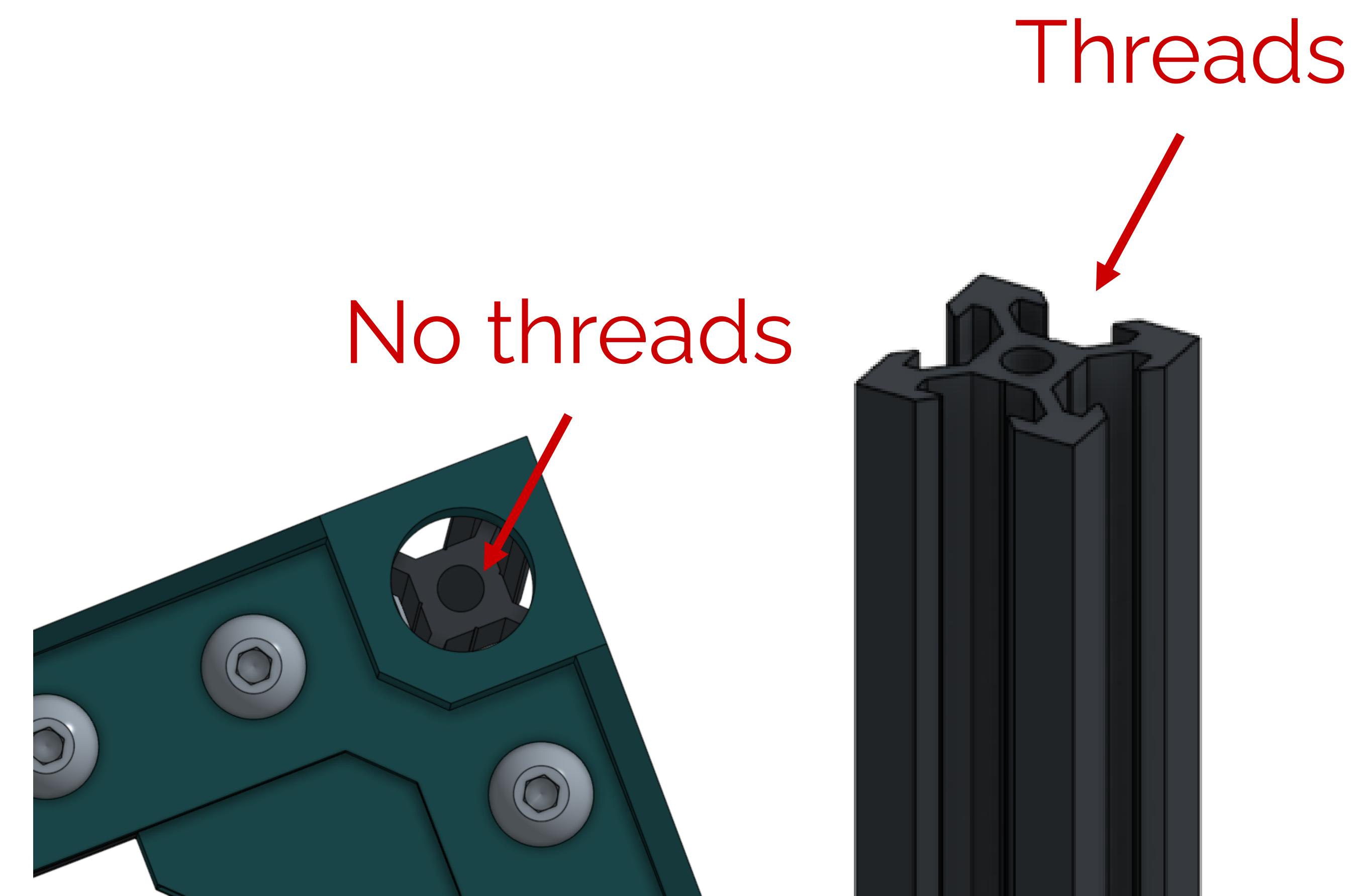
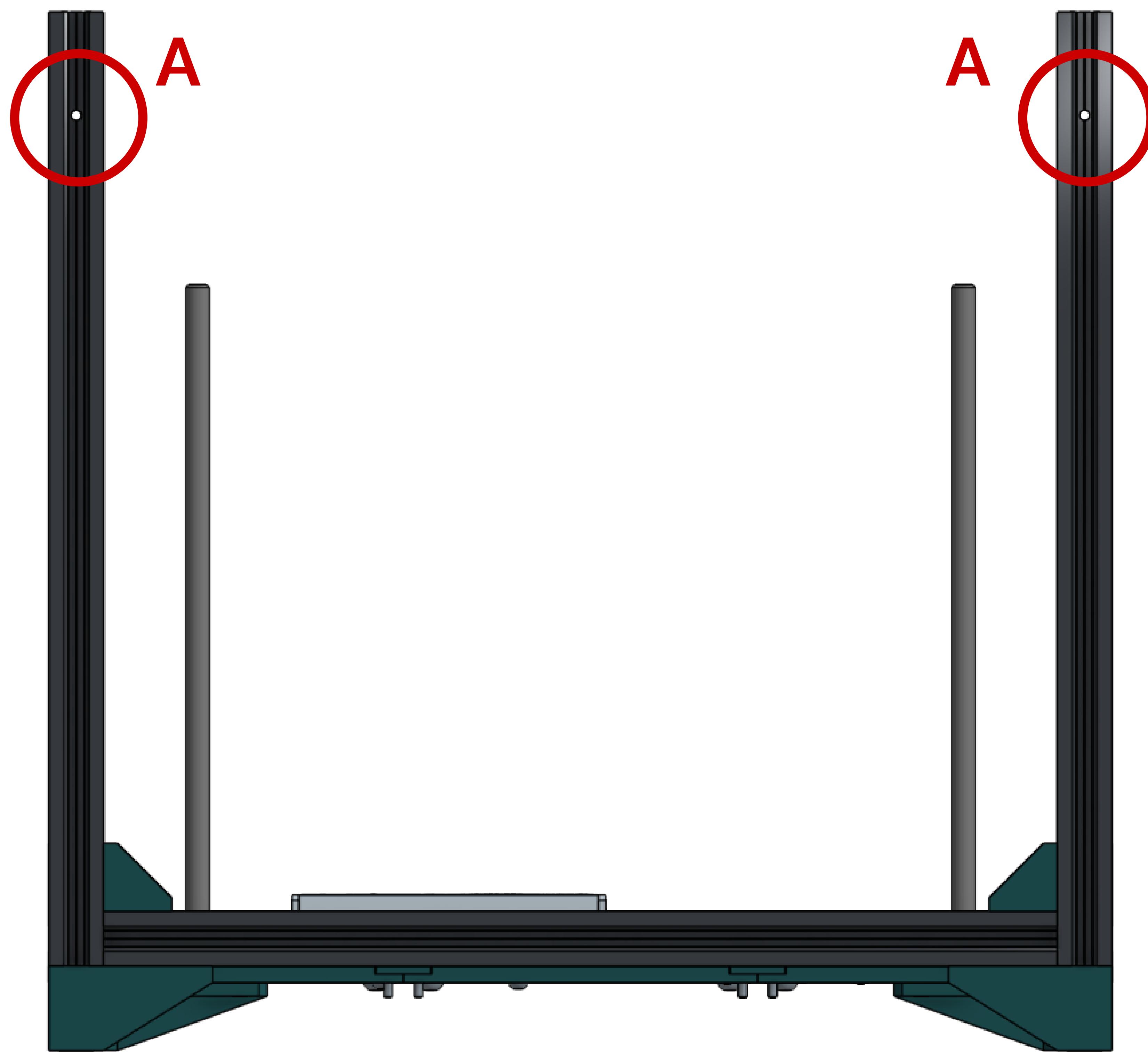


M5x10 screw	4	If you used the larger corner brackets in the previous step, you'll need twice as many nuts and bolts.
M5 T nut	4	
Extrusion A	2	



Confirm your fitment of these extrusions.

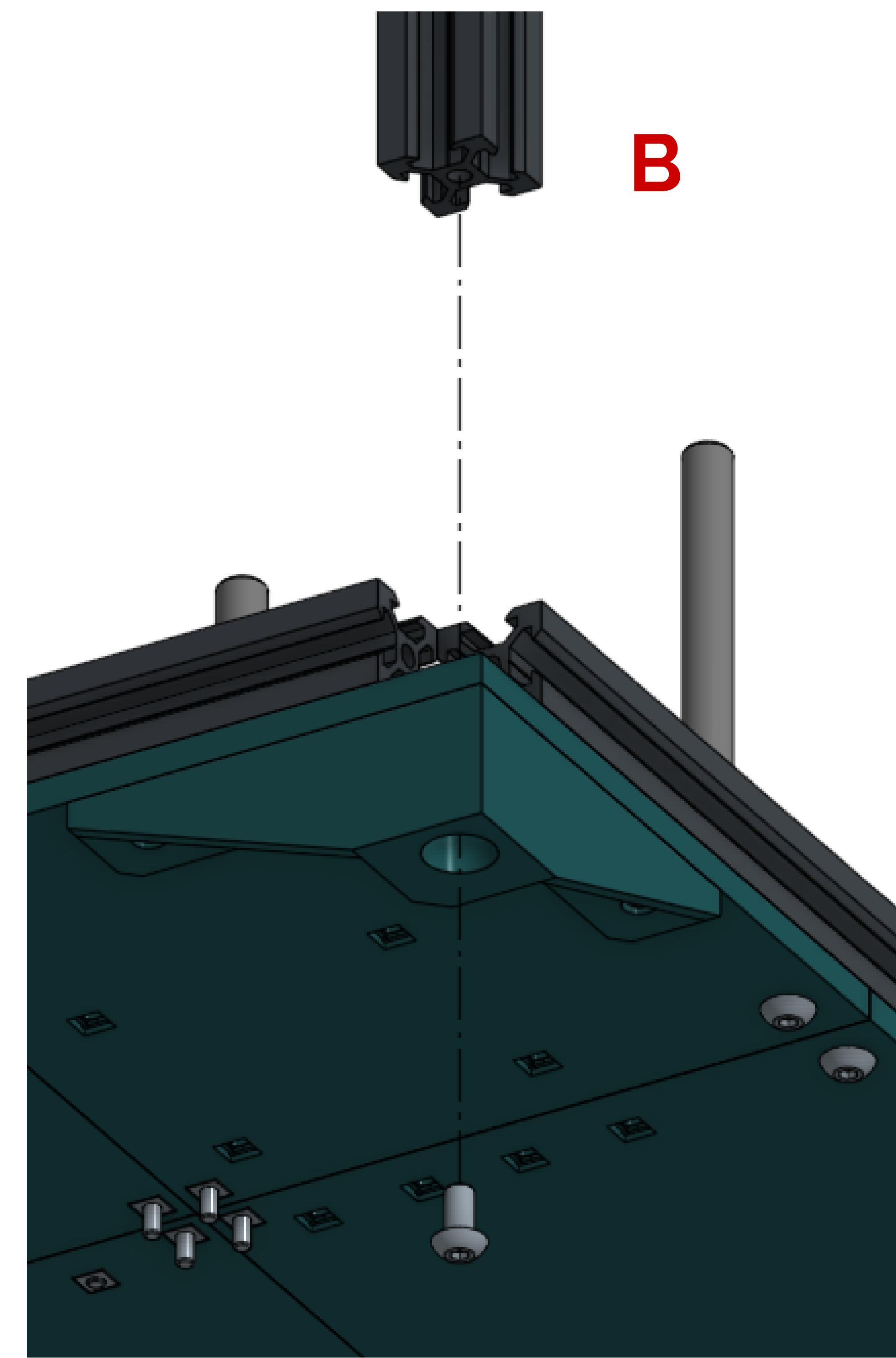
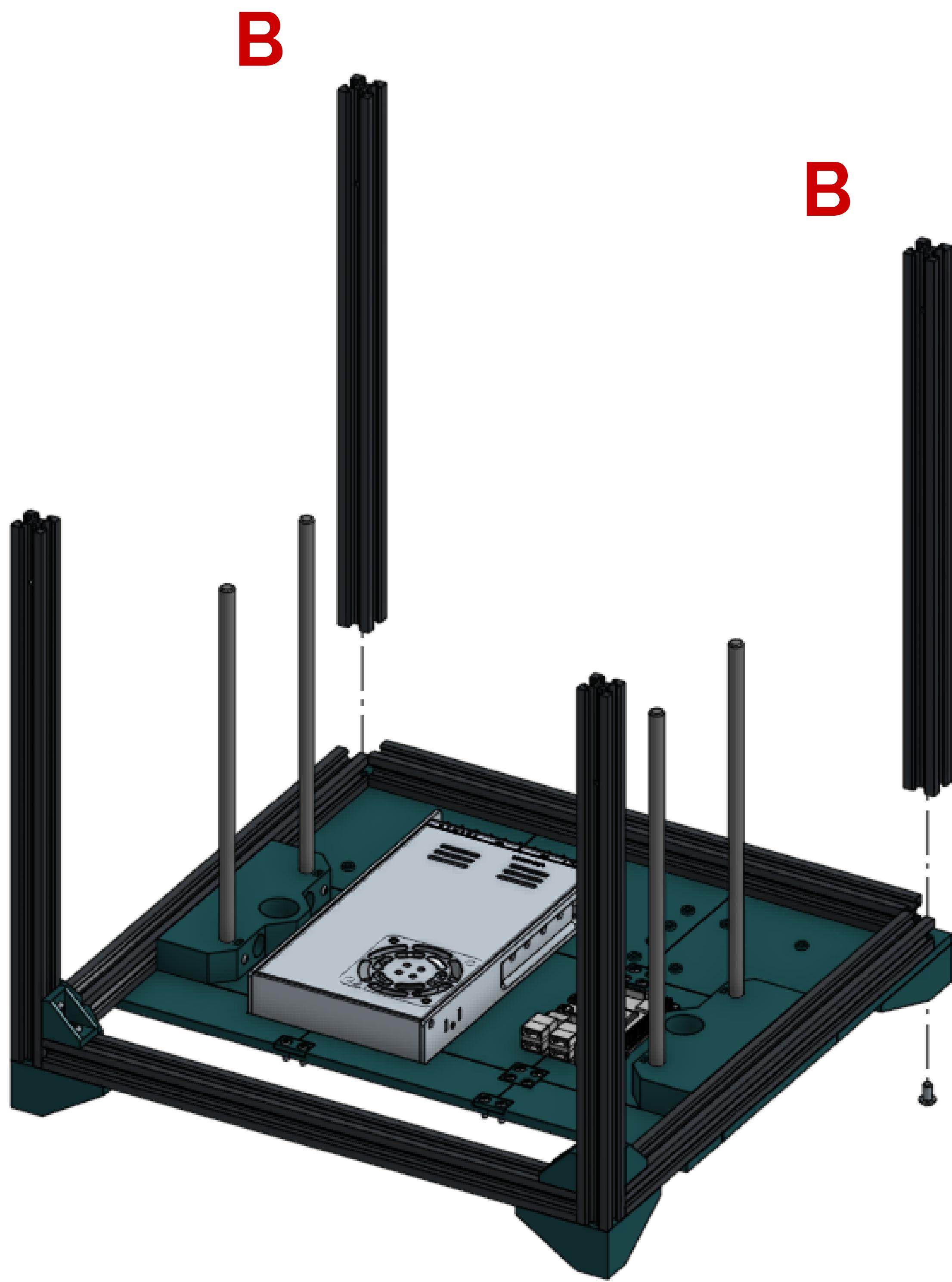
Both "A" extrusions should have their "high" mounting holes facing forwards. The tops should have threads, and the bottoms should not.



M5x10 screw	2
Extrusion C	1
Extrusion D	1

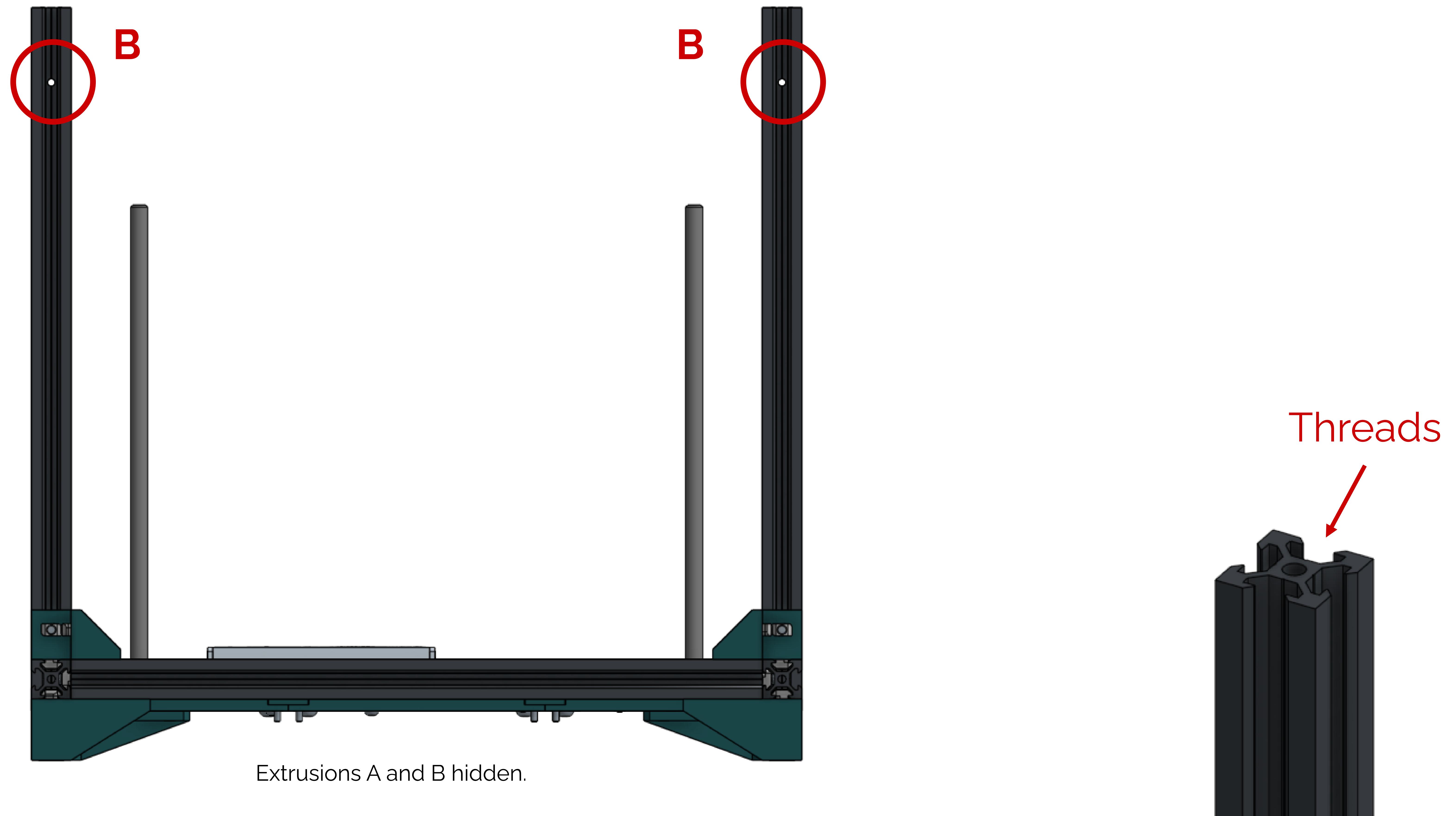
Attach the B extrusions to the back, with the fronts facing forwards.

These will be secured only with a single bolt each through the bottom for now.



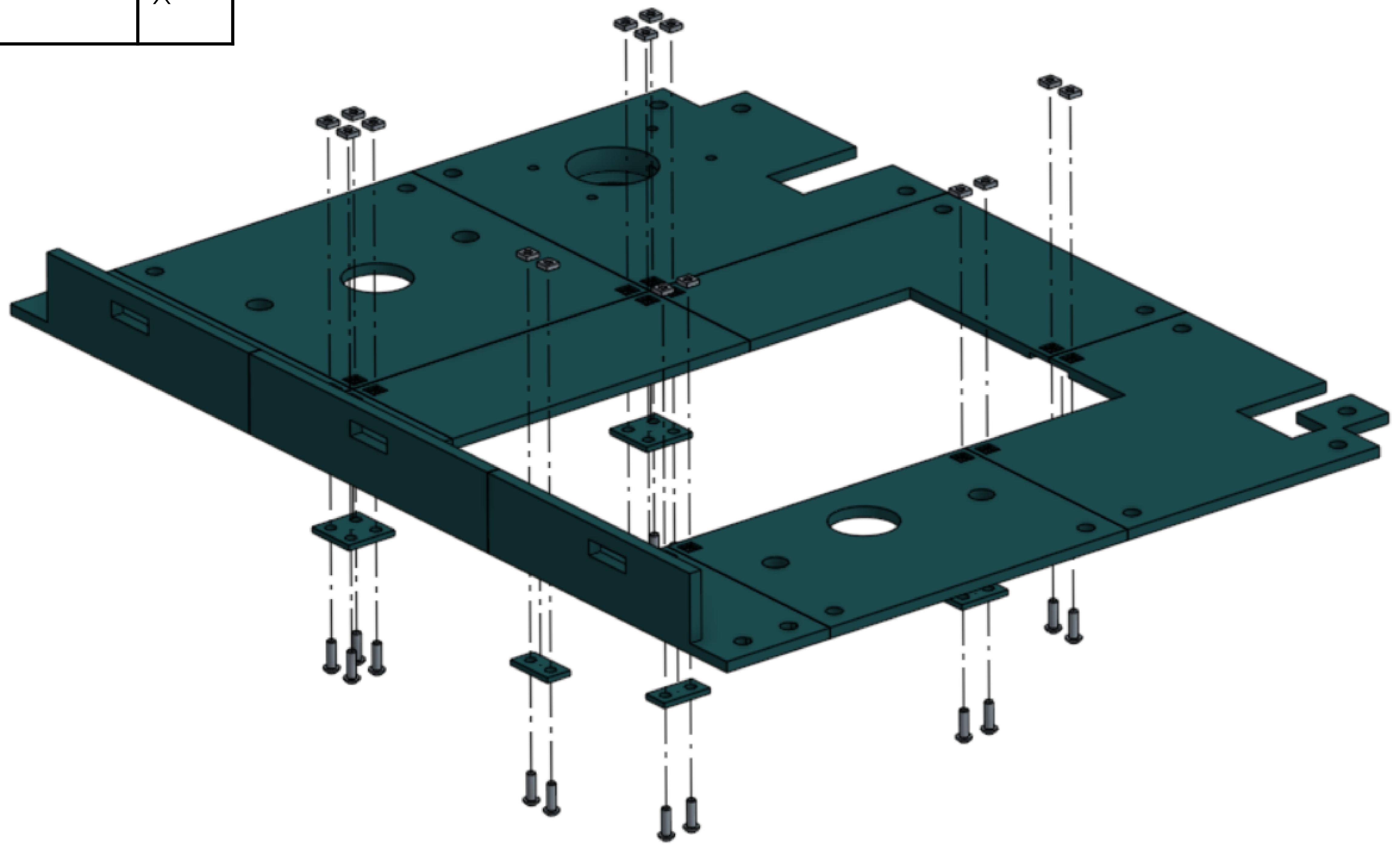
Confirm your fitment of these extrusions.

The "B" extrusions should have their "high" mounting holes facing forwards. The tops should be threaded.



