Studica ROBOTICS

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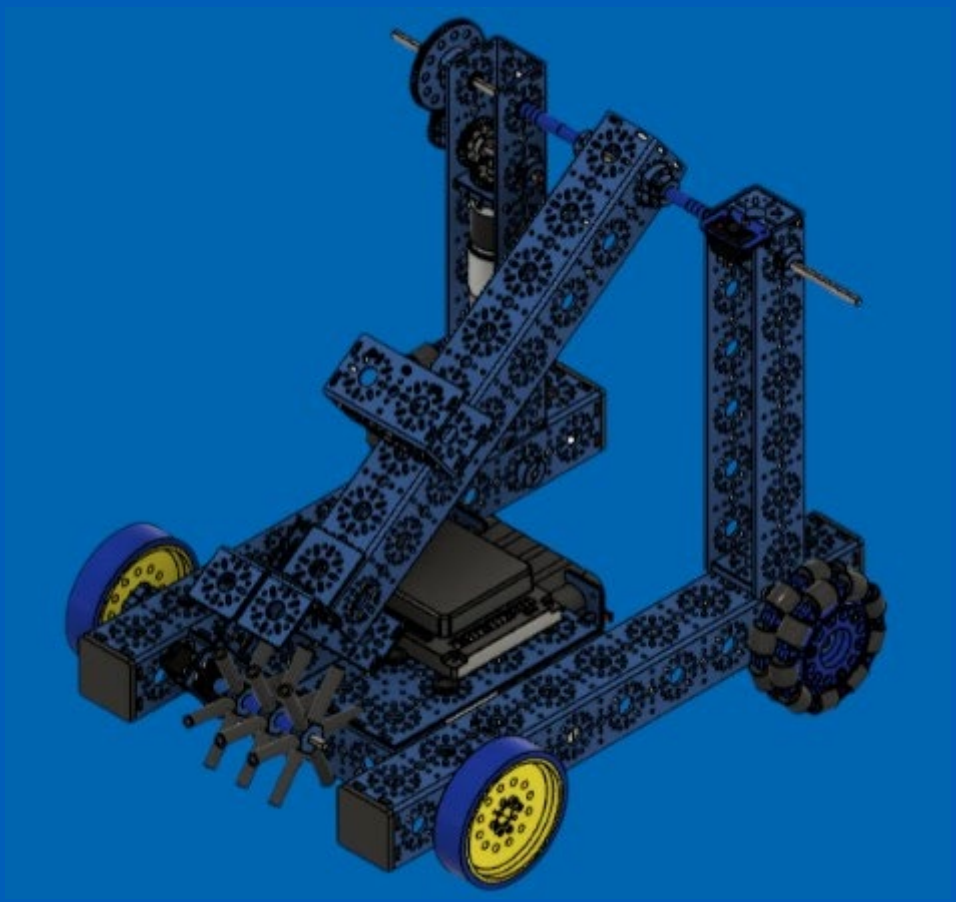
Studica Starter Bot 2024 / 2025 Build Guide



Document History

Release	Date	Note
0.1	20 September 2024	• Initial draft
1.0	01 October 2024	• Release

Welcome to the 2024/2025 Season

Our team here at Studica is happy to provide you with this guide for building an FTC Starter Bot for the 2024-2025 FTC Season, INTO THE DEEP competition presented by RTX. The Studica Robotics FTC Starter Kit (2024-2025) contains all the structural items and motion components needed to build this robot. This robot will require the *FIRST* approved REV Control Hub and Electronics Set along with the Control and Communication Set, which can be purchased through your *FIRST* Dashboard.

Studica is a proud *FIRST* sponsor and supplier of many legal parts for the *FIRST* Tech Challenge (FTC) Competitions. We understand the challenges that *FIRST* teams face and we are happy to help support your efforts by offering 25% discounts for *FIRST* Teams along with a Grant Program, and free samples of our structural products which are available in a variety of colors, blue, green, gold, red, black, and silver. There are many STEP 3D files, training videos and documentation available on our resource page and a Studica USA GitHub with build guides, assets and more. Feel free to check out our full line of robotics products at https://www.studica.com/

We wish all teams the best for the FTC 2024-2025 FTC Season and hope everyone has a wonderful experience this year.

