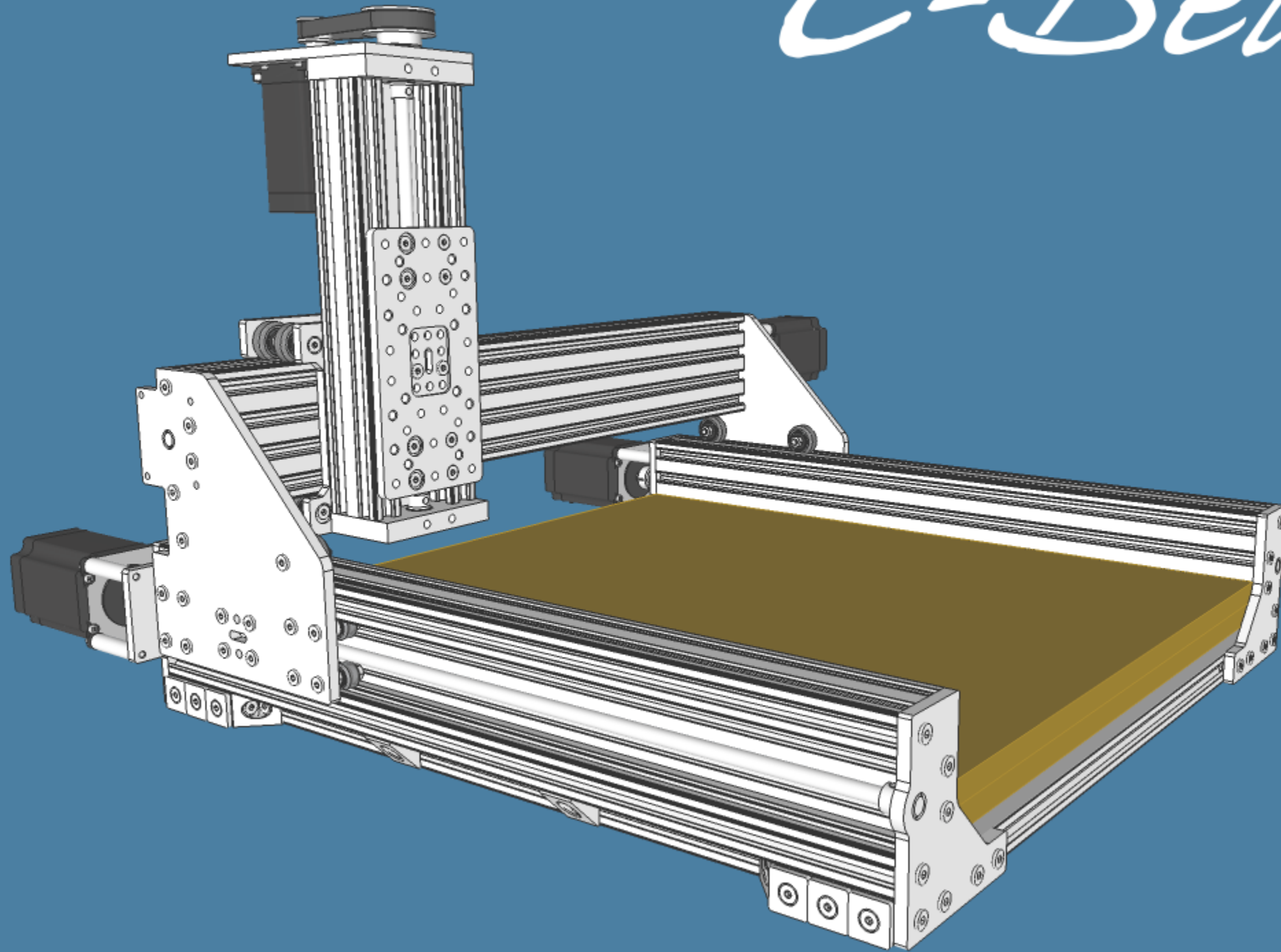


# C-Beam CNC

*Build Manual v1.0*

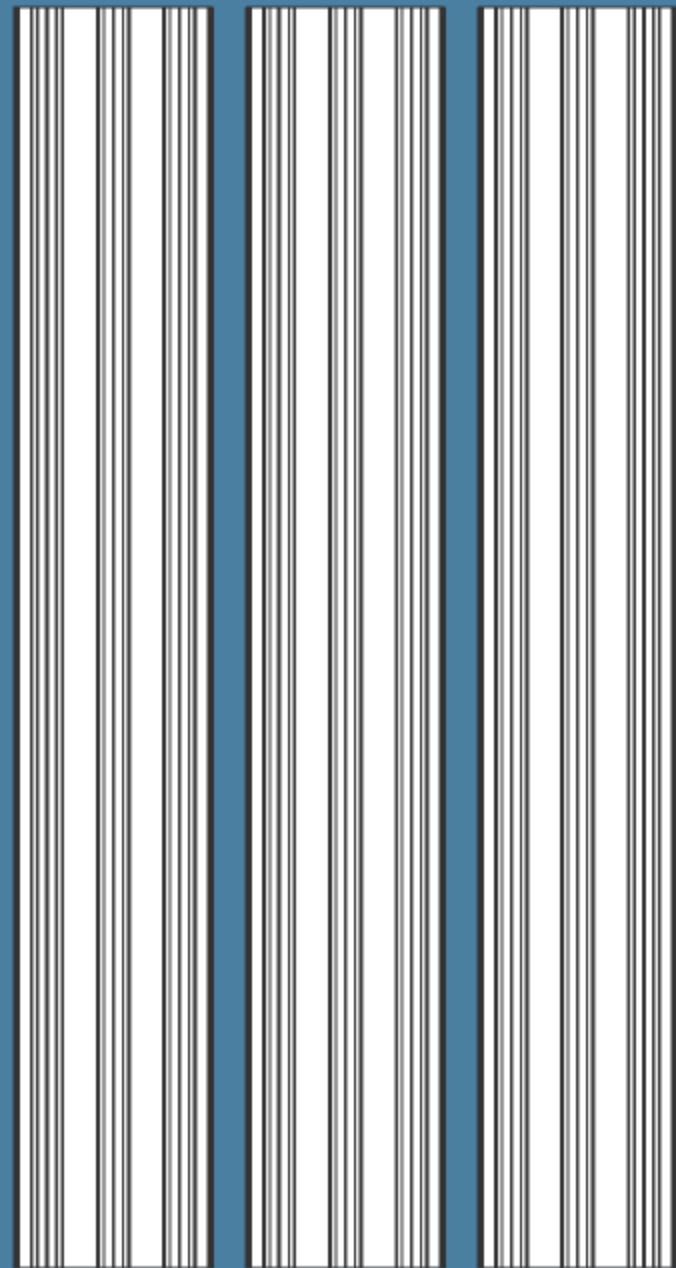


# - Chapter One -

: Base Frame Assembly Guide

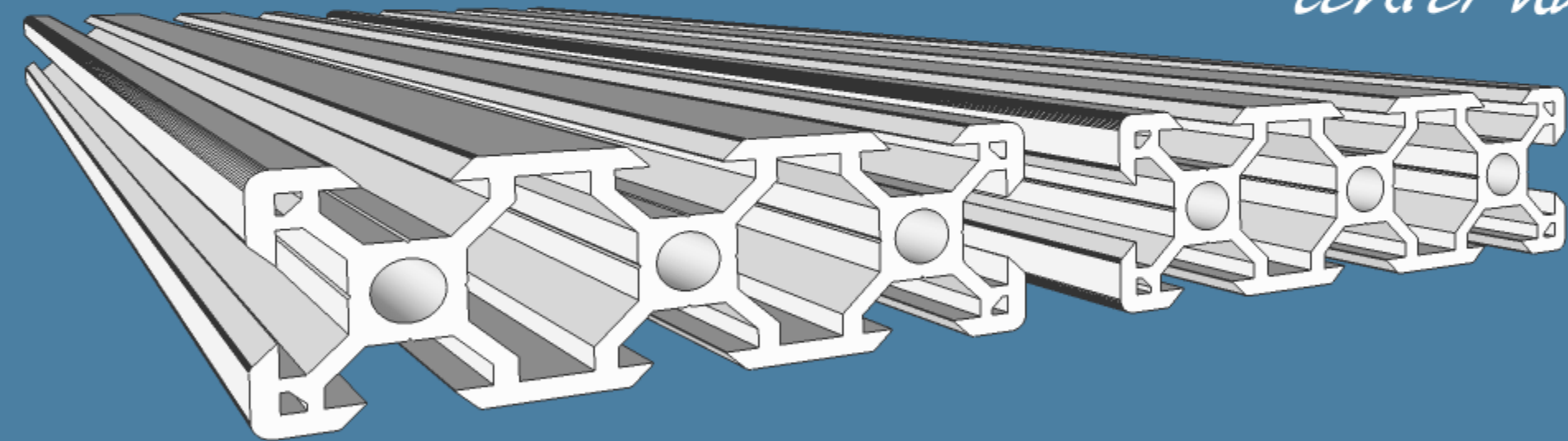
# Gather The Following Parts

- 500mm 20x60 (x2)
- 380mm 20x60 (x3)
- End caps (x12)
- 90° Corner (x16)
- M5x8mm (x44)
- M5 T-nuts (x48)



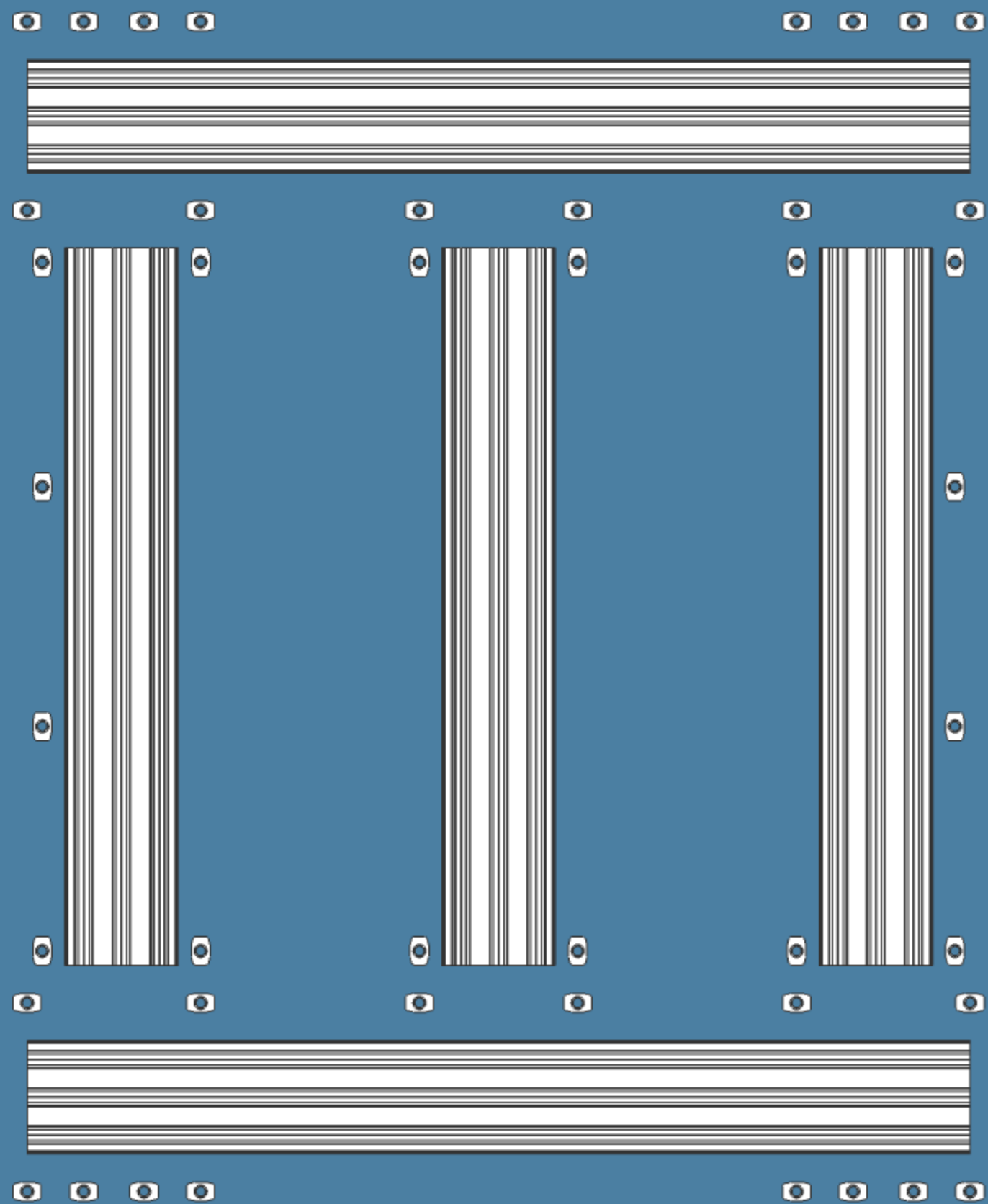
# - Step One -

Grab both 500mm long 20x60 pieces of V-slot. Use a M5 x 0.8 Tap to create threads in all twelve center holes of the v-slot profiles.



## - Tools Required -

: M5x0.8 Metric Tap

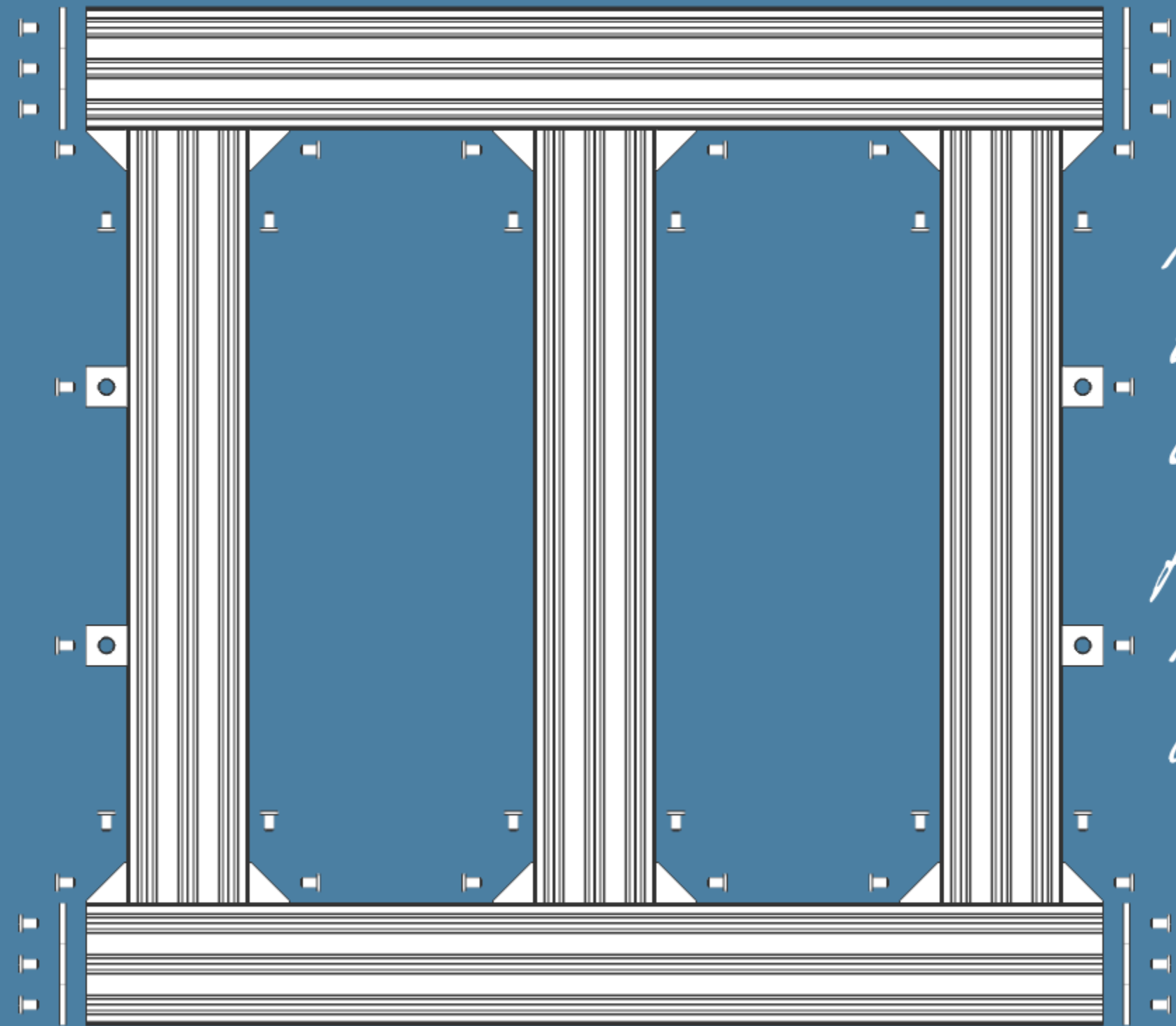


## - Step Two -

Begin by laying out your V-slot as show to the left. 500mm top and bottom, left and right 380mm inset 20mm each. Last 380mm centered. Preload T-nuts into V-slot as shown. Top and bottom each have six on inside slot and eight on outside slot, Center has two on each side, outside profiles have two on the inside slot and four on the outside slot

- Tools Required -

: None



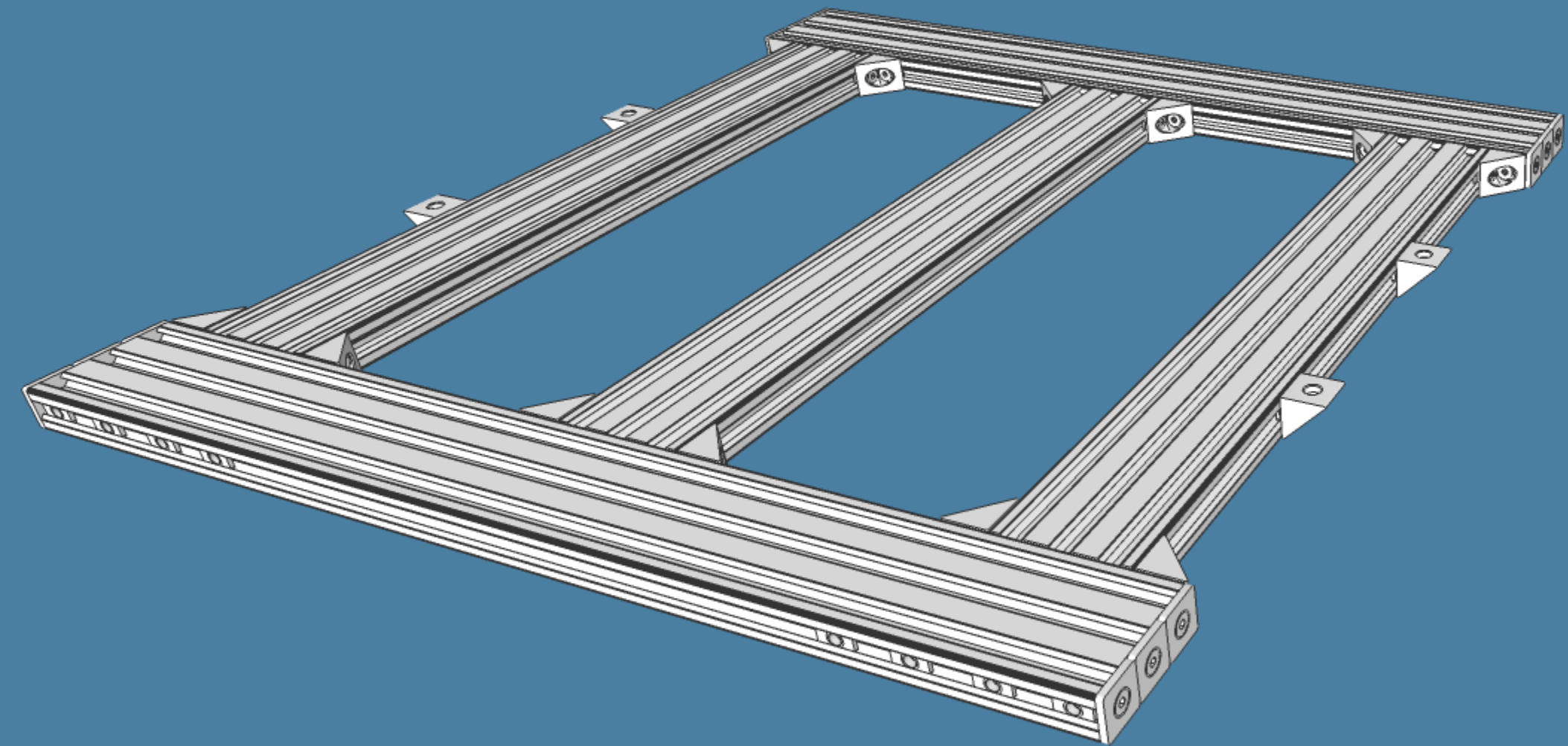
## - Step Three -

Now that the T-nuts have been inserted we can join the base together as a single unit. Using the 90° corner brackets and M5x8mm bolts join the V-slot profiles as shown. Use the twelve end caps along with M5x8mm bolts to cap both ends of each top and bottom V-slot.