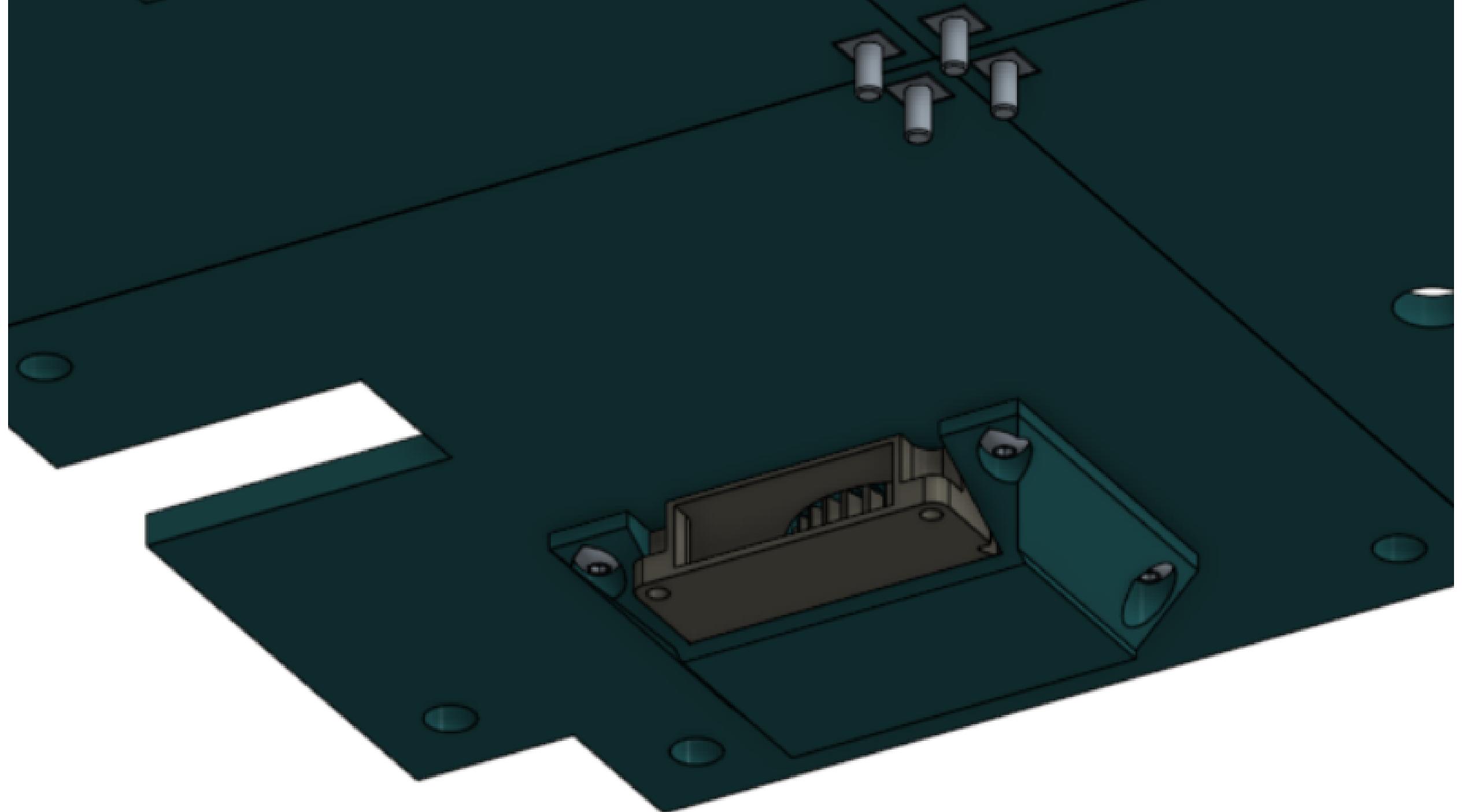
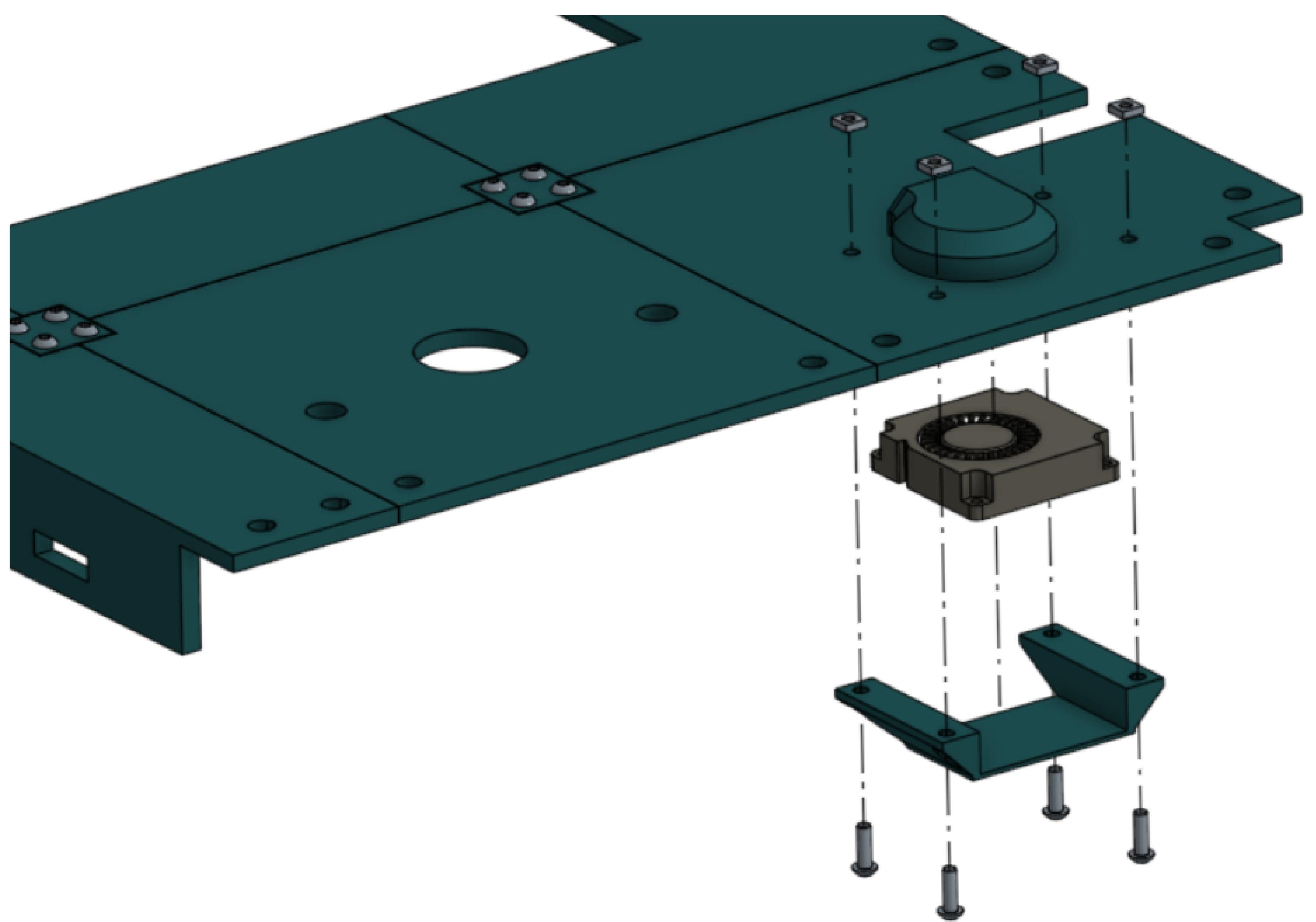
M5x10 screw	16
M3 T nut	16
2x2 screw plate - 2mm	2
2x1 screw plate - 2mm	4
All top panels	X

Pictured upside-down.

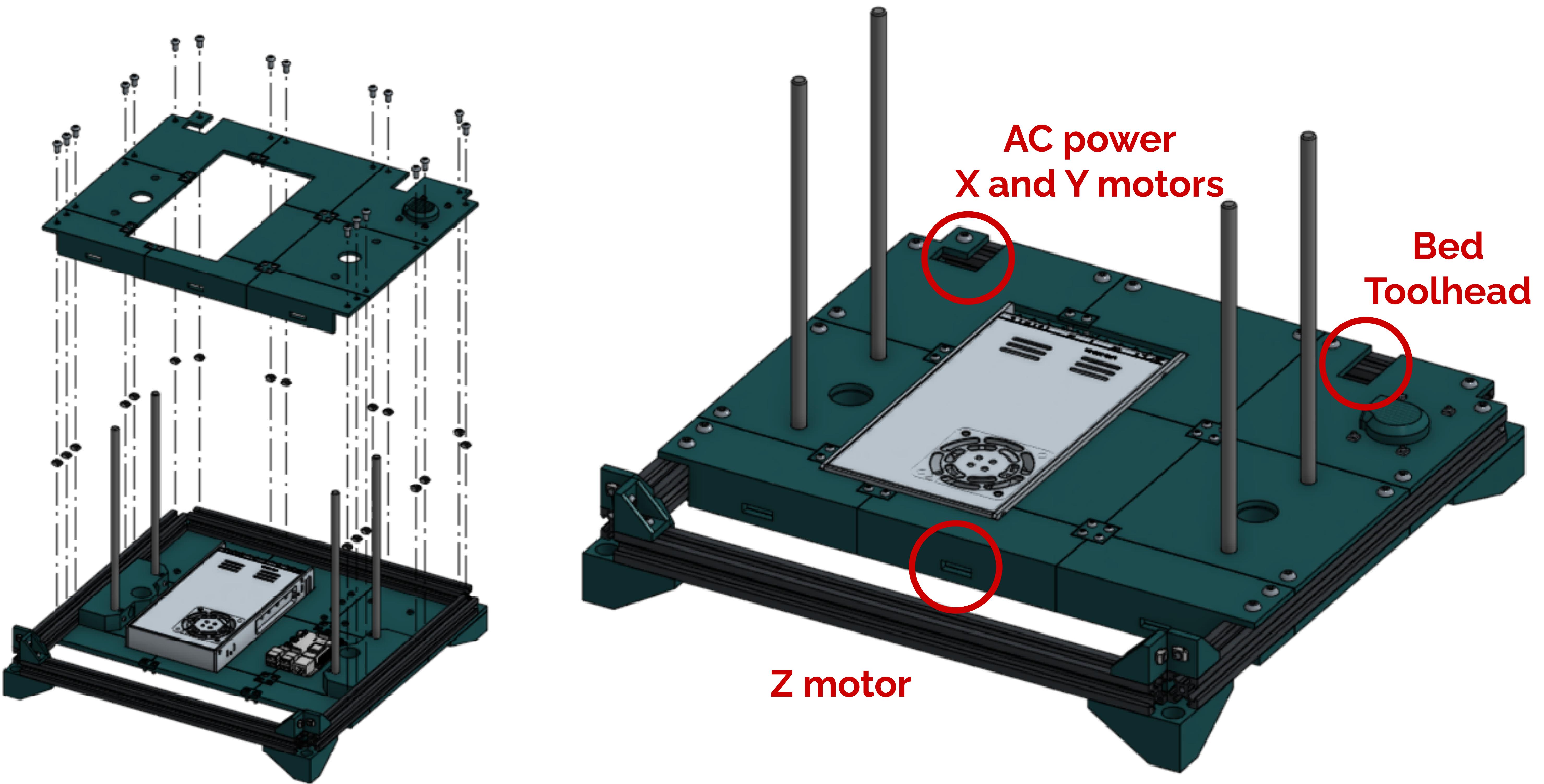


M5x10 screw	4
M3 T nut	4
4010 blower fan	1
4010 retainer	4

The outlet should be facing to the left.

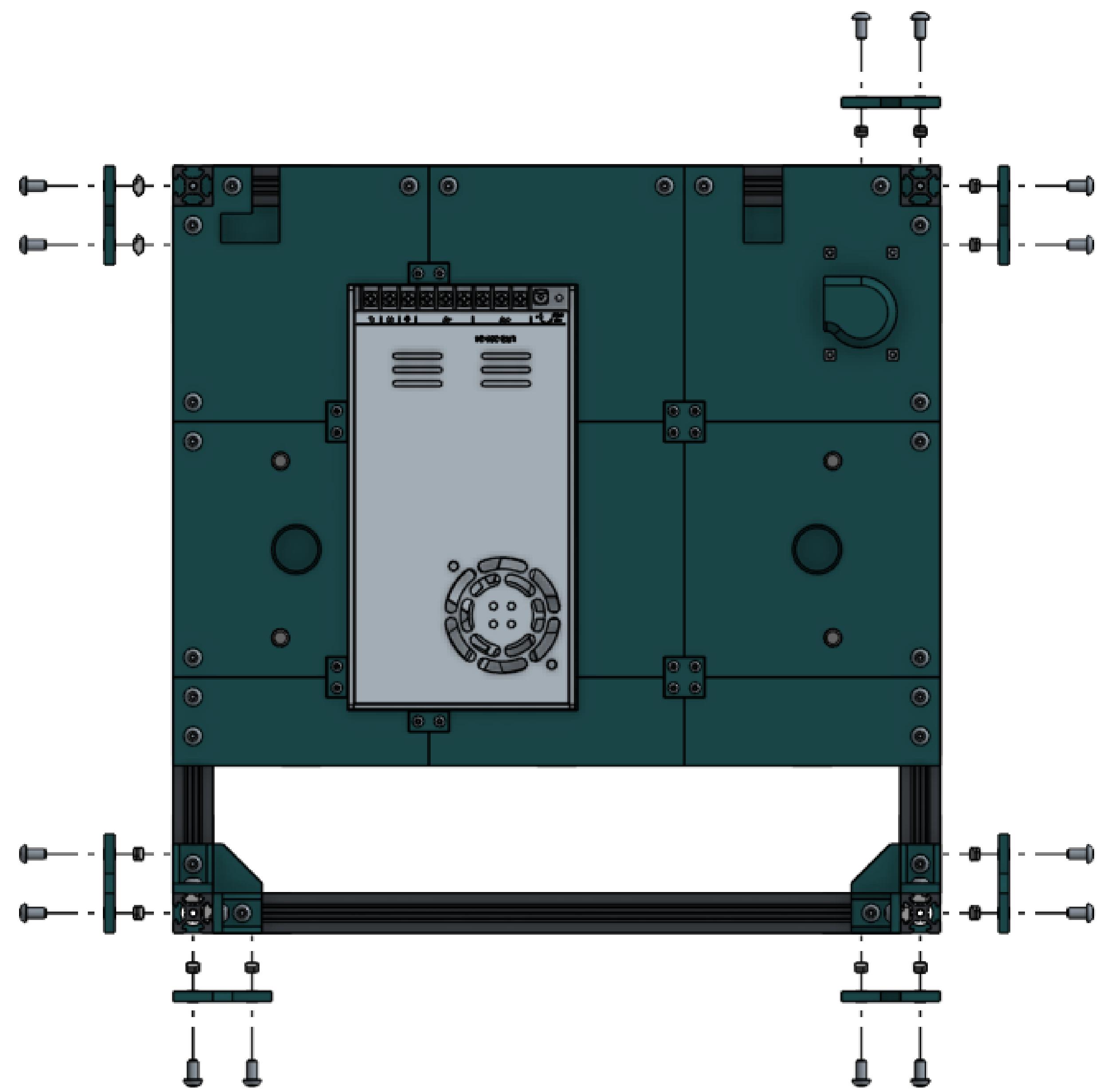
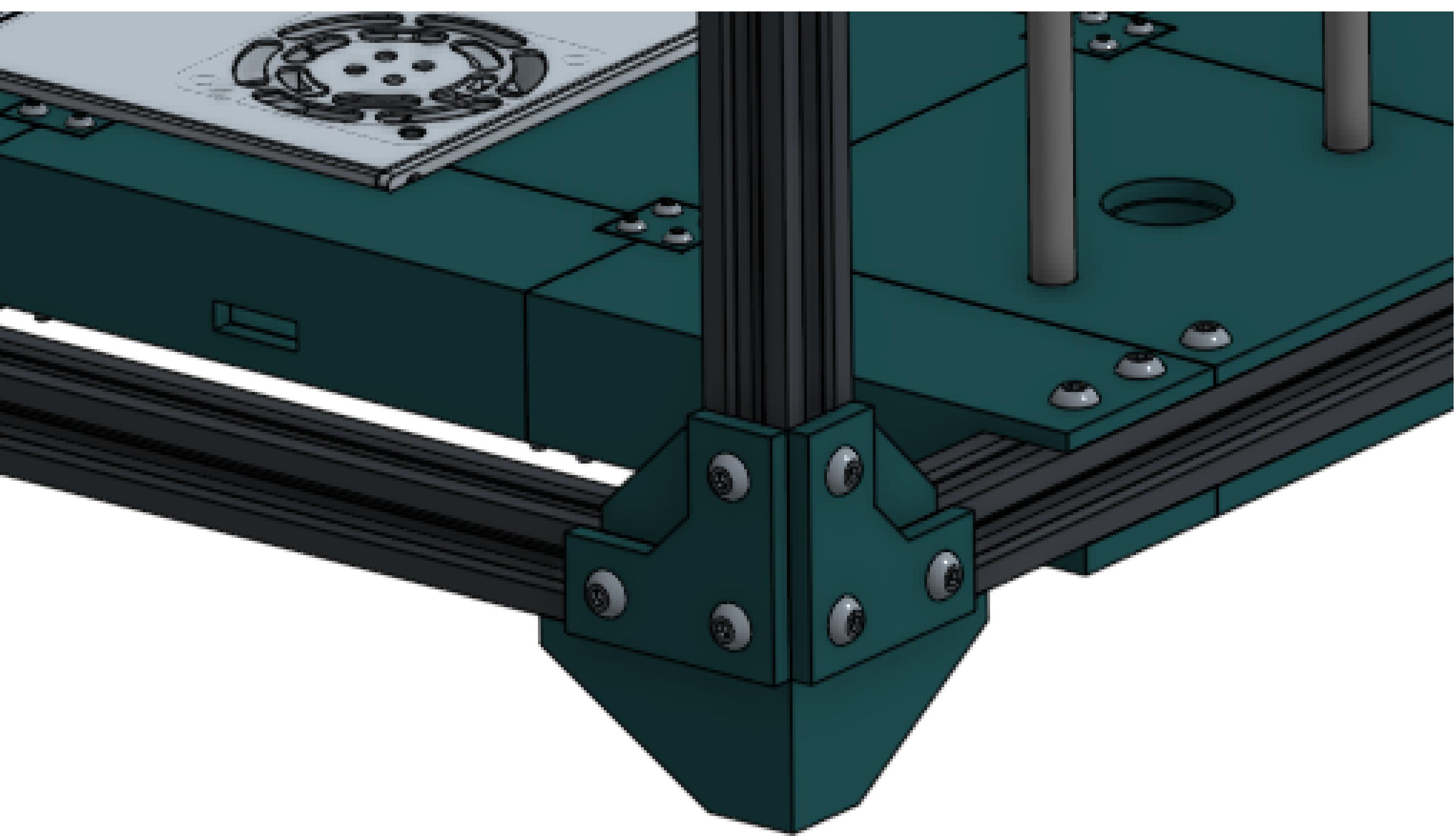


M5x10 screw	18
M5 T nut	18
Assembled top panel	1

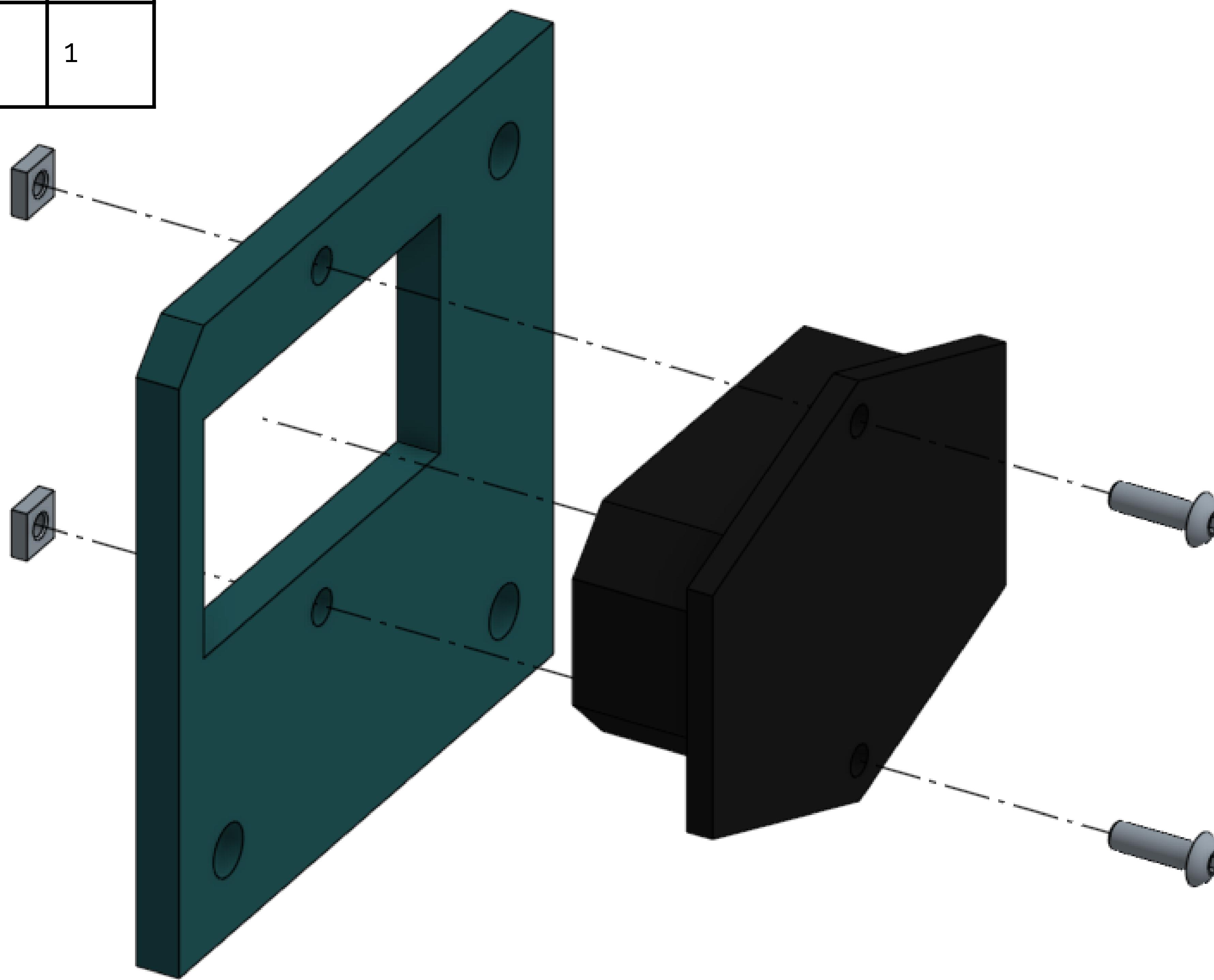


M5x10 screw	21
M5 T nut	21
Fastening plate	7

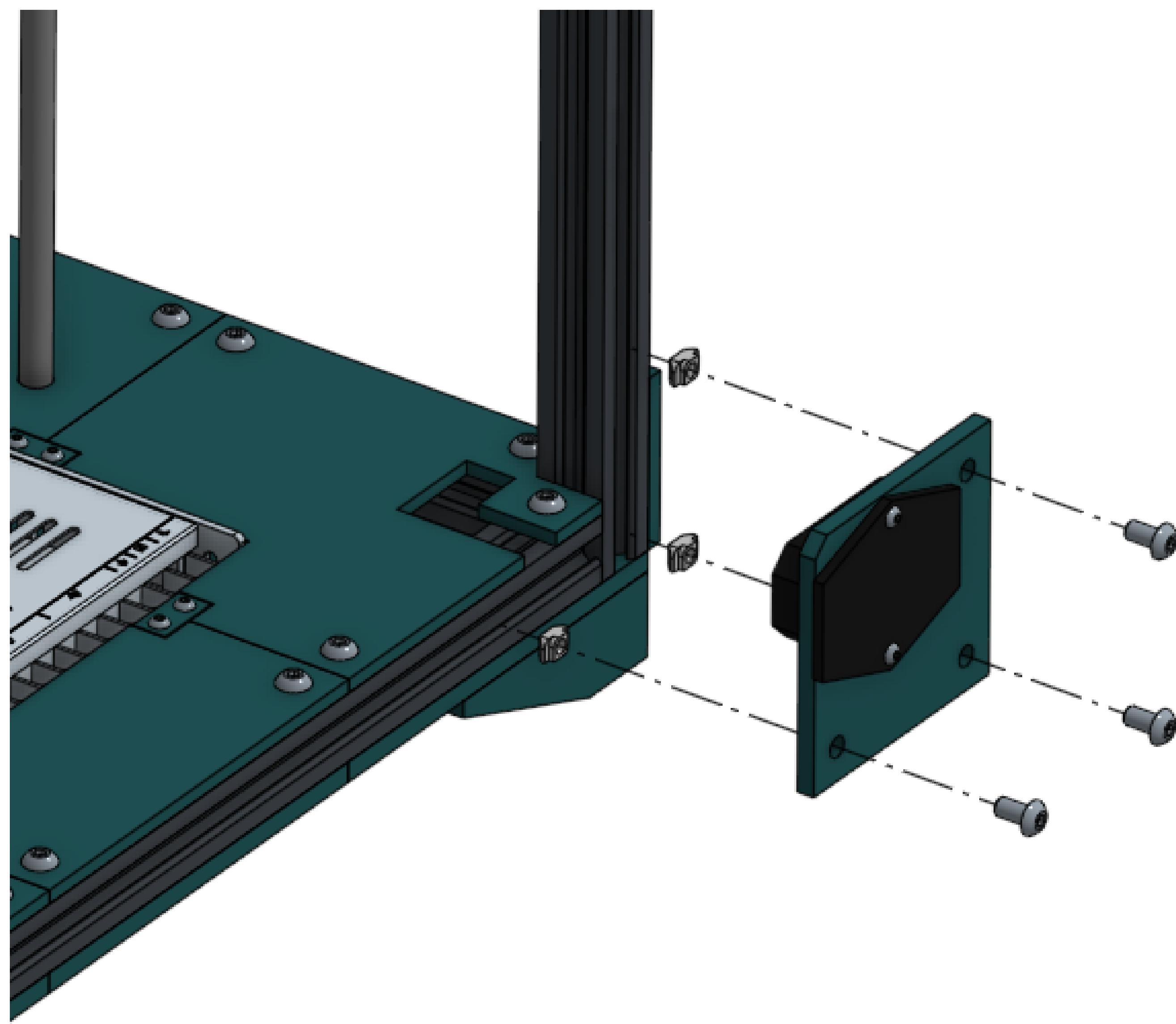
A plate at the back left will be excluded as shown.