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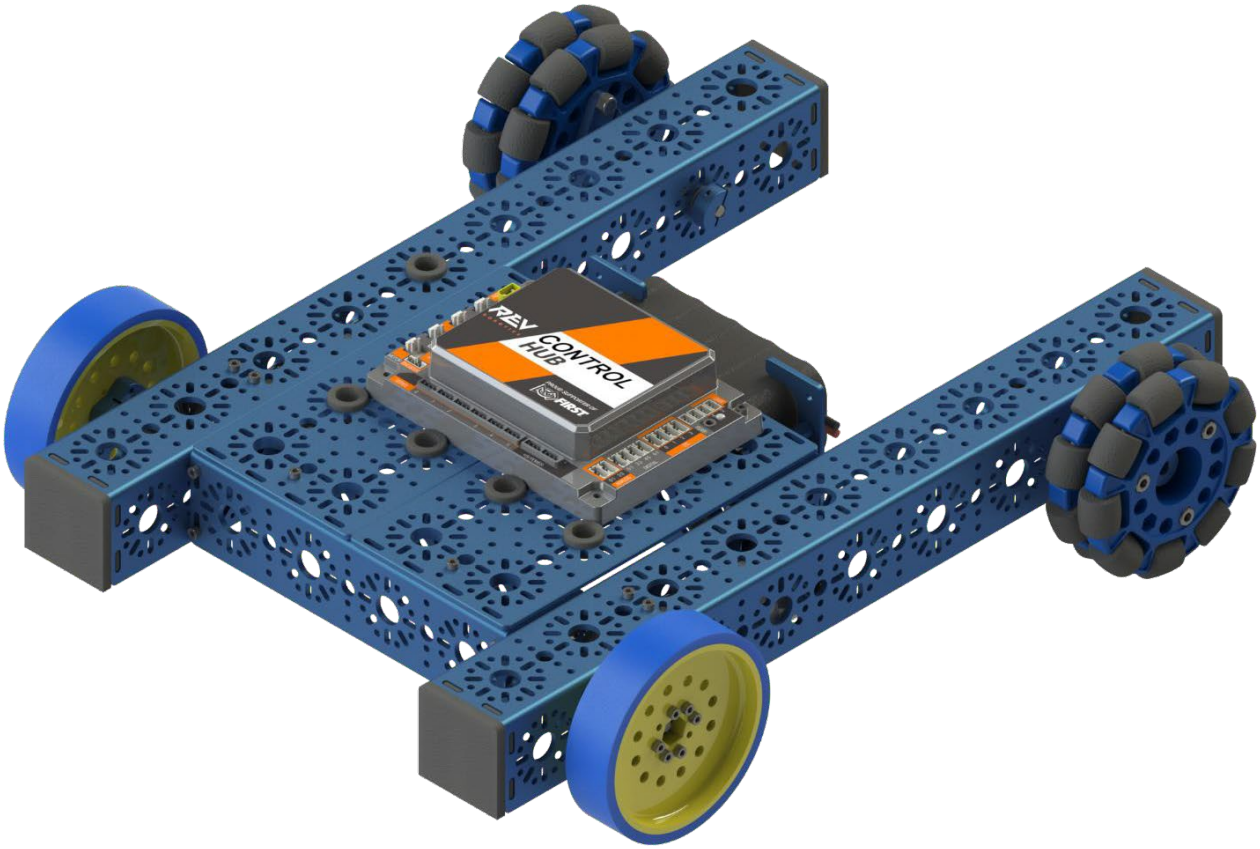
Drive Base



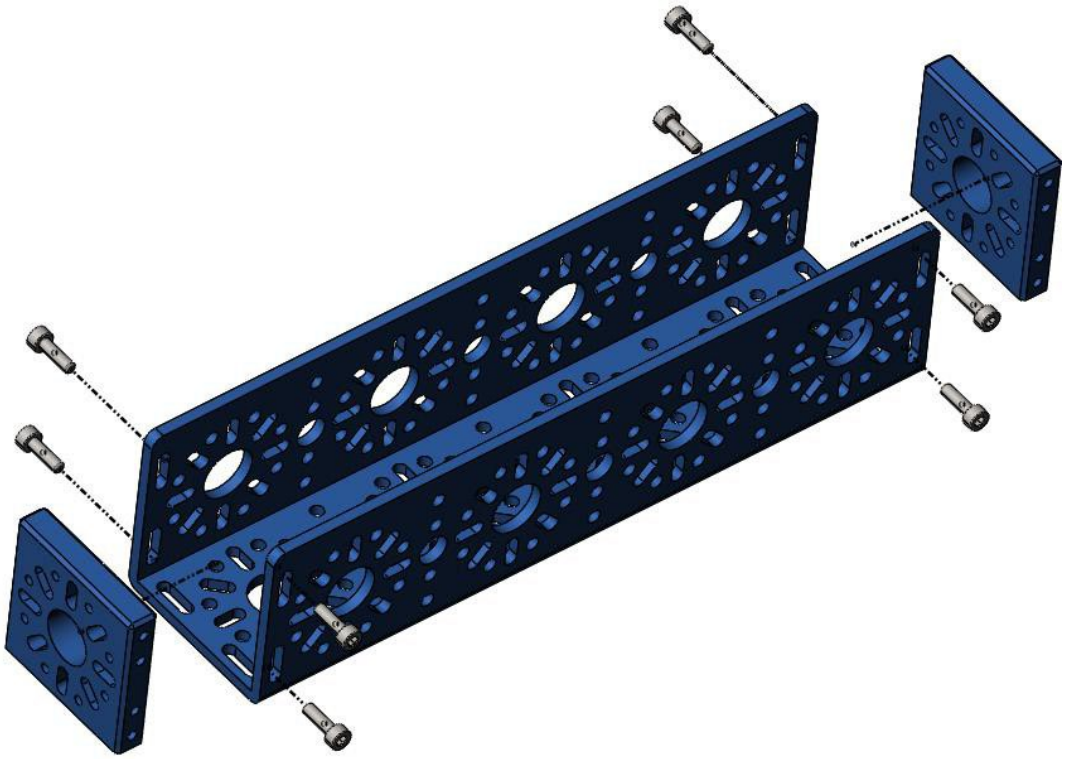
Tools Required

- Hex Key Metric 7 Piece Set, Part # 70144-7
- Combination Wrench, Part # 70145
- 8mm Wrench or Pliers (Not in Kit)

Step 1:

Parts:

- 1 x 192mm U-Channel
- 2 x End Piece Plate
- 8 x M3 x 10mm SHCS
- 2.5mm Hex Key (Green)



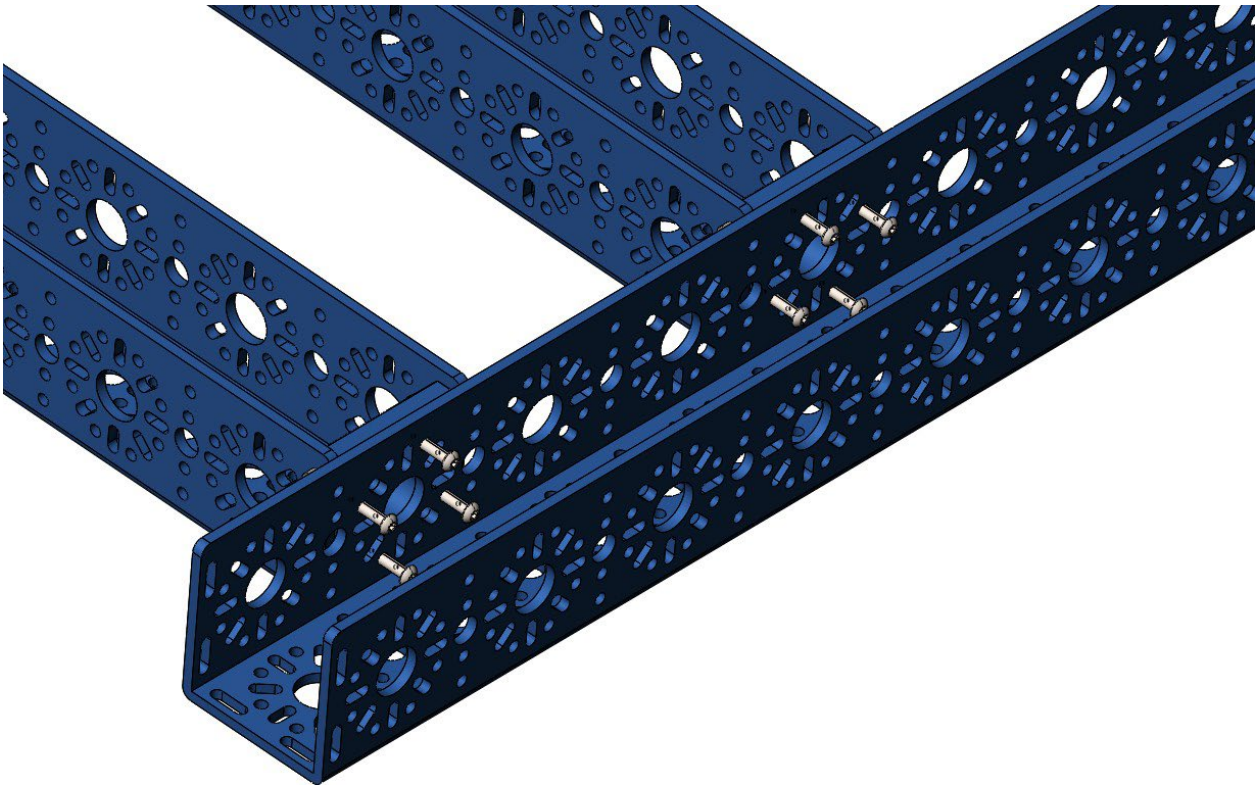
Using the Green 2.5mm Hex key screw 4 x M3 x 10mm SHCS into the end piece through the holes of the 192mm U-Channel. Note the end piece plate must sit flush with the ends of the 192mm U-Channel.

Repeat step 1 to create another 192mm U-Channel assembly.

Step 2:

Parts:

- Assembly from Step 1
- 1 x 432mm U-Channel
- 8 x M3 x 10 BHCS
- 2mm Hex Key (Pink)