## - Tools Required -

- : 3mm Hex Wrench
- : small square

# - Base Complete -



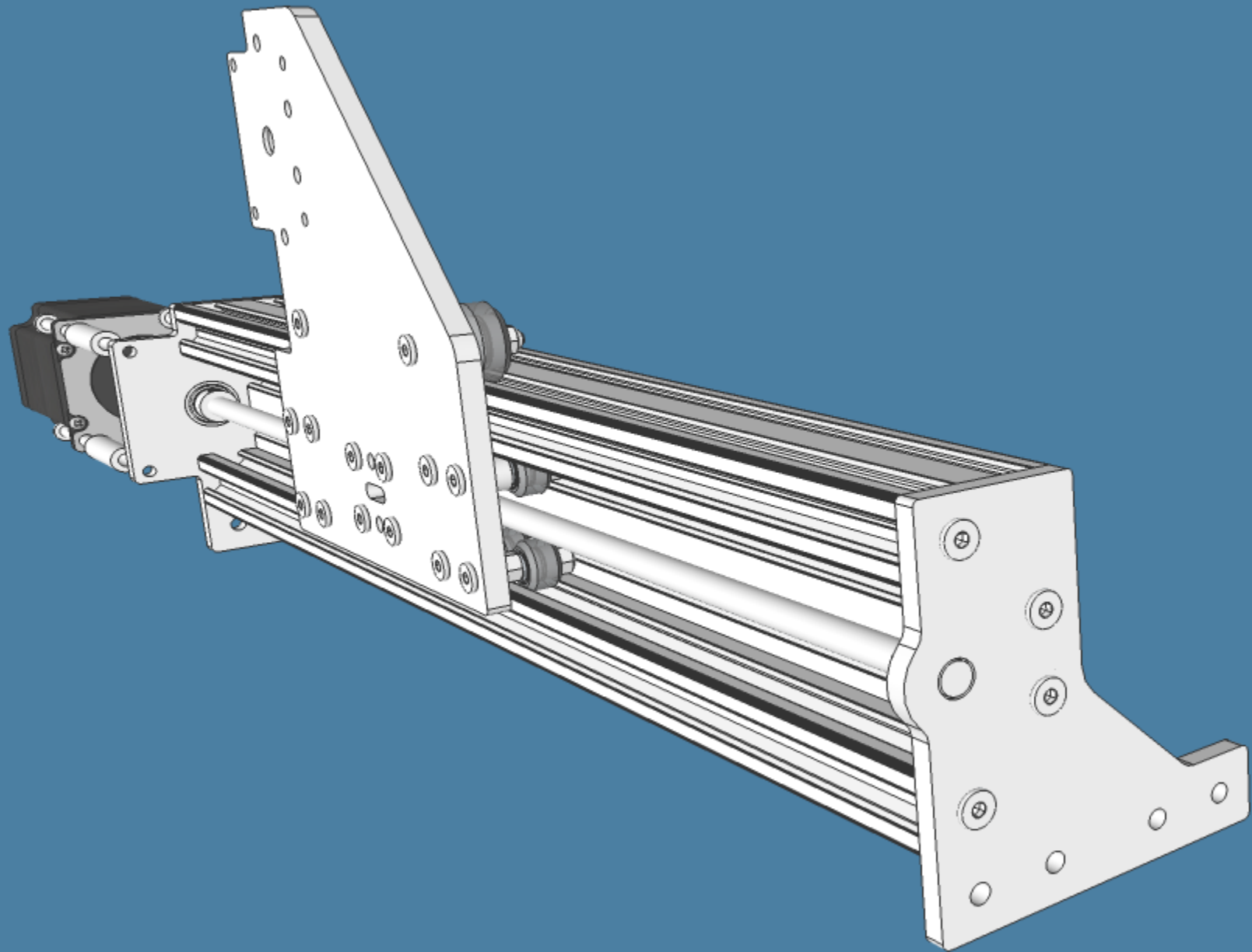
*Congratulations! The base frame of the cnc router has been completed. You can now set it aside for the moment and begin assembly of the next step.*

- Chapter Two -

: Left Y-axis Assembly Guide

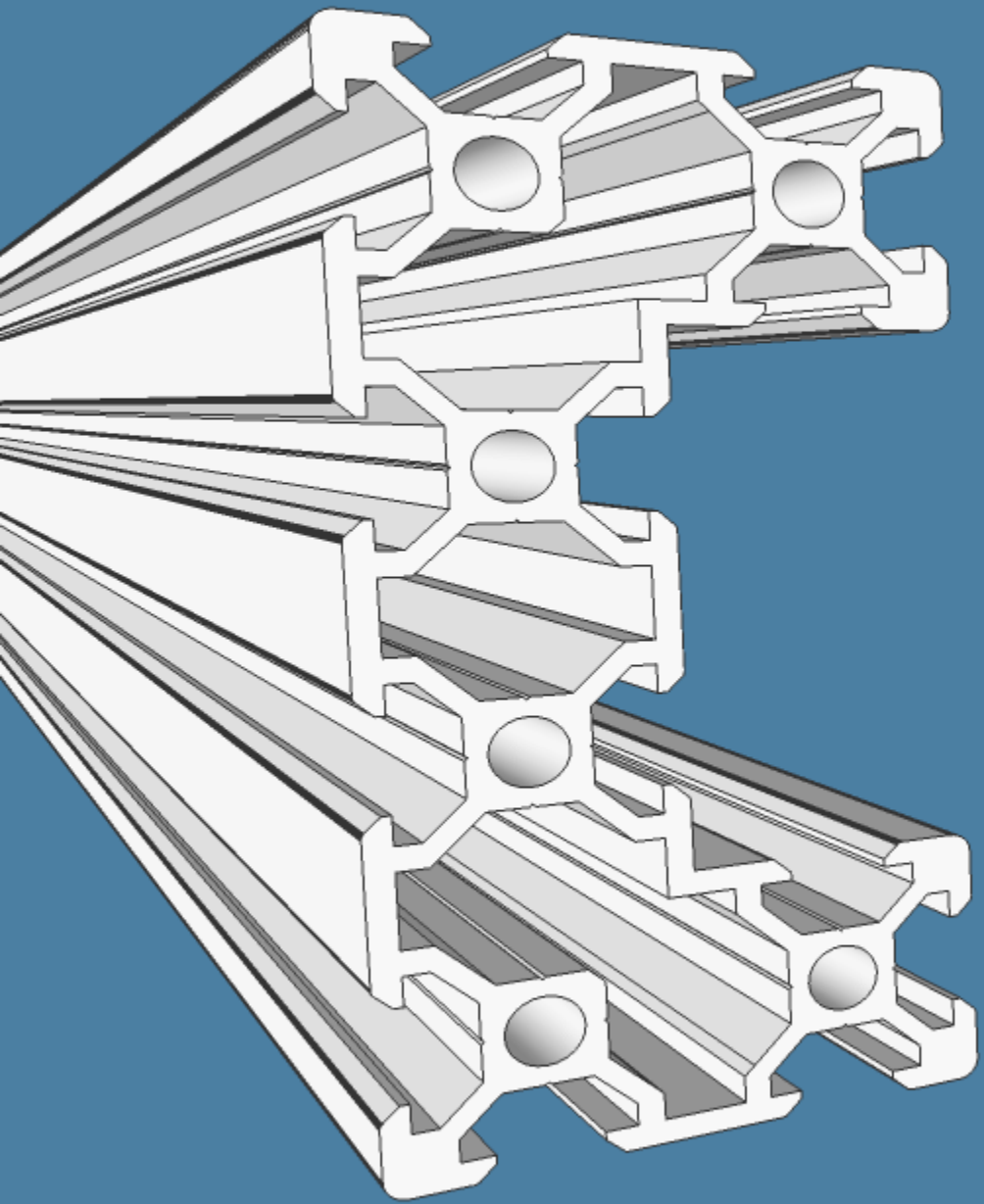


# Gather The Following Parts



- Left Side Y-axis Plate
- Left Front Y-axis Bearing Plate
- Left Rear Y-axis Motor Mount Plate
- Nema 23 Motor
- 500mm C-beam
- 530mm Tr8 \*8-2p Leadscrew
- 688-2Z Flanged Bearing (x2)
- 8mm Lock Collar (x2)
- 8mm x 1/4" Coupler
- 40mm Spacer (x4)
- M5x50mm Bolt (x4)
- M5x30mm Bolt (x2)
- M5x25mm Bolt (x4)
- M5x15mm Bolt (x8)
- M5x27mm Bolt (x8)
- M5 Lock Nut (x14)
- M5 T-nuts (x2)
- 6mm Spacers (x4)
- 6mm Eccentric Spacer (x6)
- 3mm Spacer (x4)
- 8mm Shim (x2)
- Anti Backlash Nut (x2)
- Mini V-Wheel Kit (x8)
- Solid V-wheel Kit (x2)

# - Step One -

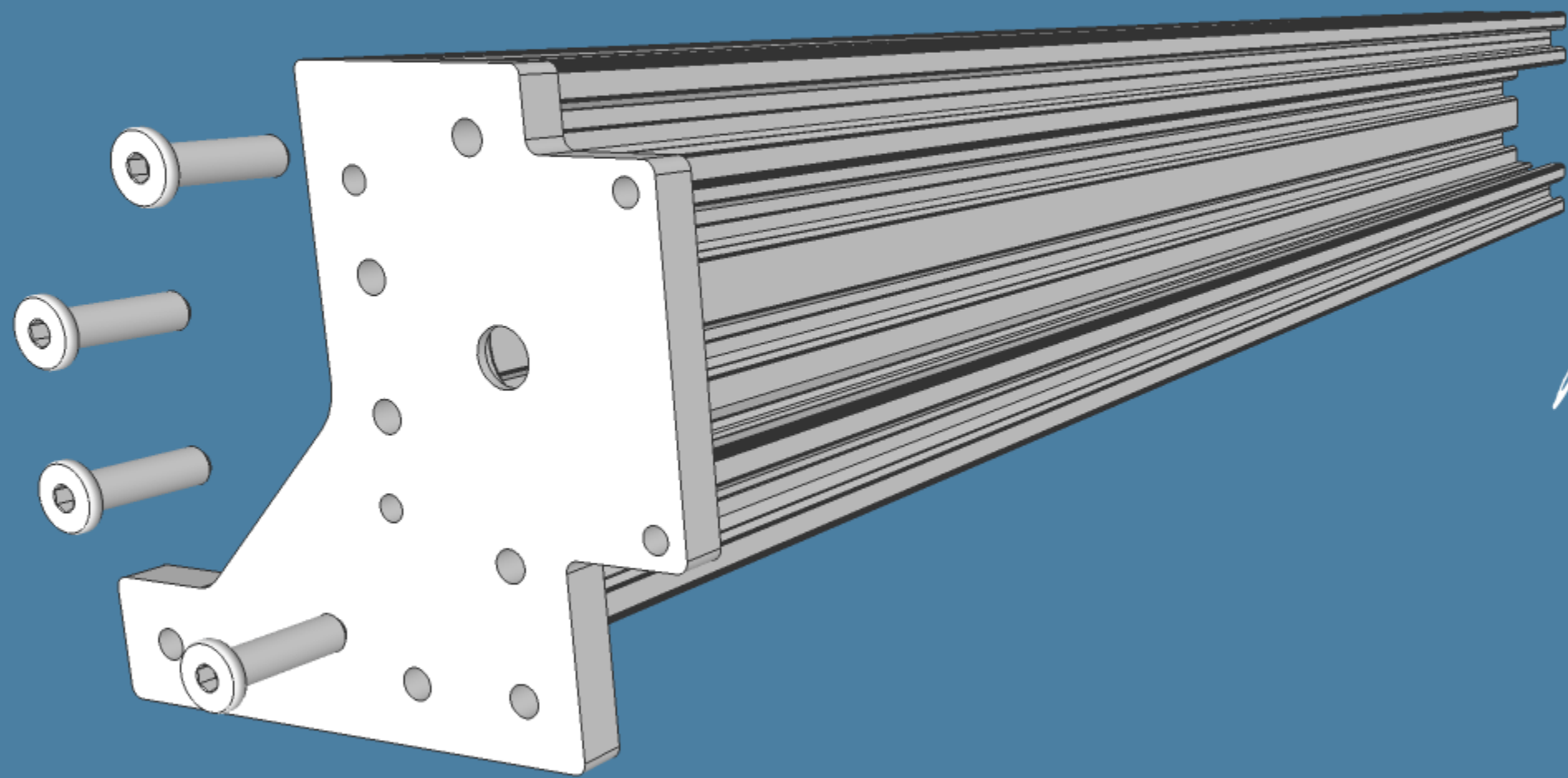


Grab one of the 500mm long C-beam rails. If you followed the B.O.M. and cut down your own C-beam you will need to tap each end for M5 x 0.8 threads.

NOTE: If you purchased 500mm long precuts they come pre-tapped and you can skip this step!

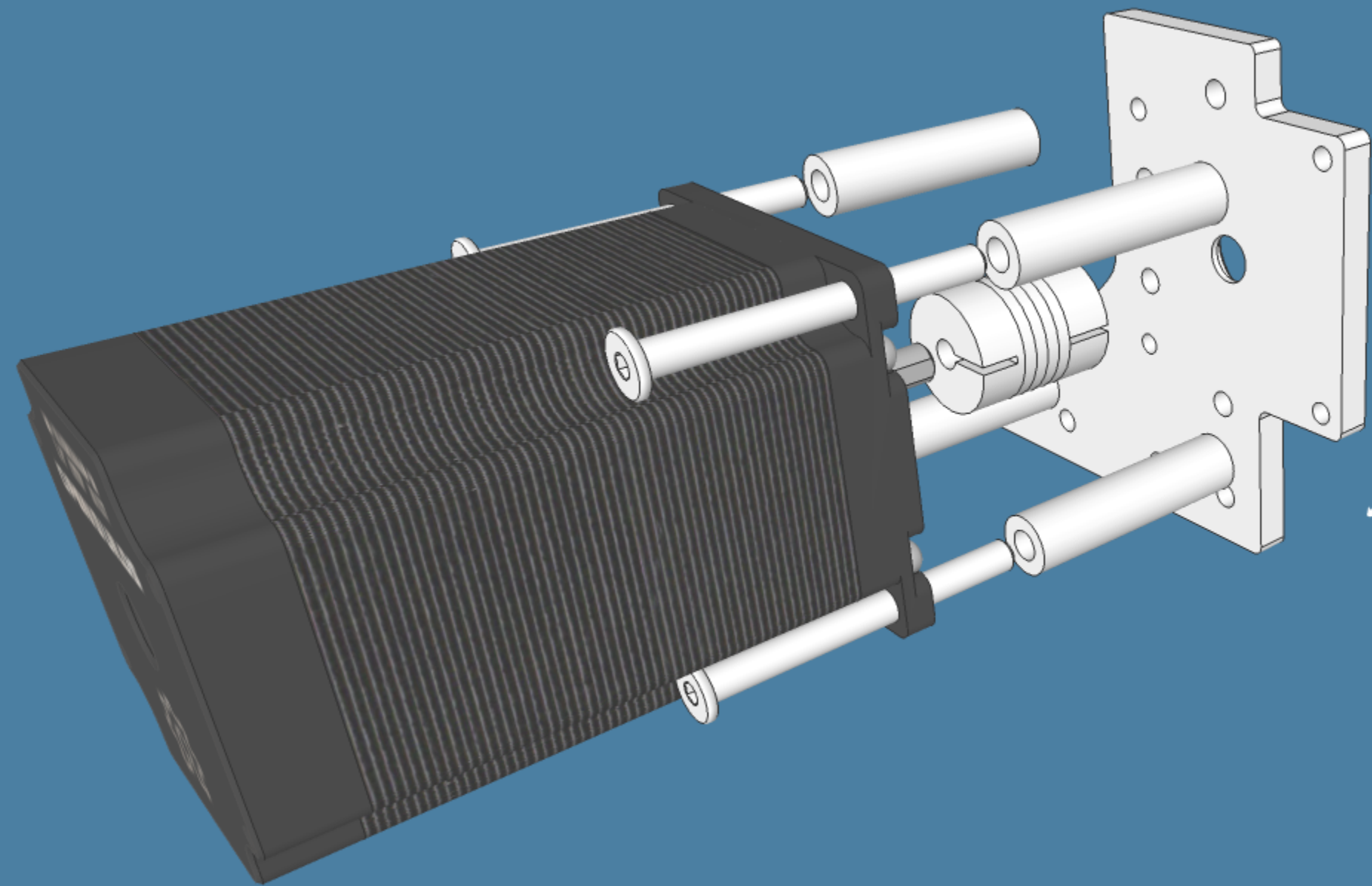
- Tools Required -  
: M5 x 0.8 Metric Tap

## - Step Two -



Grab the 500mm long C-beam rail from step one. The left rear motor mount plate and four m5x15mm bolts and secure the plate as shown in the accompanying image.

- Tools Required -  
: 3mm Hex Wrench



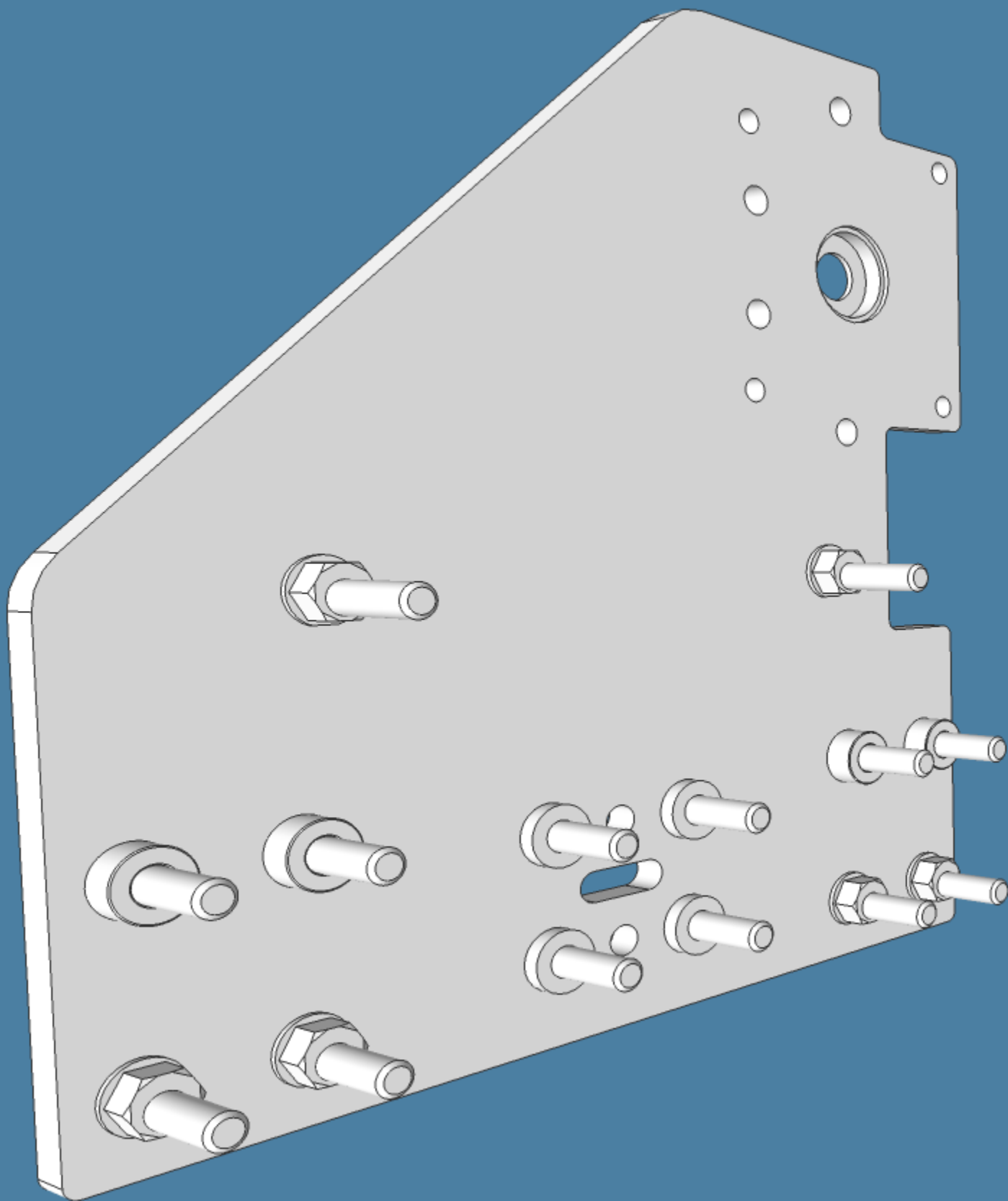
## - Step Three -

With the motor mount plate secured to the c-beam we can mount our motor. Grab your nema 23, coupler, 40mm spacers, and four M5x50mm bolts. First mount your coupler to the motor and then mount the motor to the plate using a small amount of loctite on each thread.

## - Tools Required -

- : 3mm Hex Wrench
- : loctite

# - Step Four -



We are now going to start the assembly of the Y-axis side plate. Grab the Left Side plate, Six 6mm eccentrics, four 6mm spacers, Four 3mm spacers, Two M5x30mm bolts, Four M5x25mm bolts, Eight M5x27mm Bolts.