M3x10 screw	2
M3 square nut	2
Socket plate	1
Power socket	1



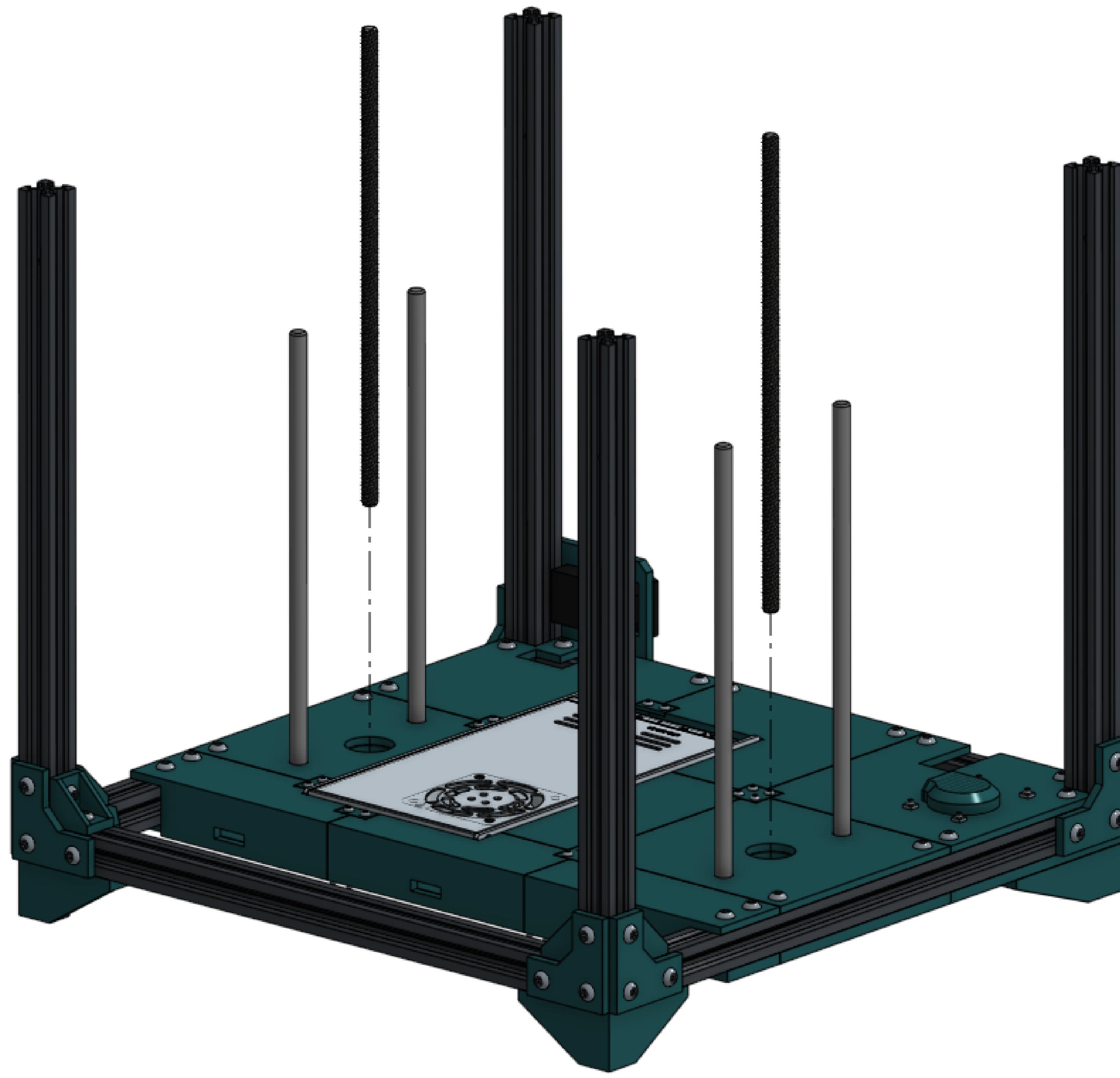
M5x10 screw	3	At this time connect the power socket to the loose power wires. Ensure safe insulation with heat shrink, there is no shroud or cover for the live wires provided.
M5 T nut	3	
Assembled socket	1	



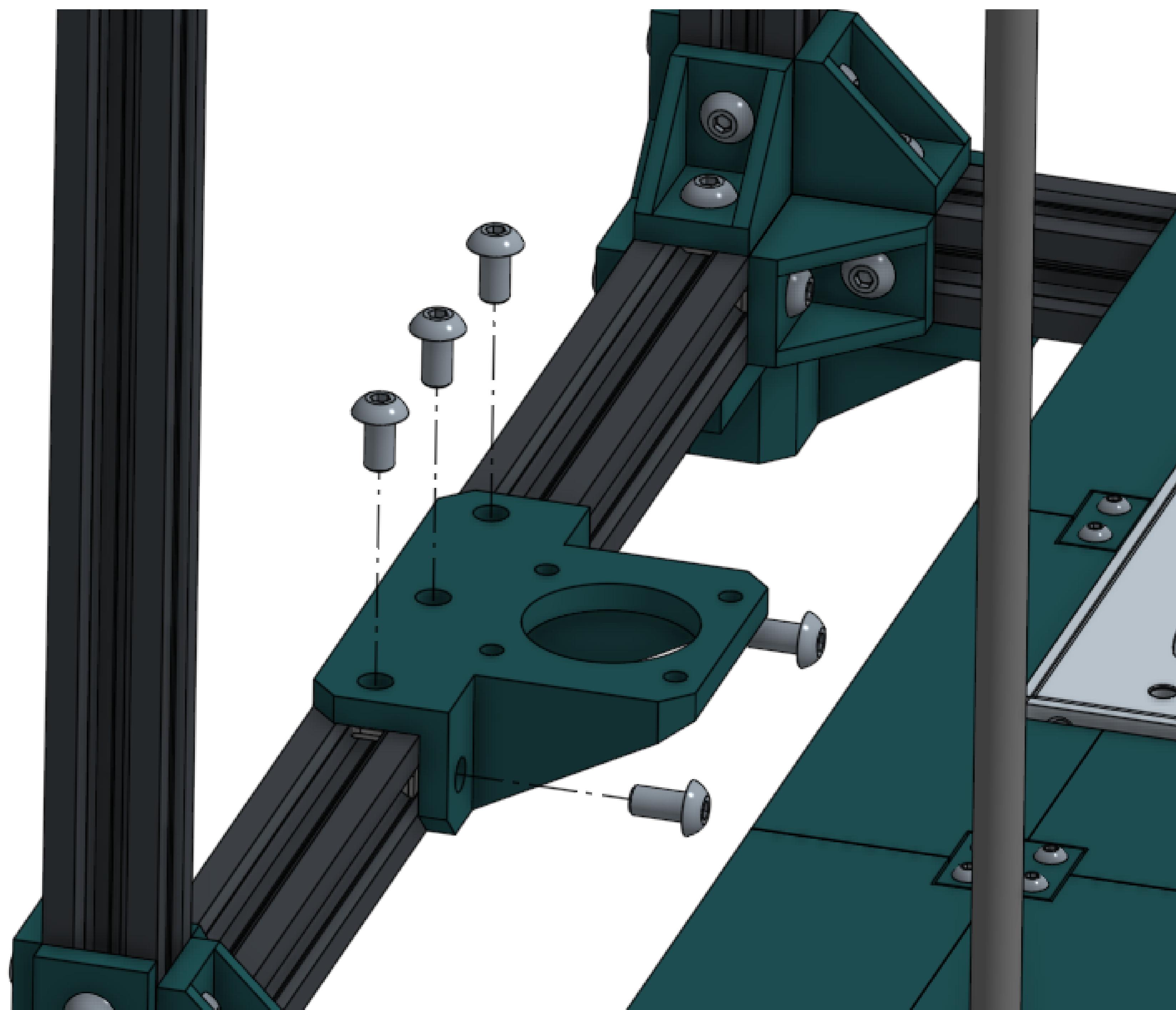
Leadscrew

2

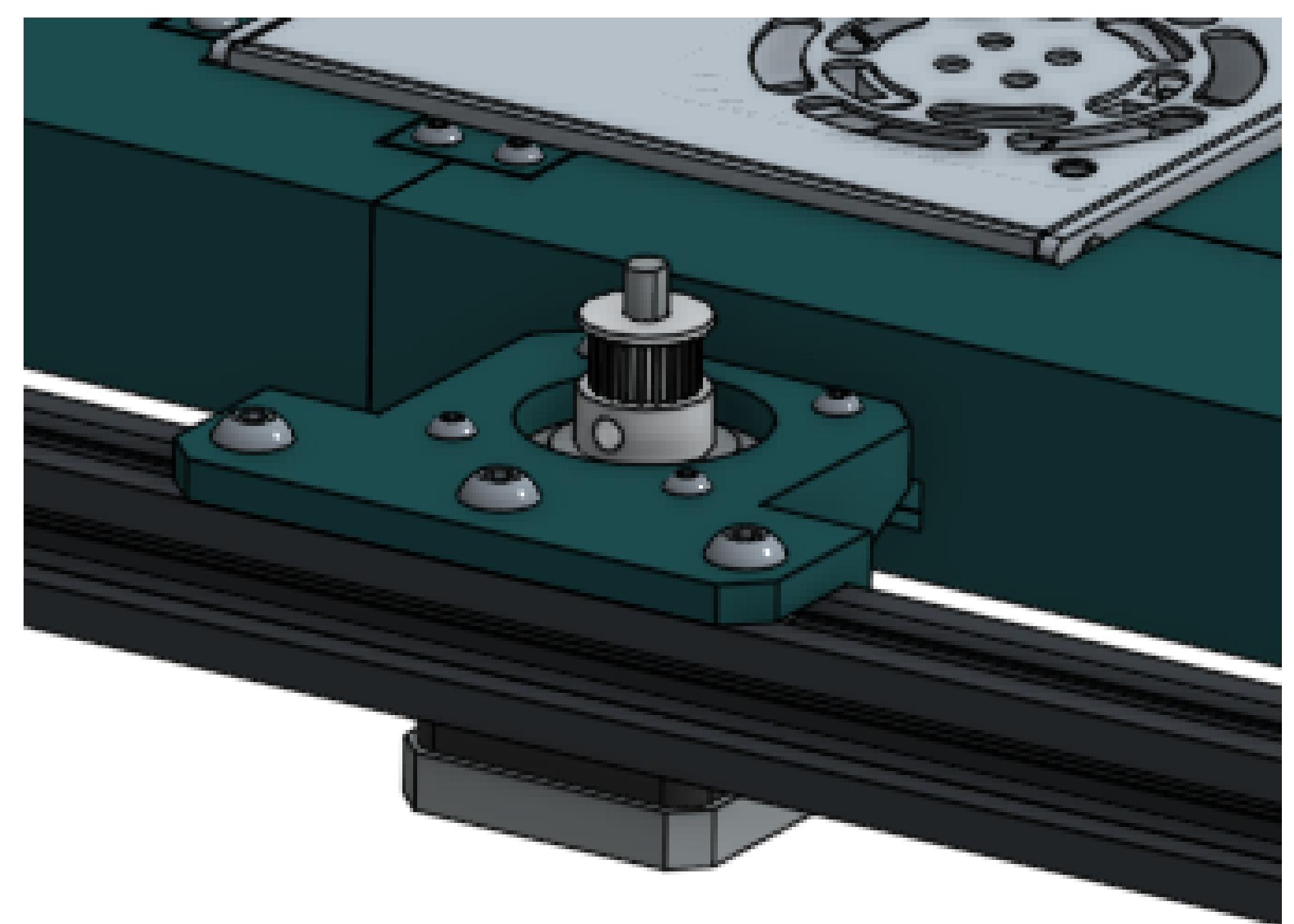
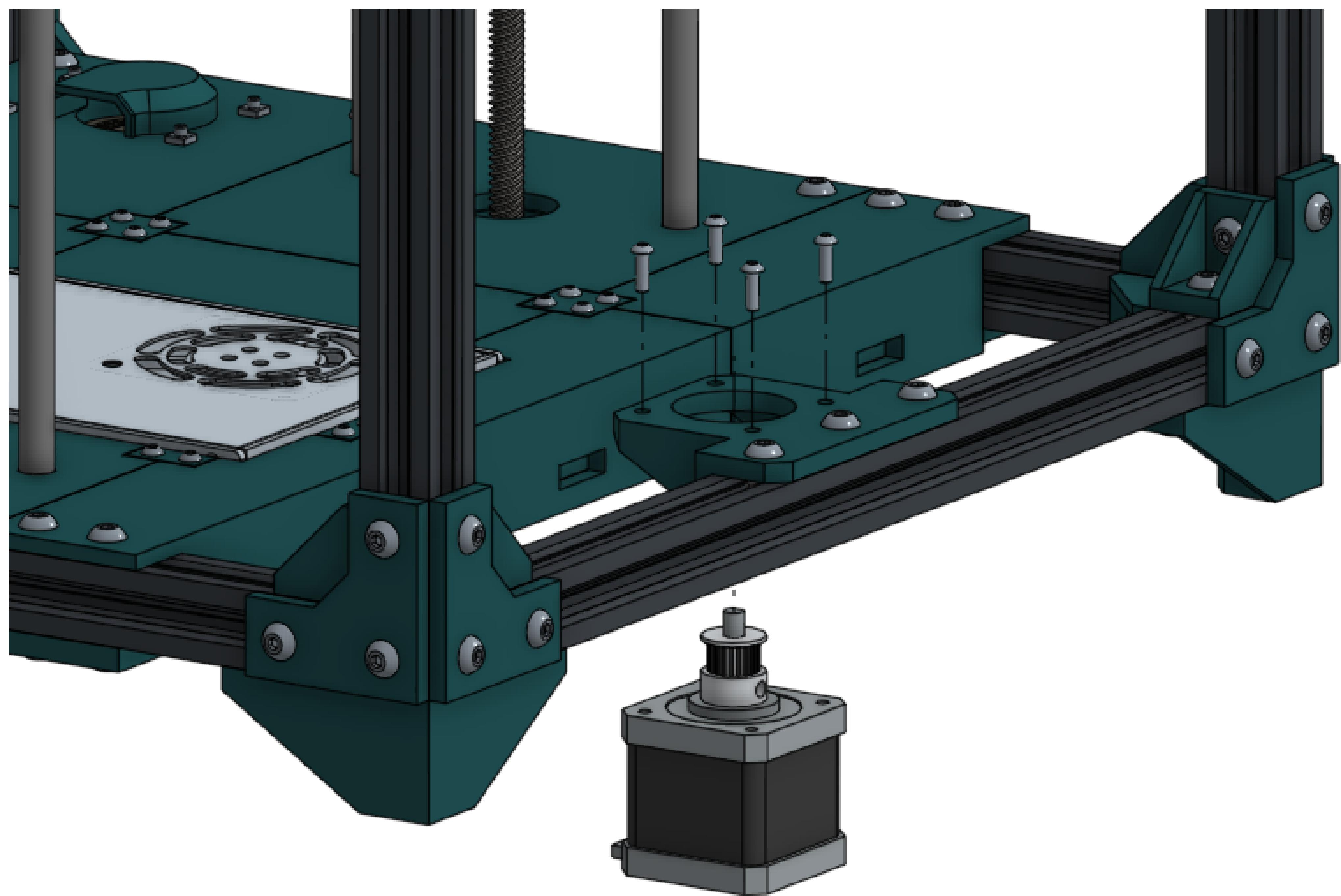
Drop the Z axis leadscrews into the bearings in the base of the machine. This will be a very loose fit for now.



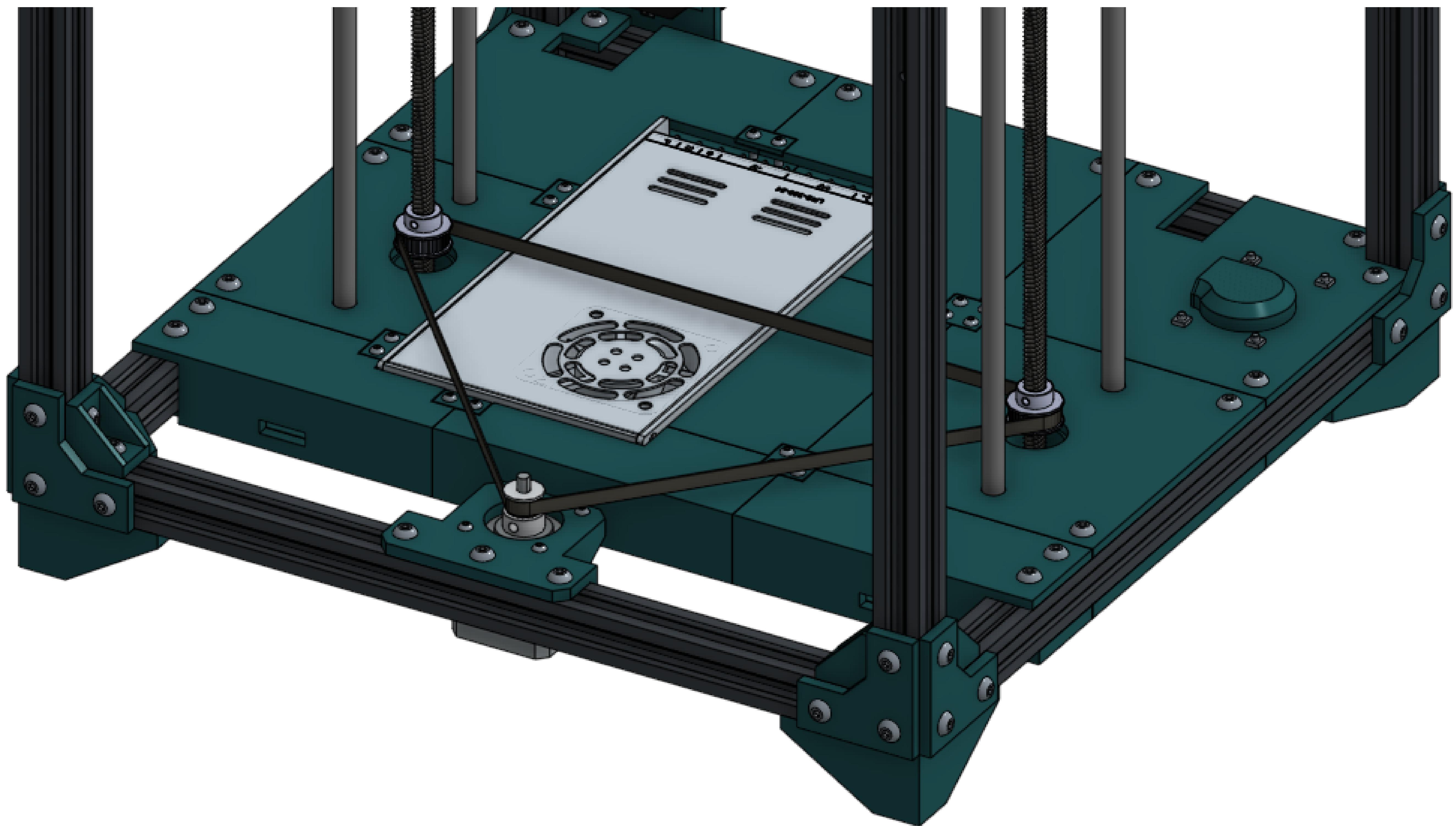
Z motor mount	1	Loosely fasten the Z axis motor mount to the front rail of the machine.
M5x10 screw	5	
M5 T nut	5	



Z motor	1	Remember to plug the cable in.
M3x10 screw	4	

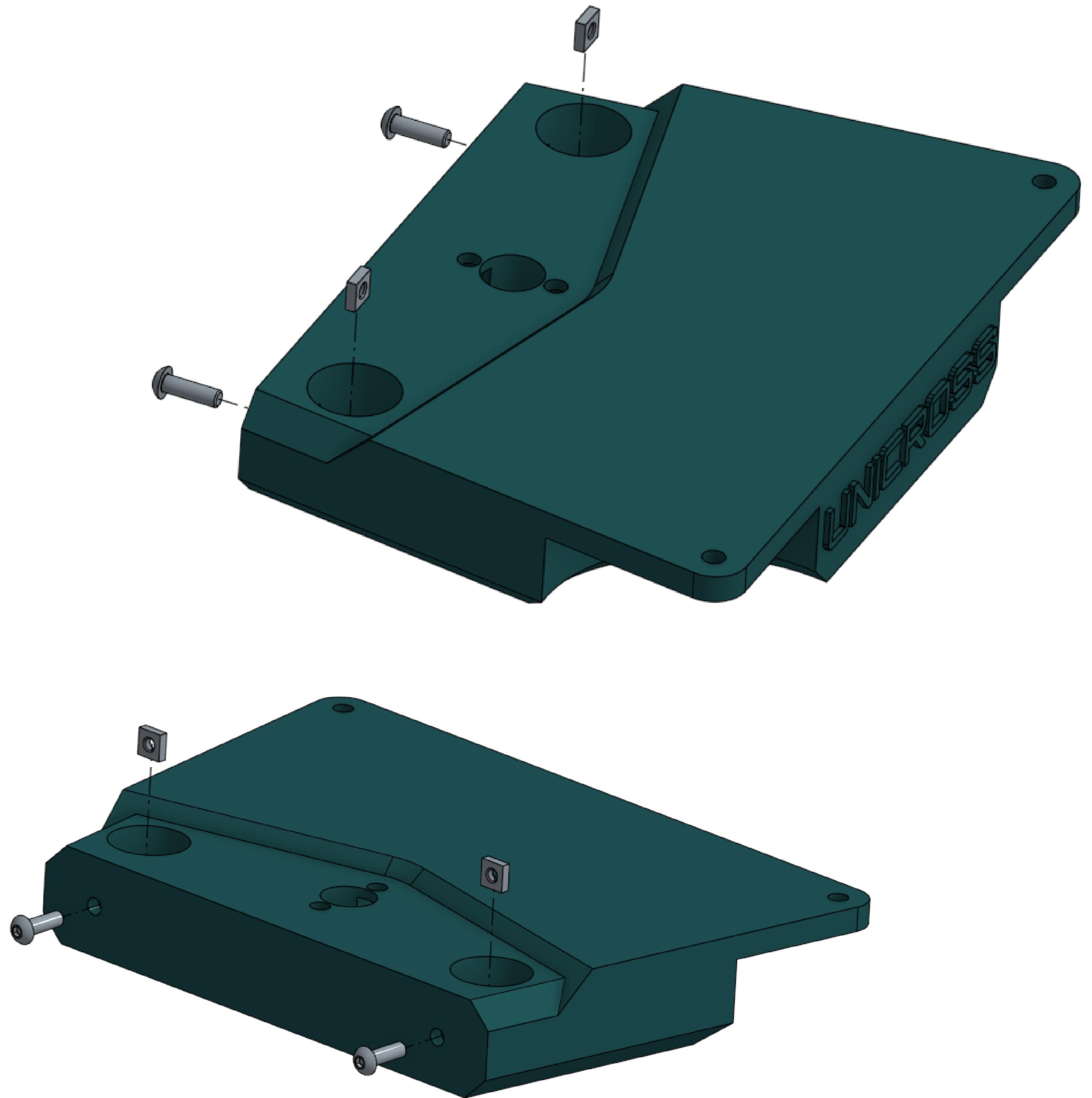
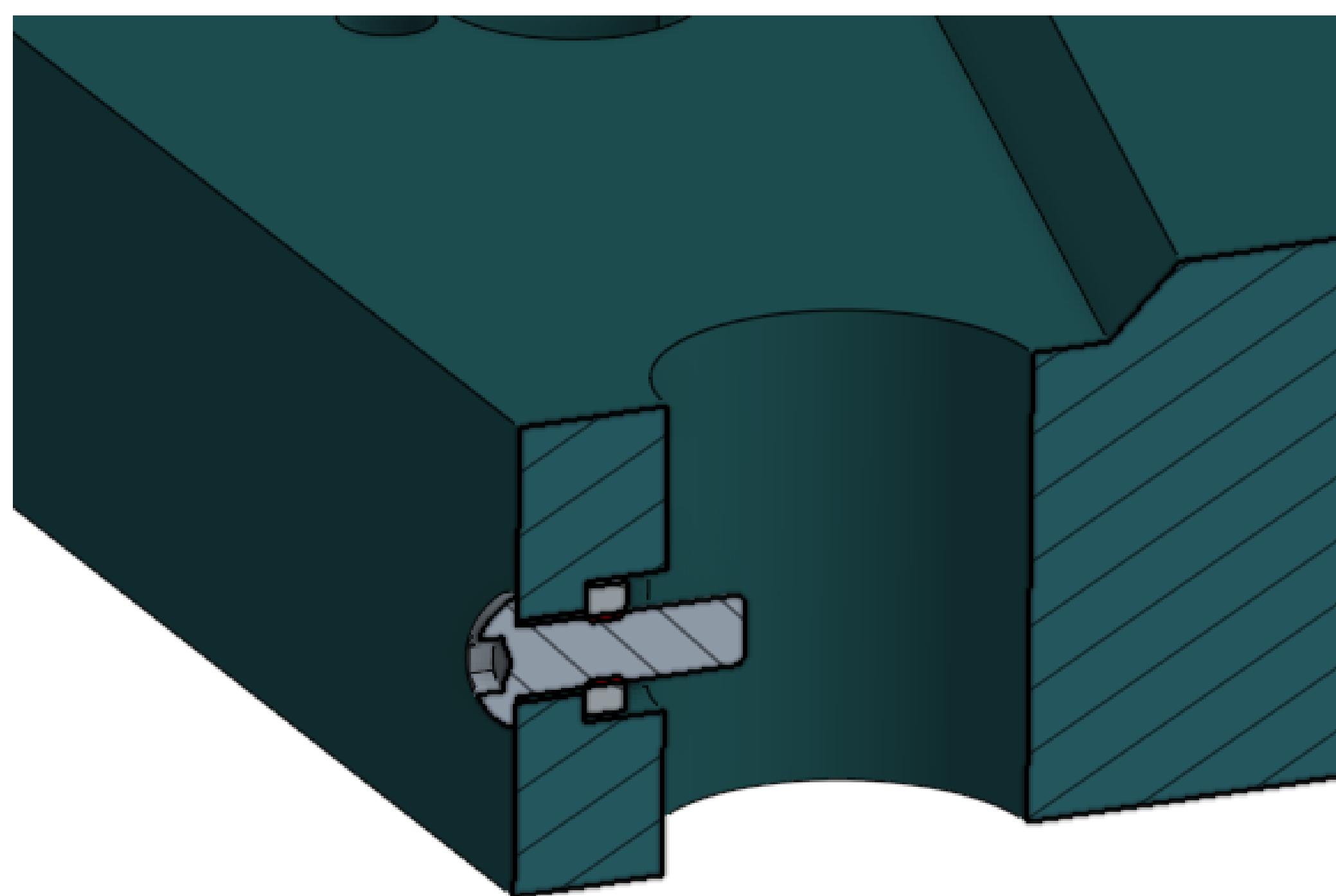


Z belt	1	Install the Z axis idlers and belt. It should be a loose fit. Make sure the belt path is level.
30T Z idler	2	The belt will be tightened once the Z axis is mostly together.