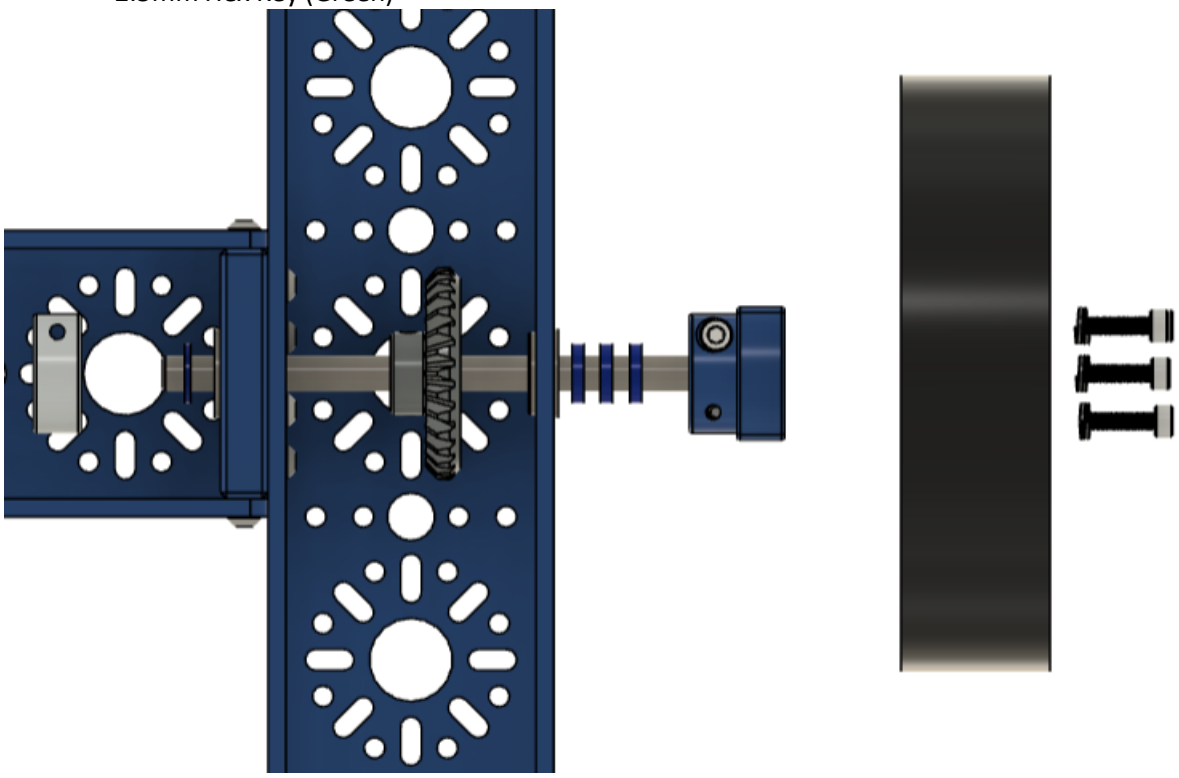
Using the 2mm hex key, screw the M3 x 10mm BHCS through the 432mm U-Channel into the tapped holes of the end piece plates of the two assemblies completed in step 1.

Repeat Step 2 for the other 432mm U-Channel on the other side.

Step 3:

Parts:

- 6 x M3 x 12mm SHCS
- 6 x M3 Stainless Steel Split Washers
- 1 x Clamping Shaft Hub V2
- 1 x Drive Wheel
- 2 x 14mm Flange Bearing
- 1x 96mm D-Shaft
- 1 x 1mm Shaft Spacer
- 4 x 2mm Shaft Spacer
- 1 x 5mm Shaft Spacer
- 1 x Collar Clamp
- 1 x 30 Tooth Bevel Gear
- 2.5mm Hex Key (Green)

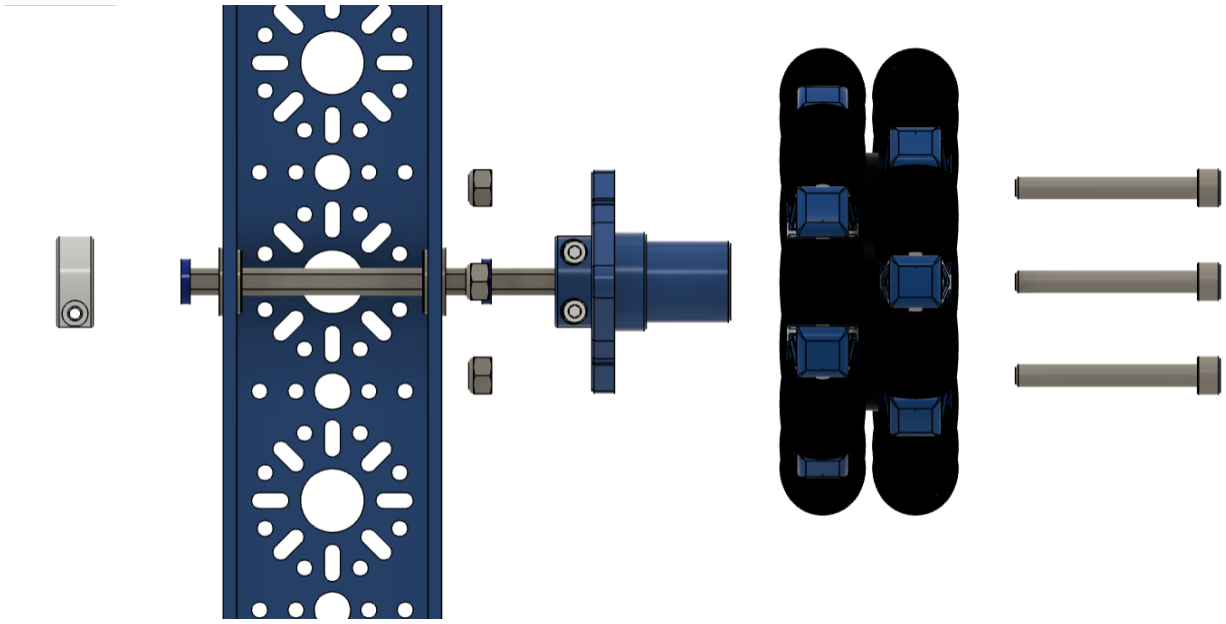


This part of the assembly can be a bit hard at first. Start by attaching the collar clamp to the one end of the 96mm shaft and clamp it down with the one end flush with the collar clamp. Place the two bearings in. Slide a 2mm spacer onto the shaft and next to the collar clamp. Slide the shaft from inside the 192mm U-Channel through the first bearing. Once through the bearing, slide the bevel gear on and the 5mm and 1mm spacer. Slide the shaft through the other spacer. Slide 3, 2mm spacers onto the shaft and push up to the bearing. Slide the clamping shaft hub to be flush with the bearings. While pushing the collar, clamp in, and the clamping shaft hub tighten the screws inside the clamping shaft hub to create a locked-in-place shaft. The shaft should be able to spin quite freely. If it does not loosen the pinch of the collar clamp and clamping shaft hub until it does. Lastly, screw the wheel to the shaft hub using 6 x 12mm SHCS. Repeat this step for the other side.