Top Row: M5x30mm - plate - 6mm eccentrics

Middle Row: M5x27mm - plate - 6mm spacers

Bottom Row: M5x27mm - plate - 6mm eccentrics

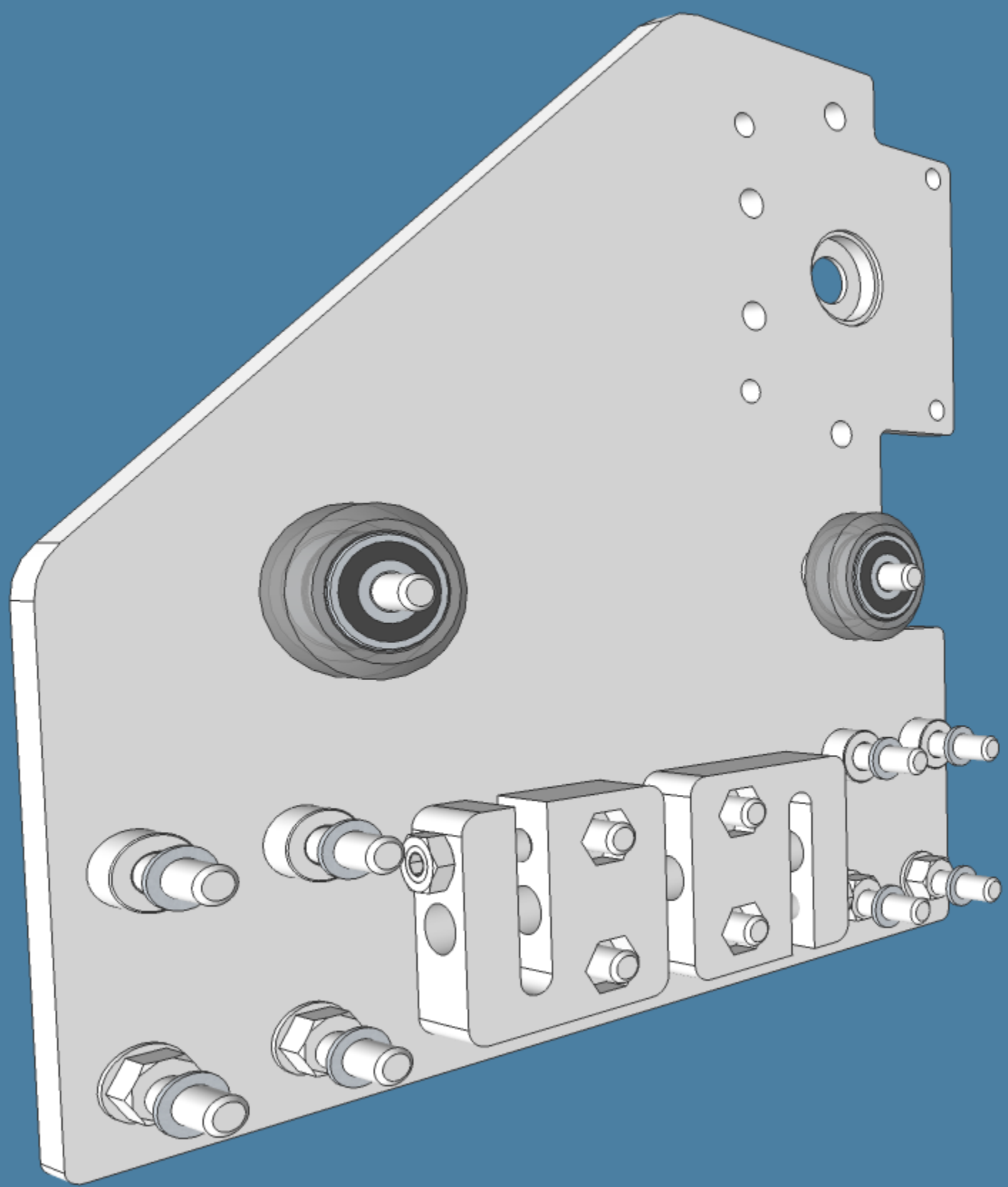
Four Center: M5x25mm - plate - 3mm spacers

- Tools Required -  
: None

## - Step Five -

Take two fully assembled Solid V-wheels and place on top two bolts, Take two assembled anti-backlash nuts and mount in center as shown. Remaining eight M5x27mm bolts now receive a 1mm precision shim from the mini V-wheel kits.

- Tools Required -  
: None



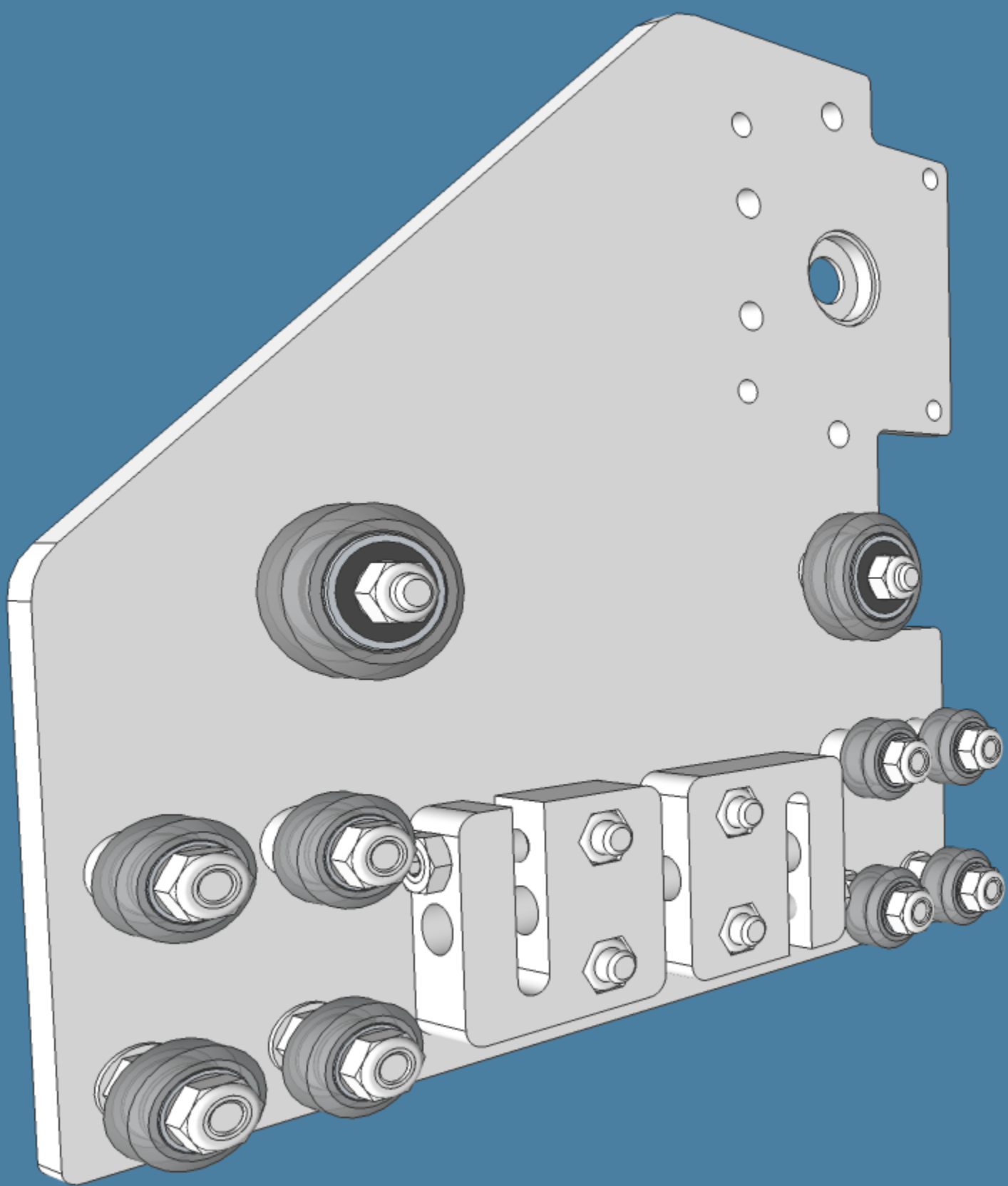
# - Step Six -

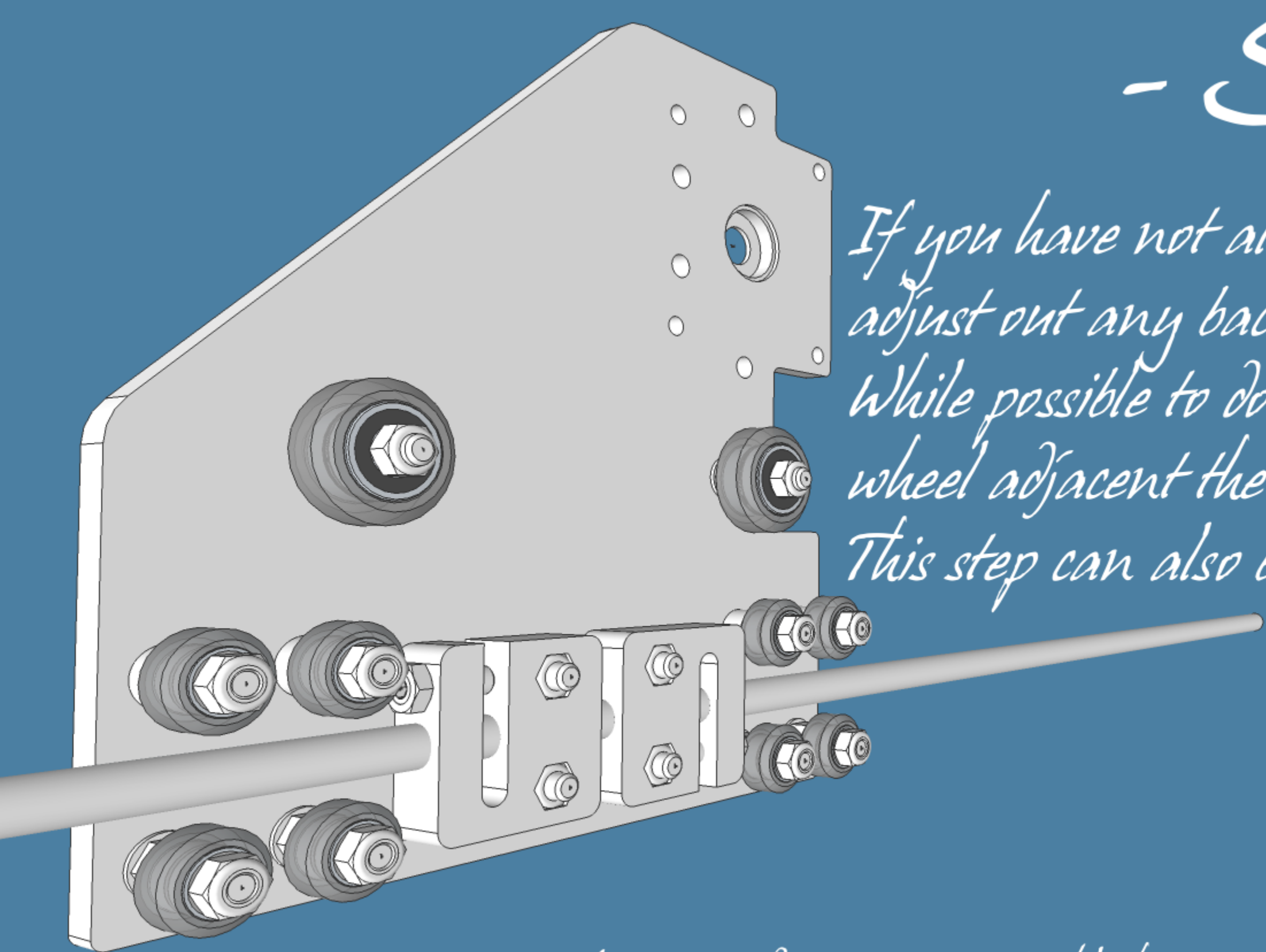
Take eight fully assembled mini V-wheels and place on M5x27mm bolts, Take fourteen M5 lock nuts and secure all of the parts in place on the M5 bolts. Snug up all nuts sitting on spacers tightly. Leave nuts on eccentrics only lightly snug for now.

Optinal: use a dab of loctite on each bolt / nut for extra security.

## - Tools Required -

- : 3mm Hex Wrench
- : 8mm Wrench
- : loctite





## *- Step Seven -*

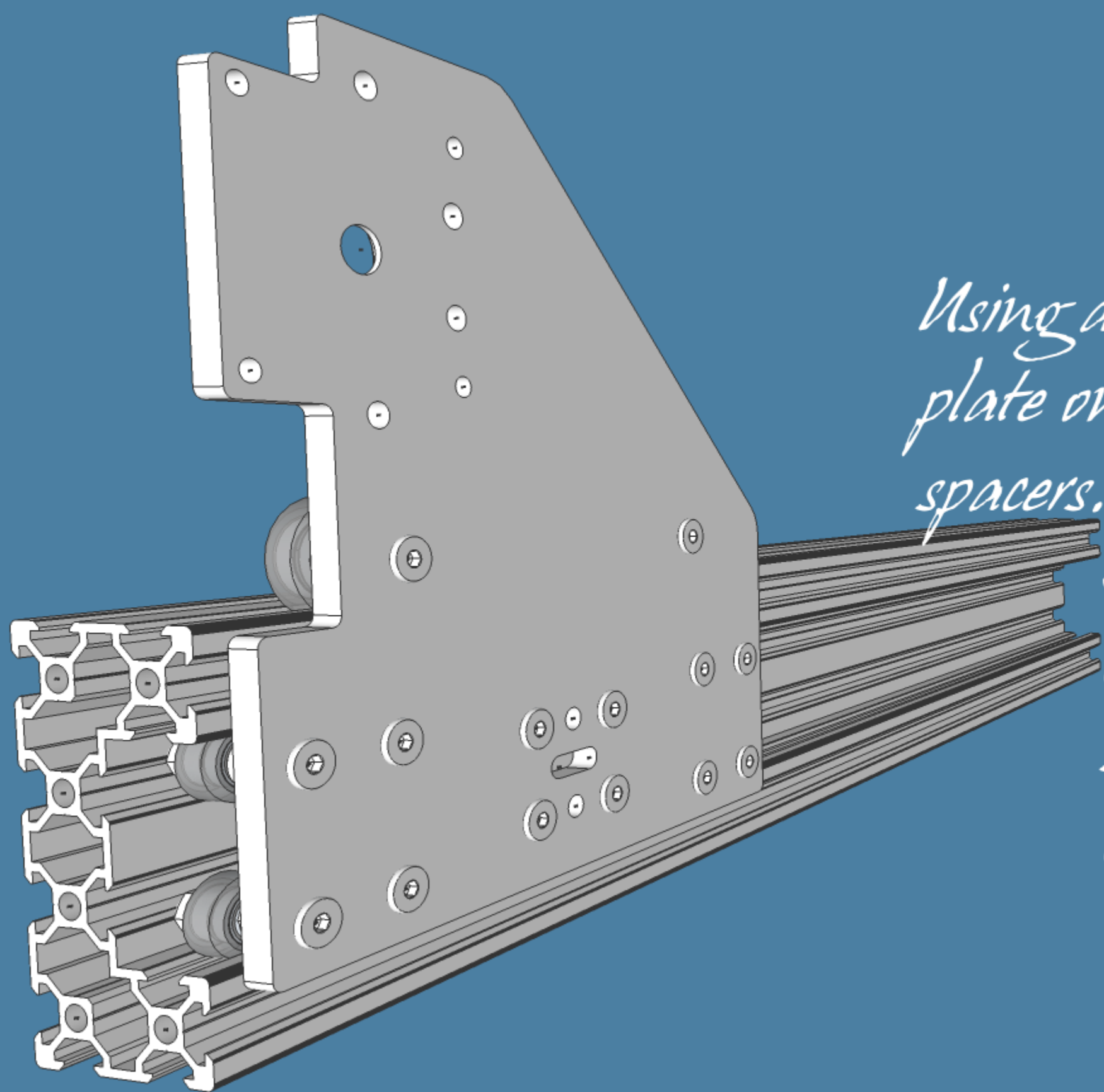
*If you have not already done so; take your leadscrew and adjust out any backlash from your anti-backlash nuts. While possible to do in place the removal of the mini V-wheel adjacent the adjustment nut may be required. This step can also be done prior to mounting your wheels.*

*- Tools Required -*

*: 8mm Wrench*

*Note: for proper adjustment anti-backlash nuts must be secured to plate.*





## - Step Eight -

Using a piece of c-beam rail slide the assembled y-axis side plate on the c-beam and make adjustments to the eccentric spacers.

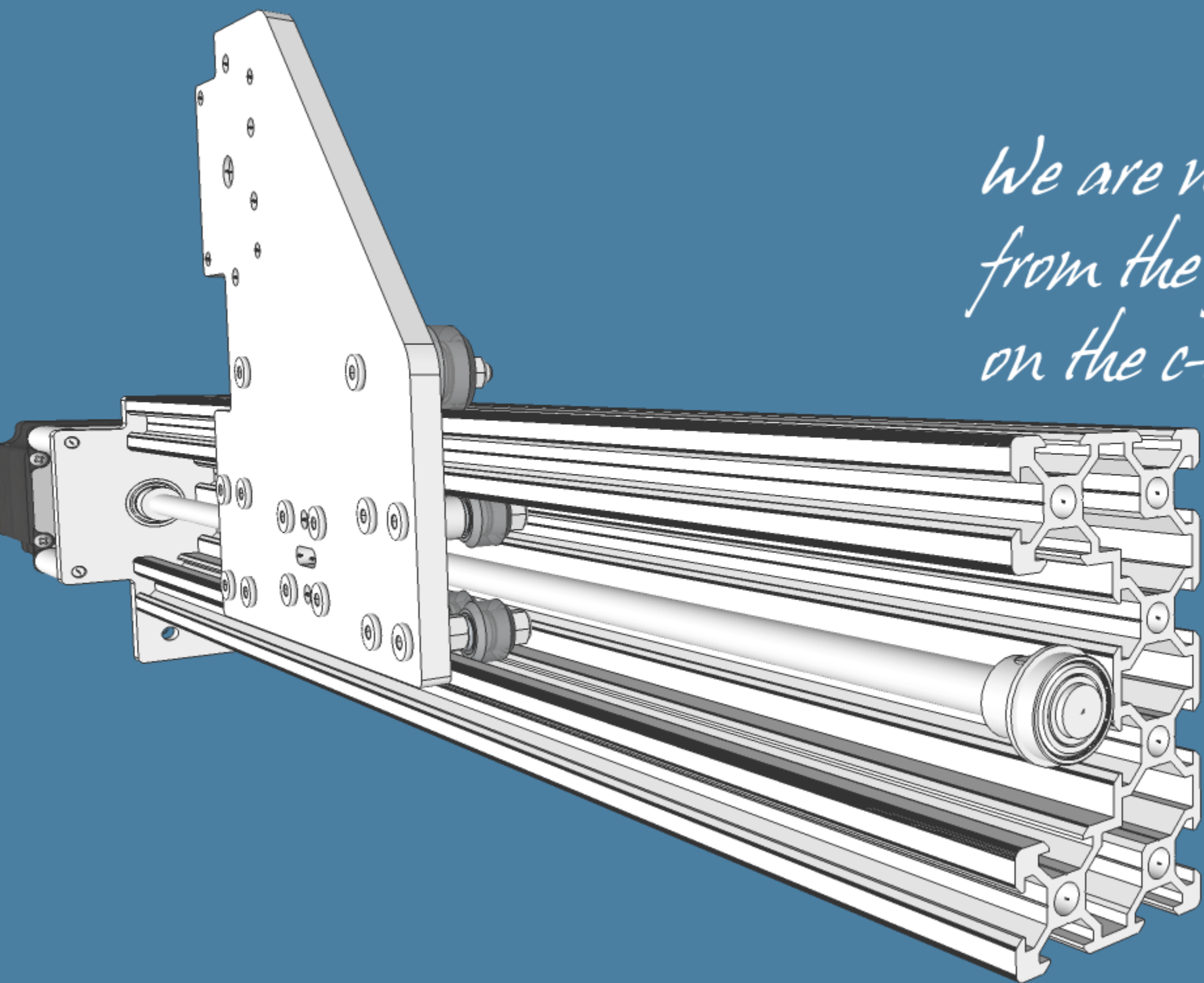
Start with the center mini V-wheels followed by the outer mini V-wheels. Finally adjust the top solid V-wheels to the c-beam. Once adjusted tighten all lock nuts.

## - Tools Required -

- : 3mm Hex Wrench
- : 8mm Wrench

# - Step Nine -

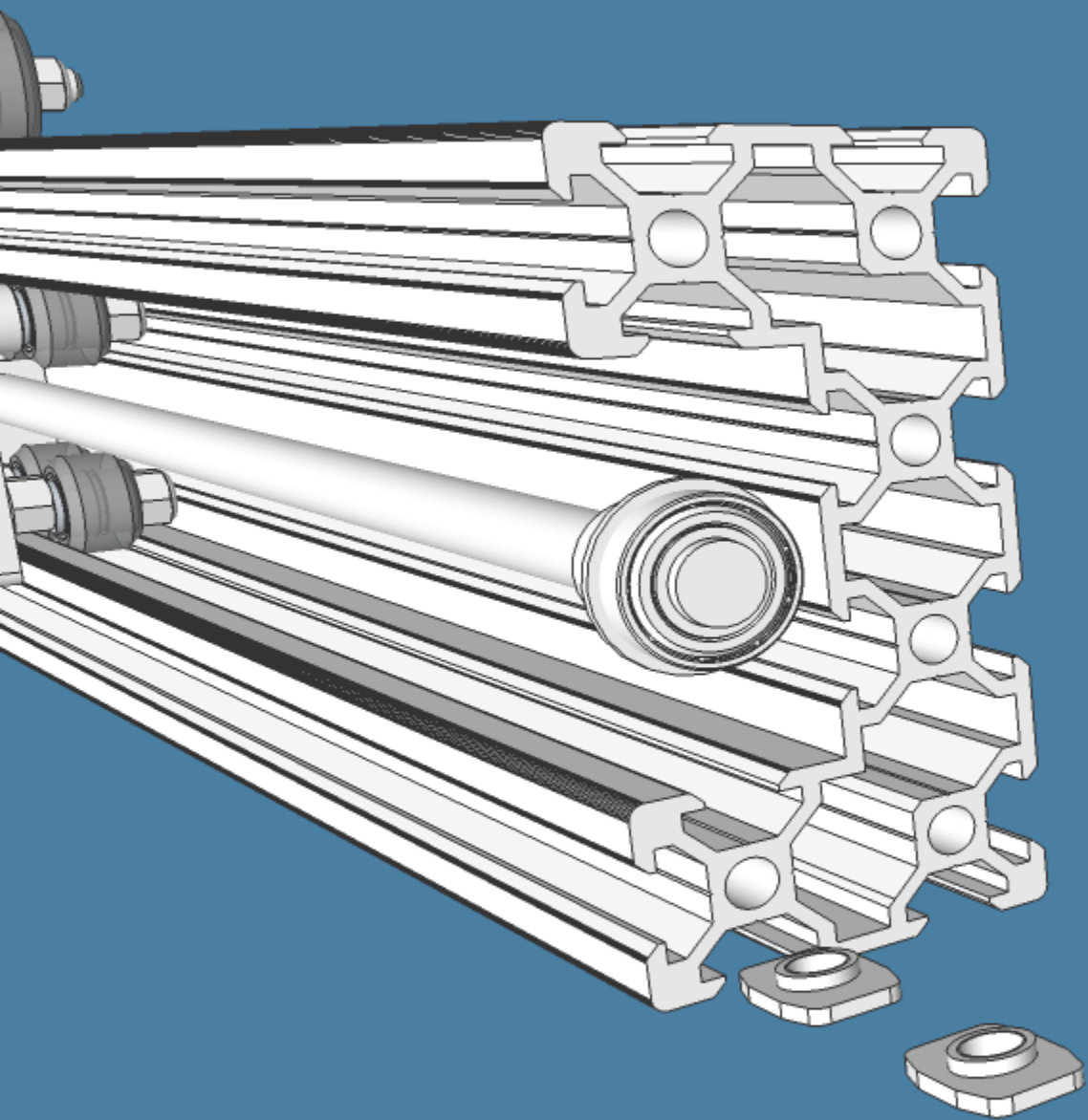
We are now going to begin combining our sub assemblies from the following eight steps. Slide the y-axis side plate on the c-beam rail we mounted our motor to.