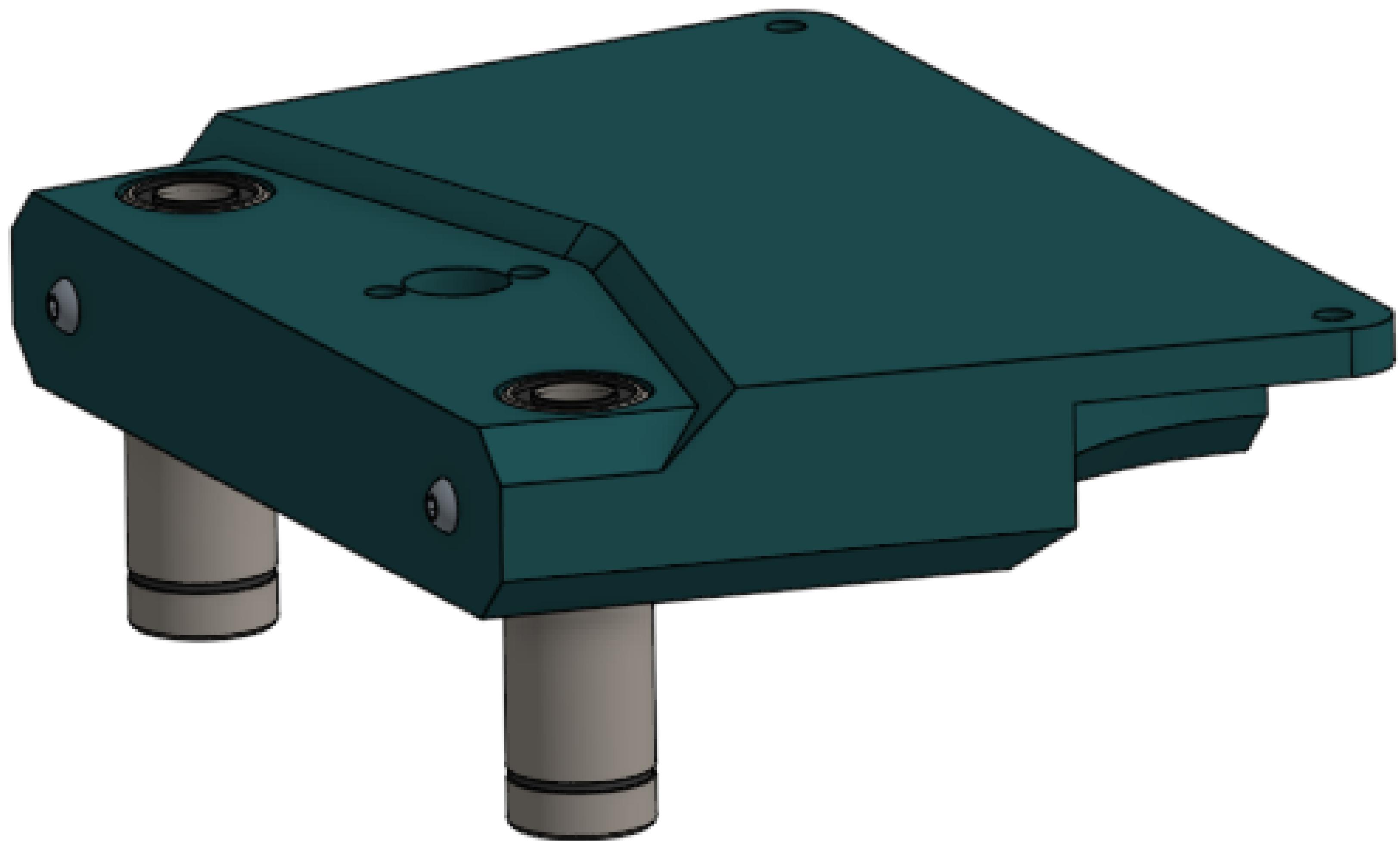


M3x10 screw	4
M3 square nut	4
Bed mount	2

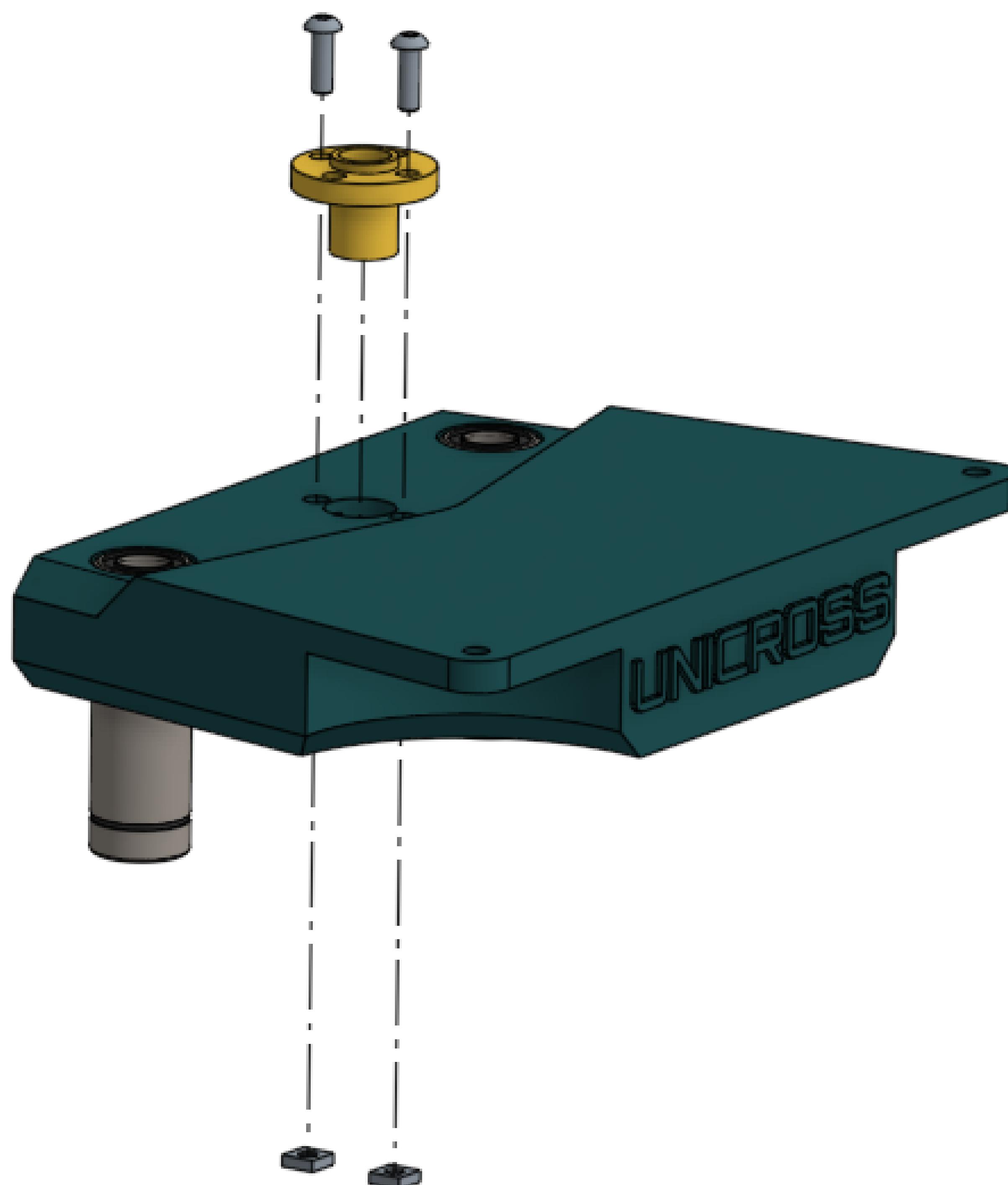
For the following steps, only one bed mount will be shown for clarity. Both must be assembled.



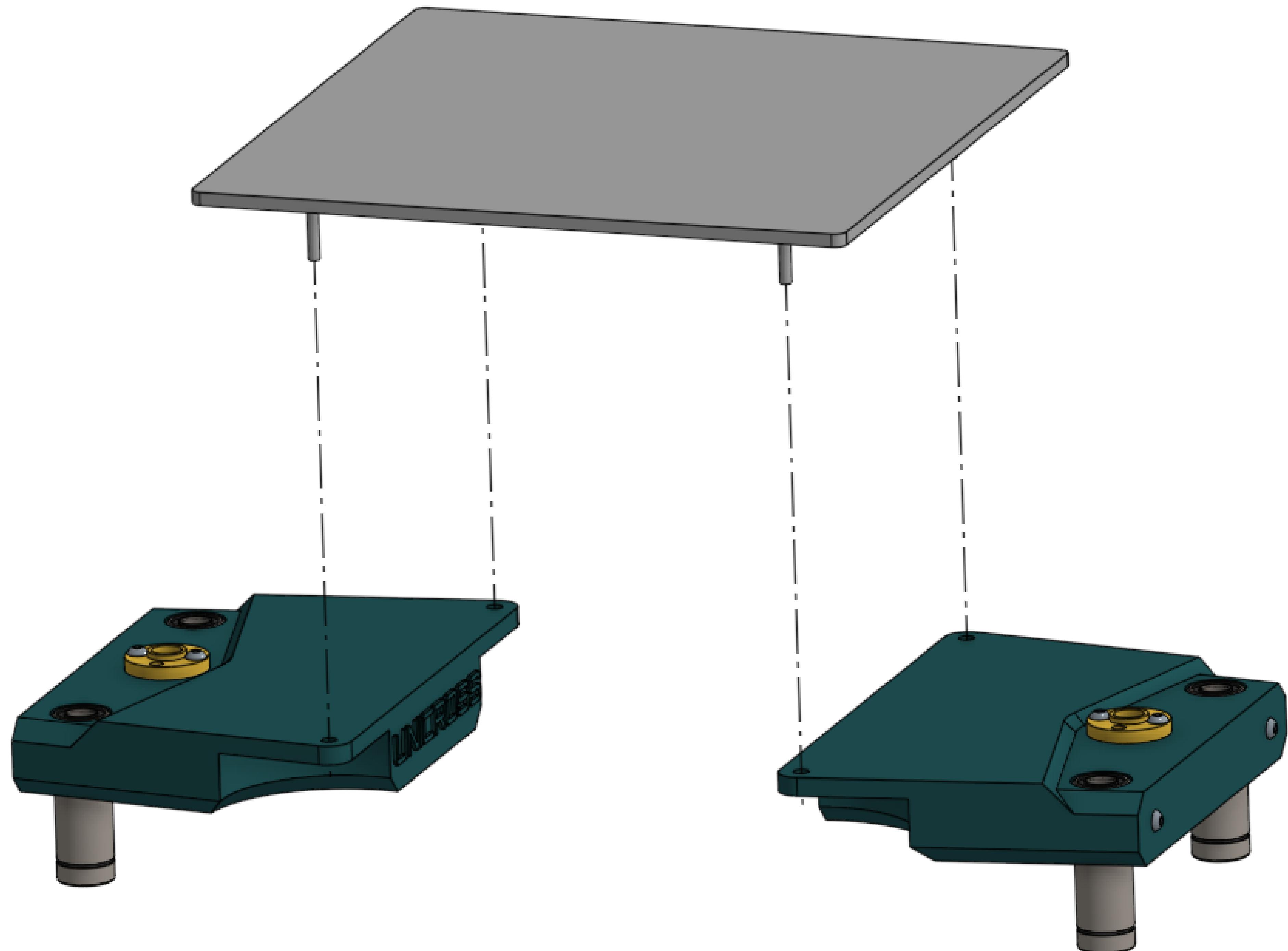
LM8LUU bearing	4	Install and clamp down linear bearings.
Bed mount	2	



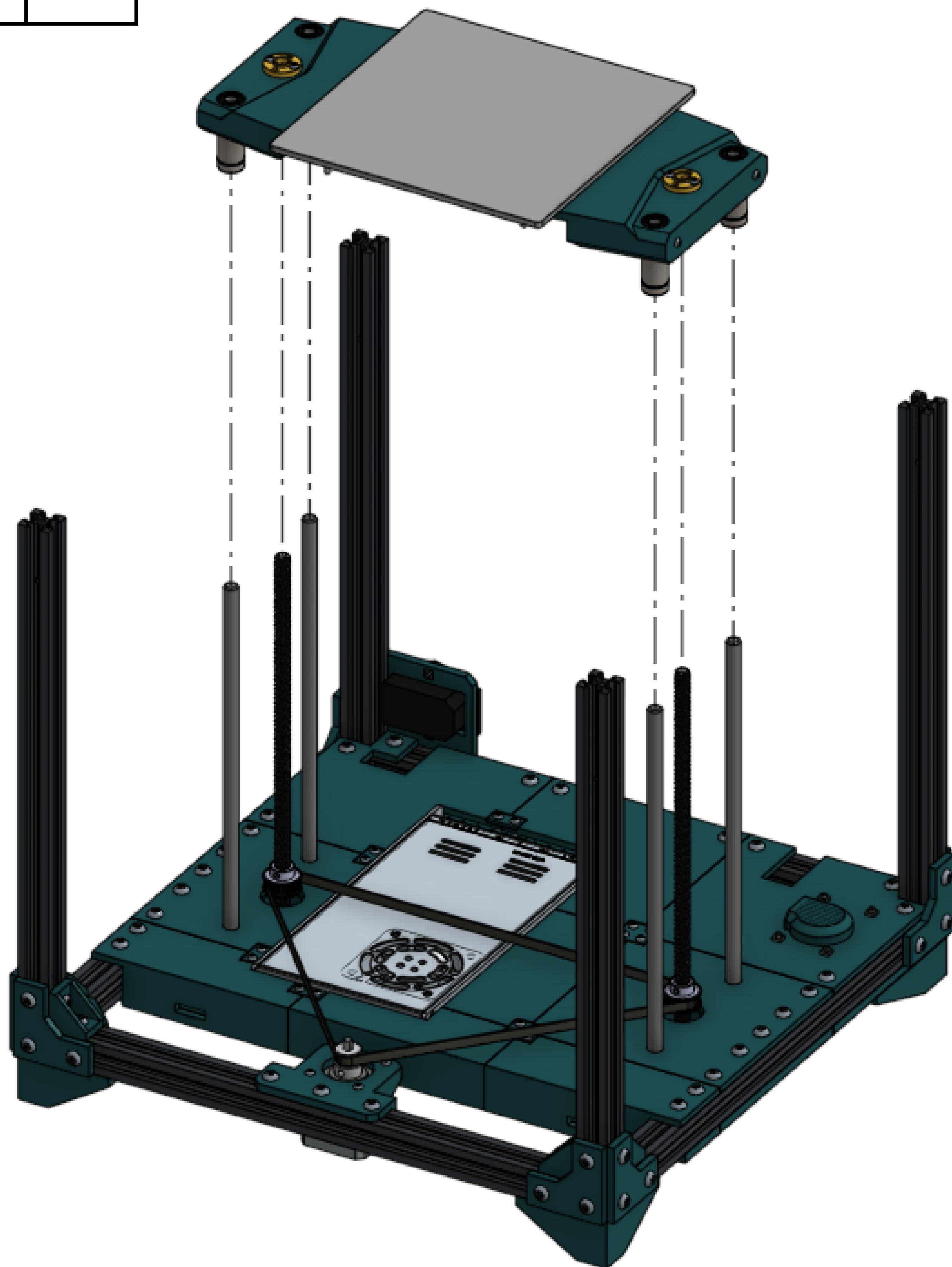
T8 nut	2
M3x10 screw	4
M3 square nut	4
Bed mount	2



Bed	1	Install the bed. This step varies depending on the bed you're using, and you might have to provide your own screws and other hardware.
Bed mount	2	

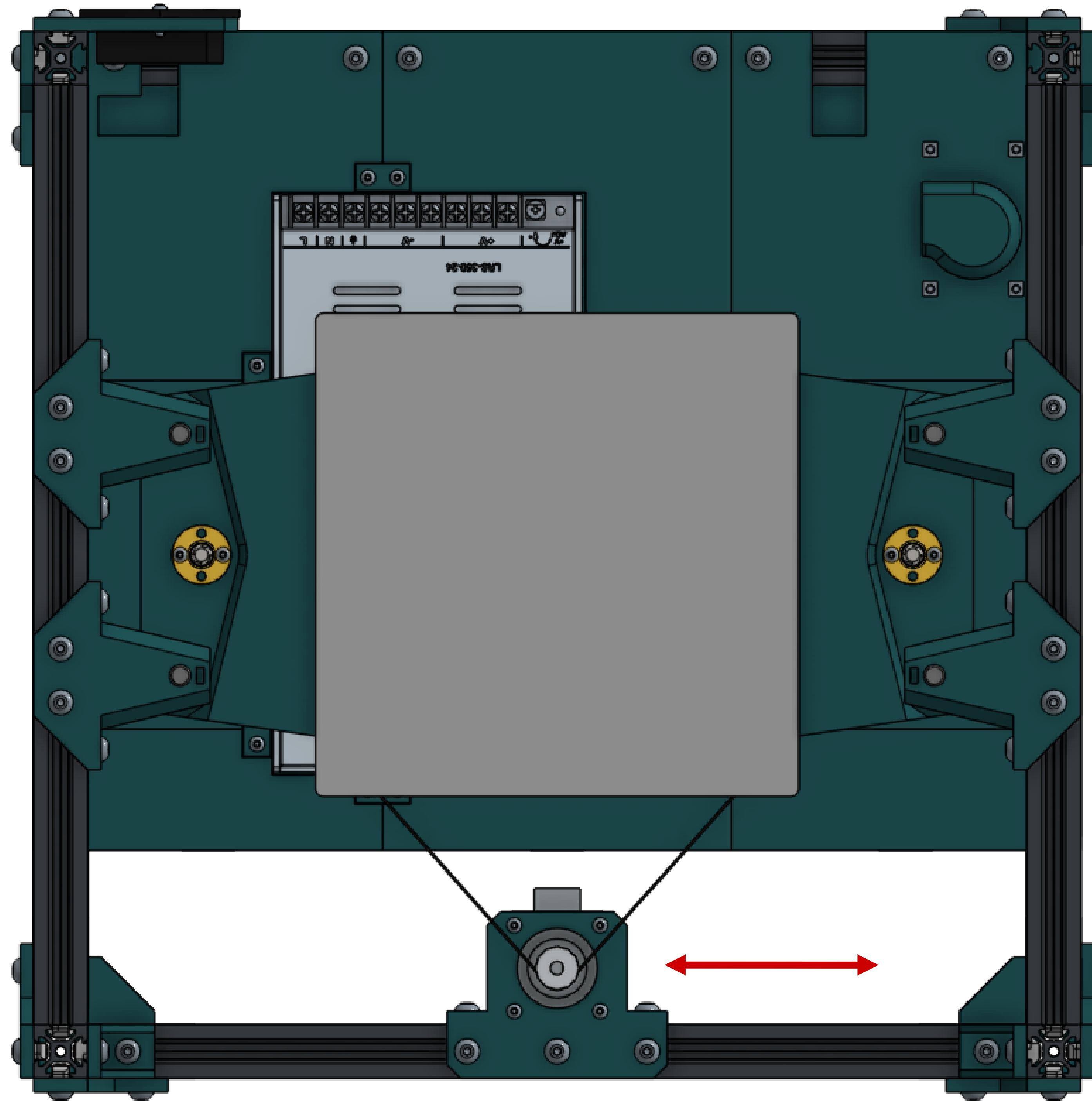


Assembled bed	1	Lower the bed onto the printer, aligning the rods and screws. KEEP IT AS LEVEL AS POSSIBLE.
Printer assembly	1	



Pull the Z belt tight by sliding the Z axis motor mount to the left or right. If it does not slide easily, loosen the bolts more.

When the belt is reasonably tight, tighten the Z axis motor mount bolts to lock it in place. Do not over-tighten the belt.

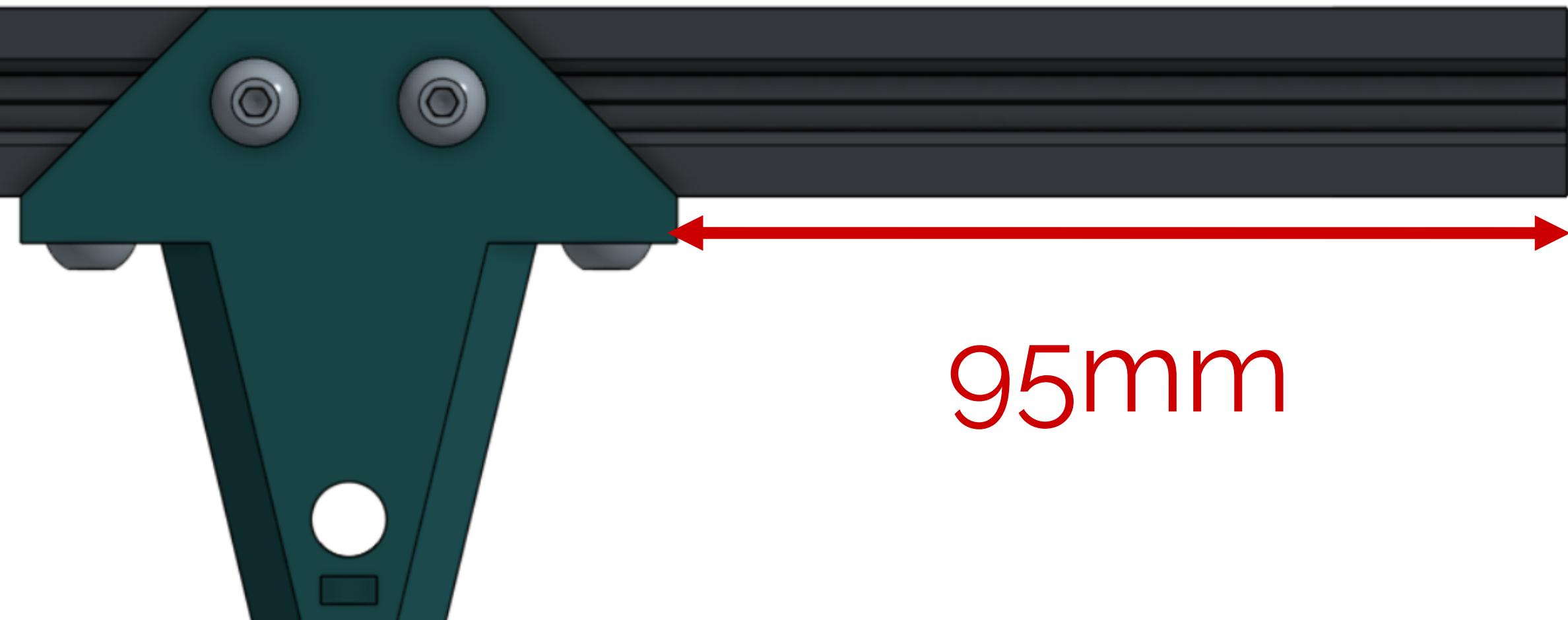
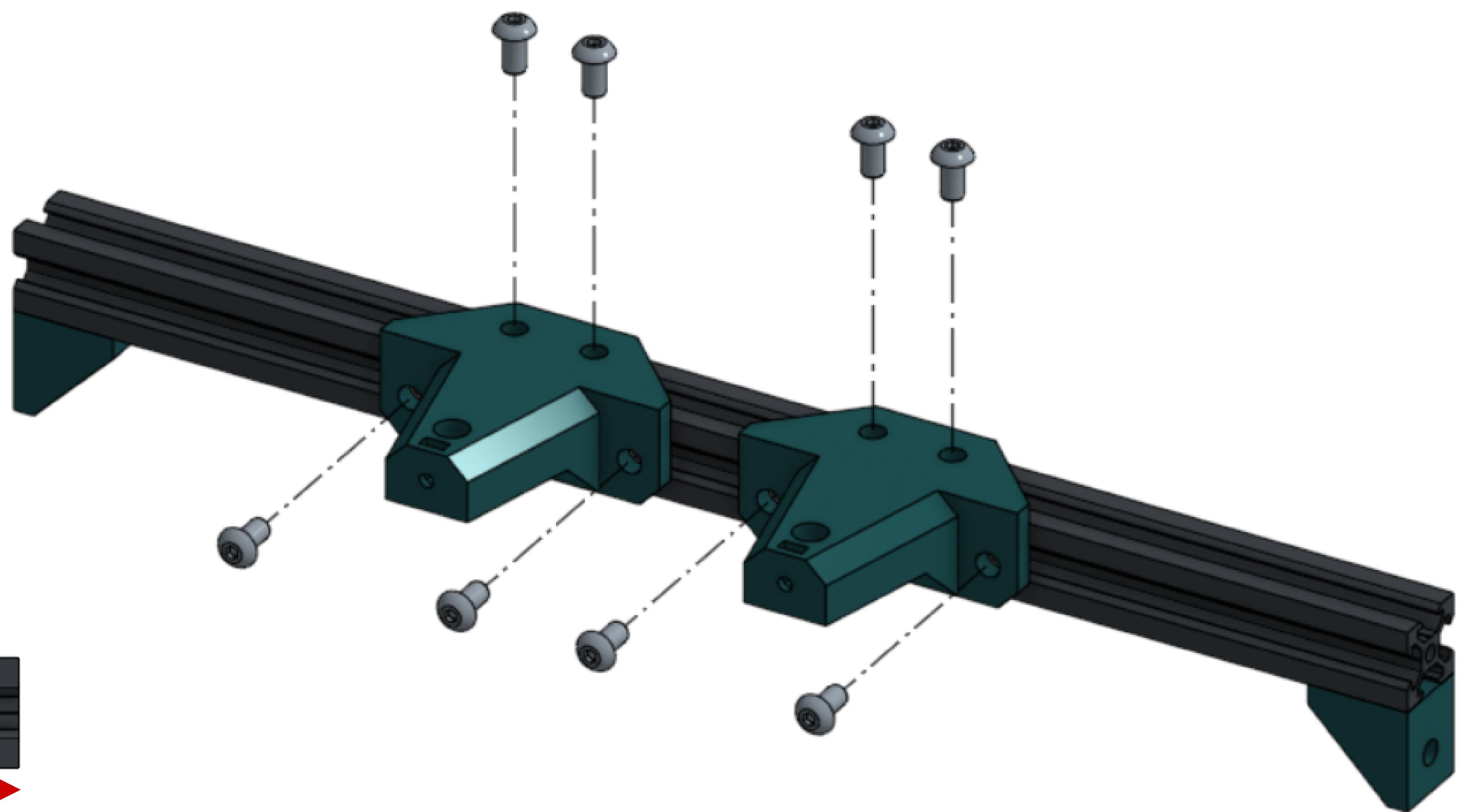