Step 4:

Parts:

- 1 x Enhanced wheel hub kit
- 1 x 96mm D-Shaft
- 2 x 14mm Flange Bearing
- 2 x 2mm Shaft Spacer
- 1 x Collar Clamp
- 1 x Omni Wheel
- 1 x 2.5mm Hex Key (Green)
- 1 x 3mm Hex Key (Blue)
- 1 x 4mm Hex Key (Yellow)
- 1 x 8mm Wrench or Pliers



Start by placing the enhanced wheel hub (triangle piece) into the Omni wheel. Take out three shorter M5 screws inside the enhanced wheel hub kit. Slide the screws through the wheel and the hub. On the other end of the hub, use the M5 Nyloc Nuts to secure the screws to the hub. You will need the Yellow 4mm hex key and the 8mm wrench to tighten the nuts fully.

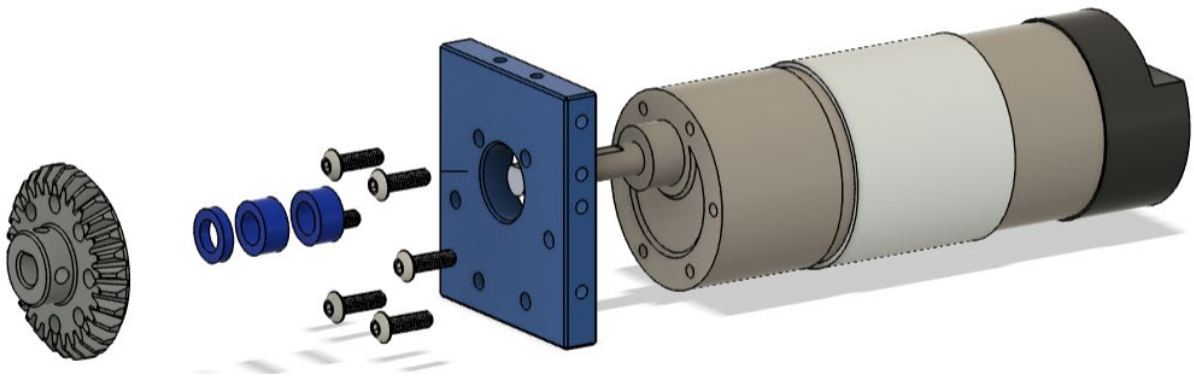
Finish the assembly as shown in the picture above. Clamping the hub to the shaft requires the Blue 3mm hex key and the included M4 screws inside the enhanced wheel hub kit. Note this wheel should be able to spin super smooth and is not driven. The smoother the wheel spins, the better.

Repeat this step for the other side.

Step 5:

Parts:

- 1 x Neverest classic 40 Motor
- 1 x Motor Mount Plate
- 1 x 30 Tooth Bevel Gear
- 1 x 1mm Shaft Spacer
- 2 x 5mm Shaft Spacer
- 6 x M3 x 10mm BHCS
- 1 x 2mm Hex Key (Pink)