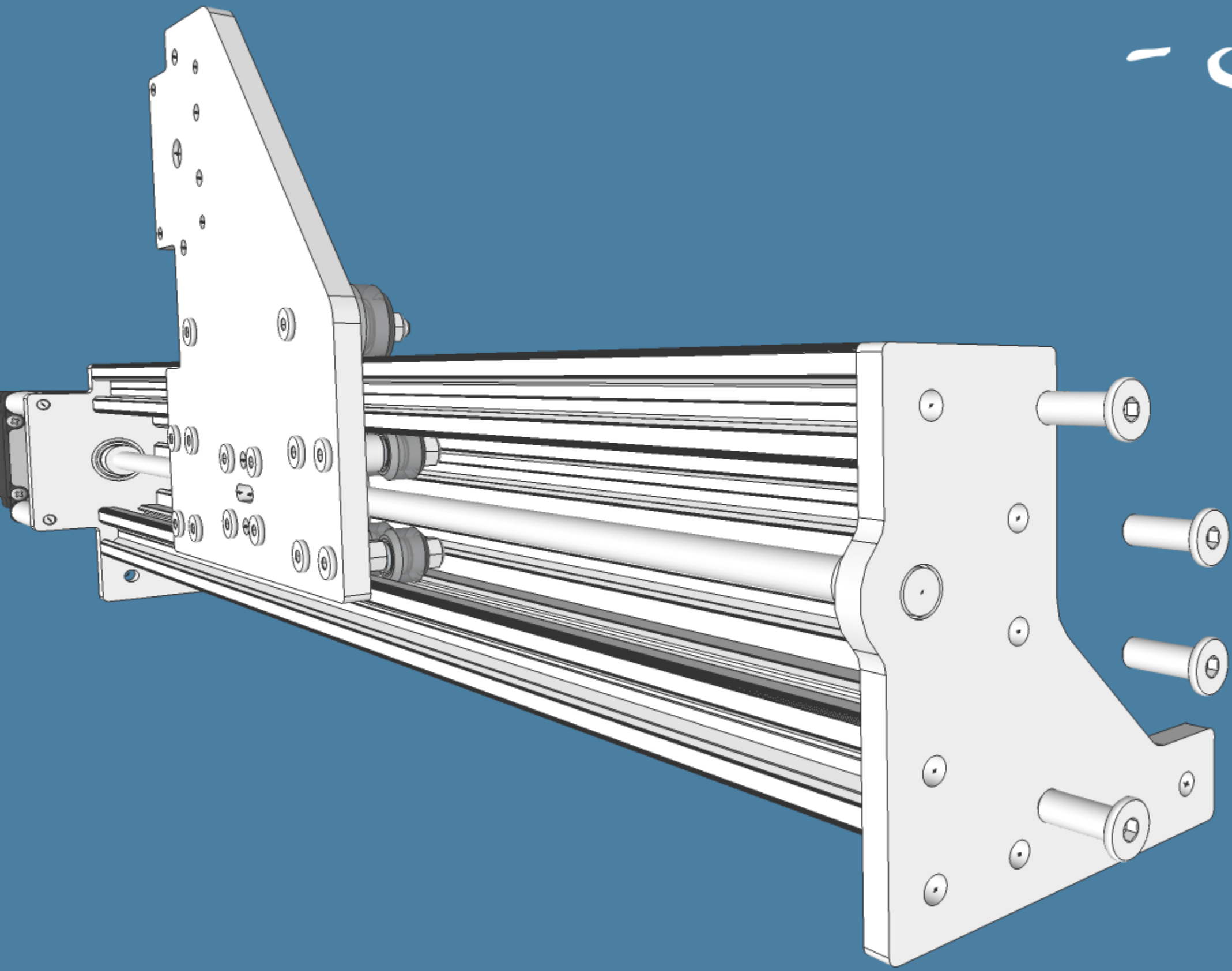
Grab your 530mm leadscrew, two 688-23 bearings, two 8mm lock collars, two 8mm shims. Insert one bearing into rear motor mount plate now thread the leadscrew through the anti-backlash nuts. Before inserting leadscrew in rear bearing install lock collar and shim on leadscrew. it should go; motor mount plate - bearing - shim - lock collar. Install the same on the front of the lead screw lock collar - shim - bearing.

# - Step Ten -

Grab two M5 t-nuts and place on the outside lower slot just under the leadscrew. As can be seen in the photo to your left.



- Tools Required -  
: None

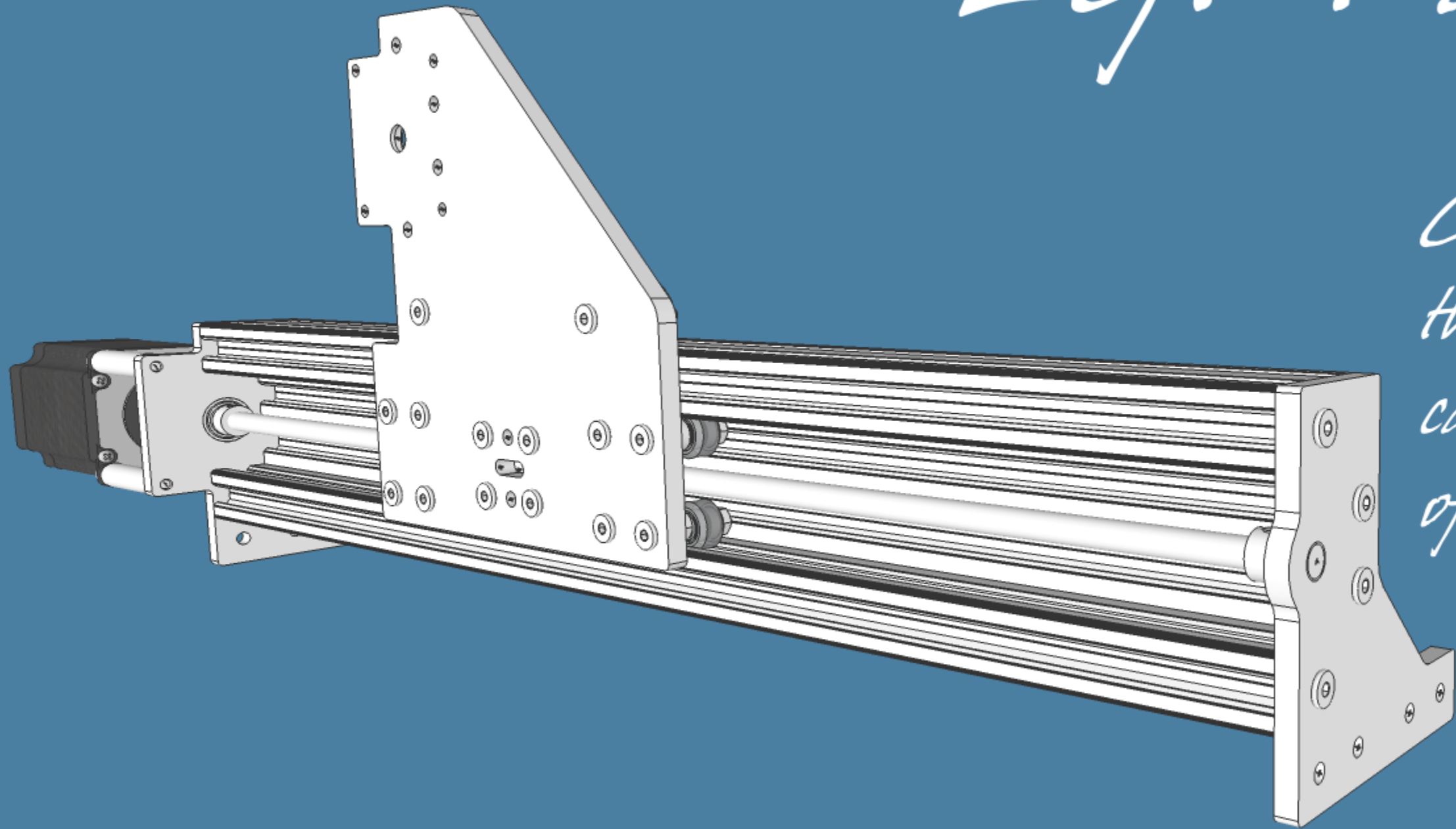


## - Step Eleven -

Grab your left front bearing plate, four M5x15mm bolts. Mount front bearing plate to front end of c-beam assembly from steps one - nine, secure with the M5 bolts. Make sure bearing is properly seated in plate and both front and rear lock collars are secured.

- Tools Required -  
: 3mm Hex Wrench

*- Left Y-axis Complete -*



*Congratulations! The Left y-axis of the cnc router has been completed. You can now set it aside and begin assembly of the next step.*

# - Chapter Three -

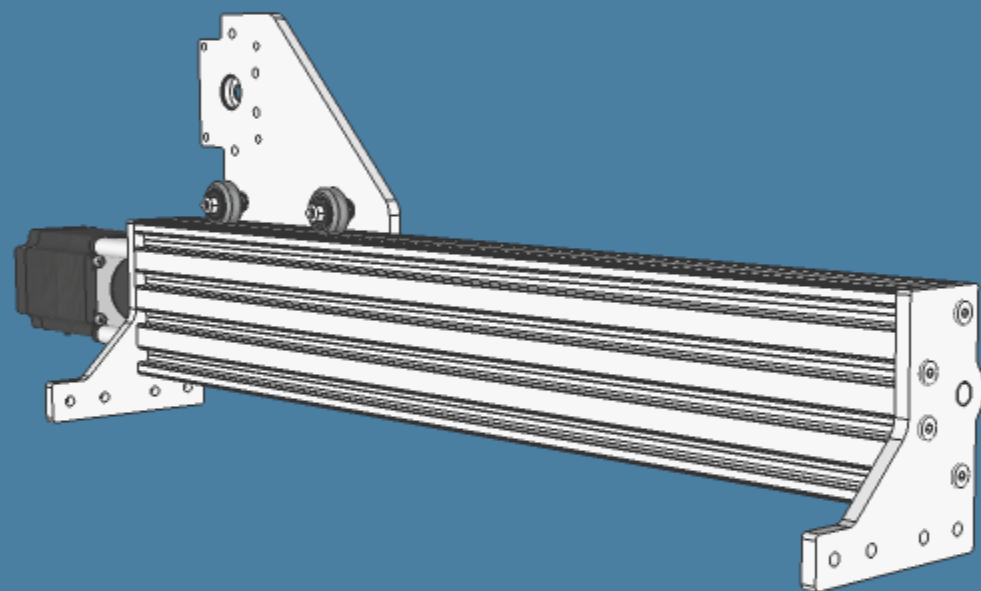
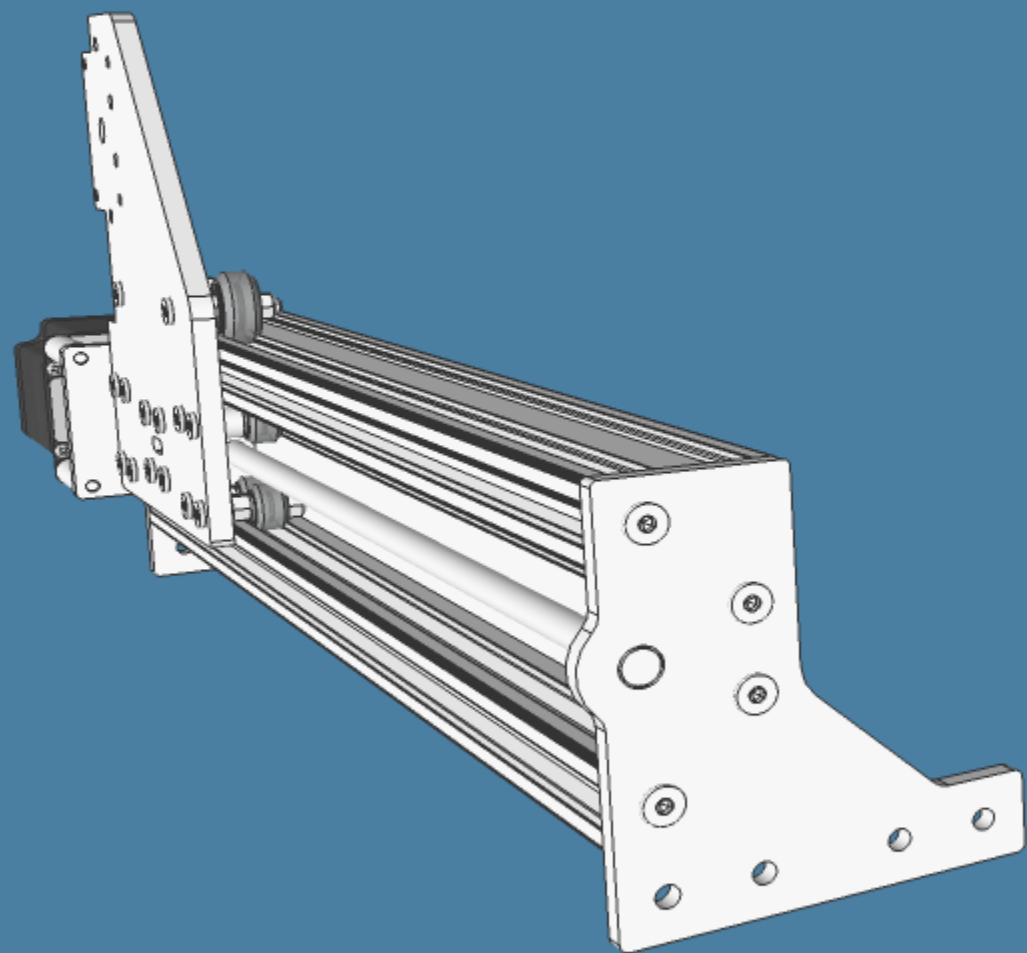
: Right Y-axis Assembly Guide

# Gather The Following Parts

The right y-axis is just a mirror image of the left.  
Please review chapter two for full details.

- Left Side Y-axis Plate
- Left Front Y-axis Bearing Plate
- Left Rear Y-axis Motor Mount Plate
- Nema 23 Motor
- 500mm C-beam
- 530mm Tr8 \*8-2p Leadscrew
- 688-2Z Flanged Bearing (x2)
- 8mm Lock Collar (x2)
- 8mm x 1/4" Coupler
- 40mm Spacer (x4)
- M5x50mm Bolt (x4)
- M5x30mm Bolt (x2)
- M5x25mm Bolt (x4)
- M5x15mm Bolt (x8)
- M5x27mm Bolt (x8)
- M5 Lock Nut (x14)
- M5 T-nuts (x2)
- 6mm Spacers (x4)
- 6mm Eccentric Spacer (x6)
- 3mm Spacer (x4)
- 8mm Shim (x2)
- Anti Backlash Nut (x2)
- Mini V-Wheel Kit (x8)
- Solid V-wheel Kit (x2)

# - Right Y-axis Complete



*Congratulations! The Right y-axis of the cnc router has been completed. You can now set it aside with the Left and begin assembly of the next step.*

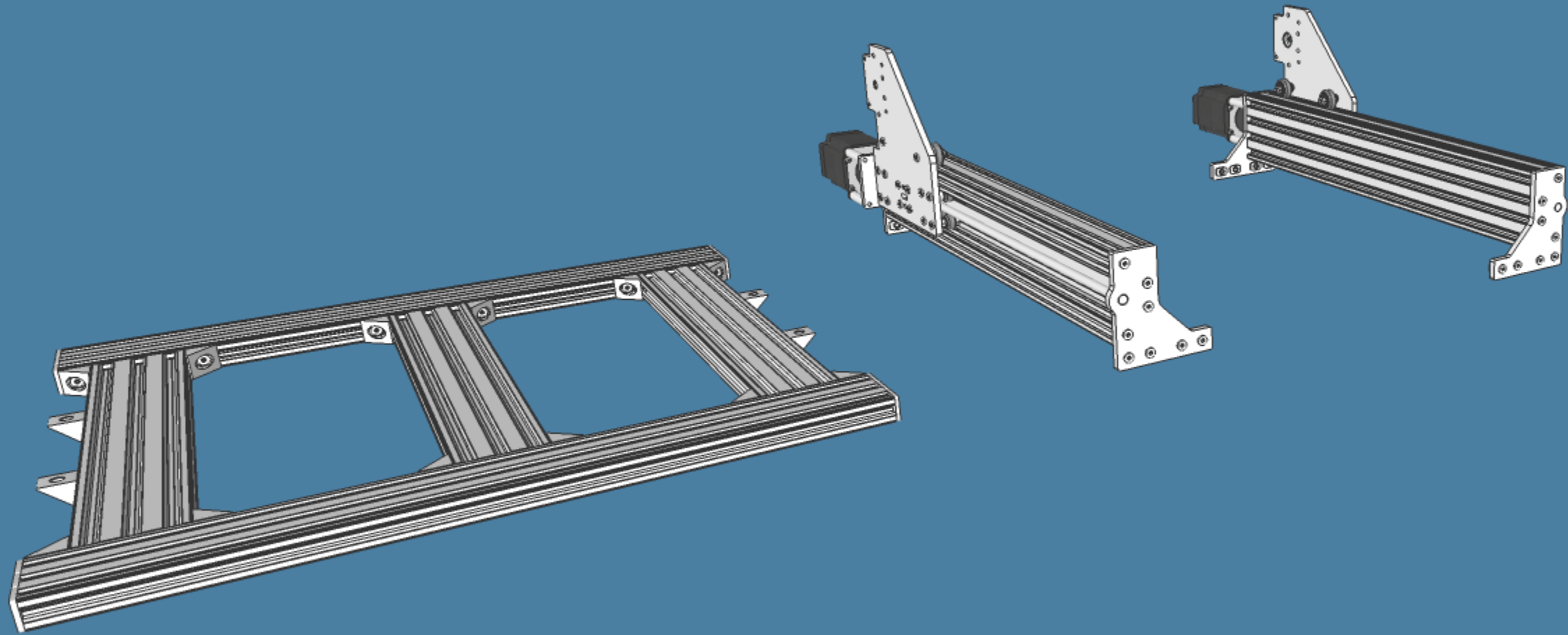


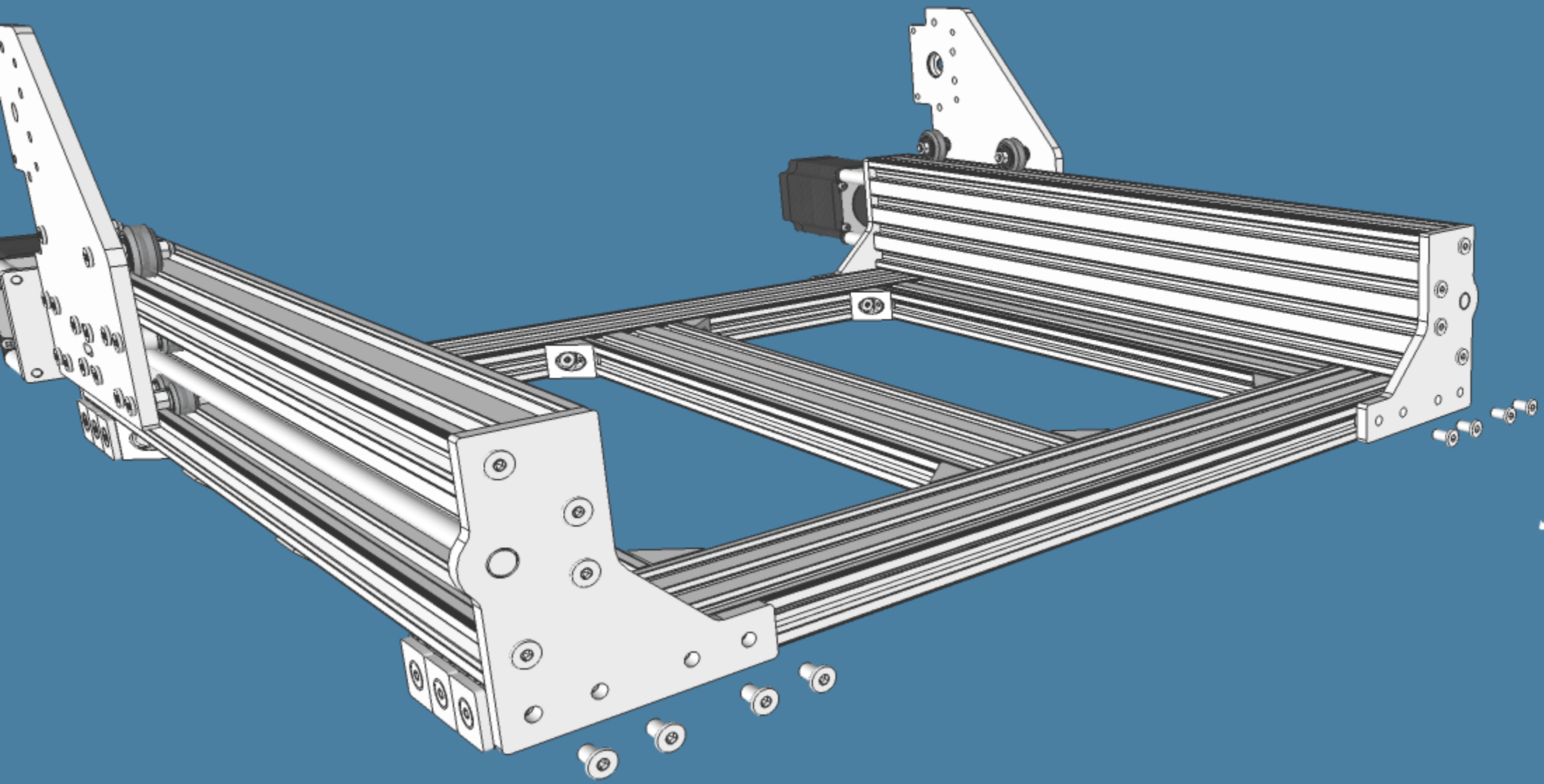
# - Chapter Four -

: Base and Y-axis Assembly Guide

# Gather The Following Parts

- Base Assembly from chapter one
- Left y - axis from chapter two
- Right y - axis from chapter three
- M5x10mm Bolts (x16)
- M5x8mm Bolts (x4)