2020 extrusion	2	Build 2 of these. You can substitute the small corner brackets for large ones if you want, but there's not much reason to here.
Corner bracket	4	
M5x10 screw	4	
M5 T nut	4	

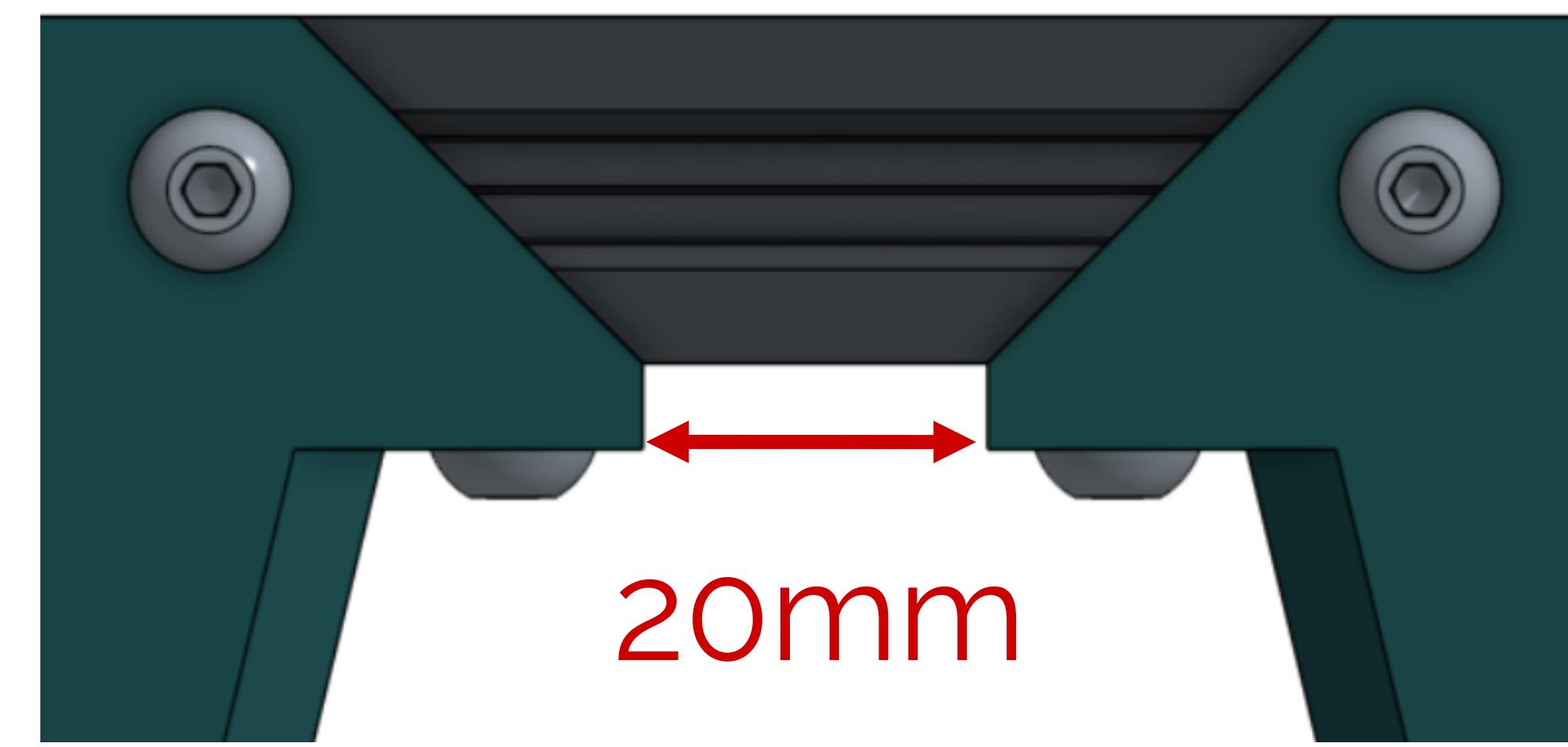


Side rail	2
Z rod support	4
M5x10 screw	16
M5 T nut	16

Fasten the Z rod supports using the measurements shown. Don't forget the other rail!



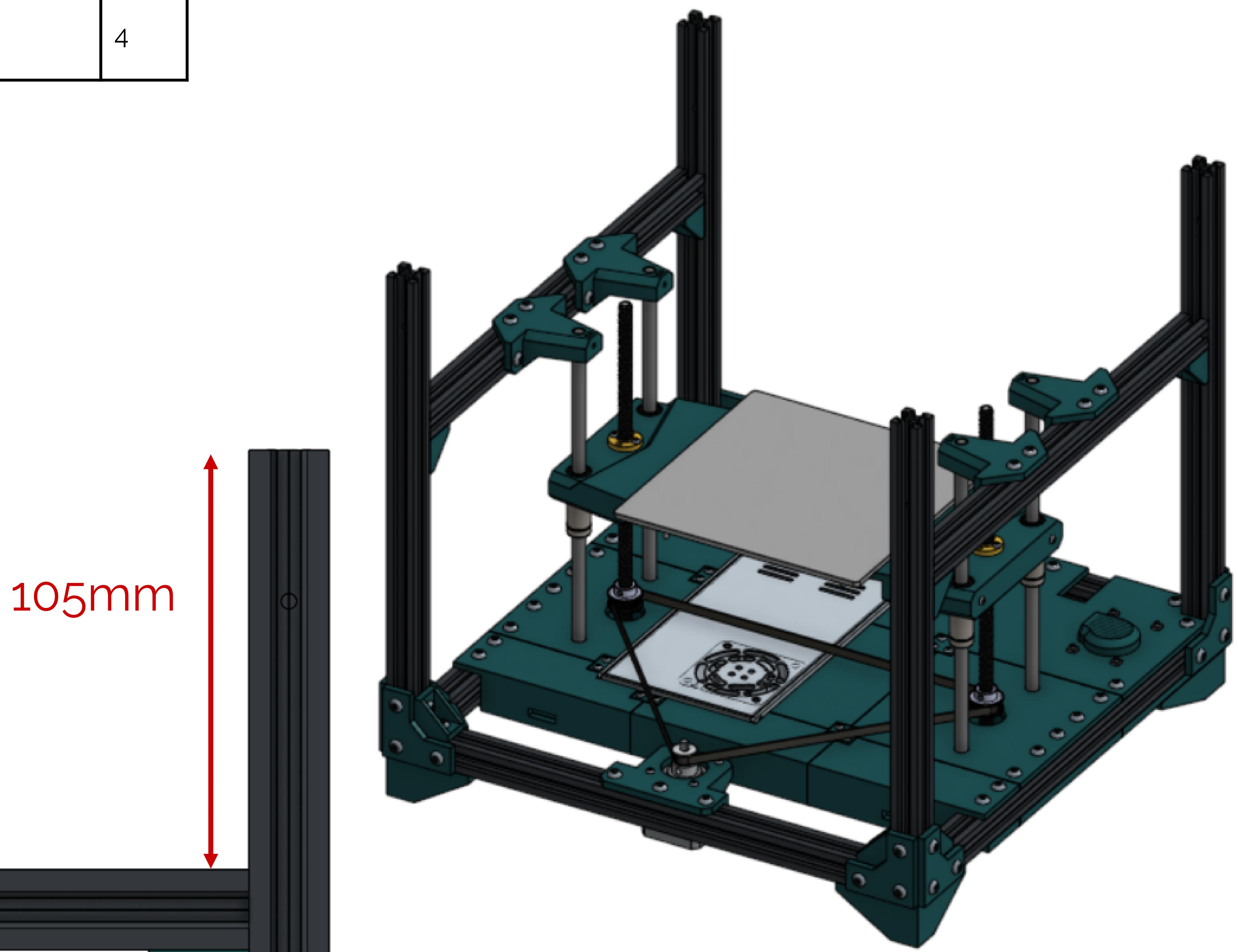
95mm



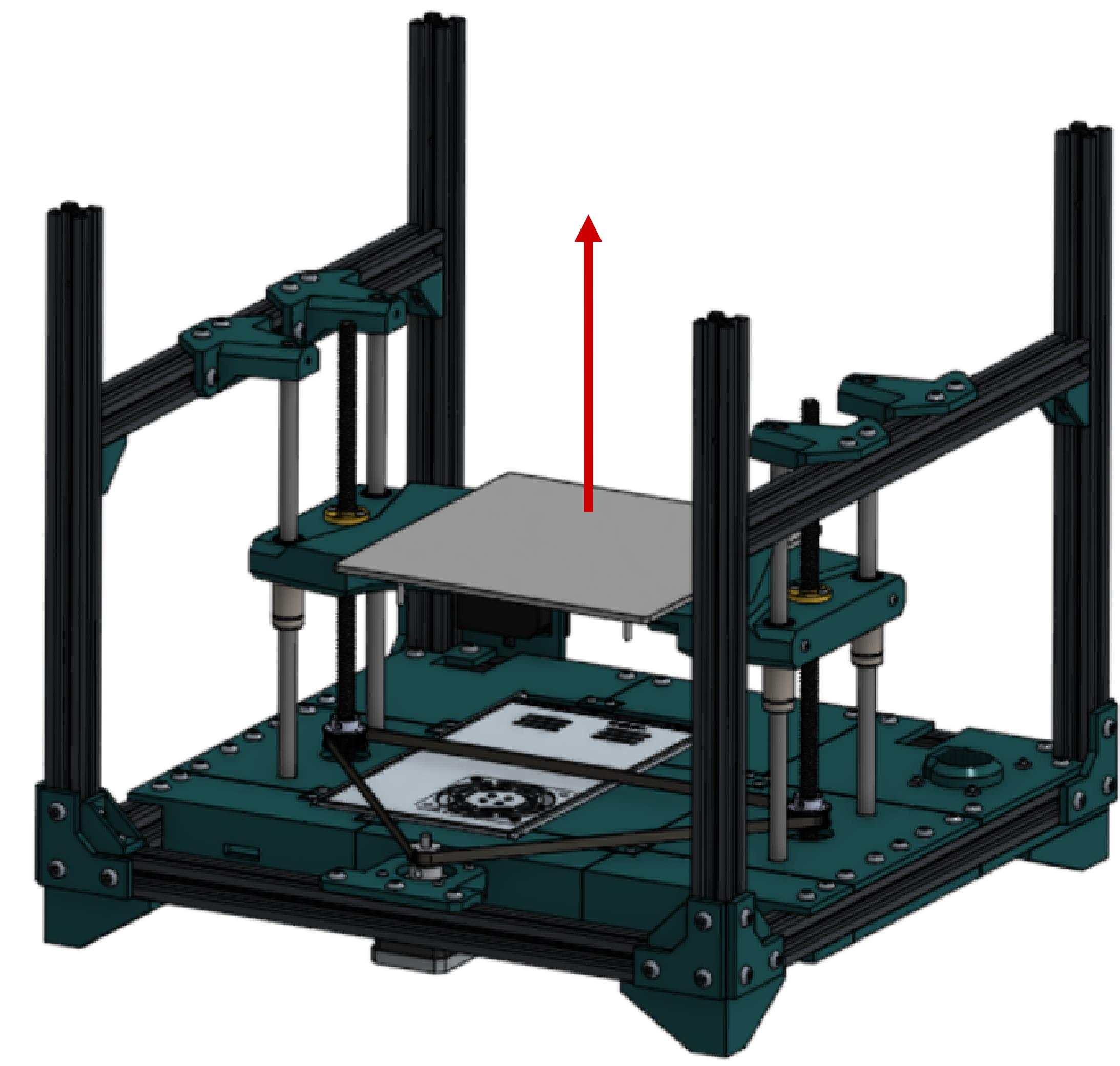
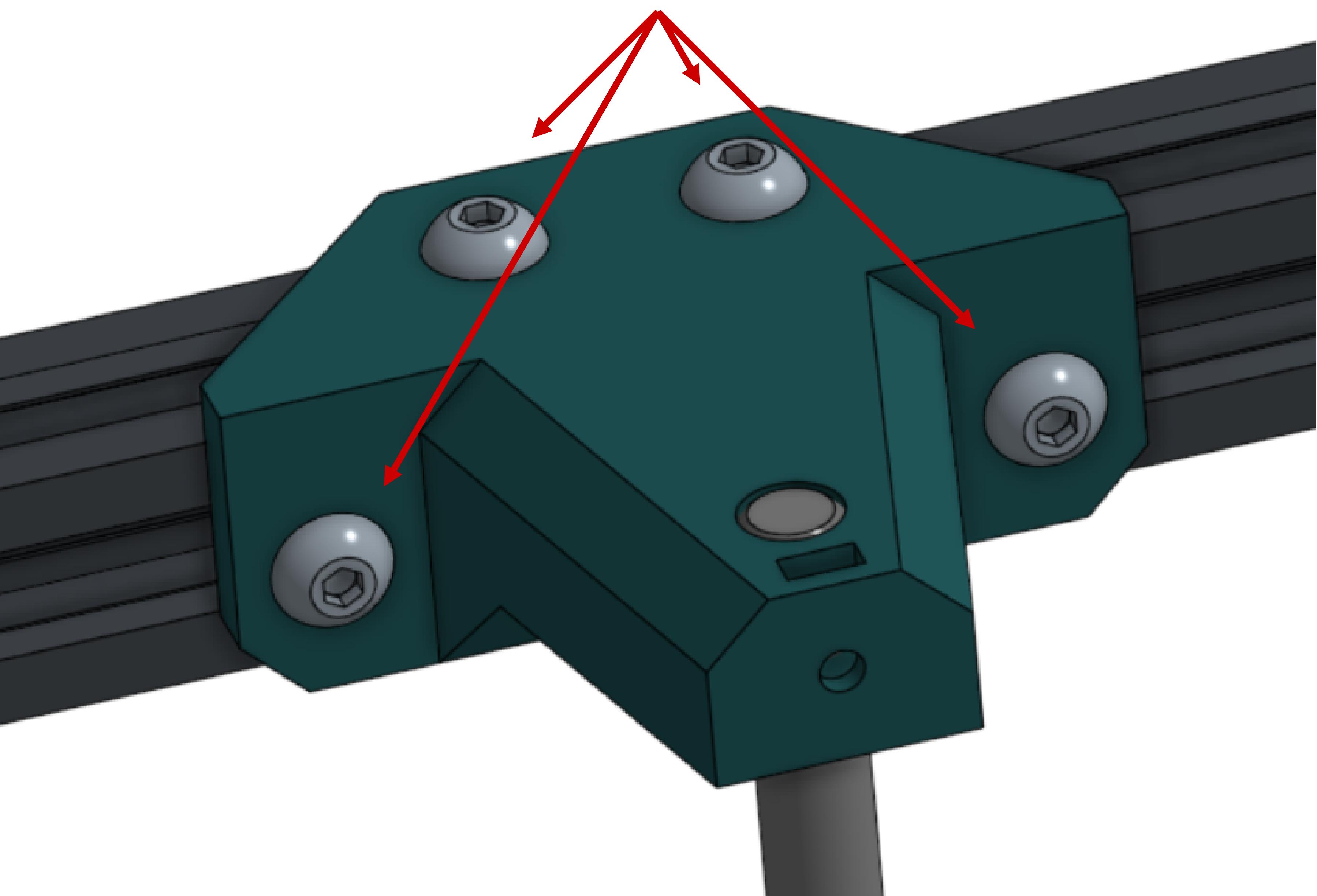
20mm

Side rail	2
M5 T nut	4
M5x10 screw	4

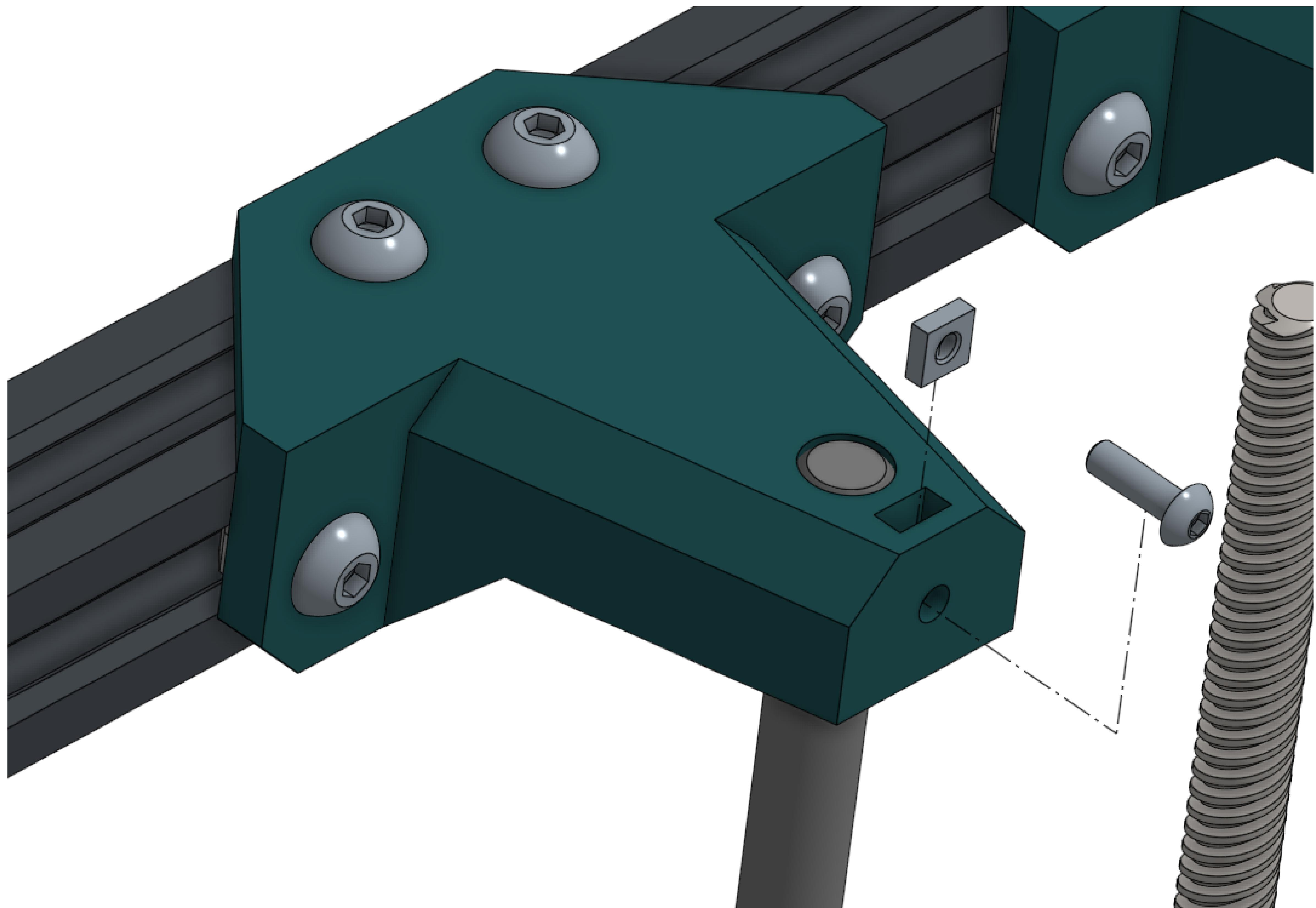
Attach the two side rails using the measurements shown. The Z rod supports should fit over the rods. Don't worry about being super accurate, the goal is to support the Z rods.



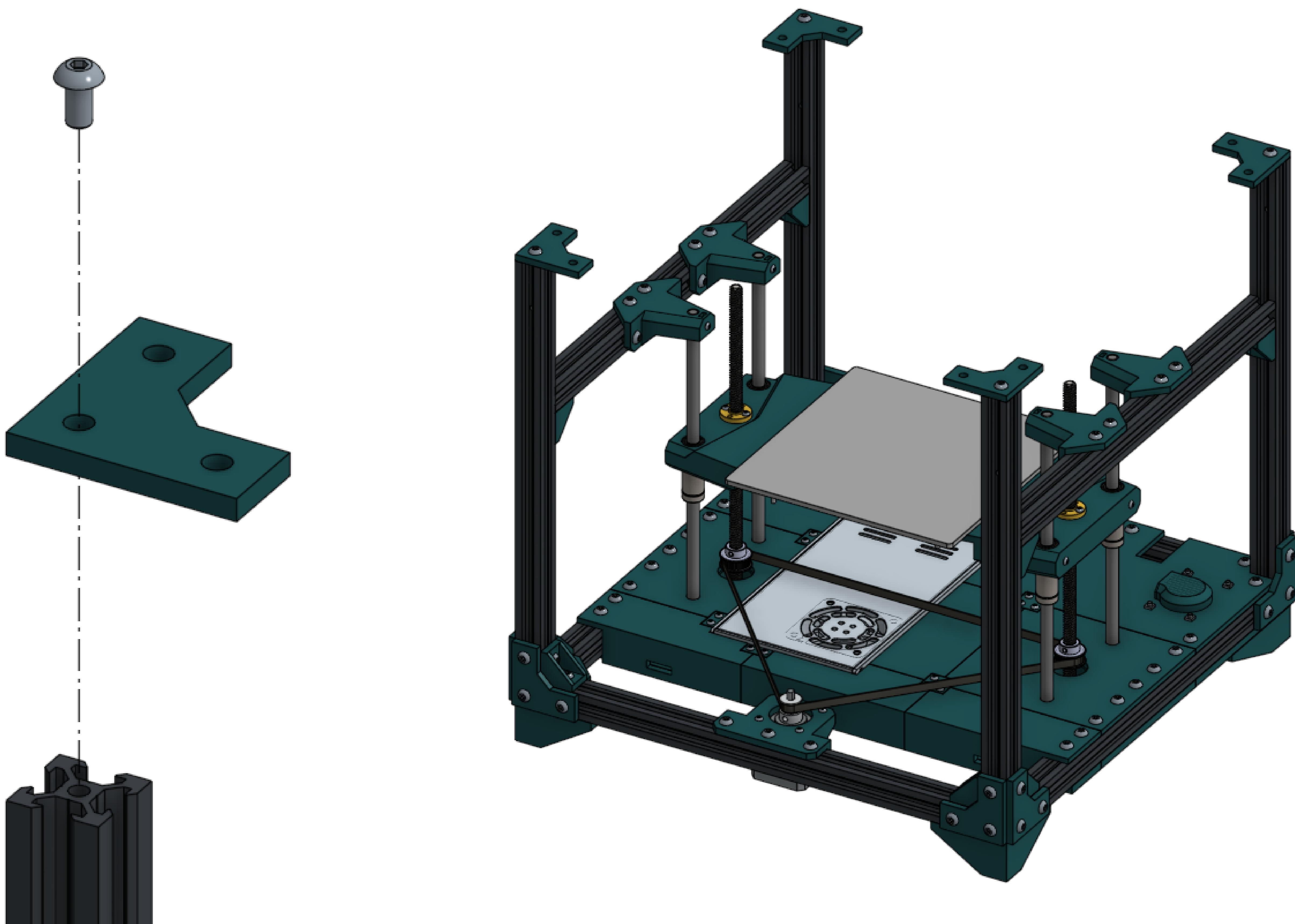
Side rail	2	Eliminate bias in the Z axis. Loosen all bolts on the Z rod mounts, raise the bed to nearly the top (about 10mm until it hits the top), and then tighten the bolts again.
M5 T nut	4	You can raise the bed by pulling on the Z axis belt.
M5x10 screw	4	



M3 T nut	4	Clamp down the Z axis rods with M3 hardware.
M3x10 screw	4	

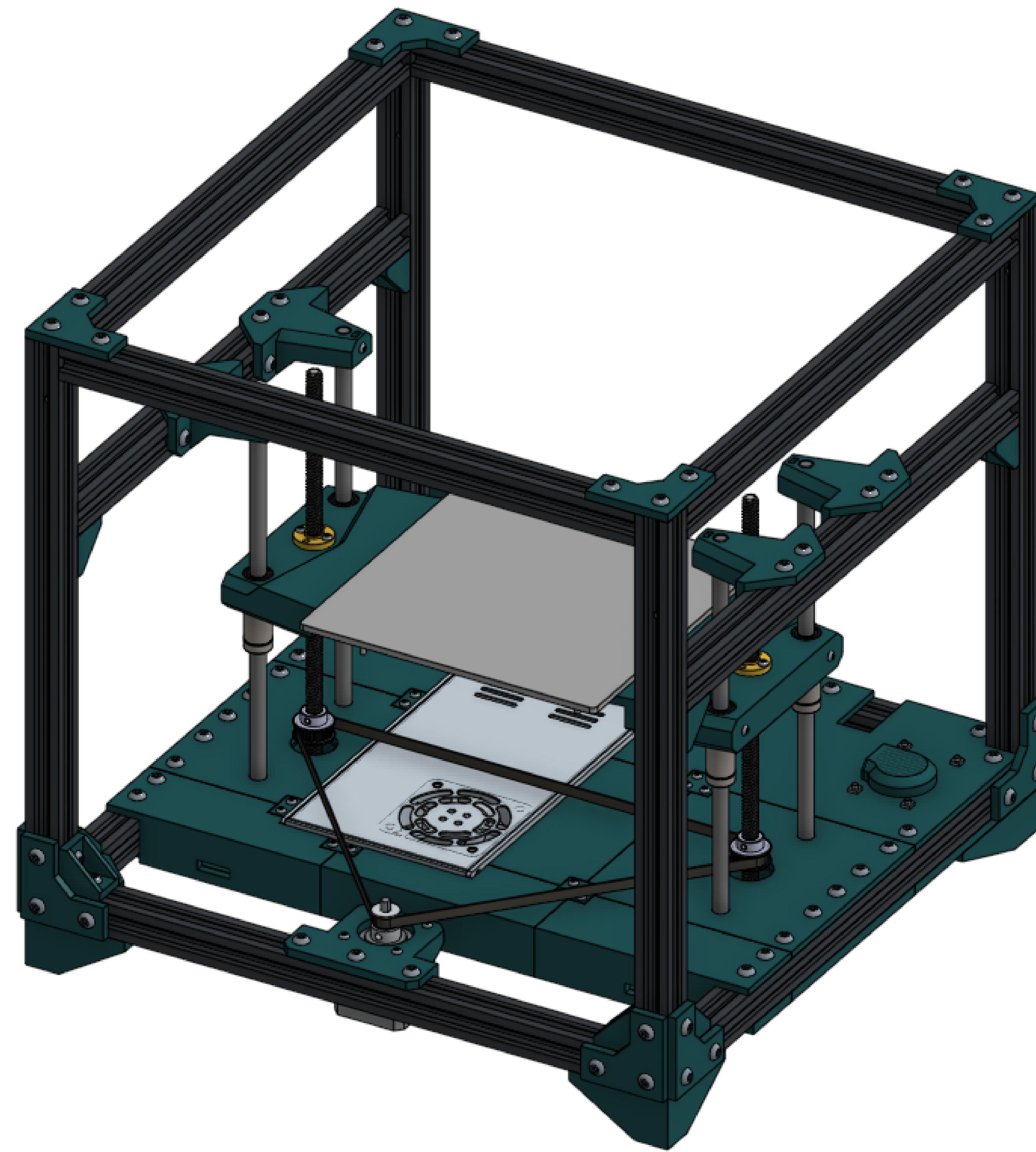


M5x10 screw	4	Fasten 4 plates to the top of the machine using the threads in each extrusion.
Fastening plate	4	