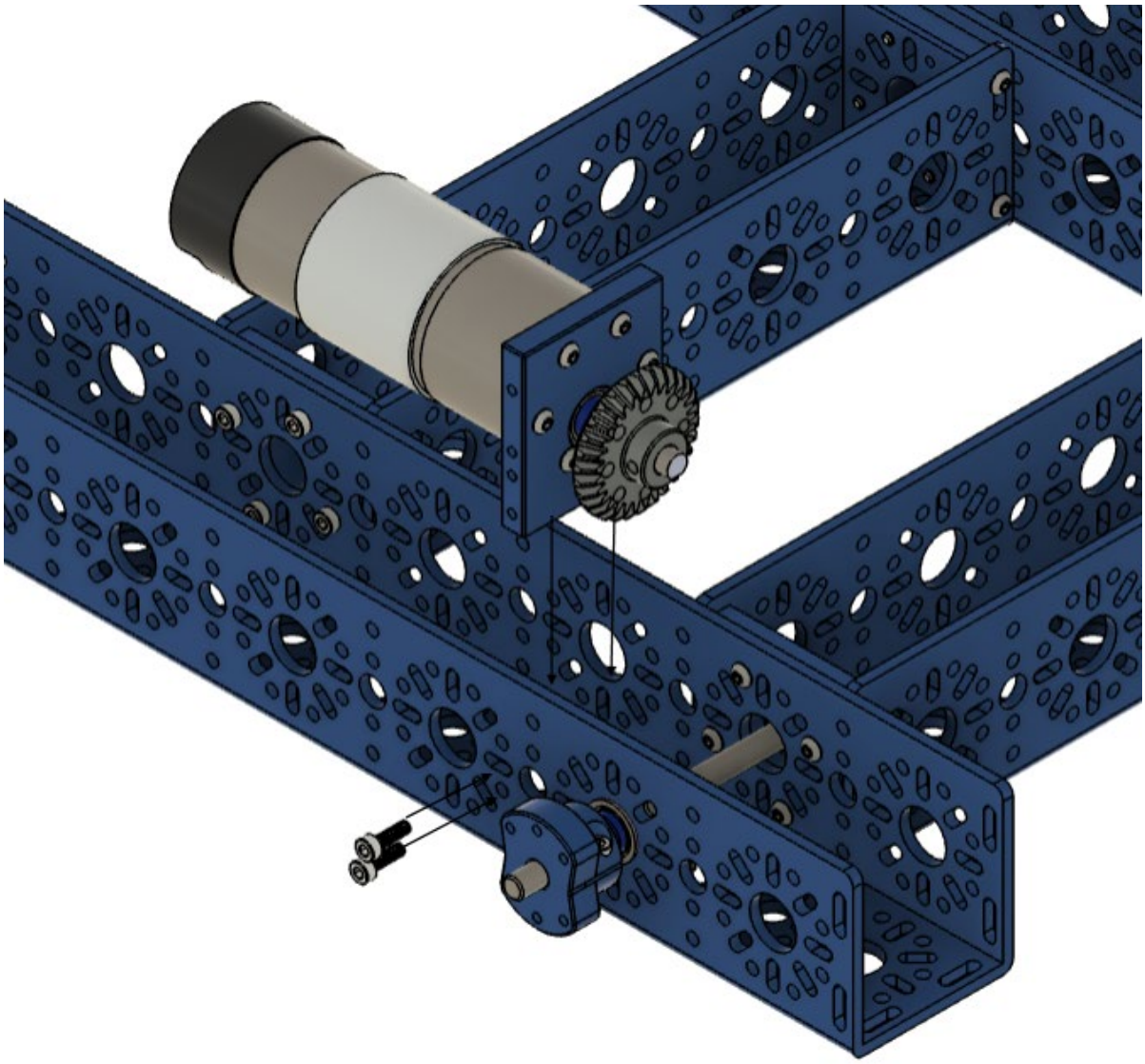
Slide the motor into the motor mount plate and use the 6 x M3 x 10mm BHCS to tighten the motor onto the plate. Slide the four spacers and the bevel gear onto the motor shaft. **NOTE: THE SPACERS AND GEARS WILL BE LOOSE.**

Repeat this step for the other motor.

Step 6:

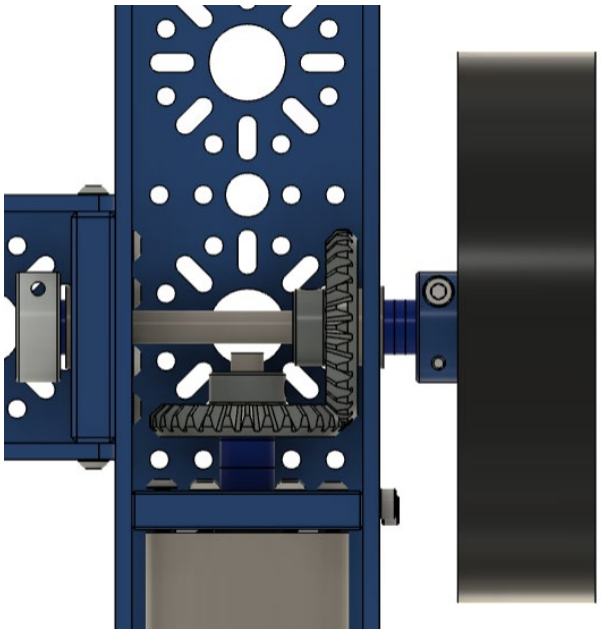
Parts:

- Assembly from Step 5
- 6 x M3 x 10mm SHCS
- 1 x 2.5mm Hex Key (Green)