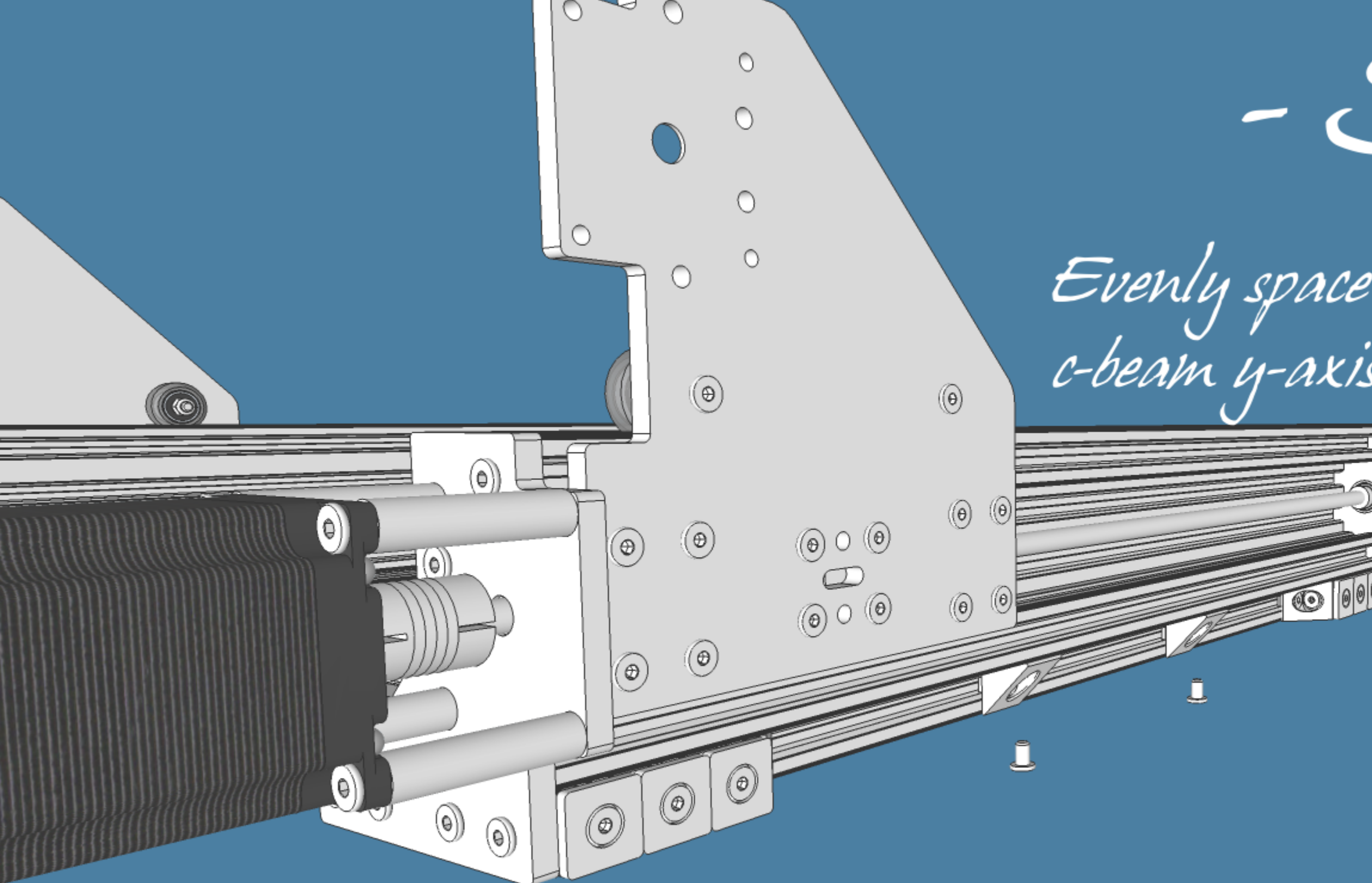




## - Step One -

Place the Left and Right y-axis rails on top of the base as shown in the image. Using a total of sixteen M5x10mm bolts (four each side front / rear) secure y-axis assemblies to base frame.

- Tools Required -  
: 3mm Hex wrench

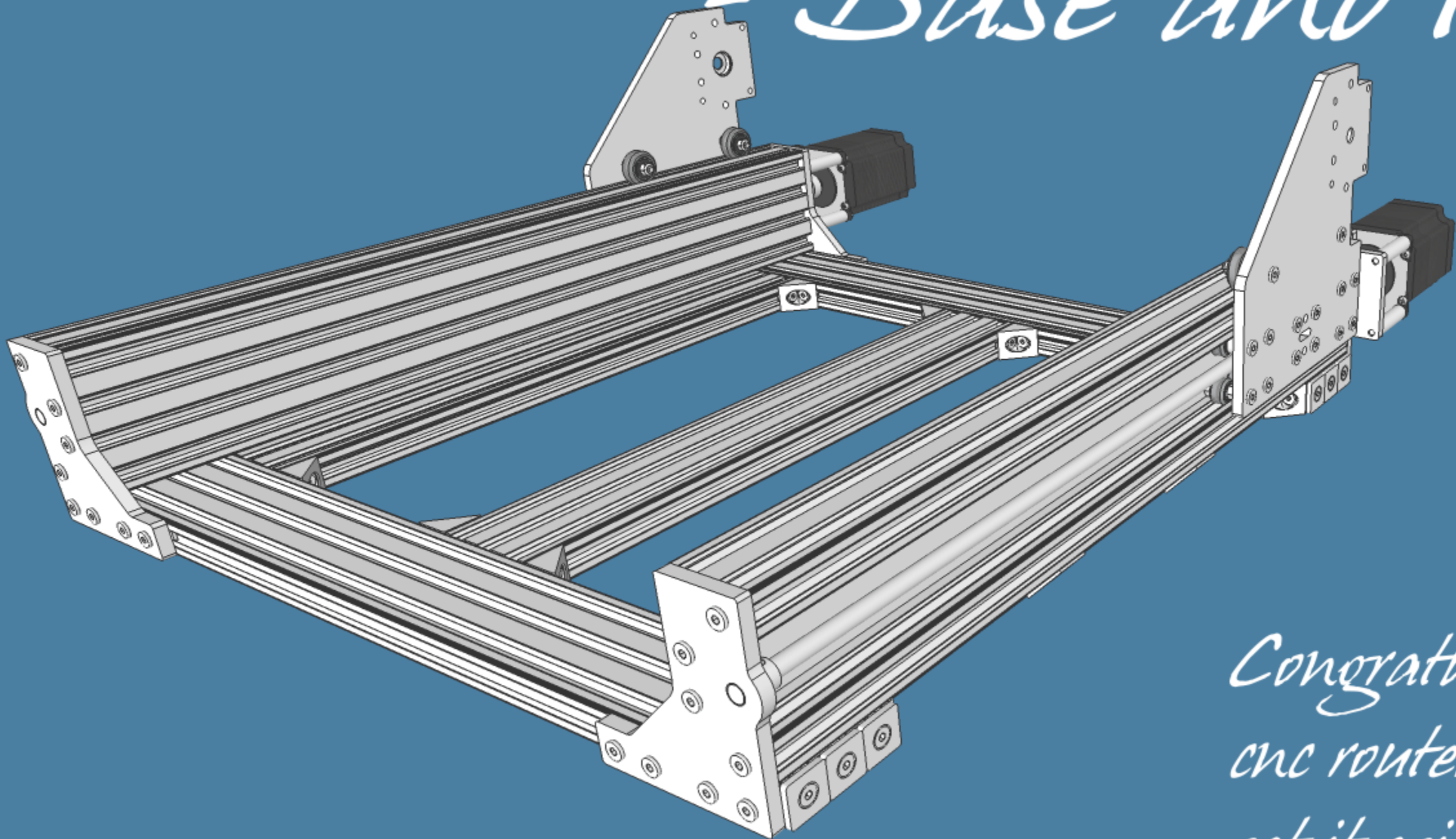


## - Step Two -

Evenly space the side 90° cover brackets along the c-beam y-axis and secure y-axis down with Two of the M5x8mm bolts on each side (four M5x8mm total)..

- Tools Required -  
: 3mm Hex wrench

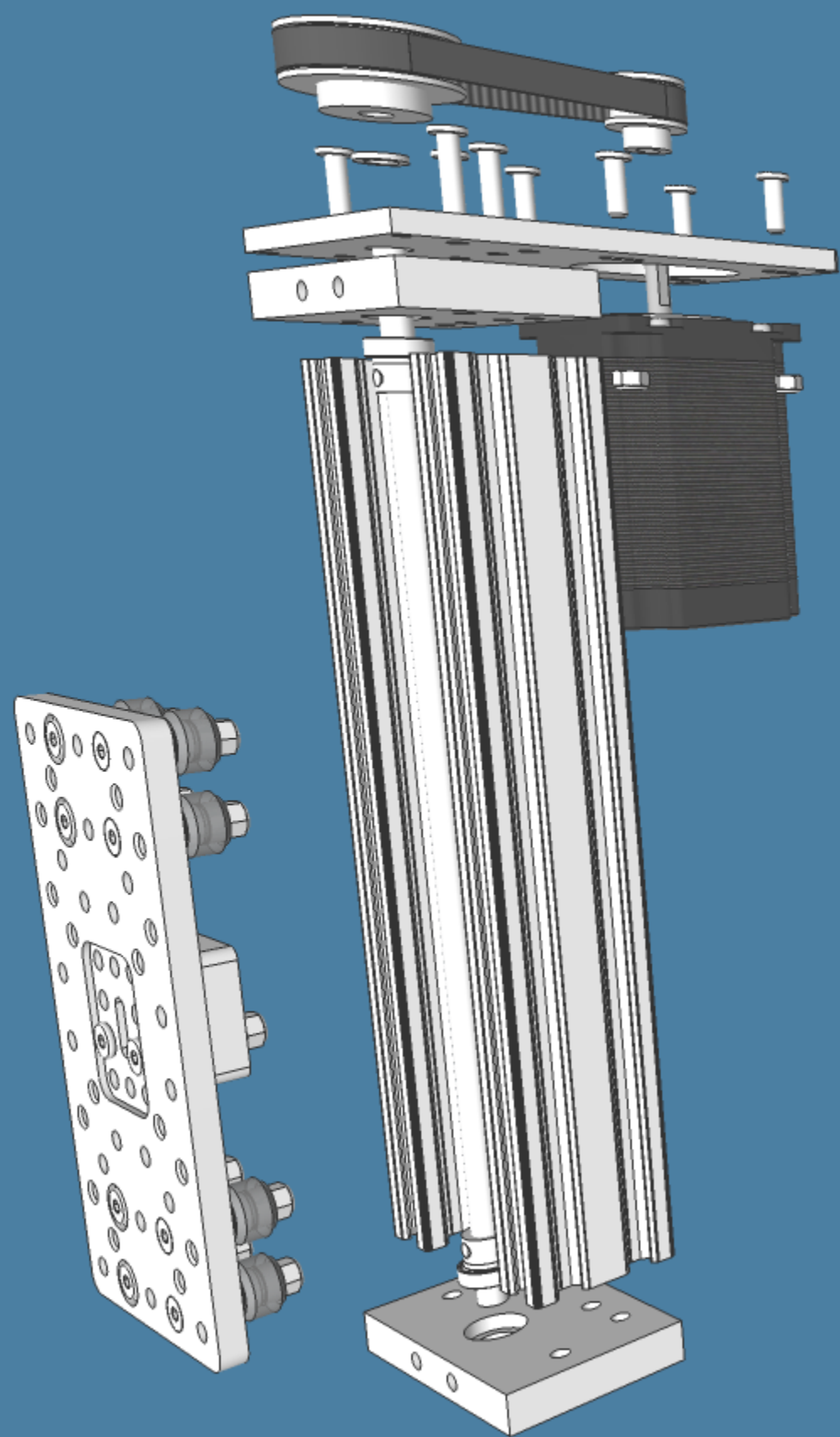
# - Base and Y-axis Complete



*Congratulations! The base and y-axis of the cnc router has been completed. You can now set it aside and begin assembly of the next step.*

# - Chapter Five -

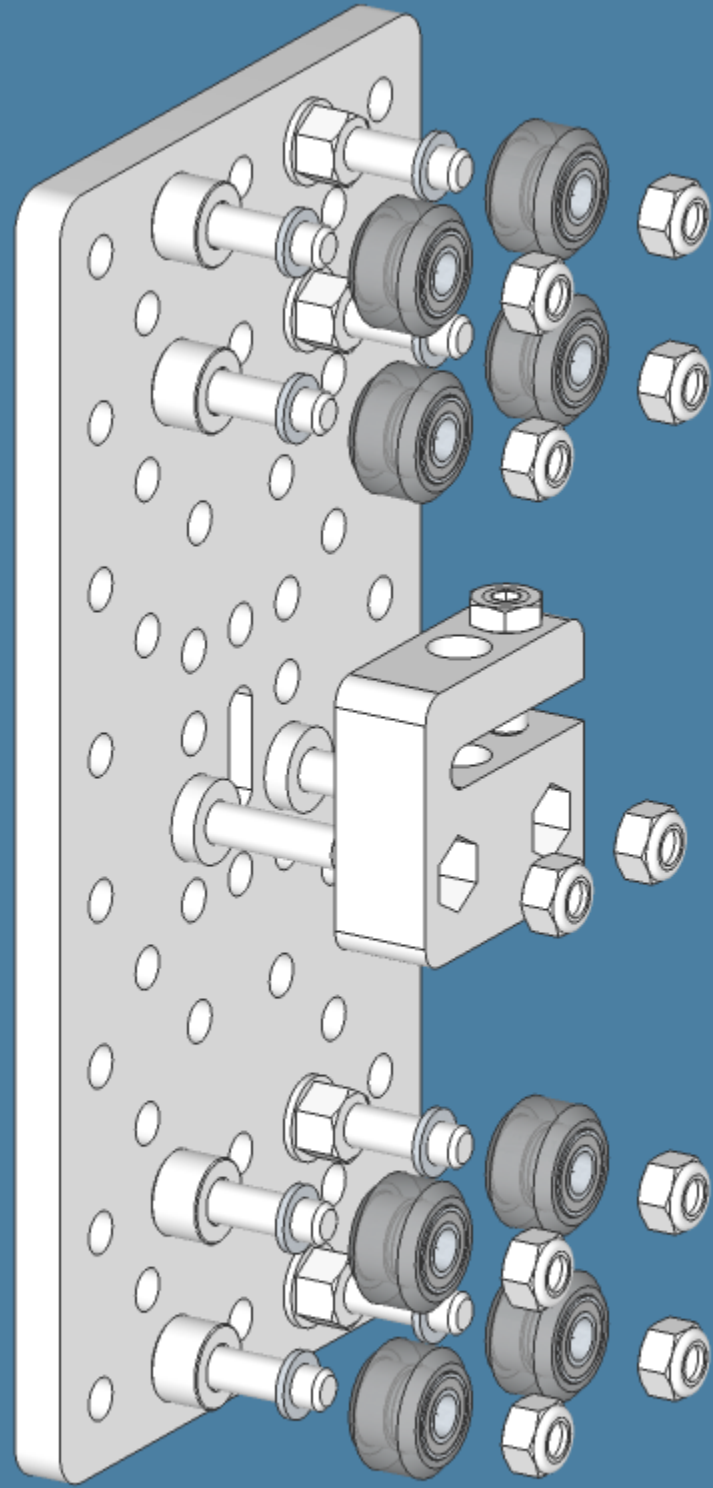
: Z-axis Assembly Guide



# Gather The Following Parts

- 250mm C-Beam
- 250mm Tr8 \*8-p2 Leadscrew
- C-Beam End Plate (x2)
- Belt Reduction Mount
- 40t GT3 Pulley
- 20t GT3 Pulley
- GT3 Timing Belt
- Nema 23 Motor
- 8mm Lock Collar (x2)
- 8mm Shim (x3)
- 688Z Bearing (x2)
- Double Wide Gantry Plate
- Anti Backlash Nut
- 3mm Spacer (x2)
- 6mm Spacer (x4)
- 6mm Eccentric (x4)
- M5 Lock Nuts (x14)
- M5x15mm Bolt (x4)
- M5x20mm Bolt (x4)
- M5x25mm Bolt (x14)
- M5 T-nuts (x12)

# - Step One -

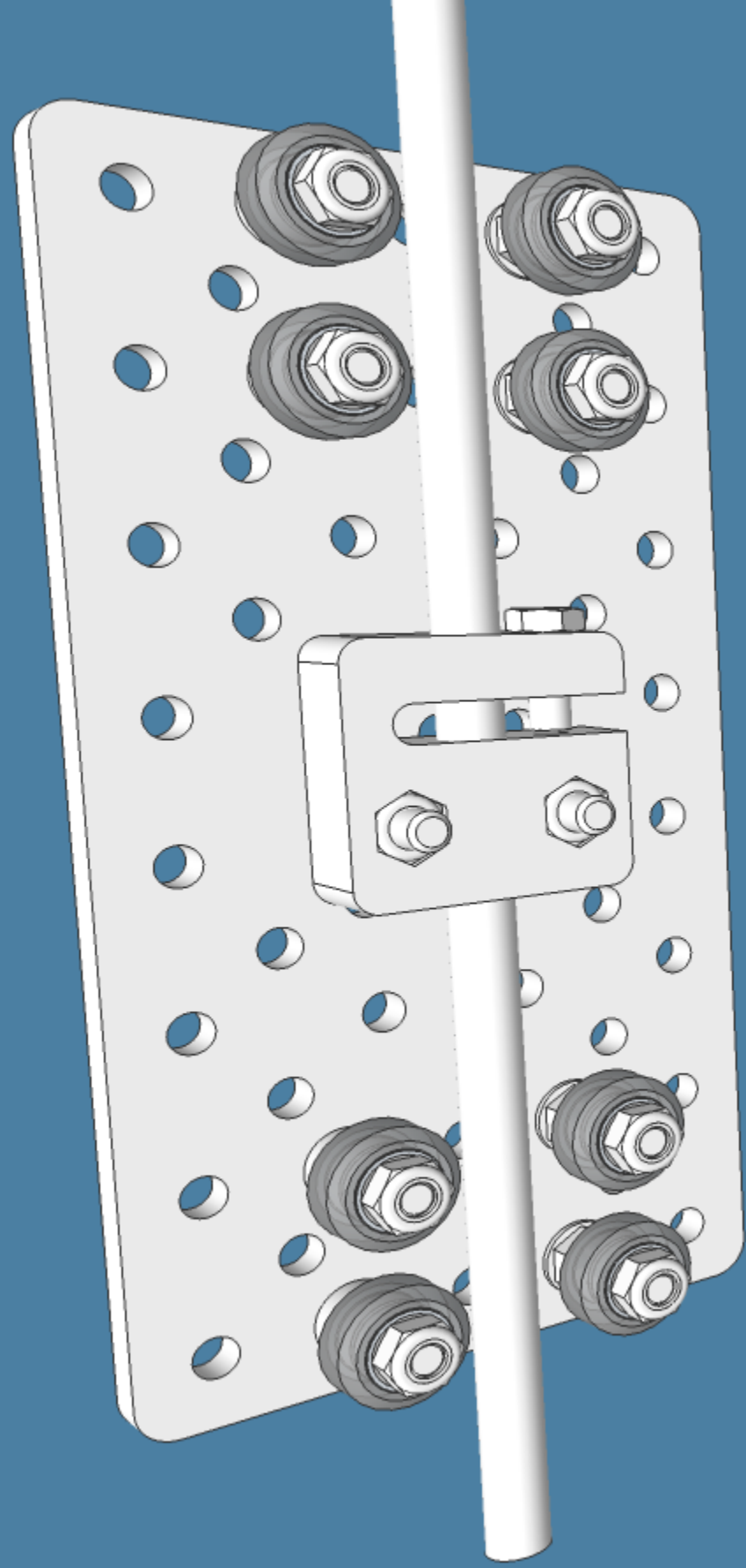


Grab your double wide gantry plate, four 6mm spacers, four 6mm eccentrics, two 3mm spacers, eight mini v-wheel kits, one anti backlash kit, ten M5x25mm bolts and ten M5 lock nuts. Assemble as shown in the image to the left. Insert the bolts thru the double wide gantry plate. Install spacers, 3mm in center for leadscrew nut. Each Mini v-wheel gets a 1mm precision shim on top of spacer. secure in place with m5 nuts. leave eccentrics snug but lose for next step.