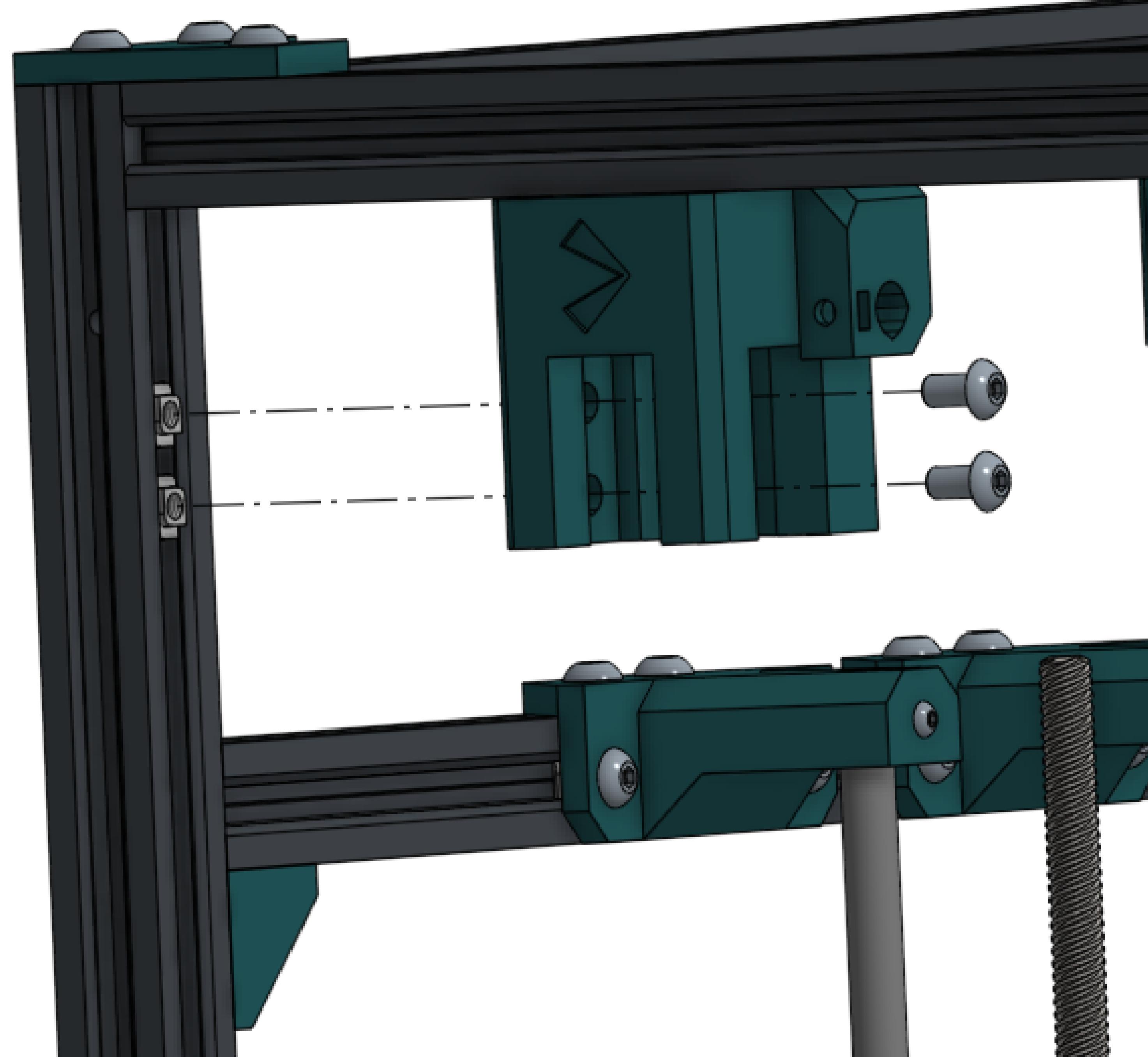
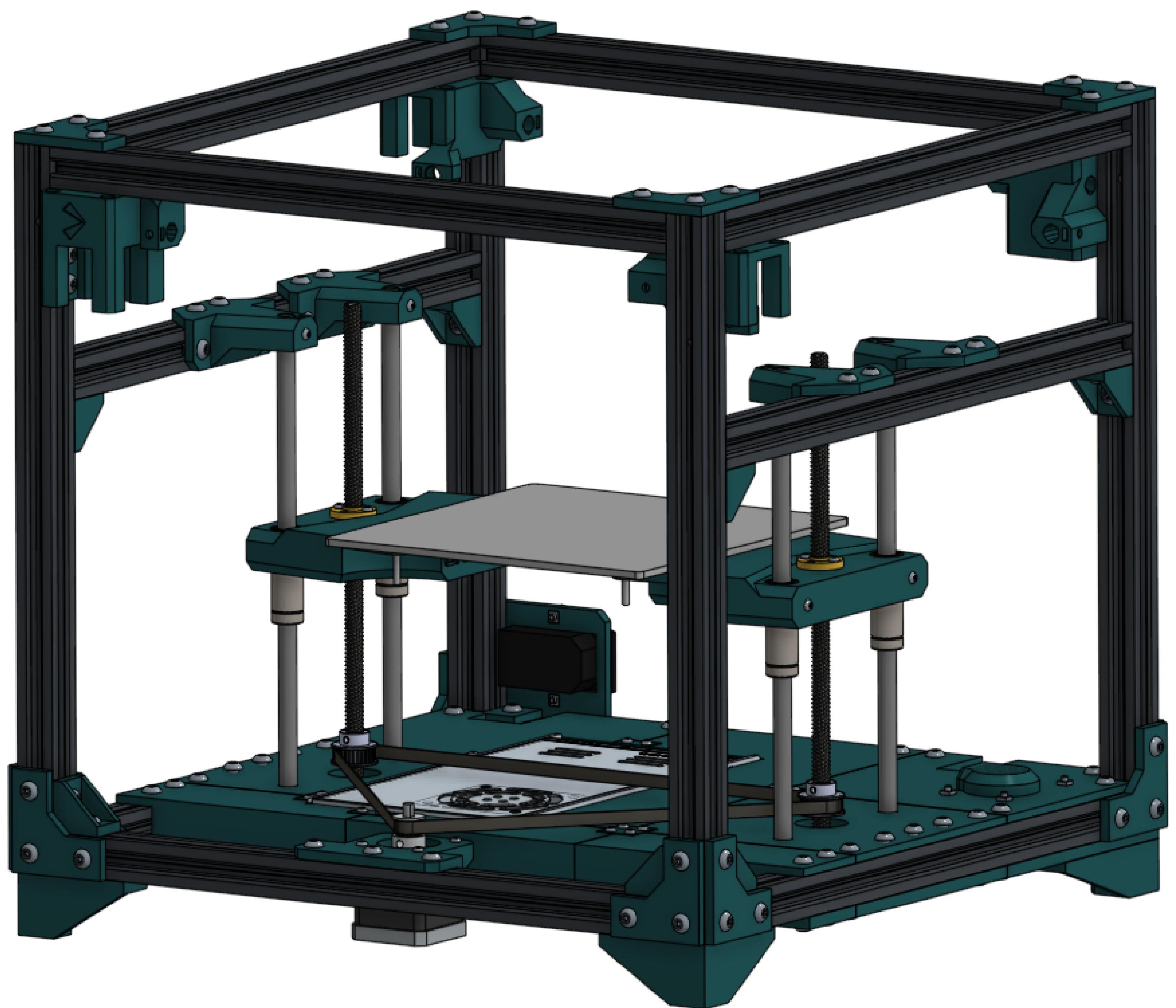


M5x10 screw	8
M5 T nut	8
2020 extrusion	4

Complete the cube. Further reinforcement will be added later.



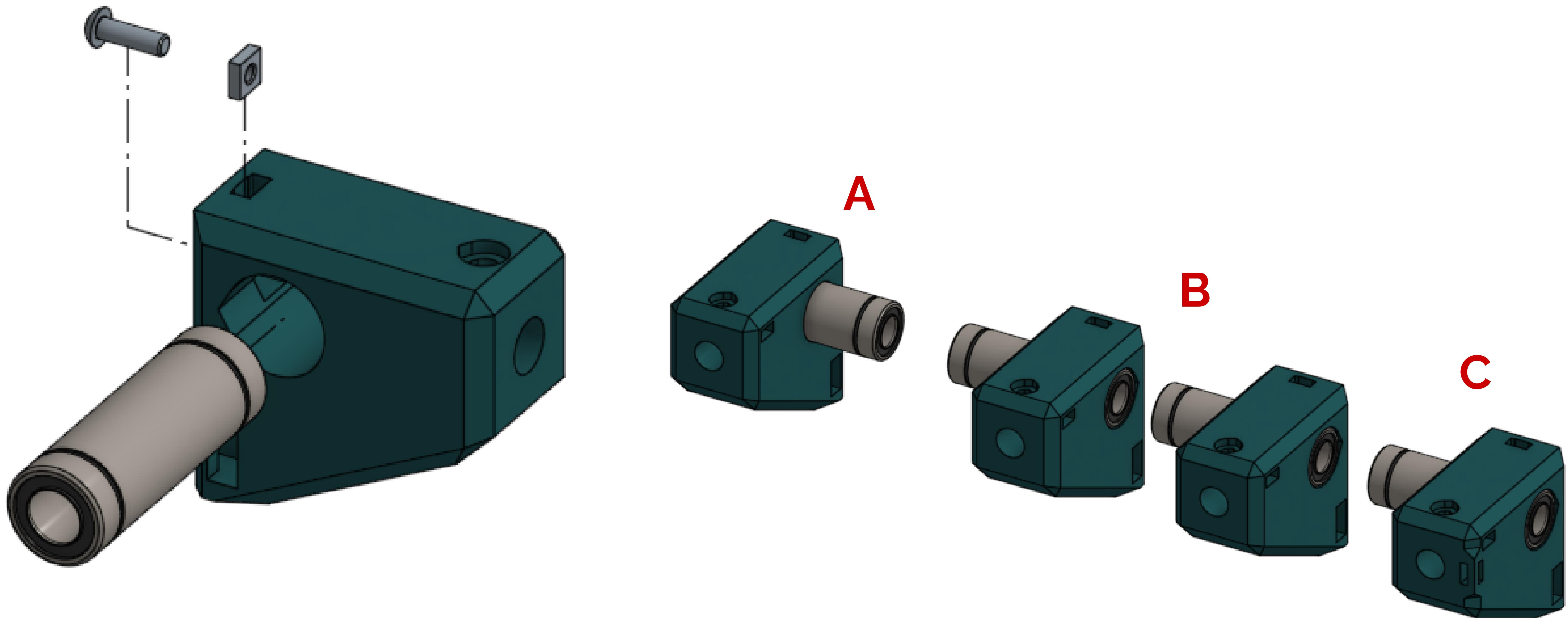
M5x10 screw	8	Fasten long and short mounts to the corners of the machine. Ensure good alignment, it is critical for correct machine operation.
M5 T nut	8	<ul style="list-style-type: none"> - Front left: Long - Front right: Short - Back right: Long - Back left: Short
Long mount	2	
Short mount	2	



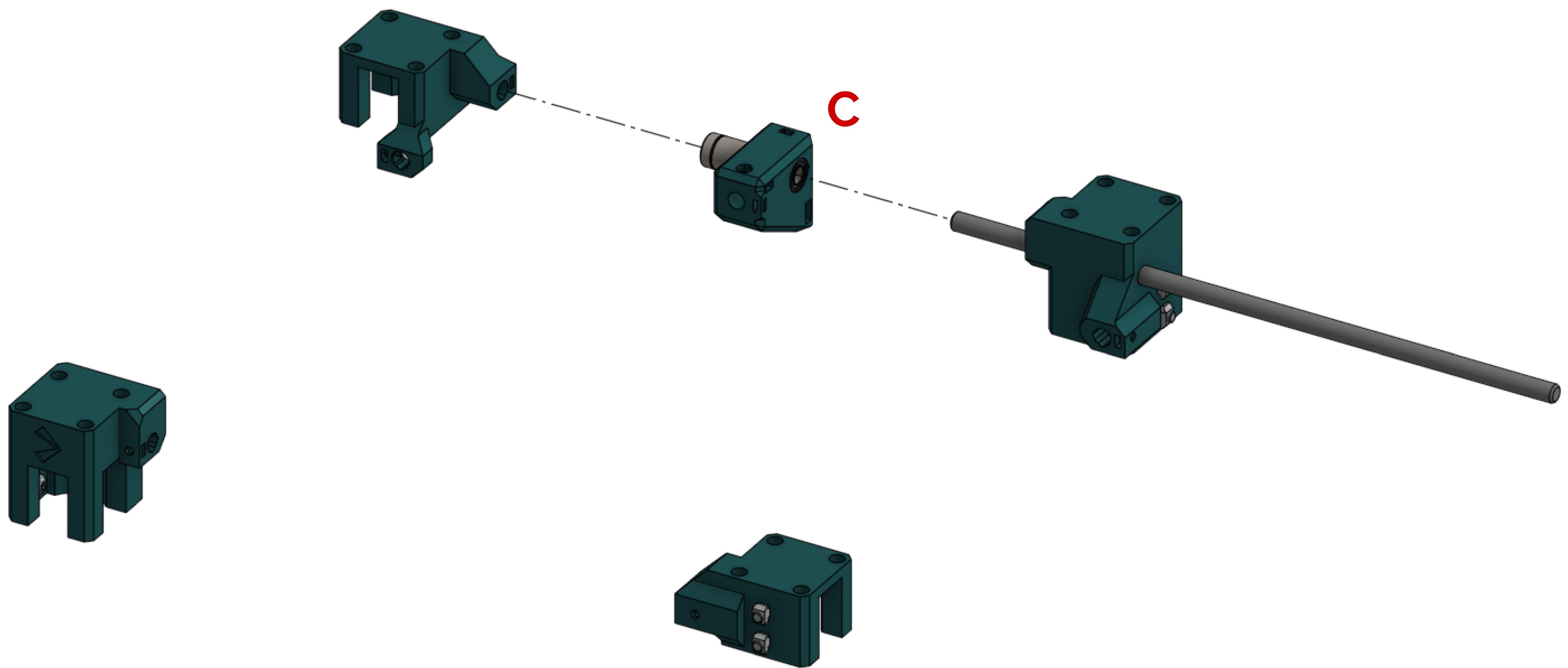
M3x10 screw	4
M3 square nut	8
LM8LUU bearing	4
Standard rod block	3
Zip-tie rod block	1

Each cross rod block requires a different configuration.

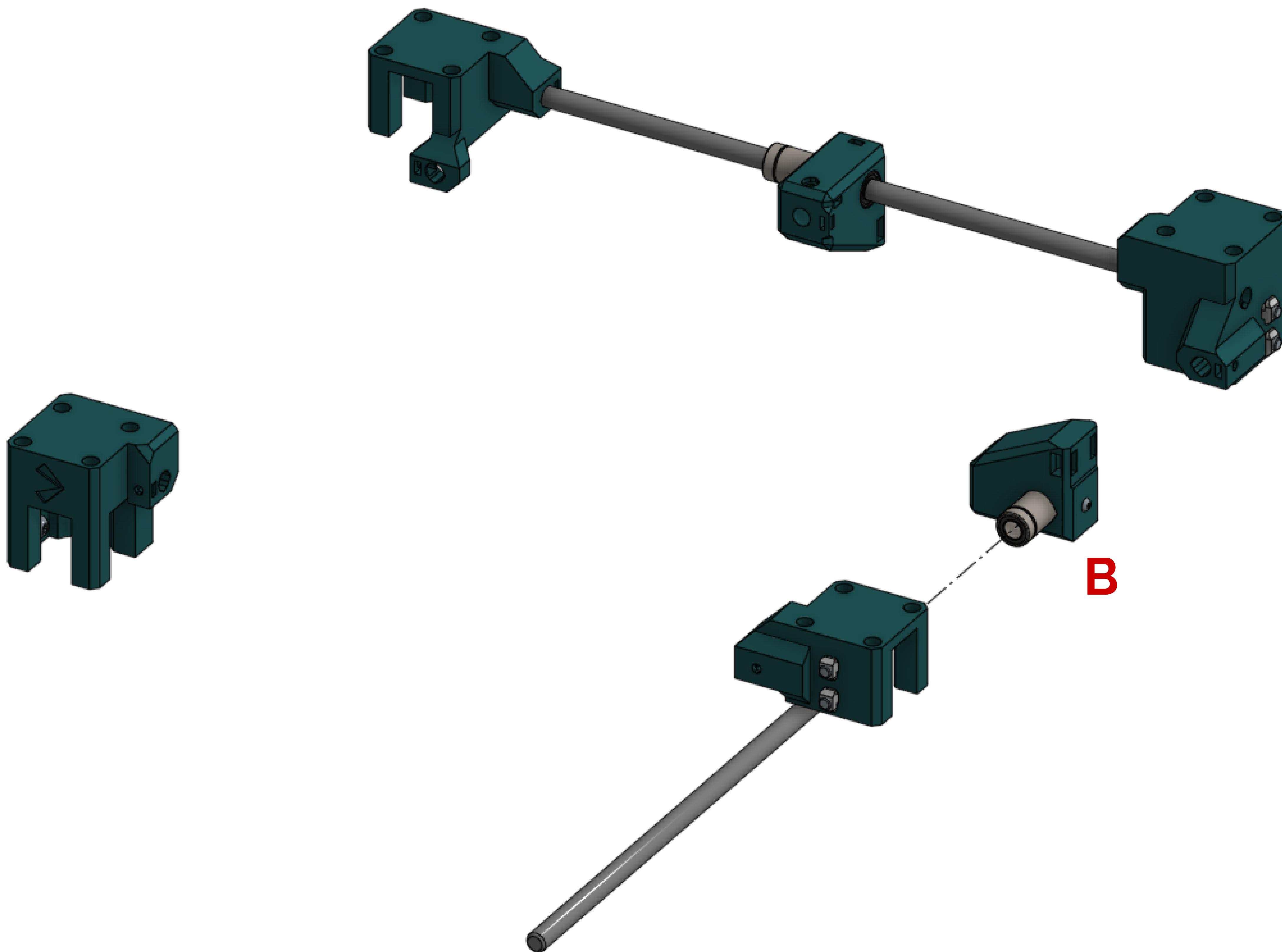
- A. 1x standard block, bearing protruding right.
- B. 2x standard block, bearing protruding left
- C. 1x zip-tie block, bearing protruding left



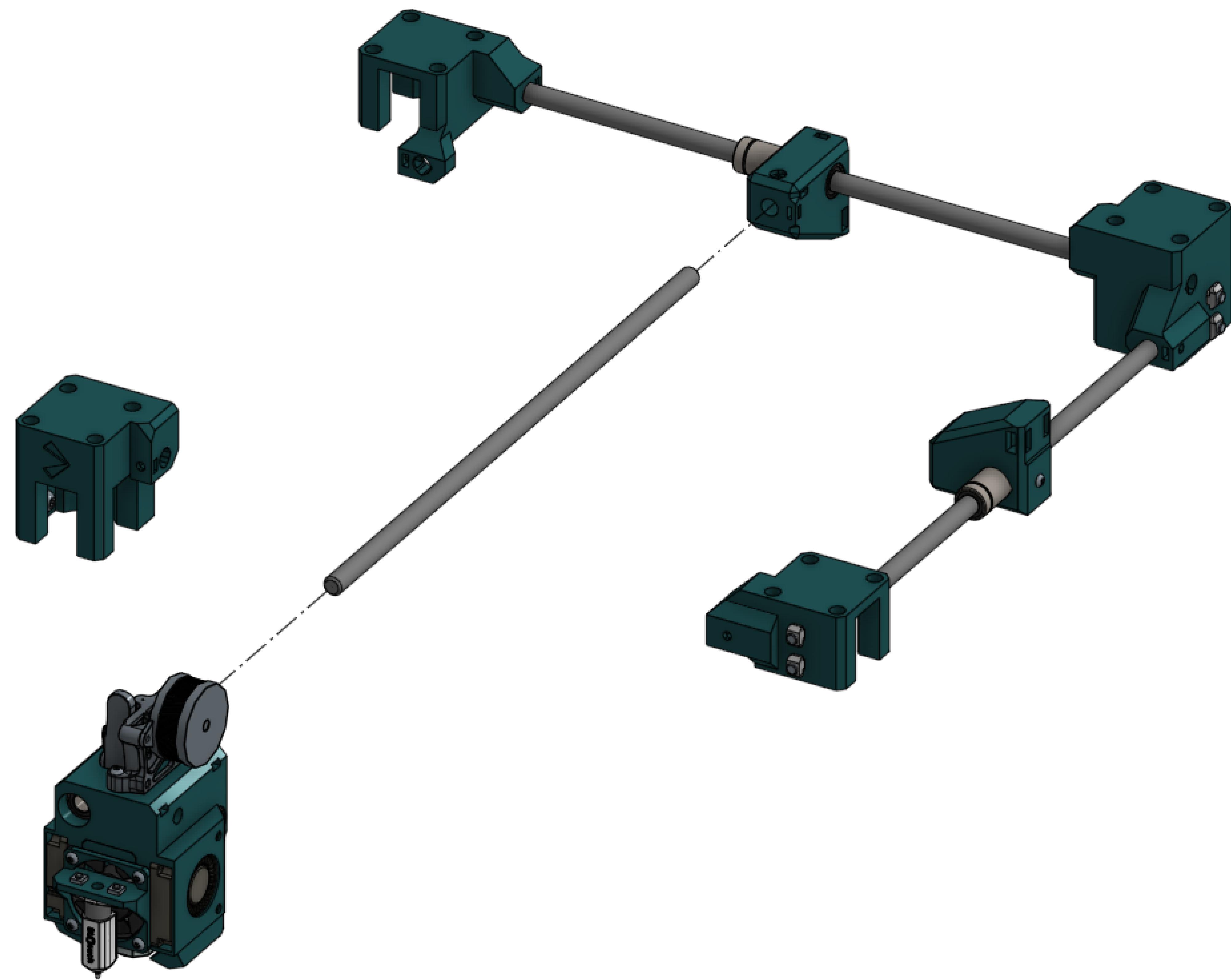
300mm rod	1	These next steps can get complicated - you are about to assemble the gantry. All unnecessary components have been hidden for clarity.
C block	1	Start by sliding the rear rod through the mounts on the back of the machine as well as the C rod mount.