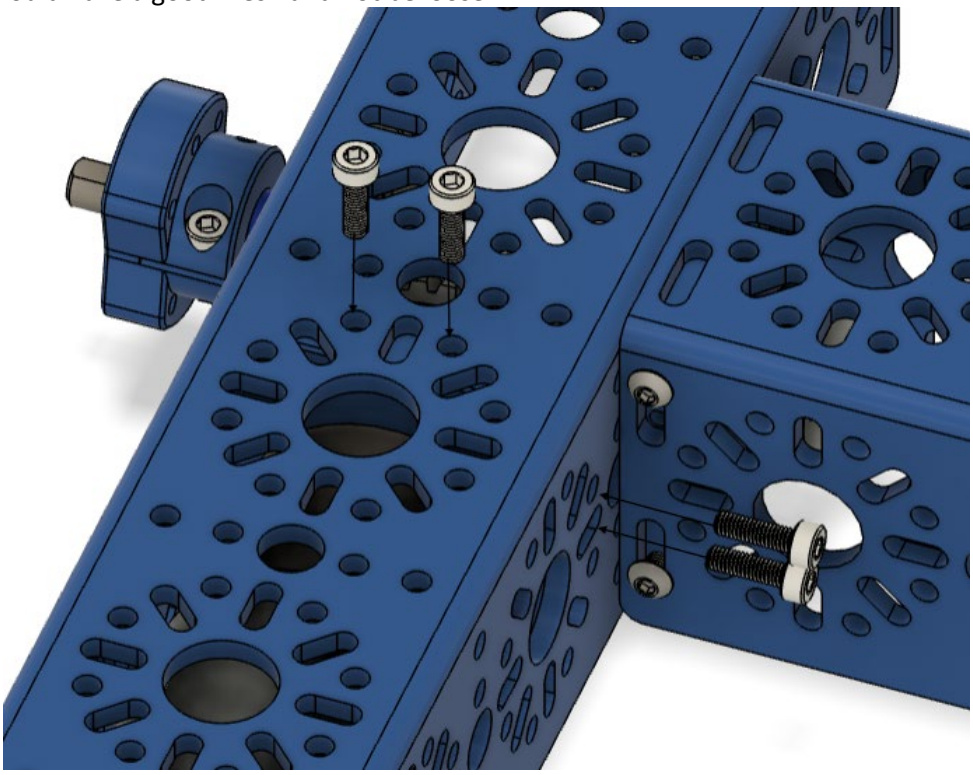


This step will be easier with the drive wheels taken off.

Slide the assembly from step 5 down into the channel. The two bevel gears should mesh and then secure the one side of the motor plate with two, M3 x 10mm SHCS.



The gears should have a good mesh and not be loose.

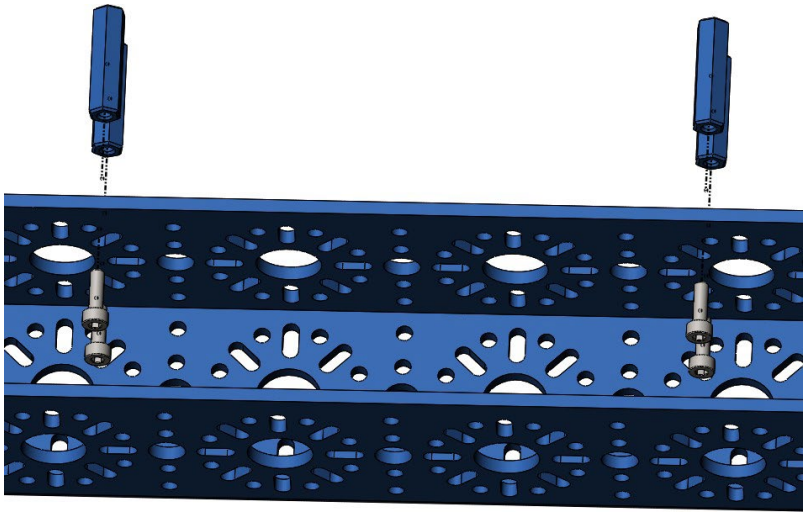


Screw in the final four, M3 x 10mm SHCS. Repeat this step for the other side.

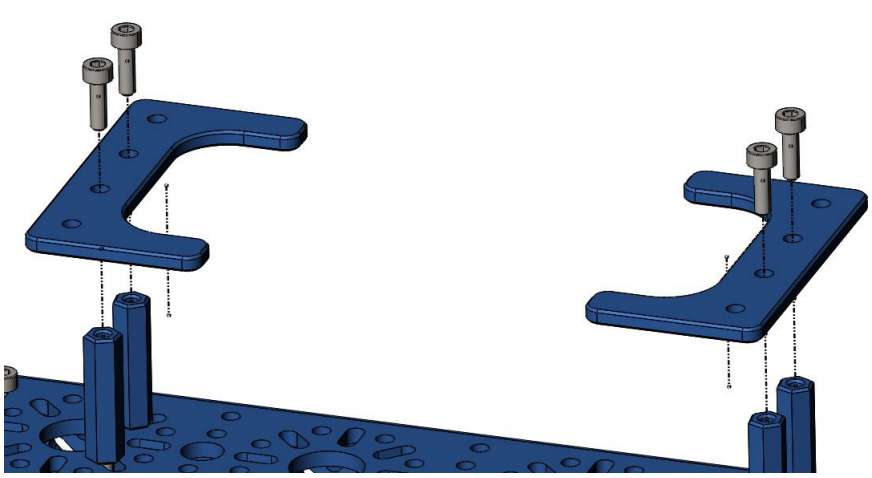
Step 7:

Parts:

- 8 x M3 x 10mm SHCS
- 4 x 25mm Standoffs
- 2 x Battery Clips
- 1 x 2.5mm Hex Key (Green)



On the middle 192mm U-Channel, attach 4 x M3 x 10mm SHCS and 4 x 25mm Standoffs. The standoffs should be facing the omni wheels.