## - Tools Required -

- : 3mm Hex Wrench
- : 8mm Wrench



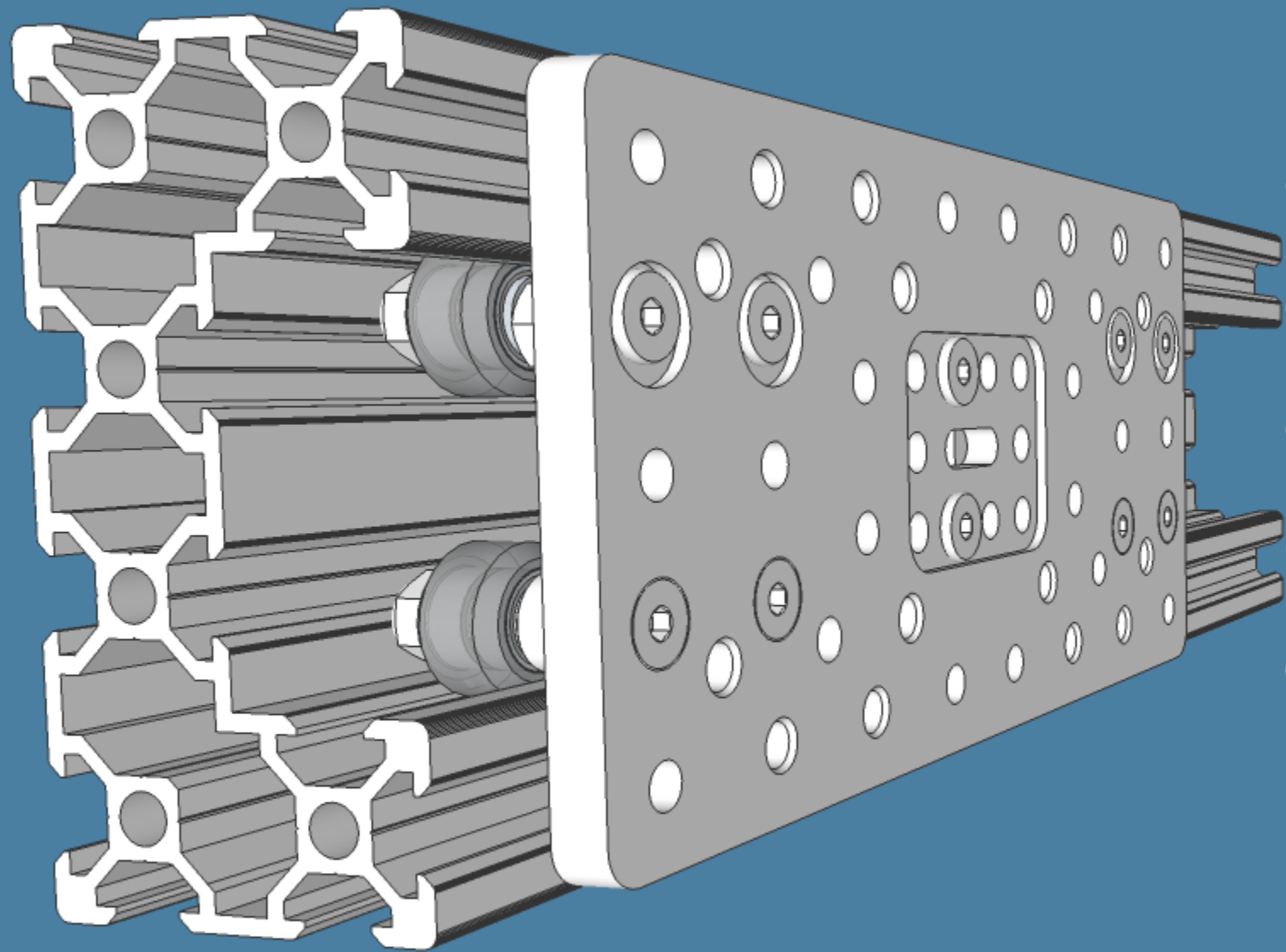


## - Step Two -

*With your double wide gantry plate now built. Grab your 250mm leadscrew and thread into the anti backlash nut. Using a 8mm wrench adjust out any backlash and lock setting in place. Remove your leadscrew for now and set it aside.*

*- Tools Required -  
: 8mm wrench*

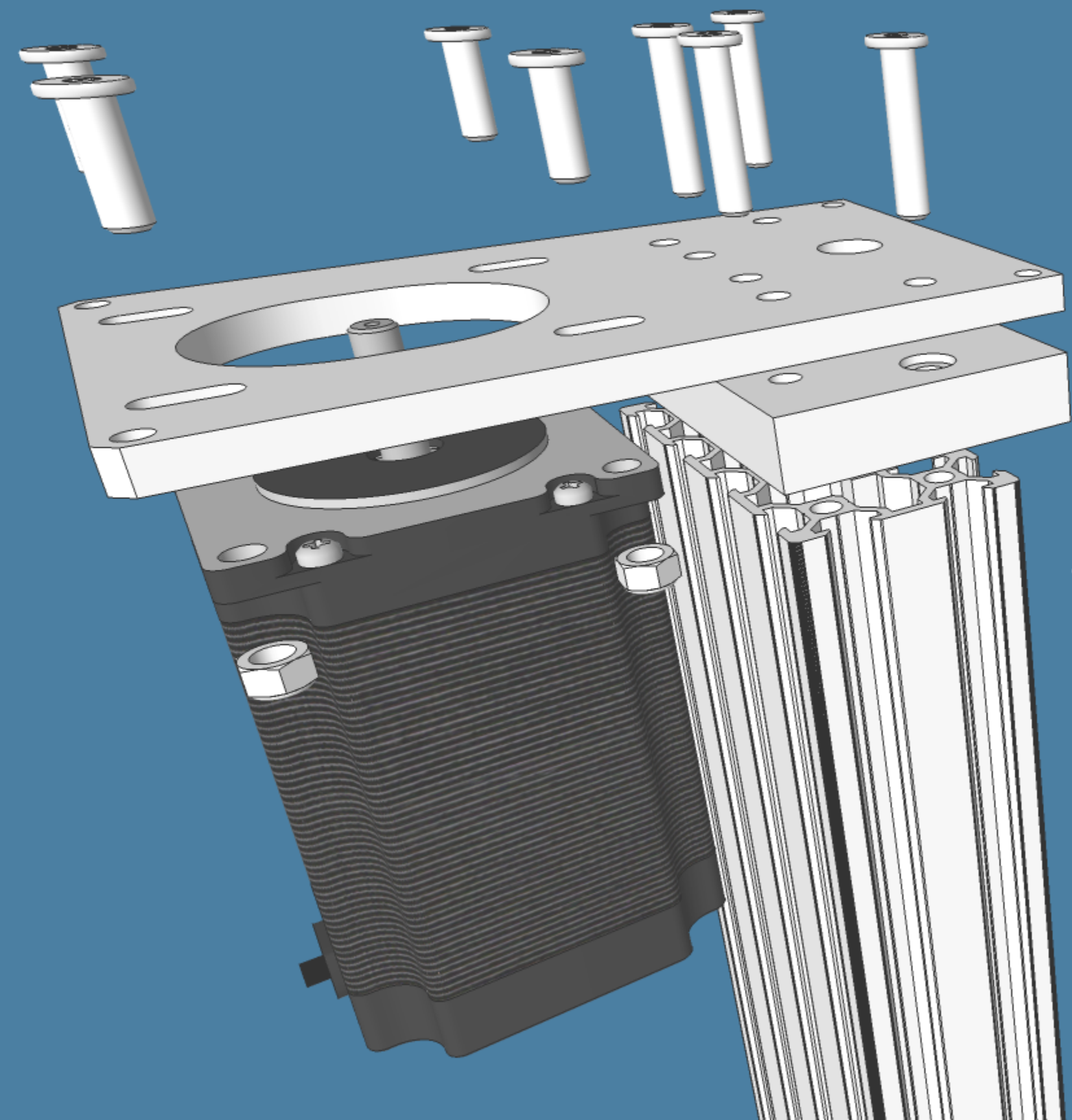
## - Step Three -



Using the 250mm c-beam rail slide the assembled double wide gantry plate on the c-beam and make adjustments to the eccentric spacers. Start with the center mini V-wheels followed by the outer mini V-wheels. Once adjusted tighten all lock nuts.

## - Tools Required -

- : 3mm Hex Wrench
- : 8mm Wrench



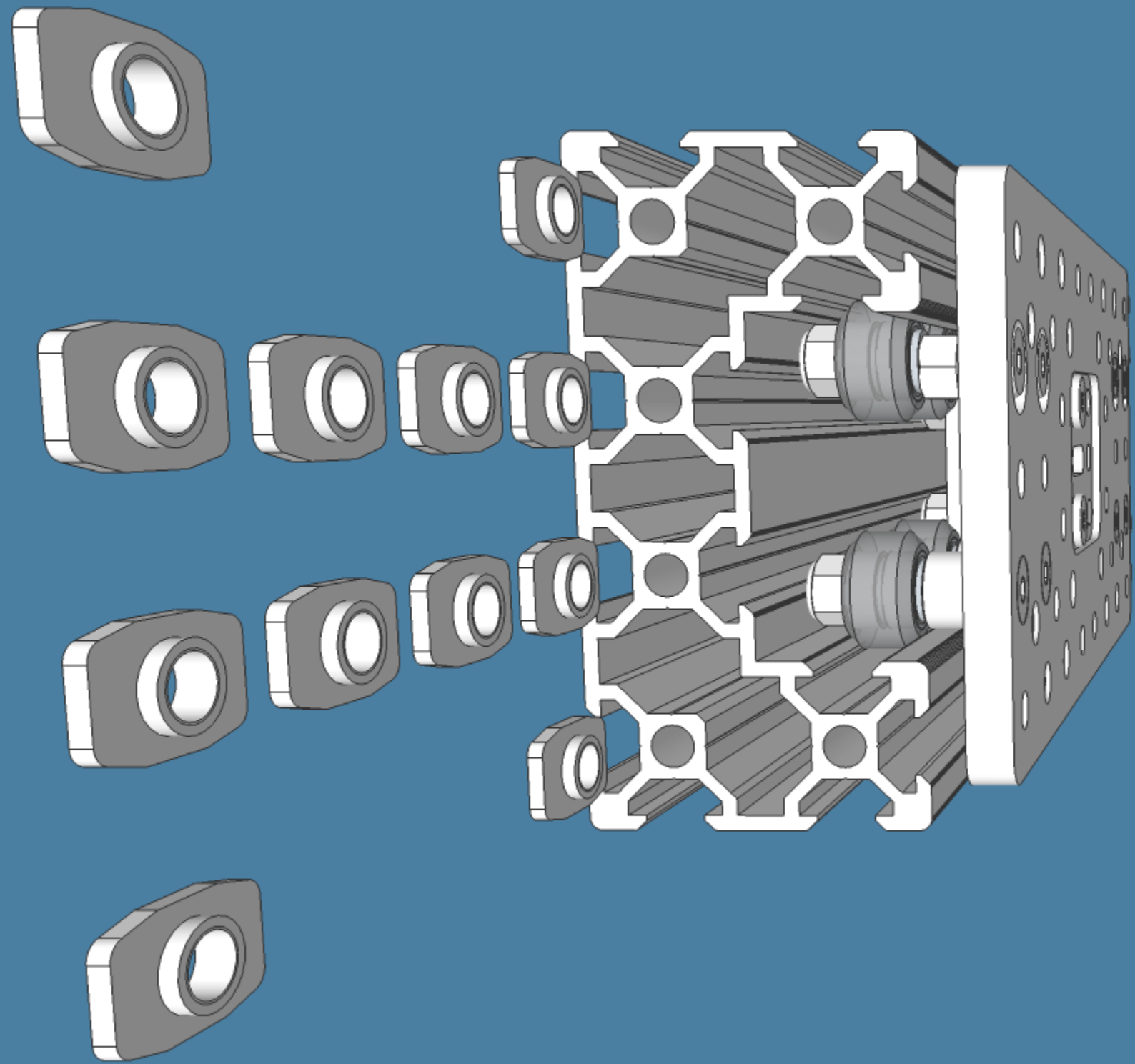
## - Step Four -

Grab your 250mm C-beam, One C-beam end plate, your belt reduction plate, nema 23, four M5x15mm bolts, four M5x25mm bolts and four m5 lock nuts. Begin by placing the belt plate over the end plate and secure both to one end of your C-beam with the 25mm bolts. Now you can mount your nema 23 using the 15mm bolts and four lock nuts.

## - Tools Required -

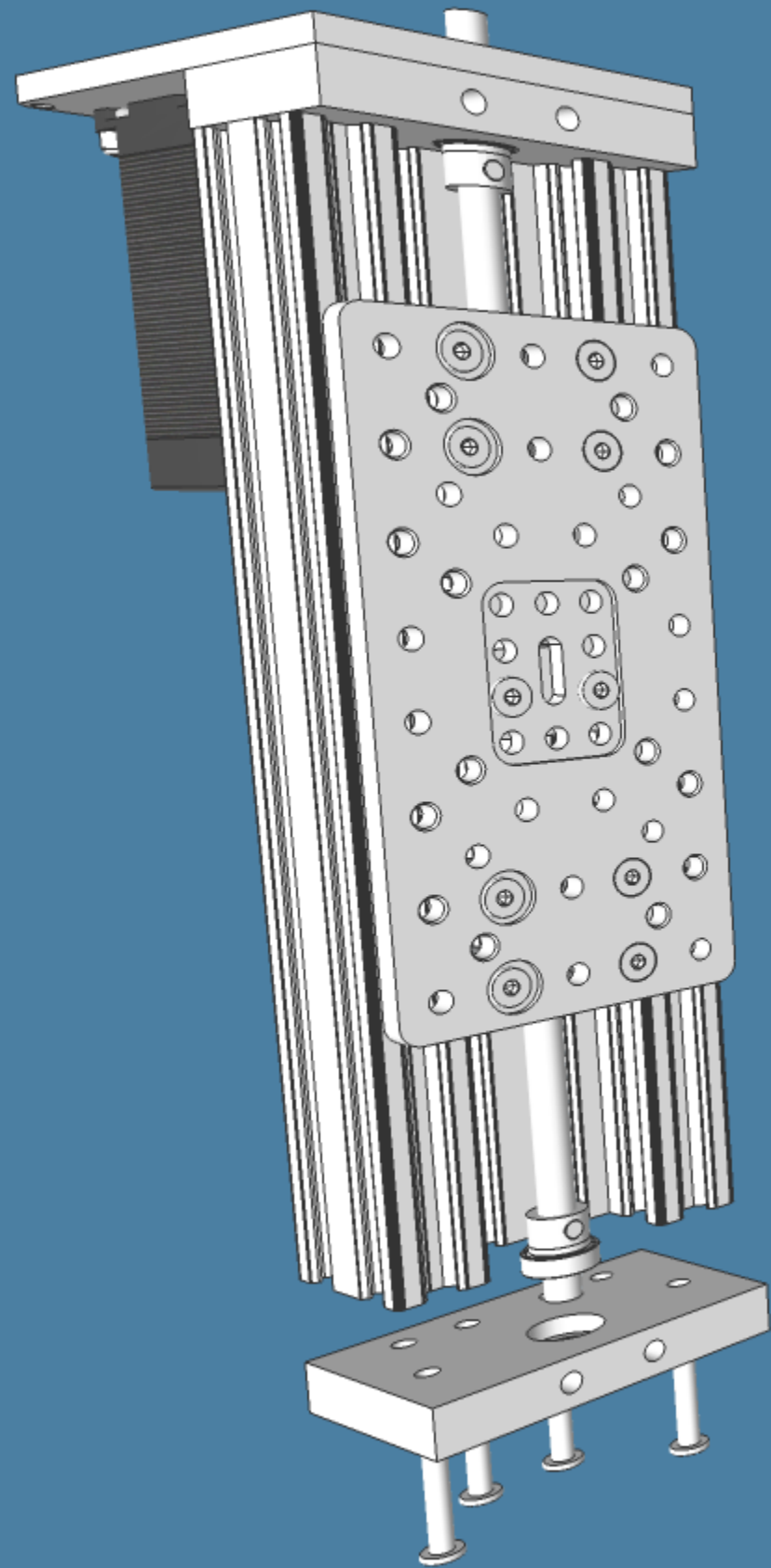
- : 3mm Hex Wrench
- : 8mm Wrench

# - Step Five -



Take the twelve M5 T-nuts and load them in to the back on the C-beam from the bottom. Follow the Placement pattern shown in the image to the left.

- Tools Required -  
: None

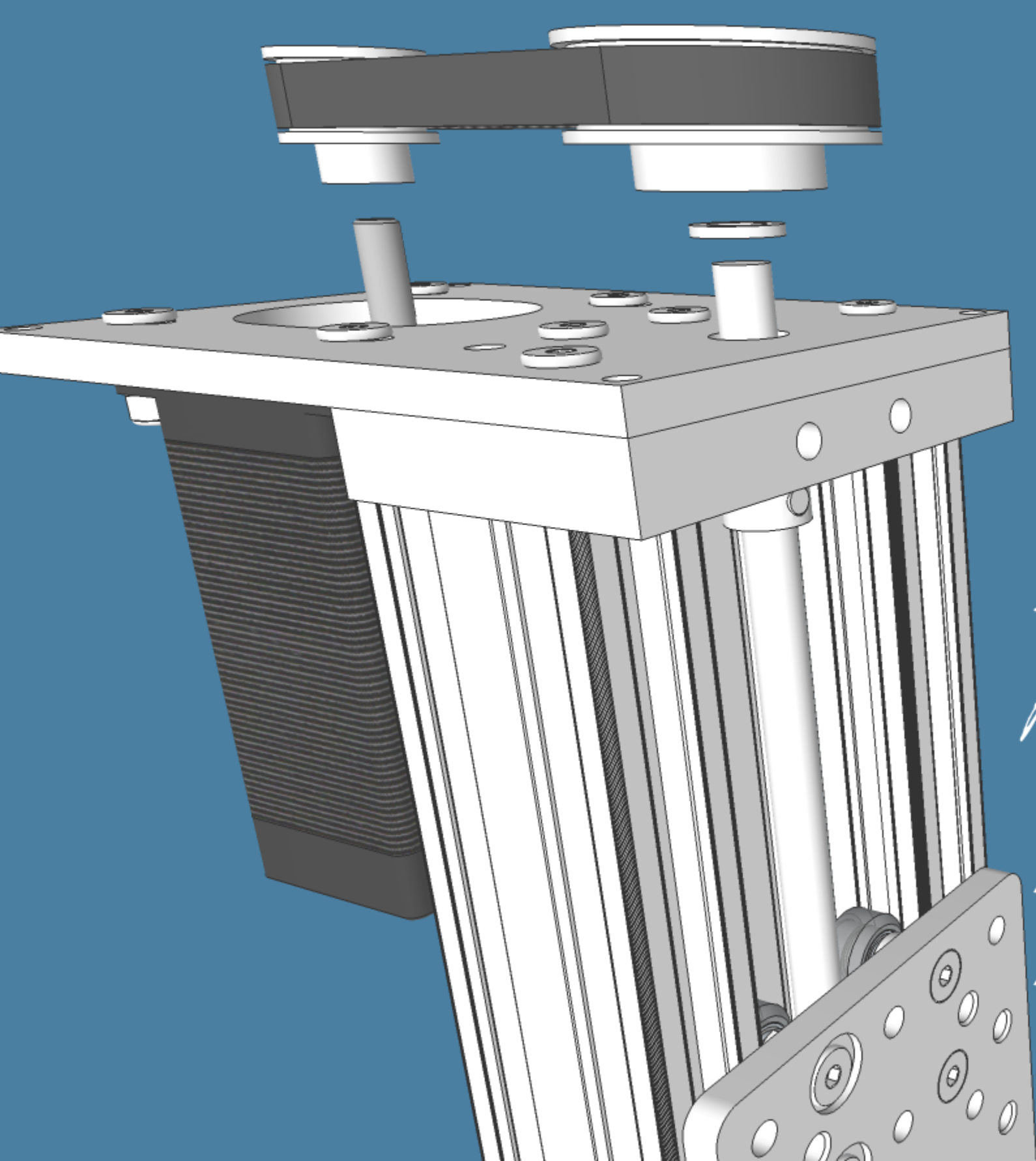


## - Step Six -

Grab the leadscrew we set aside earlier and thread it back into the double wide gantry plate anti back lash nut. Make sure to load a 688Z bearing followed by a 8mm shim and lock collar on top. Same on the bottom of screw. Using One C-beam end plate and four M5x20mm bolts cap off the bottom of your z-axis. Adjust leadscrew to be flush on bottom of end plate and secure lock collars tightly.

## - Tools Required -

- : 3mm Hex Wrench
- : 1.5mm Hex Wrench



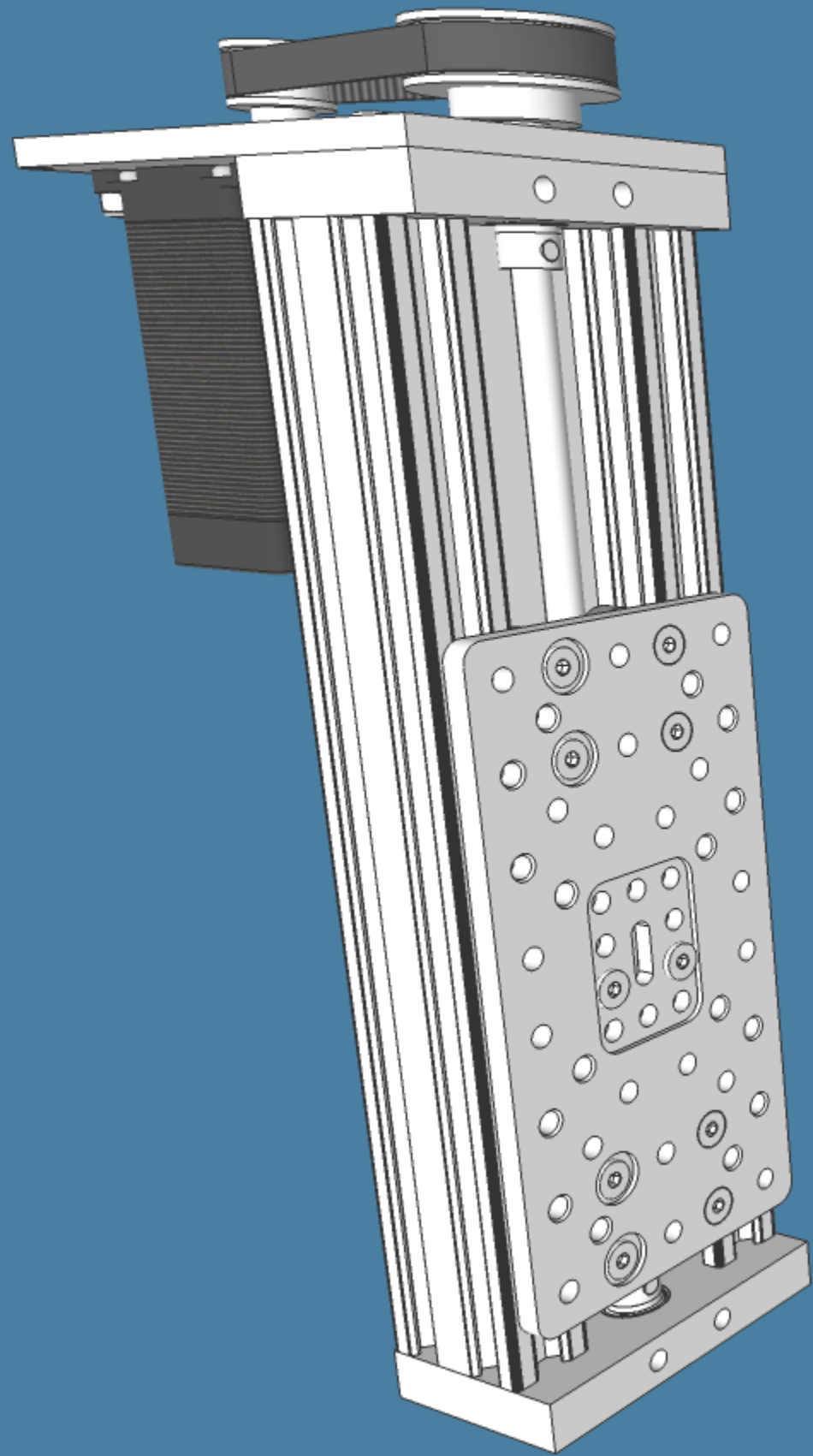
## - Step Seven

It is now time to grab your 40t and 20t gt3 pulley. You will also need the gt3 timing belt and a single 8mm shim. Secure 20t pulley to motor and lock set screw. Mount 40t pulley to leadscrew making sure to place the shim on top of the plate under the pulley on the screw. Place dab of grease on shim. loosen motor to mount belt; tighten belt and secure motor.