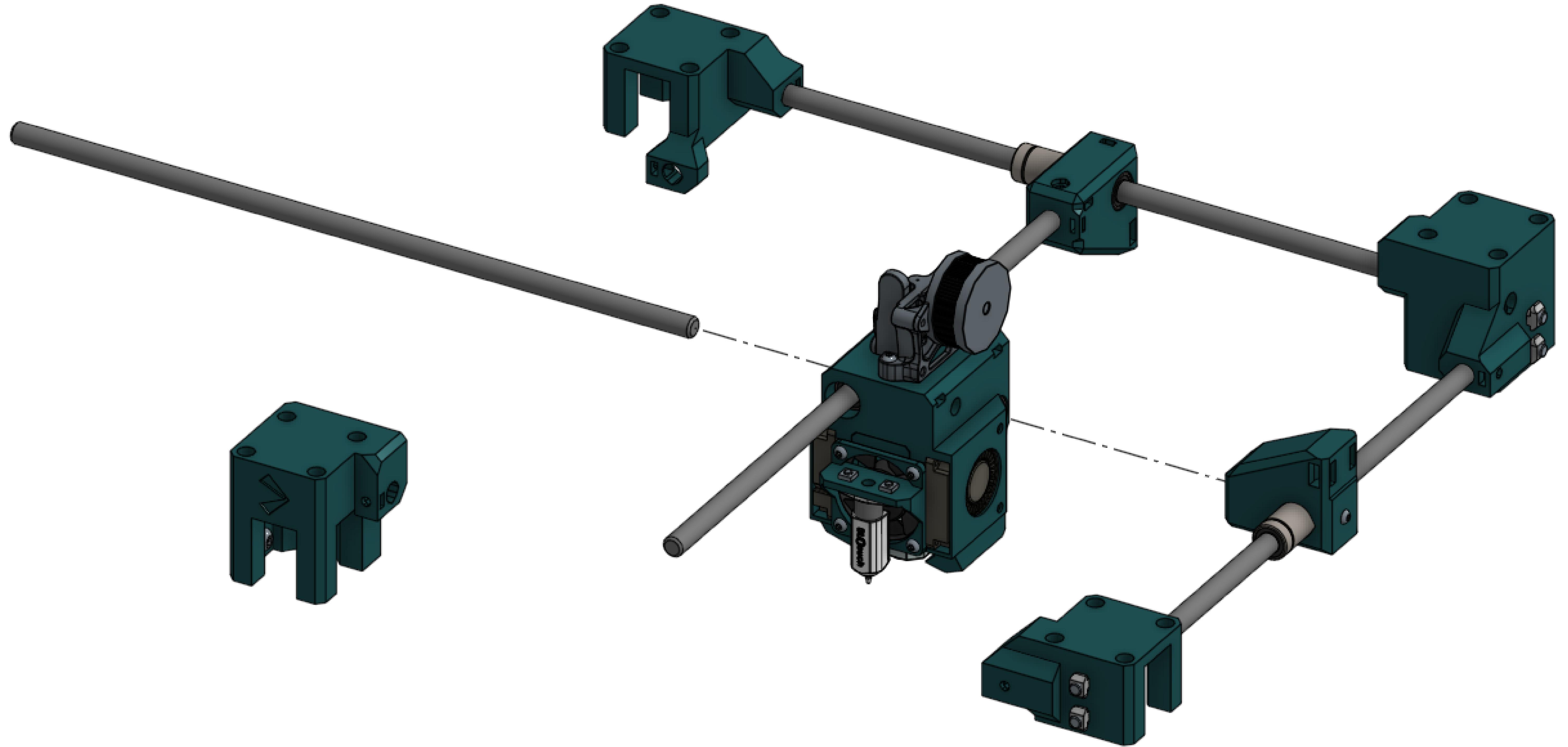
300mm rod	1	Slide the right rod through the mounts on the right side of the machine as well as an inverted B rod mount.
B mount	1	



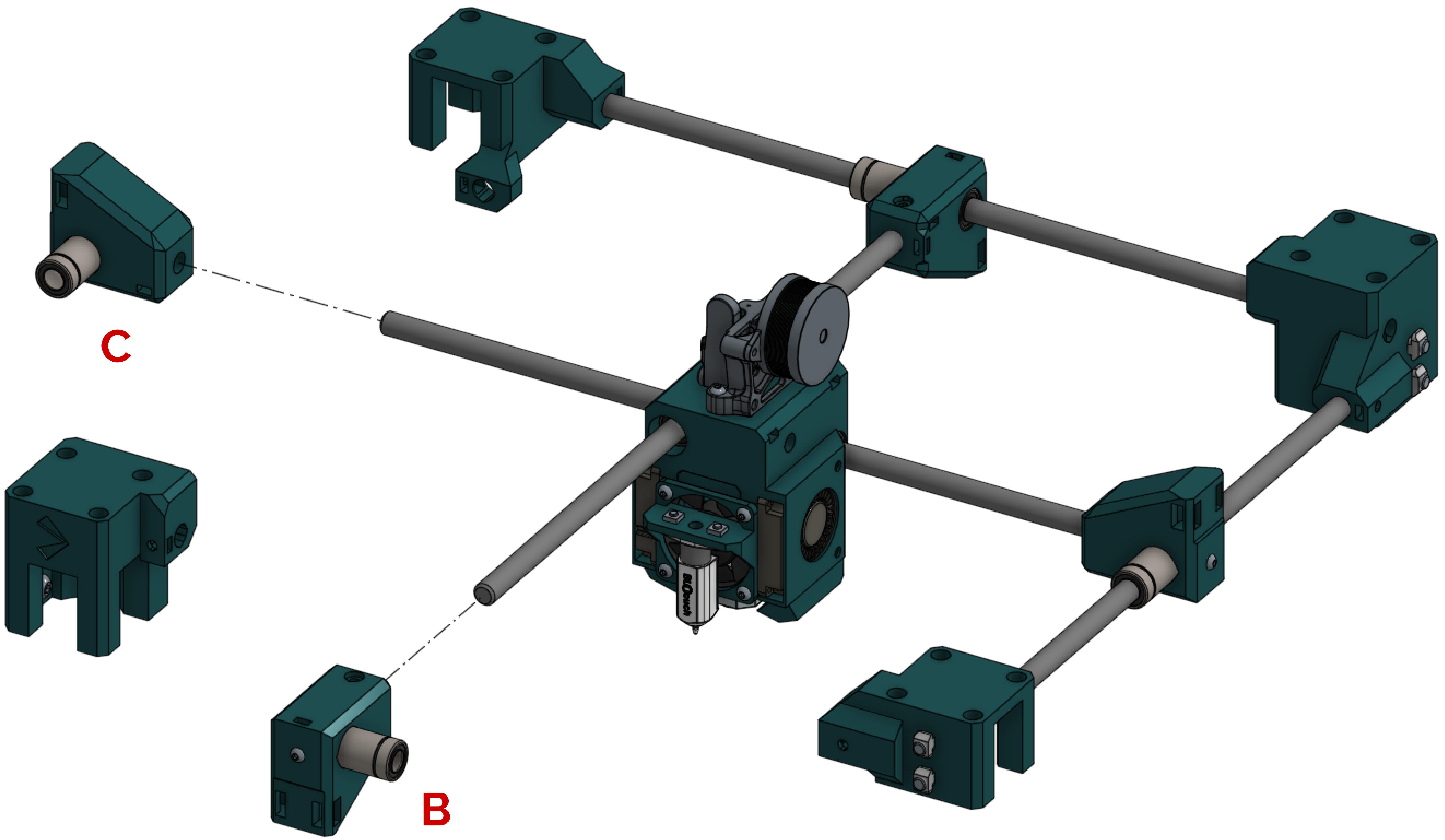
300mm rod	1	Insert a rod directly into the C mount and slide the toolhead on. This setup is unstable, so don't let the toolhead slide off.
Toolhead	1	Toolhead designs may vary.



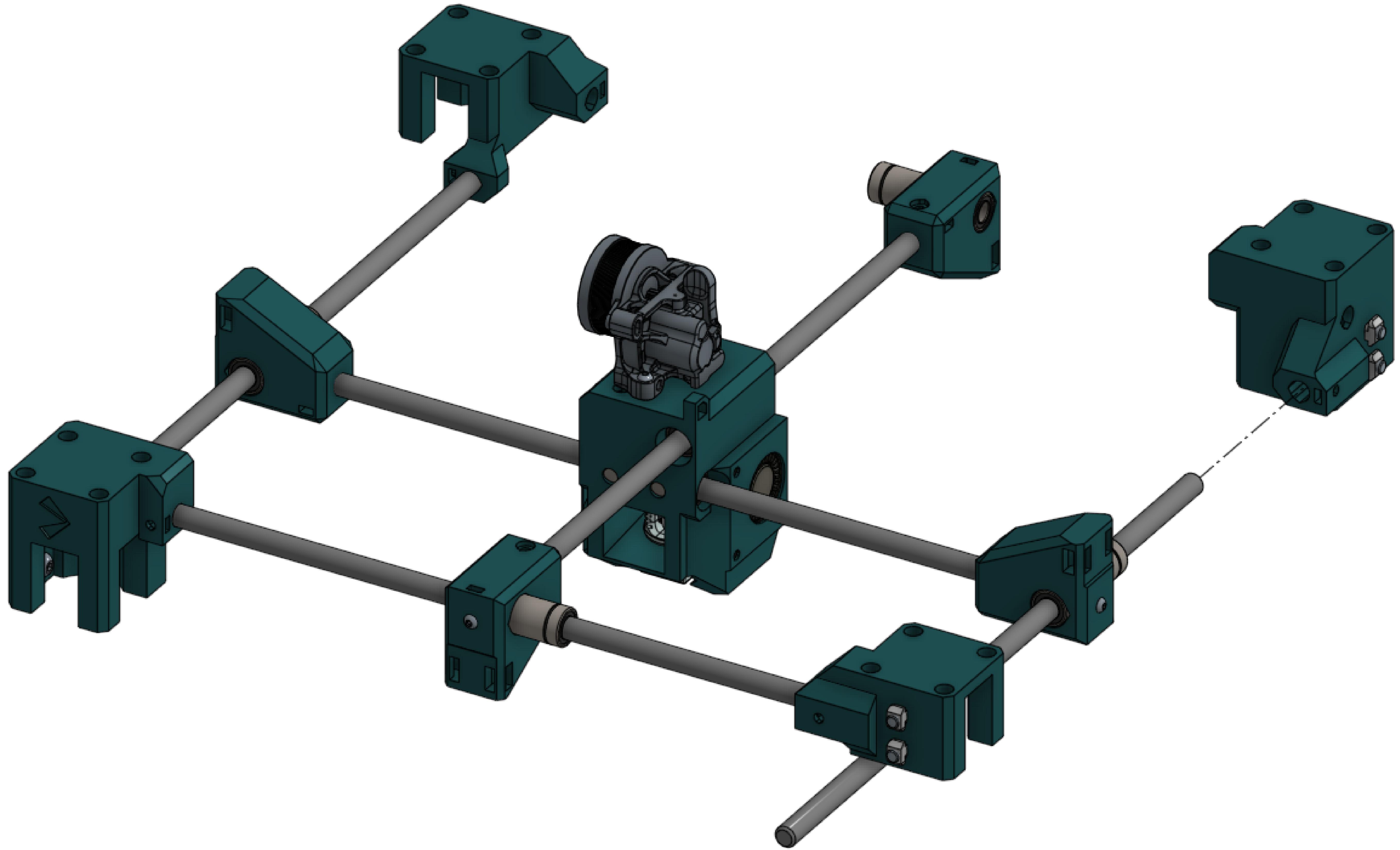
300mm rod	1
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B block	1
A block	1



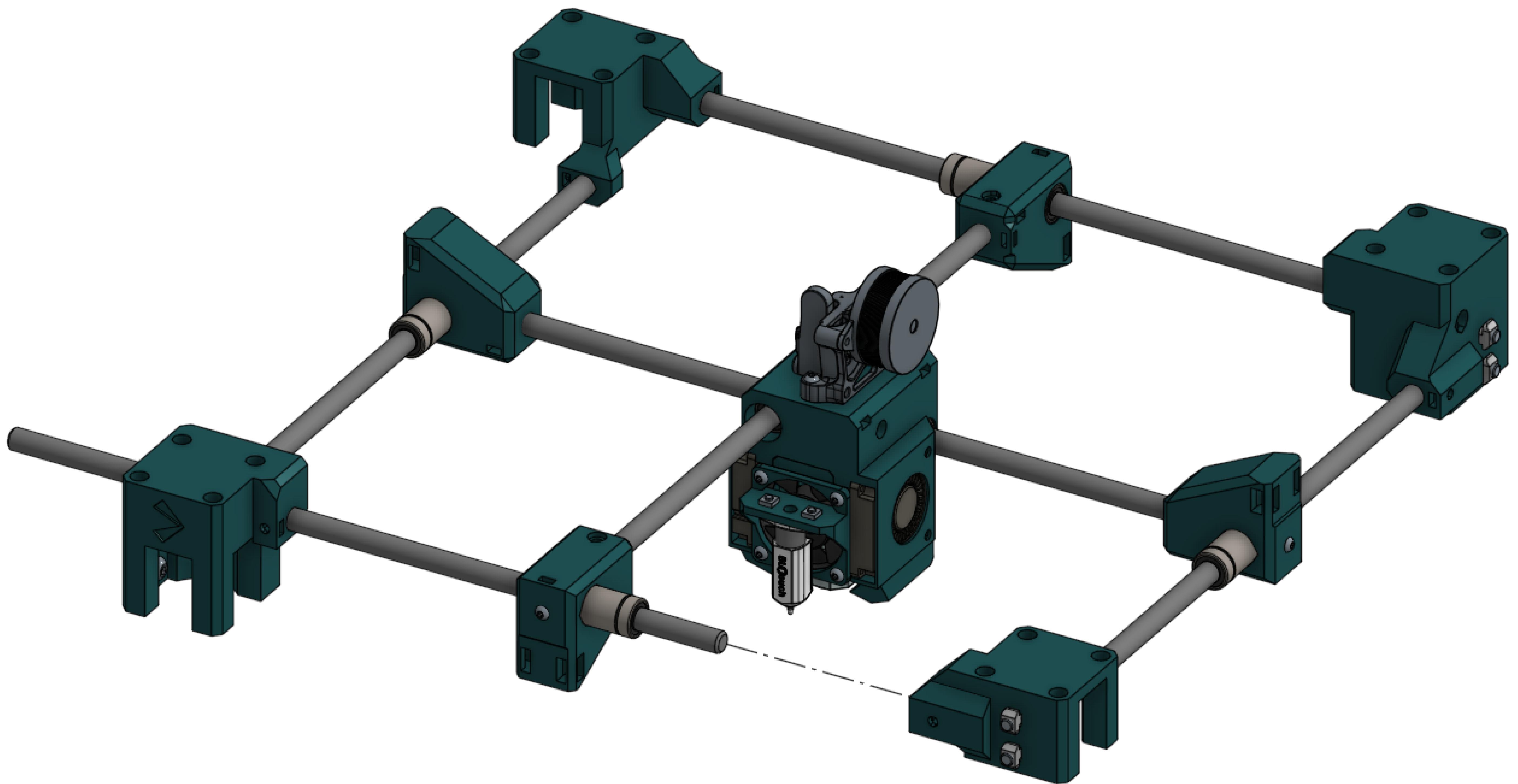
300mm rod	1
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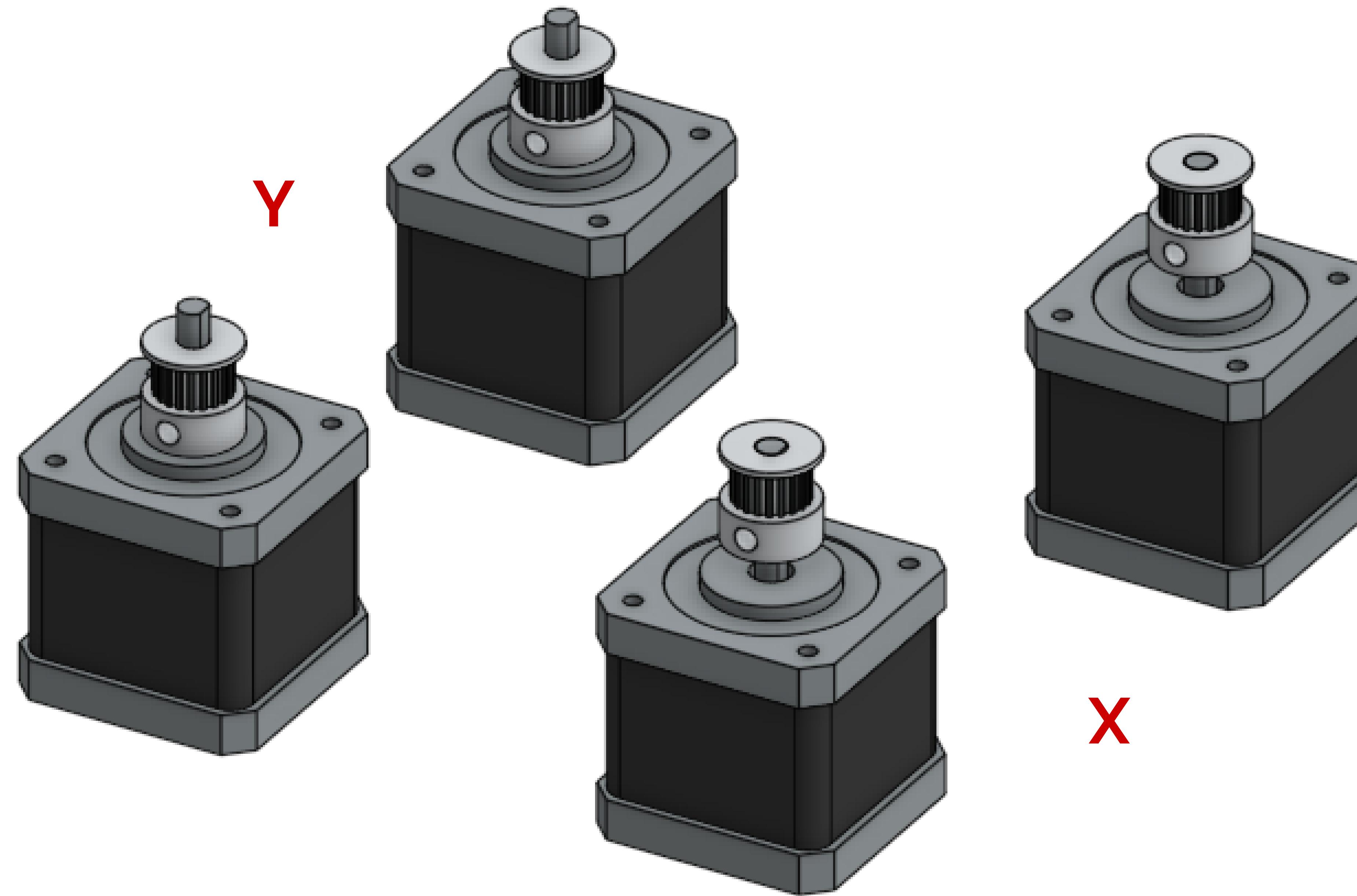
300mm rod

1

Everything should be fairly loose because there's nothing clamping anything down yet.

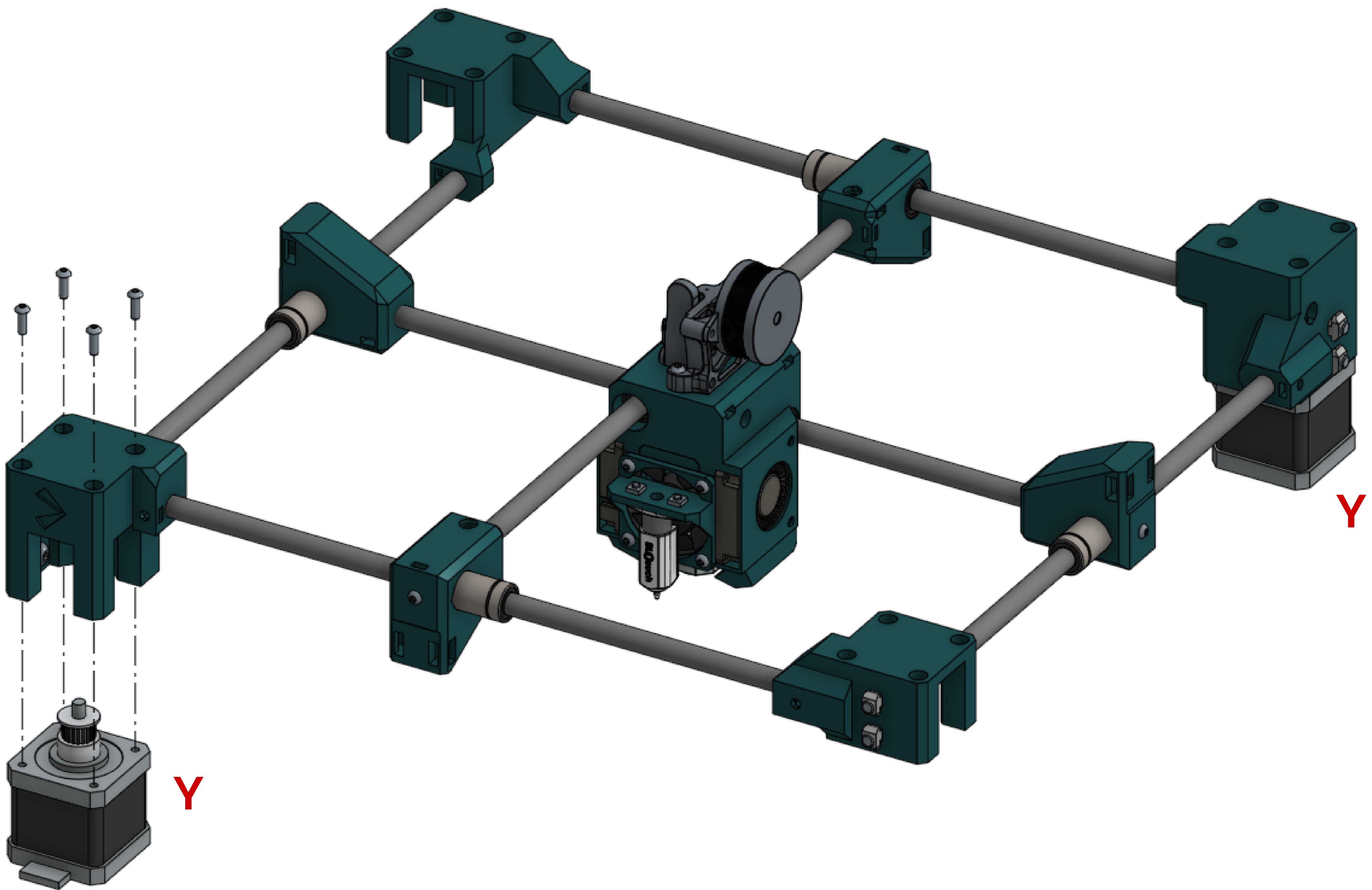


Stepper	4	Leave the machine and set up 4 motors. 2 of them should have the bottom of the idler nearly touching the motor face (or about 6mm from the top). The other 2 should have the tops of the idlers flush with the ends of the shafts.
Pulley	4	The first motors (on the left) will be A motors, and the second motors (on the right) will be B motors.