- Tools Required -

: Hex Wrench

: grease



# - Z-Axis Complete -

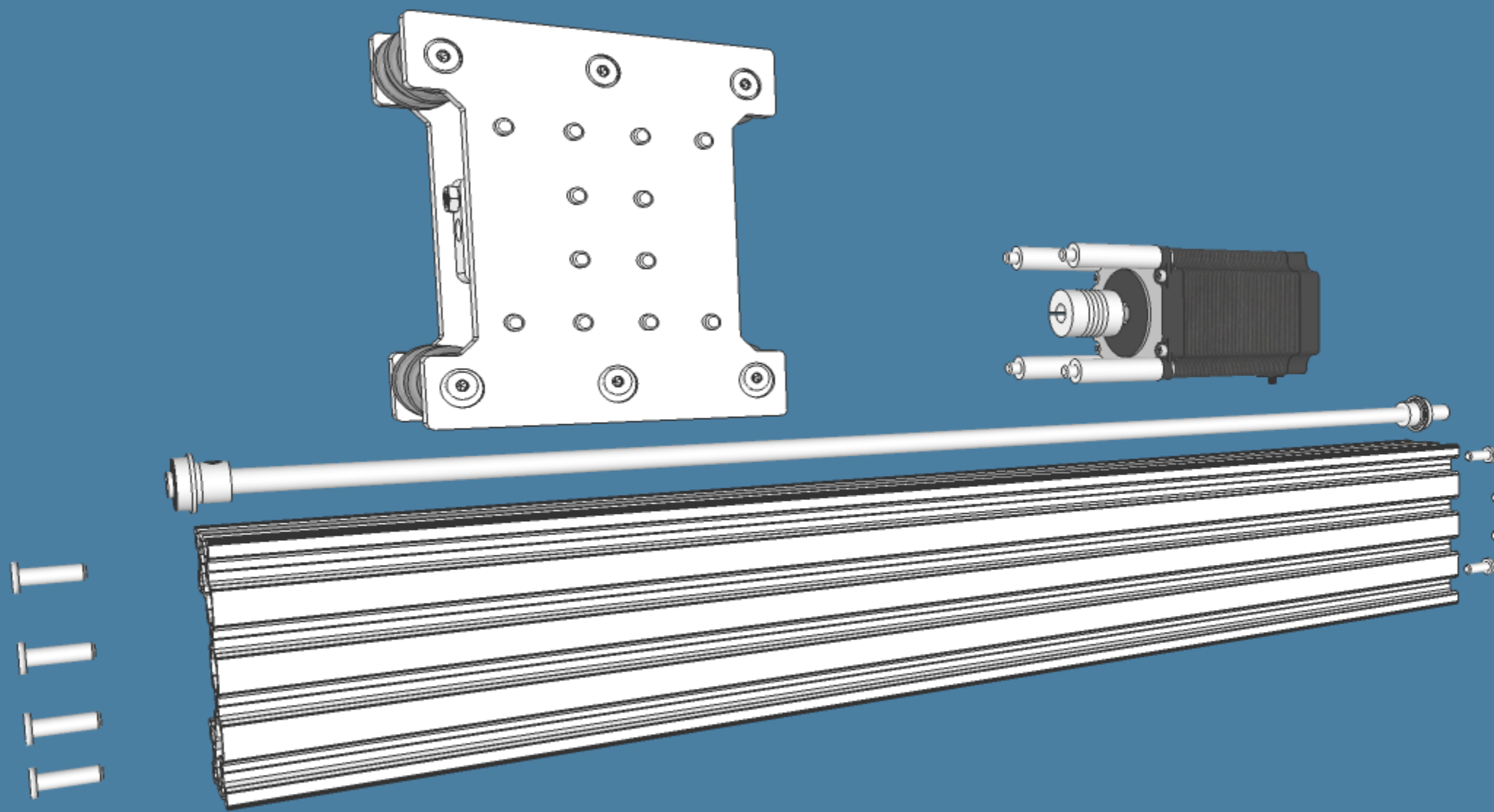
*Congratulations! The Z-axis of the cnc router has been completed. You can now set it aside and begin assembly of the next step.*

- Chapter Six -

: X-axis Assembly Guide



# Gather The Following Parts



- 503mm C-Beam

- Nema 23 Motor

- 40mm Spacers (x4)

- M5x50mm Bolt (x4)

- 8mm x 1/4" Coupler

- M5x10mm (x12)

- M5x15mm Bolt (x8)

- M5x25mm Bolt (x4)

- M5x60mm bolt (x6)

- 530mm Tr8 \*8-2p leadscrew

- 8mm lock Collar (x2)

- 8mm shim (x2)

- 688-2Z Bearing (x2)

- X-axis front plate

- X-axis rear plate

- Anti Backlash nut (x2)

- 3mm Spacers (x4)

- 6mm Spacers (x6)

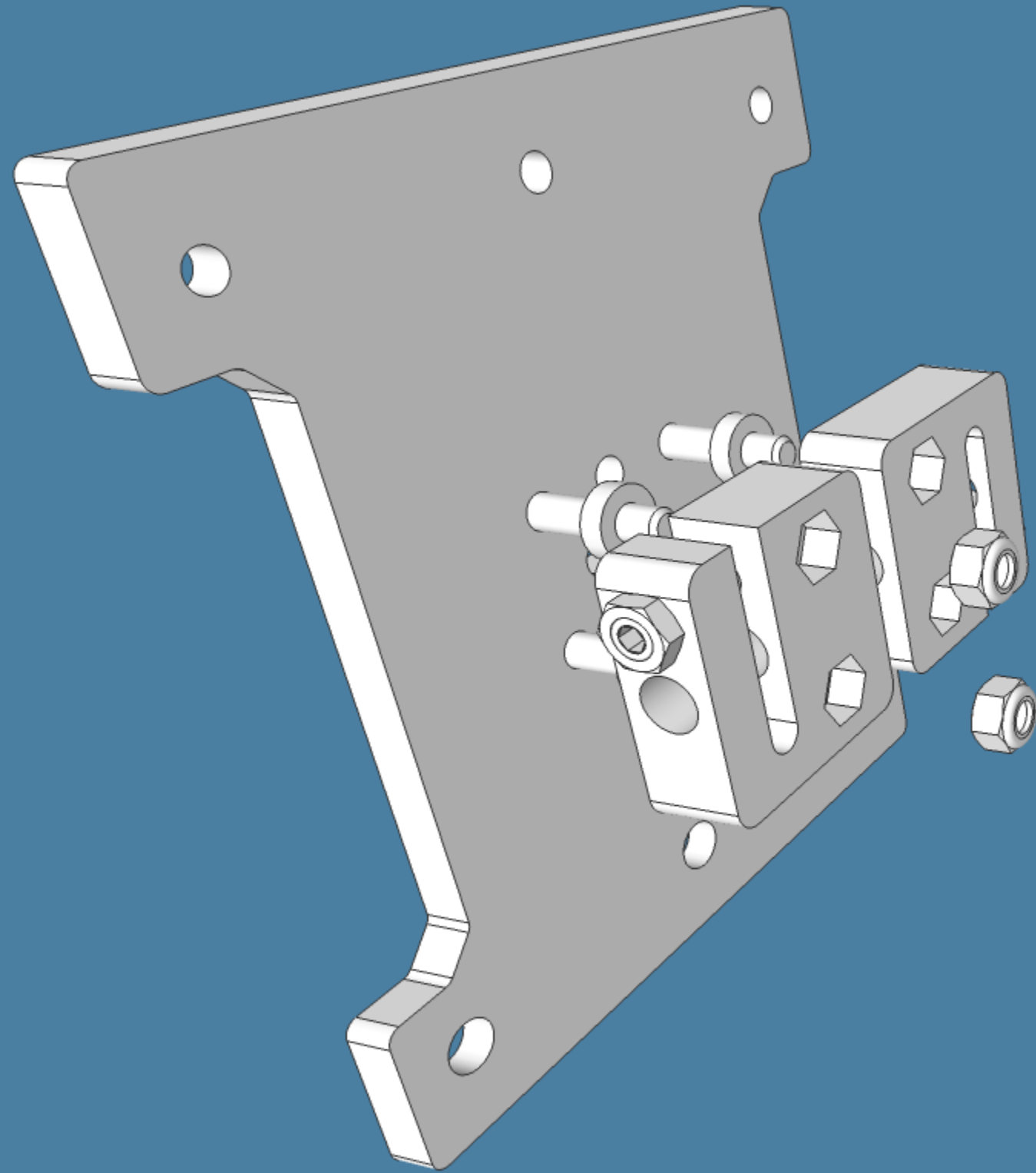
- 9mm Spacers (x6)

- 6mm Eccentrics (x6)

- 10mm OD shim (x6)

- M5 Lock nuts (x10)

- V-wheel Kits (x12)



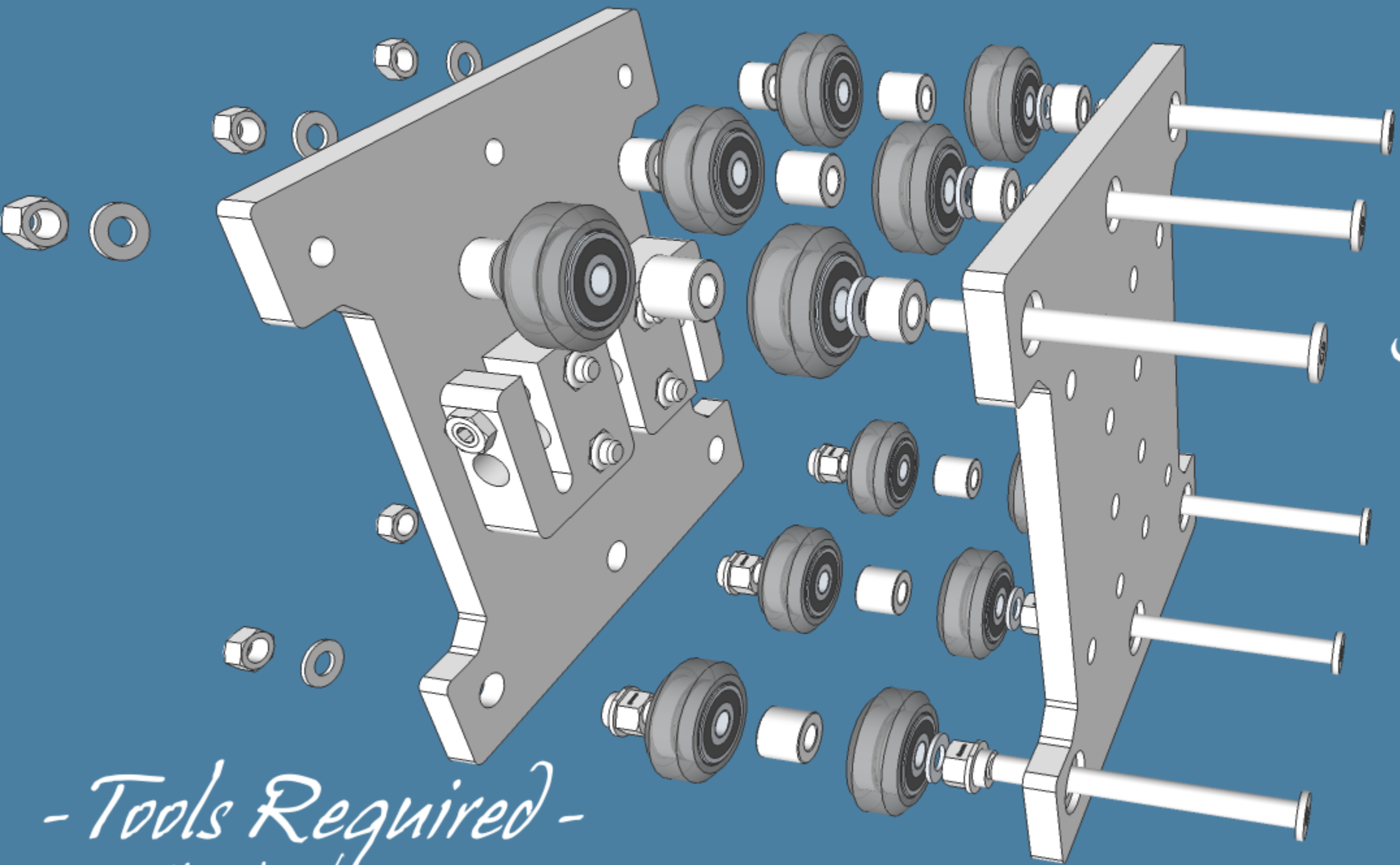
## - Step One -

Grab your rear X-axis plate, both of the anti backlash nuts, four 3mm spacers, four m5 lock nuts and four m5x25mm bolts. With plate in hand facing the bolt recesses away from you insert the m5 bolts into the outside four center holes. Load on a 3mm spacer on each bolt followed by mounting your anti backlash nuts and securing with the m5 lock nuts

- Tools Required -

: 3mm Hex Wrench

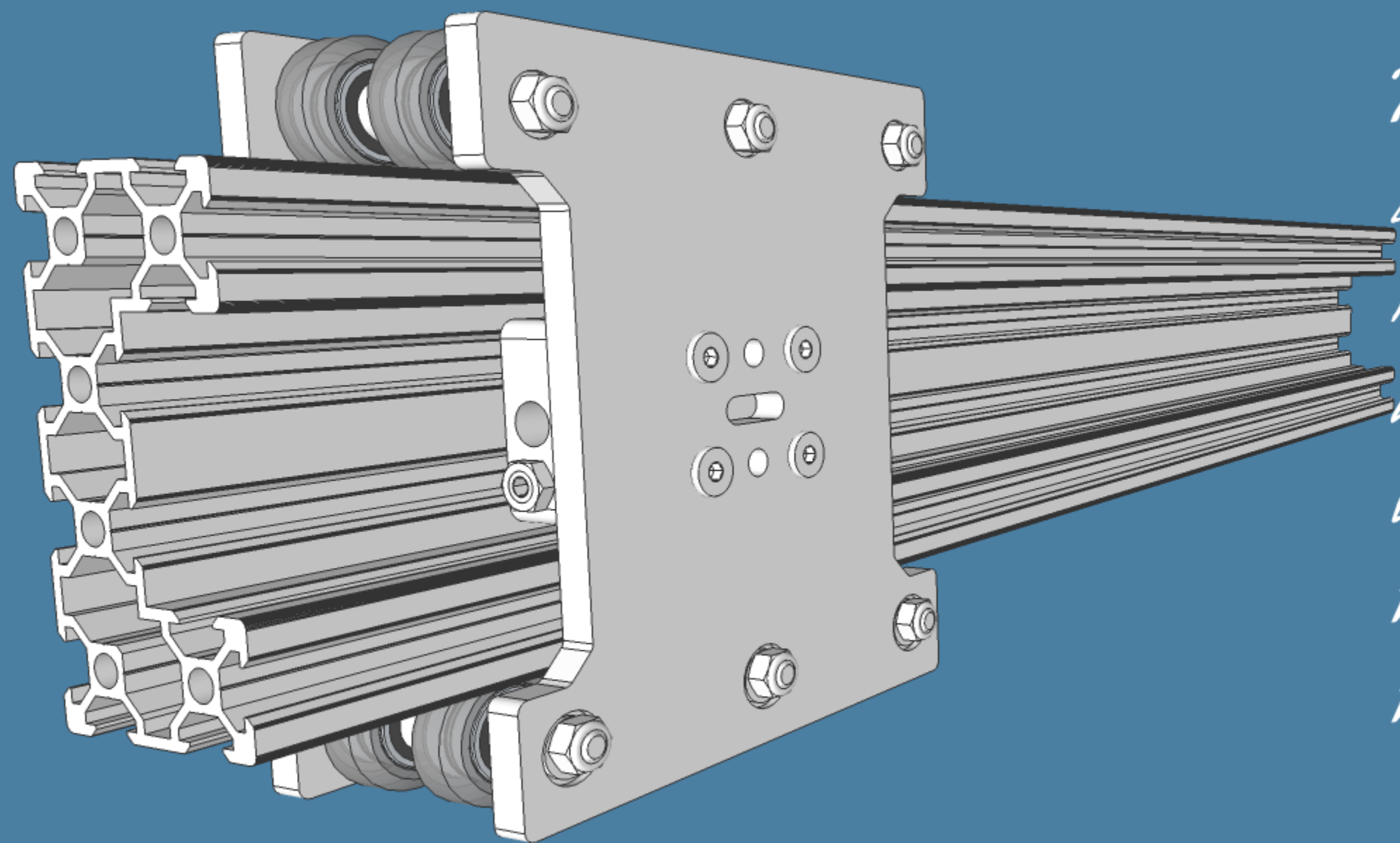
## - Step Two -



We will now continue by following the layout in the accompanying image to your left. We use a 1mm shim between 6mm and wheel on the front and not the rear to allow a little extra clearance for the bolt heads to mount the z-axis. 6mm spacers and eccentrics on outside and 9mm spacers in center. Tighten but do not snug up nuts on eccentric spacers.

## - Tools Required -

- : 3mm Hex Wrench
- : 8mm Wrench



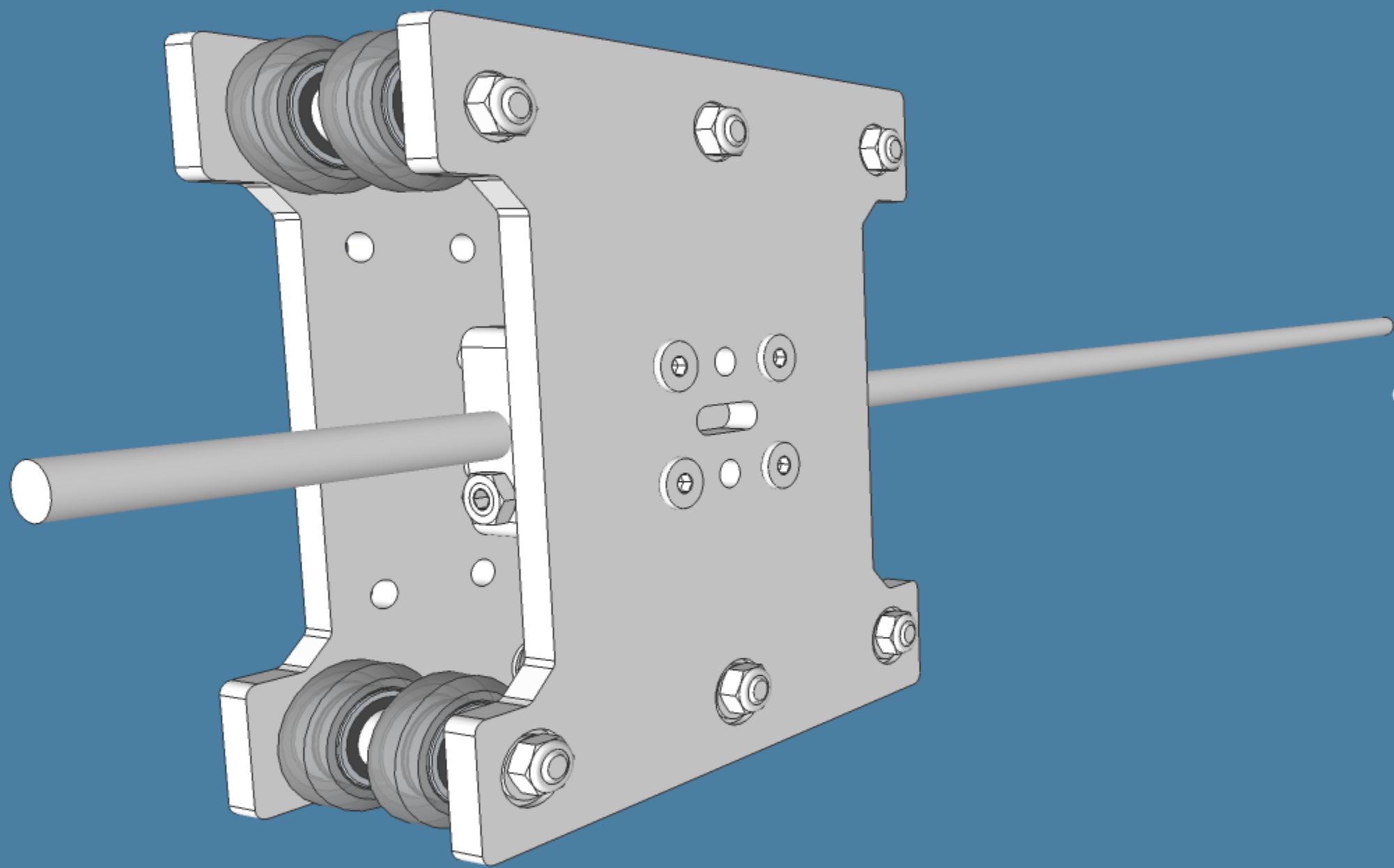
## - Step Three -

Take the fully assembled X-axis gantry and slide it onto your 503mm C-beam rail. Adjust your eccentric nuts; starting with the center two and working your way out. Once adjusted snug down the m5 nuts and remove from the c-beam for the next step.

## - Tools Required -

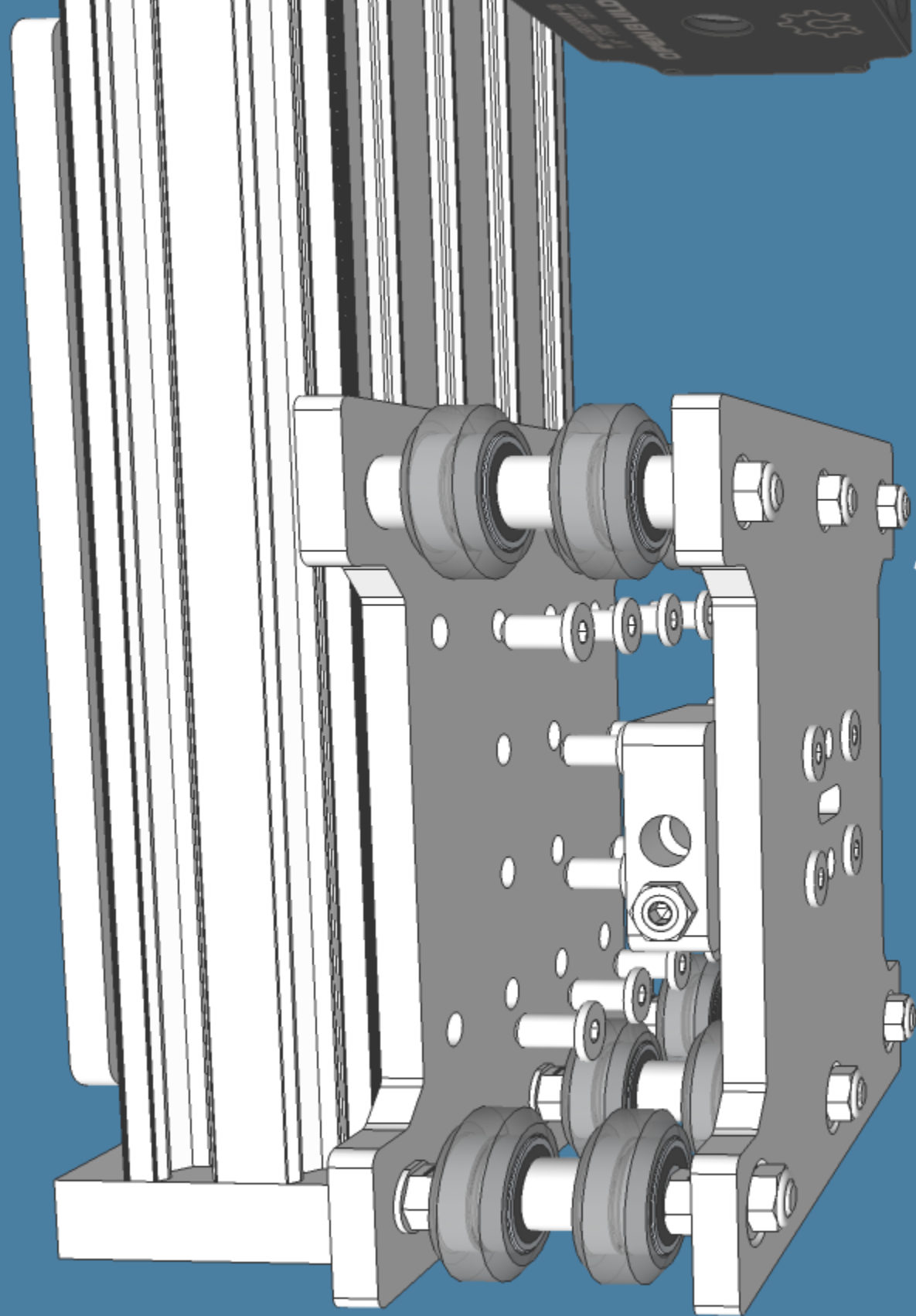
- : 3mm Hex Wrench
- : 8mm Wrench

## - Step Four -



Now thread your Tr8 \*8-p2 leadscrew into place and adjust out any backlash you may have with your anti backlash nuts.

- Tools Required -  
: 8mm Wrench



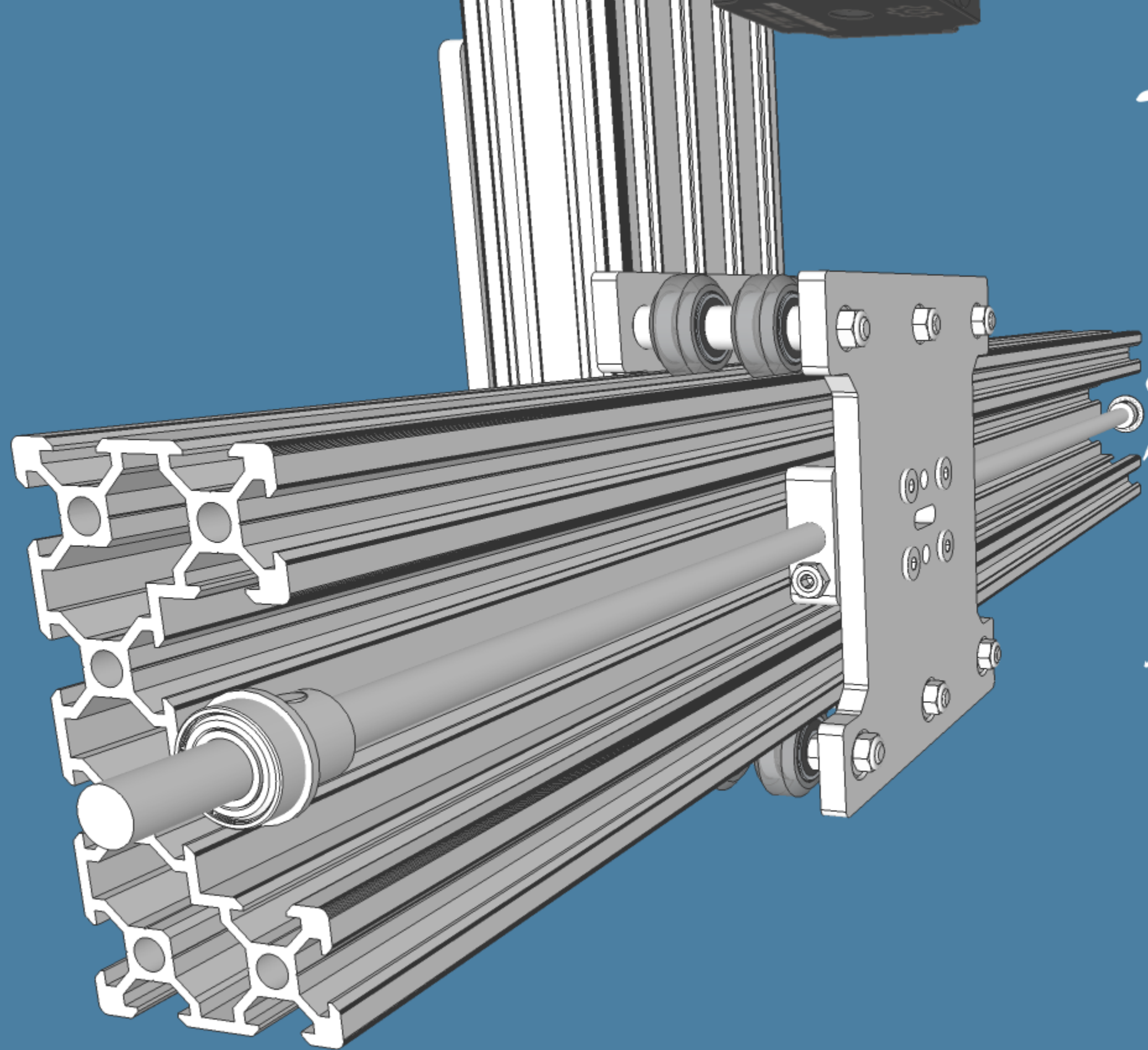
## - Step Five -

With your fully adjusted x-axis gantry in hand grab the whole z-axis assembly we built in chapter five. We will be bolting it in place on the front x-axis plate with twelve m5x10mm bolts. Align by placing both the z axis and front plate on the edge of a flat surface. The front x-axis plate is designed to be 80mm wide so make sure both sides of the plate and z-axis are flush with each other. This is to help you in alignment. once you have everything aligned carefully bolt in place. It is easiest to start all twelve bolts in to the t-nuts before aligning and then you will just need to tighten.

- Tools Required -

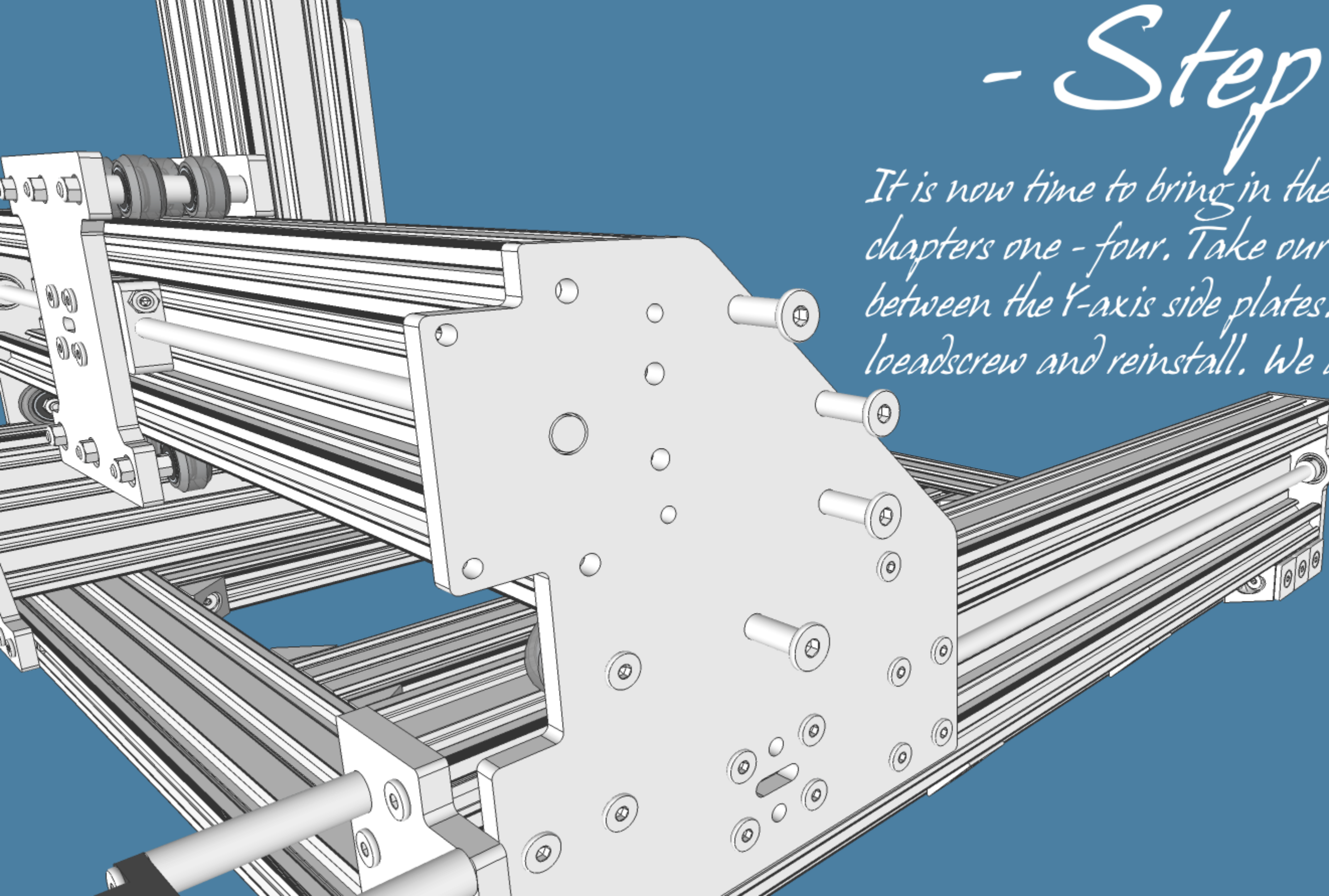
: 3mm Hex Wrench

# - Step Six -



Grab your C-beam and leadscrew and thread back onto your X / Z axis assembly. on the end of each leadscrew place a 688-23 bearing 8mm lock collar and 8mm shim. you will need two of each for this step. From the outside in the order will bearing, shim, lock collar. the flange side of each bearing will need to be on the center side of the X-axis C-beam.

- Tools Required -  
: None

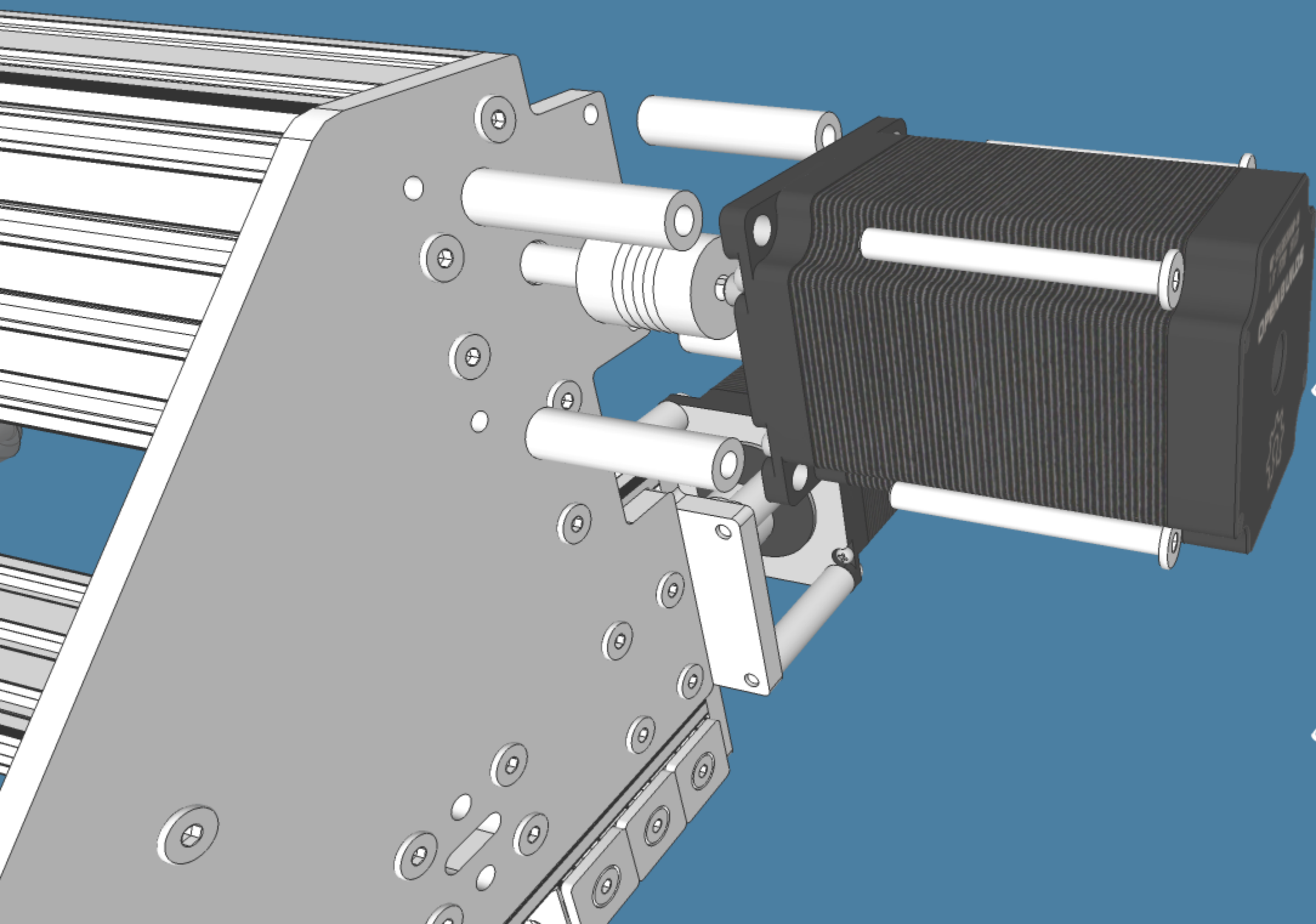


# - Step Seven -

*It is now time to bring in the first half of the machine built in chapters one - four. Take our X / Z axis assembly and place between the Y-axis side plates. You may have to remove the leadscrew and reinstall. We are going to secure our X-axis in place with four M5x15mm bolts on each end. Take care to properly level and align your X-axis.*

*- Tools Required -  
: 3mm Hex Wrench*



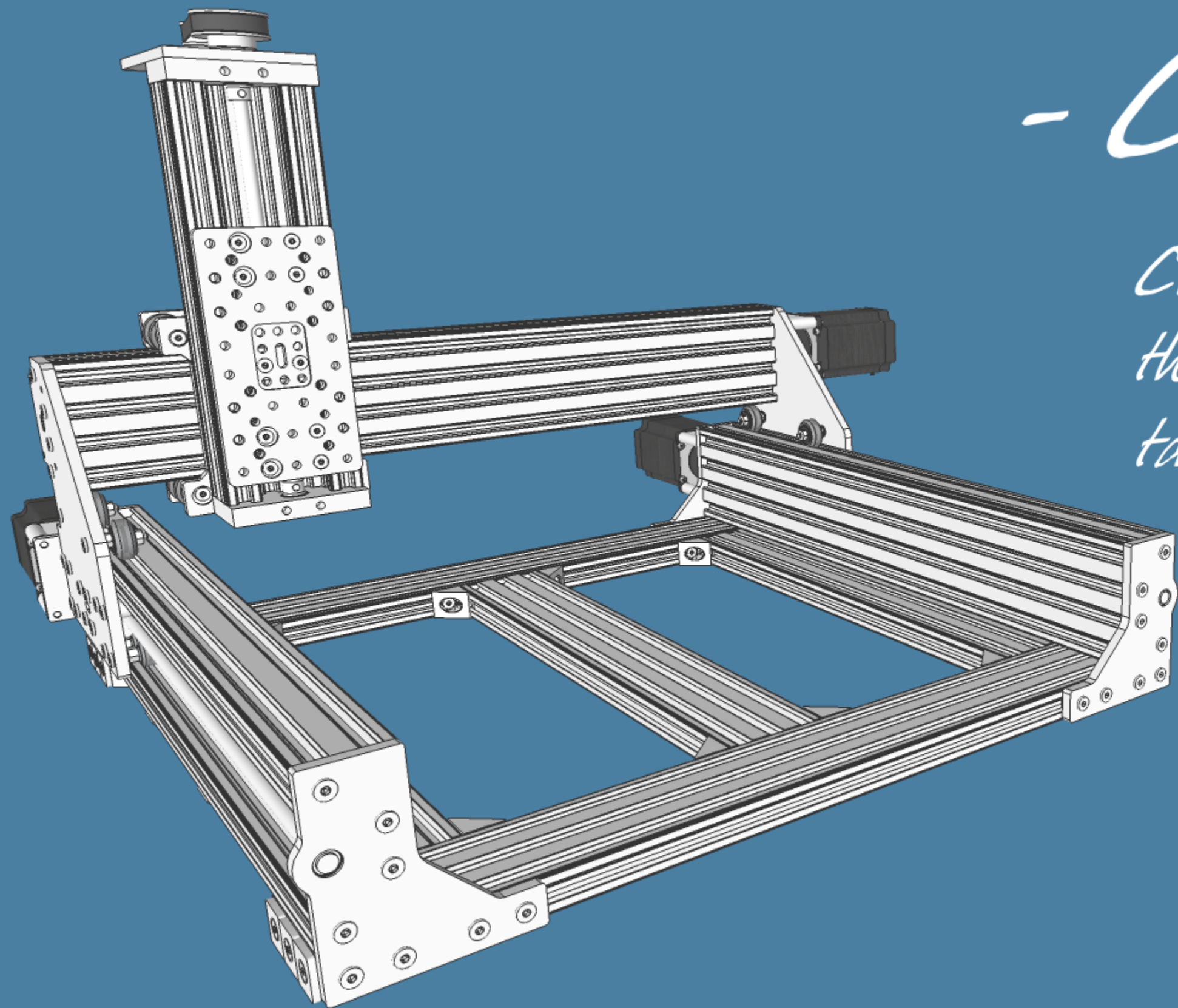


## - Step Eight -

Grab your Nema 23 motor, four m5x50mm bolts, 40mm spacers, 8mm to 1/4" coupler. We are now going to mount our X-axis motor. This is mounted in the same way we mounted the Y-axis. See image to the left. A dab of loctite on the motor mounting bolts is a good idea.

### - Tools Required -

- : 3mm Hex Wrench
- : Loctite



# - CNC Complete -

*Congratulations! You have completed the C-beam cnc build. Next you can tackle your electronics and wiring.*

*Given the number of choices you have. This manual can not cover the following.*

- Spoiler board.*
- Electronics*
- Wiring*
- Spindle / Router*