A motor

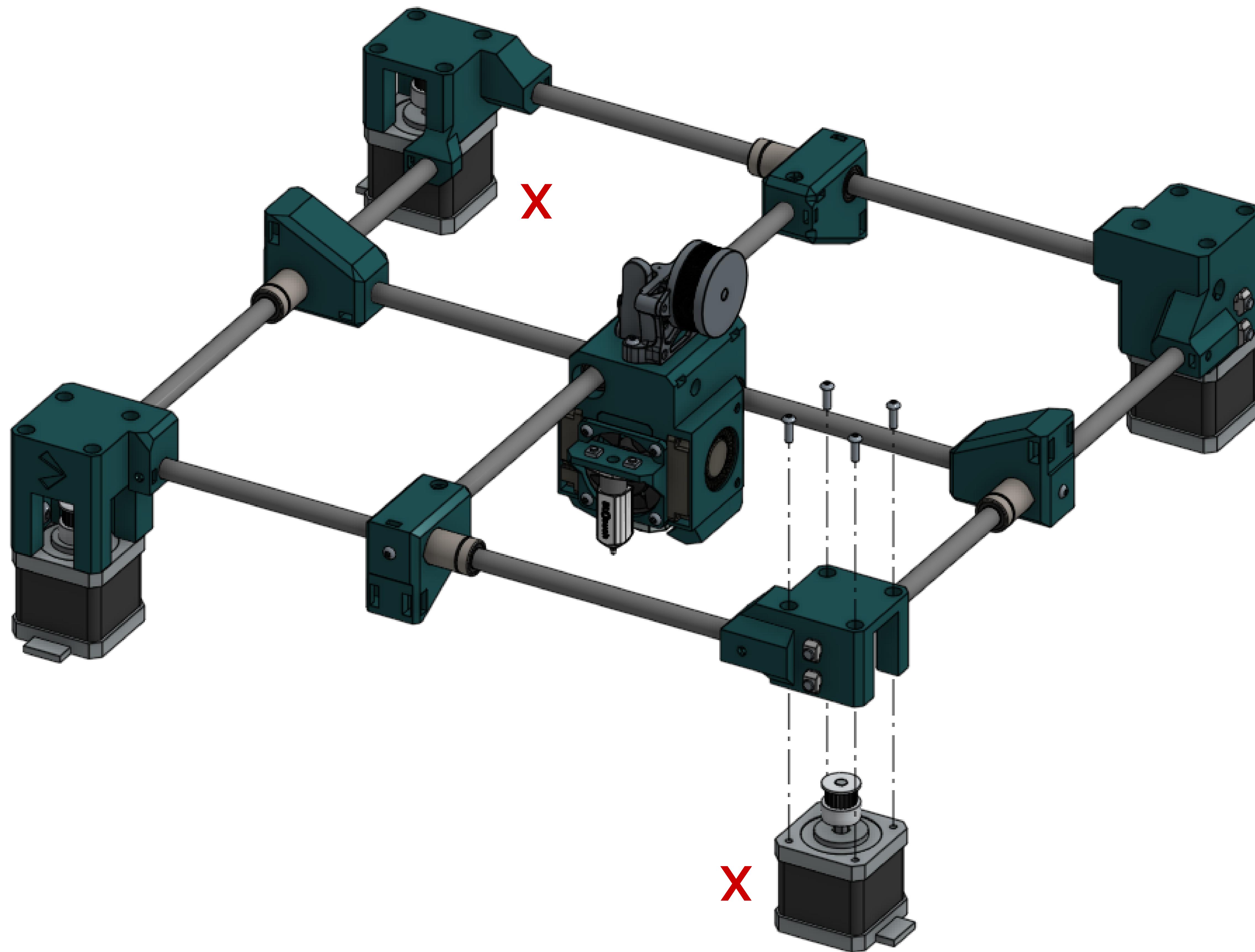
2



B motor

2

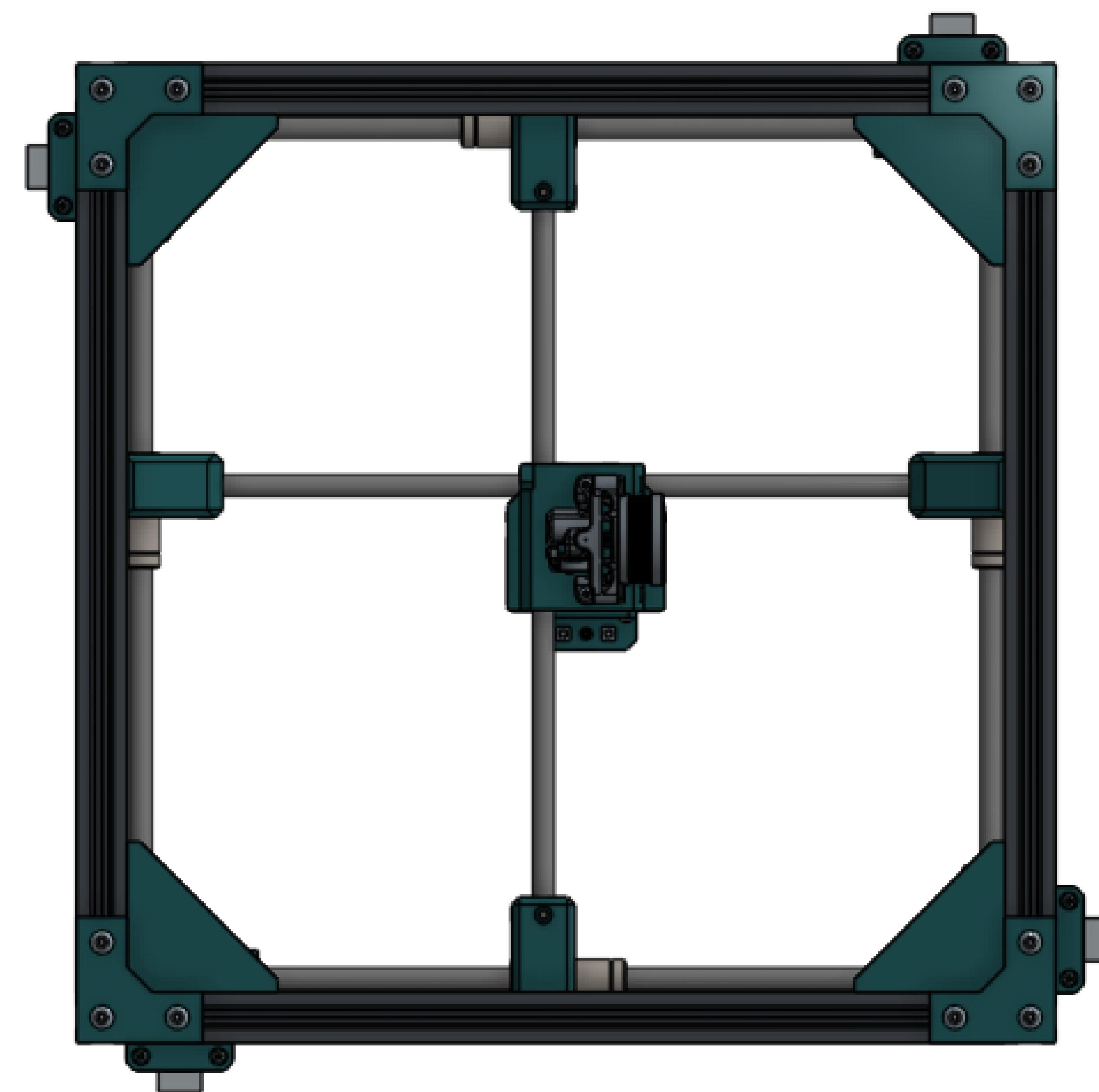
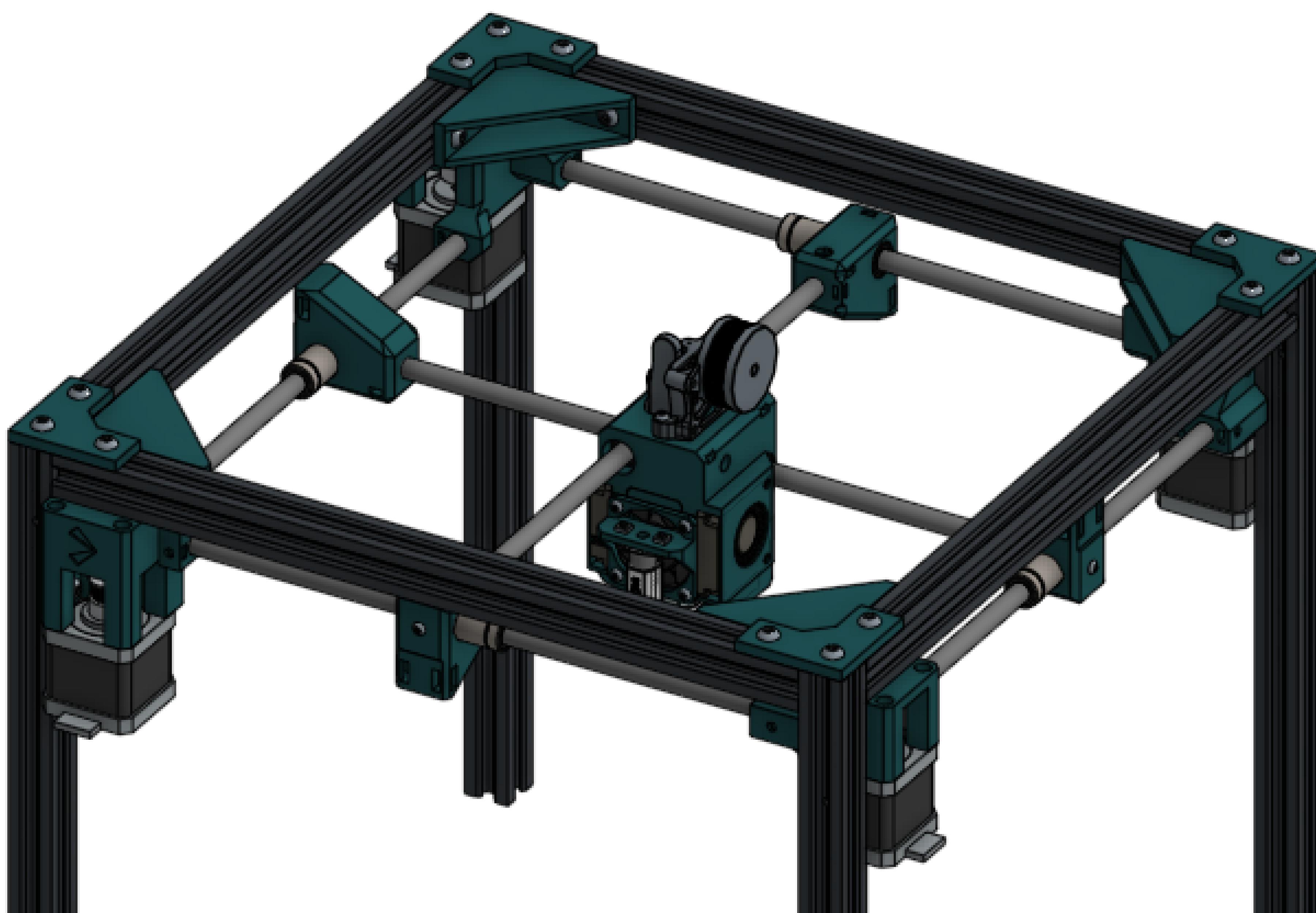
Plug in your motors once they're all installed.



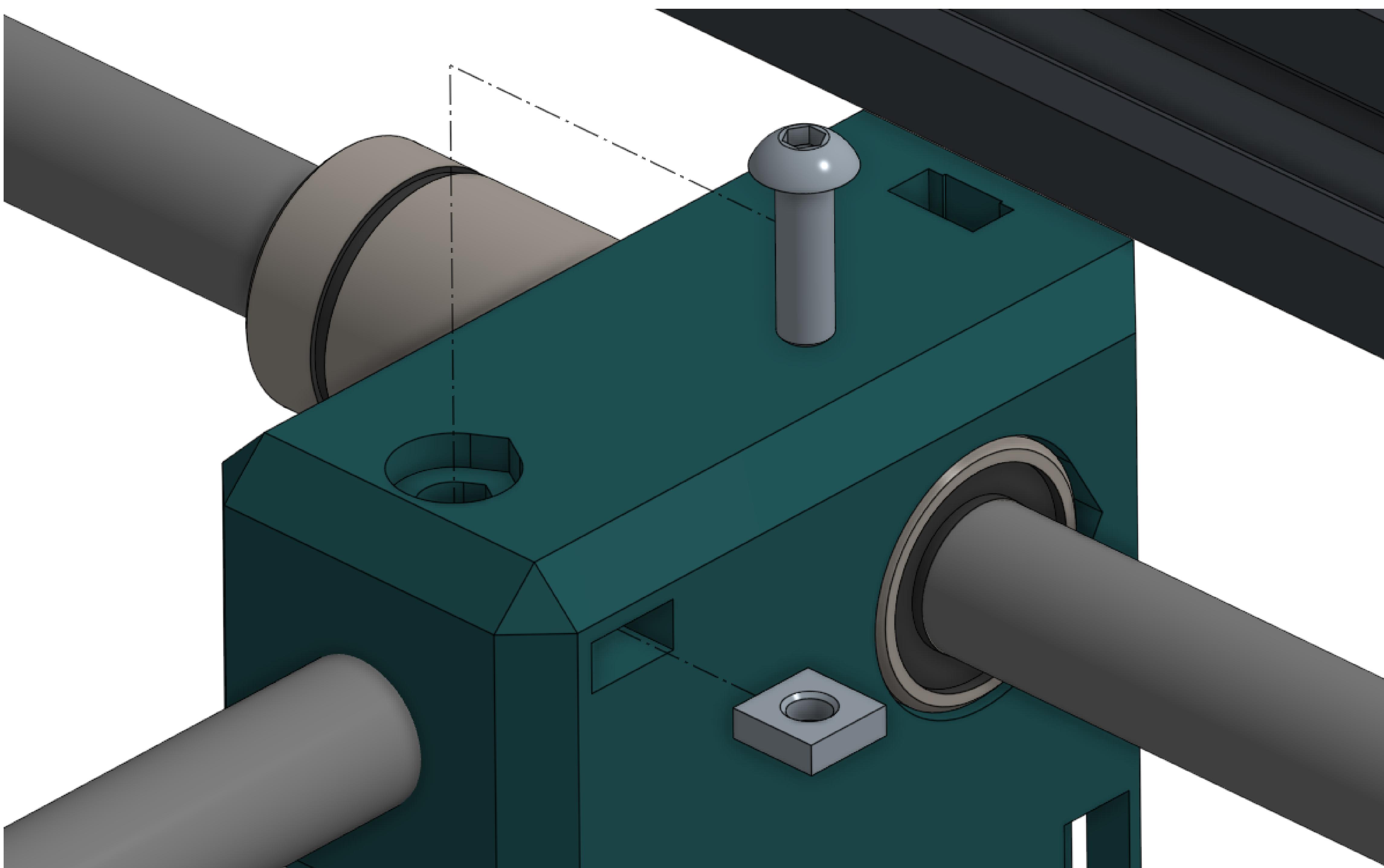
Large bracket	4
M5x10 screw	16
M5 T nut	16

Secure the top of the frame using large corner brackets.

Small corner brackets cannot be substituted.

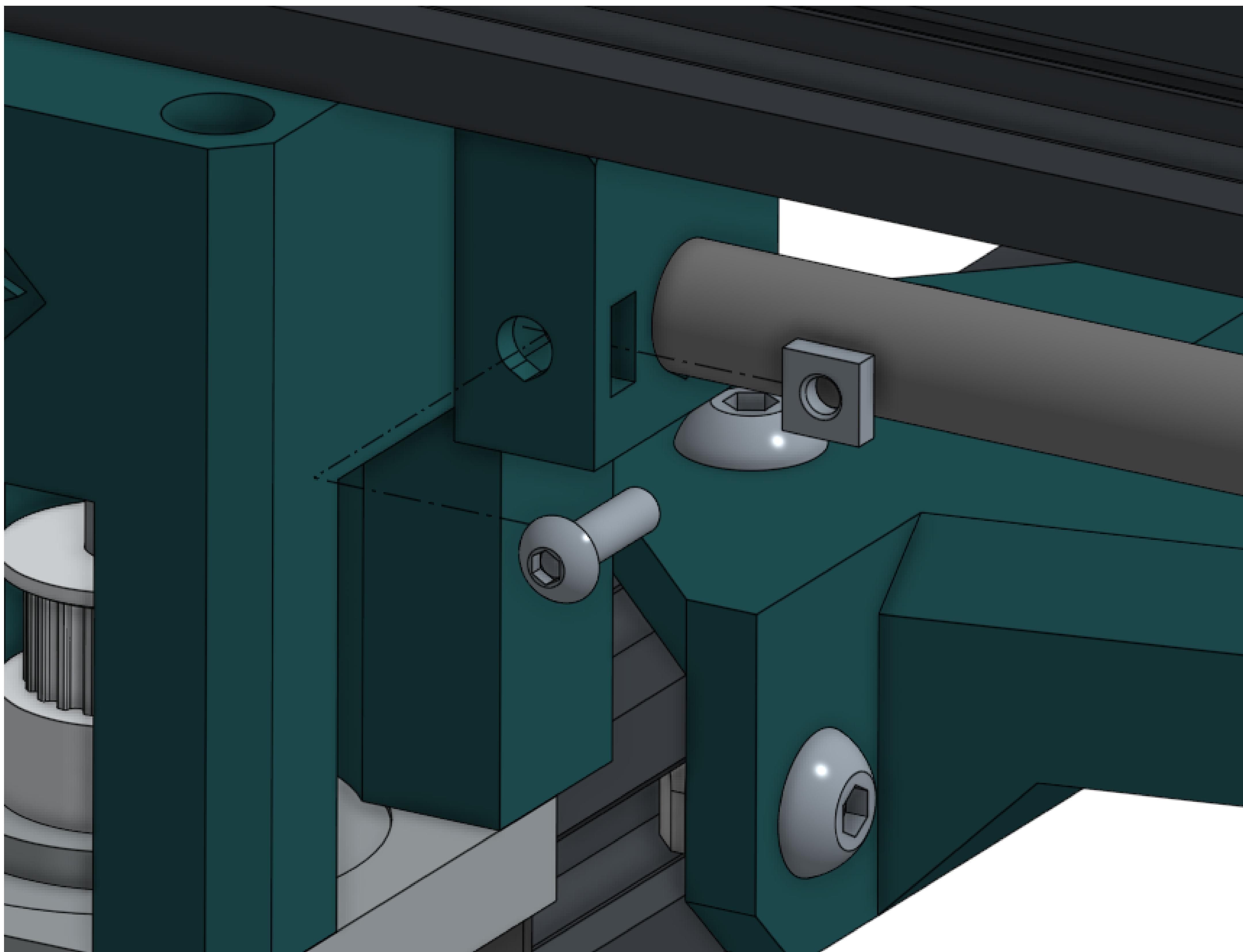


M3x10 screw	4	Use M3 hardware to clamp the cross rods in. There is a clamp on each block.
M3 square nut	4	

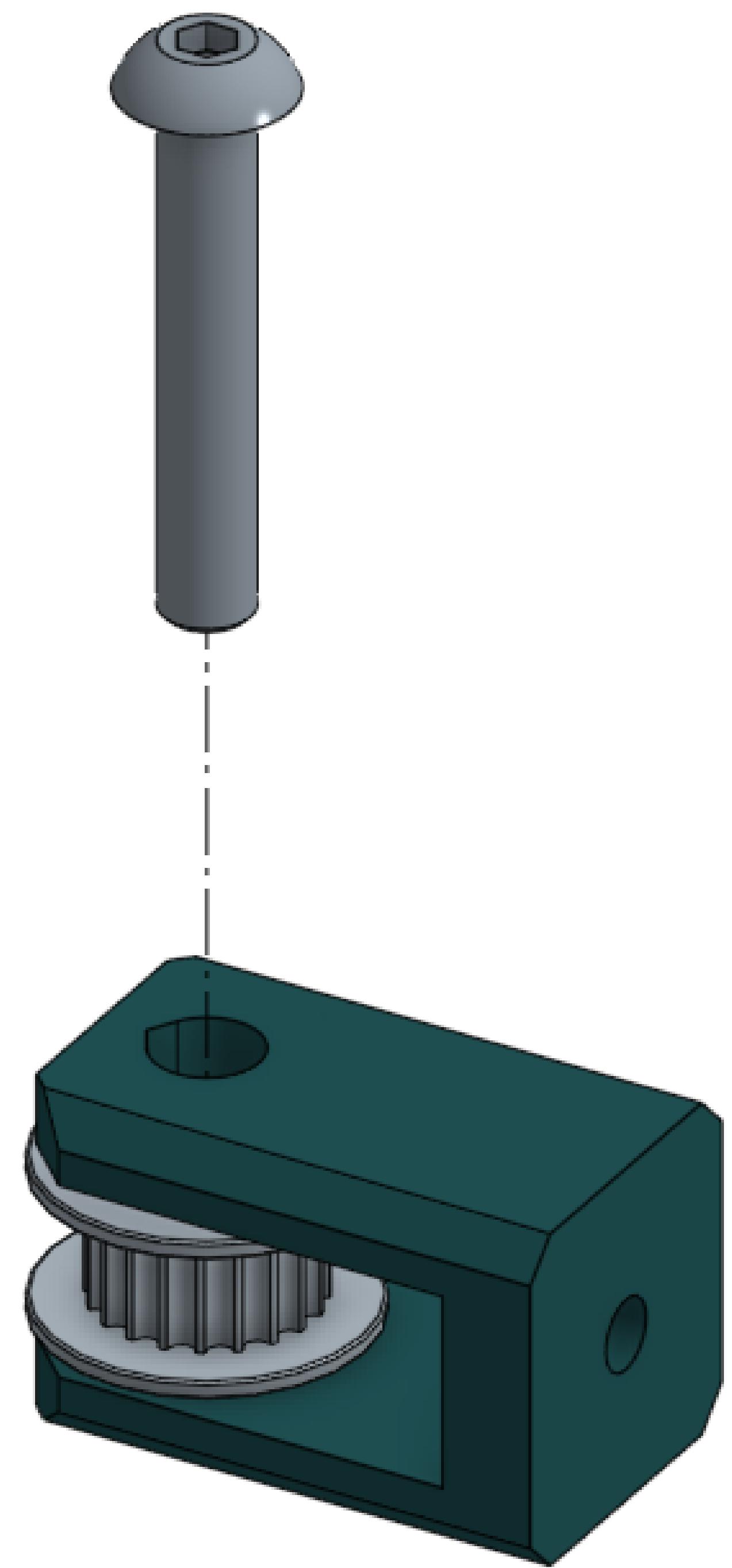


M3x10 screw	8
M3 square nut	8

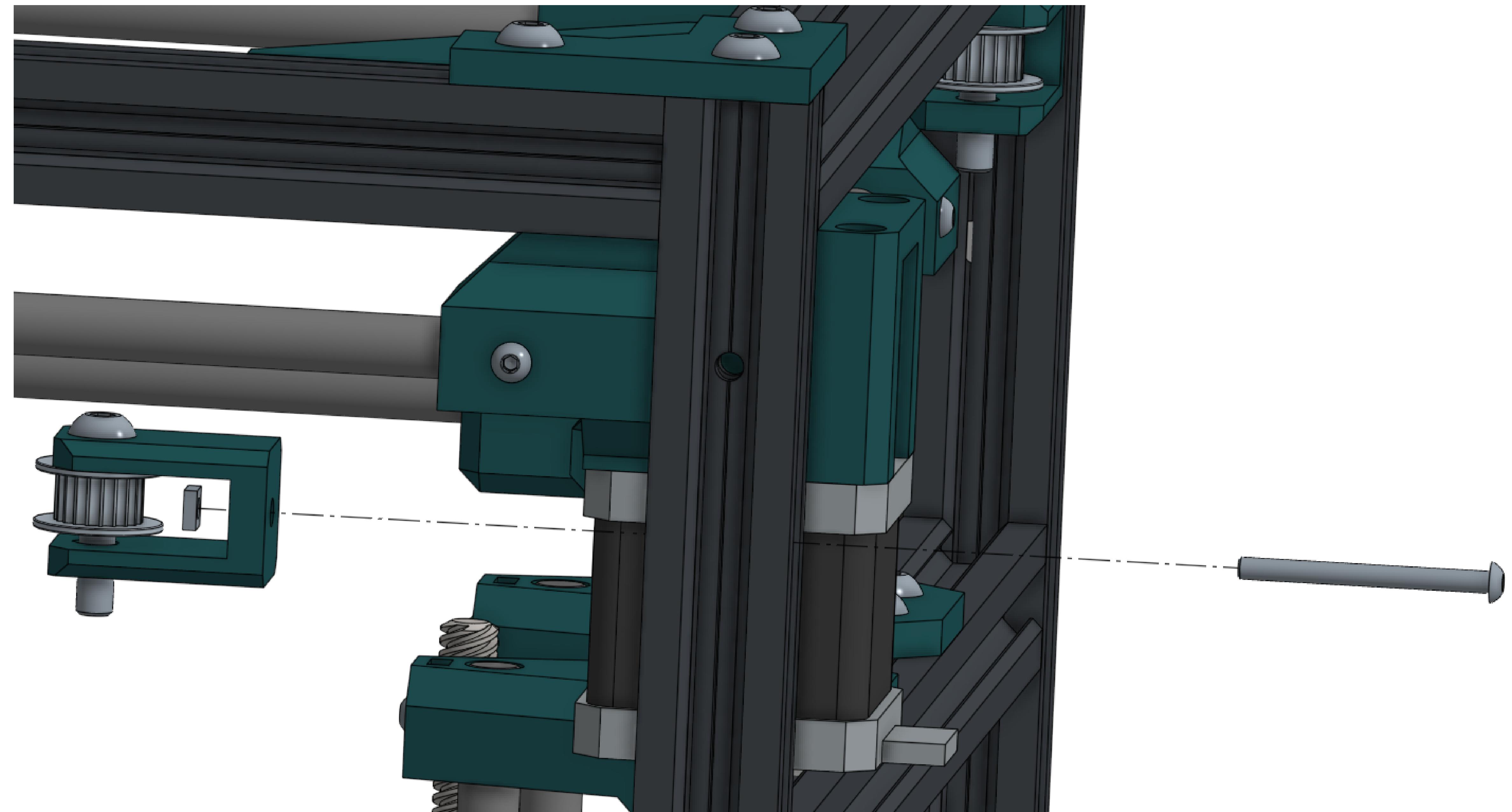
Use M3 hardware to clamp the gantry rods in. There are 2 clamps on each mount.



M5x30 screw	4	Assemble the 4 idlers with the idler pulleys, long bolts, and printed brackets. You do not need nuts, but you can install them if you want.
Idler	4	
Idler bracket	4	

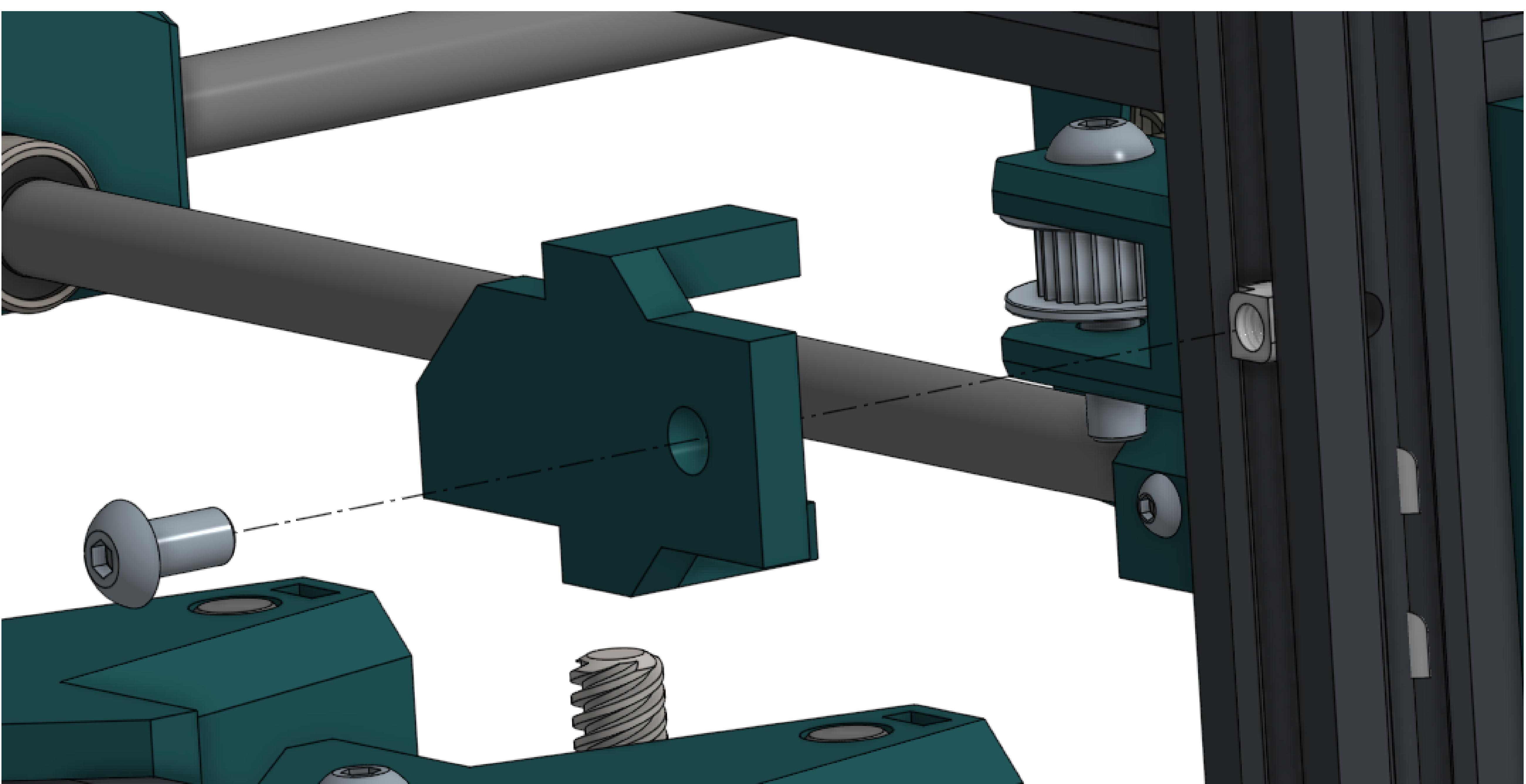


Idler assembly	4	Install the idlers using the holes in the frame. Then, install the belts. Each side of the machine gets its own ~700mm belt, and each belt is terminated at the rod block by looping through the loops and binding it to itself using zip ties.
M3x35 screw	4	
M3 square nut	4	Once installed, trim any excess length coming off the rod block and tighten the belts by turning the screws.
Belt	X	
Zip tie	8	



M5x10 screw	4
M5 T nut	4
Idler cover	4

Each idler gets an idler cover.



Mechanical assembly complete.