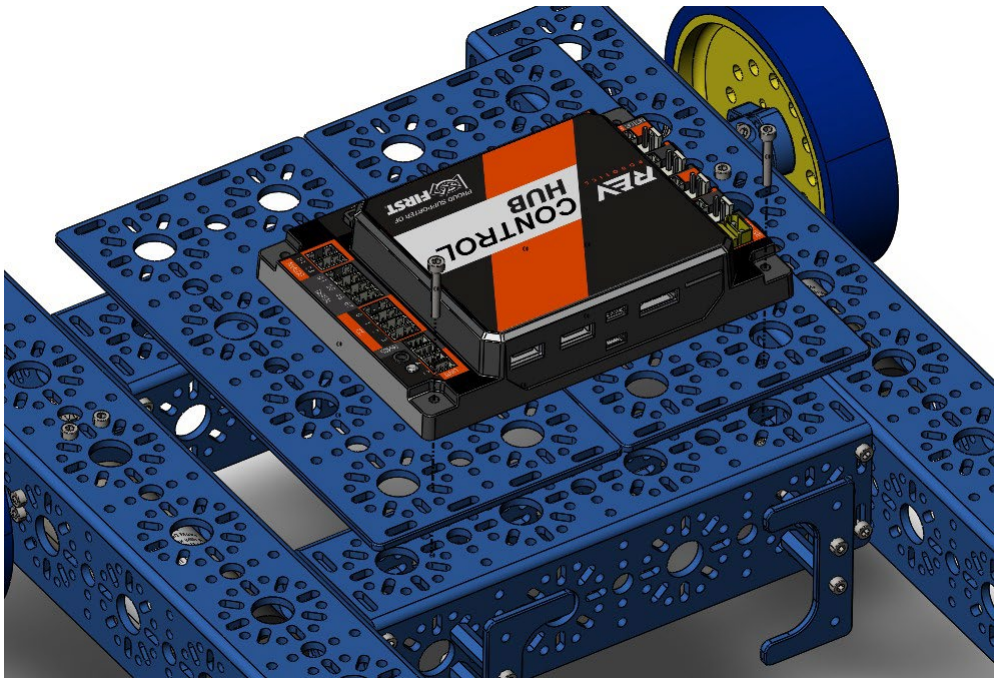


Screw the battery clips into the four standoffs using the last 4 M3 x 10mm SHCS.

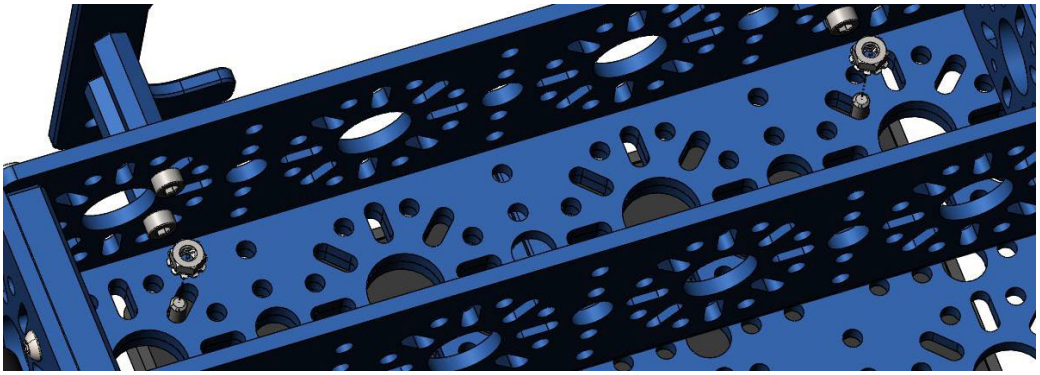
Step 8:

Parts:

- 1 x Control Hub (NOT Included)
- 2 x M3 x 20mm SHCS
- 2 x M3 Kep Nut
- 2 x 192mm x 96mm Flat
- 1 x 2.5mm Hex Key (Green)
- 1 x Combination Wrench



Using the two, M3 x 20mm SHCS, screw the Control Hub through the 2, 192mm x 96mm flats into the 192mm U-Channel of the drive base.



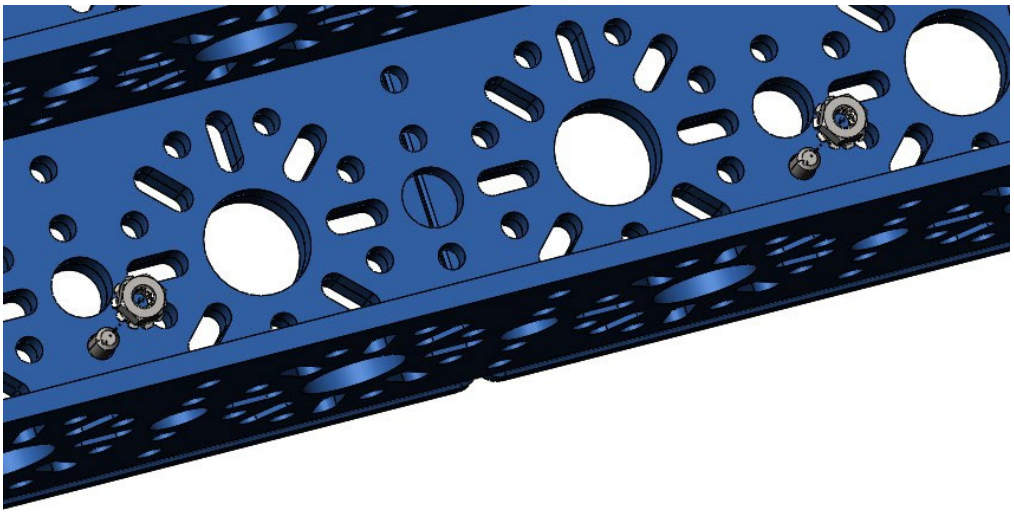
The two, M3 x 20mm SHCS will screw into two kep nuts located at the bottom of the 192mm U-Channel.

Step 9:

Parts:

- 2 x M3 x 12mm SHCS
- 2 x M3 Kep Nut
- 1 x 2.5mm Hex Key (Green)
- 1 x Combination Wrench

Screw the other end of the 192mm x 96mm flats into the 192mm U-Channel using two, M3 x 12mm SHCS.



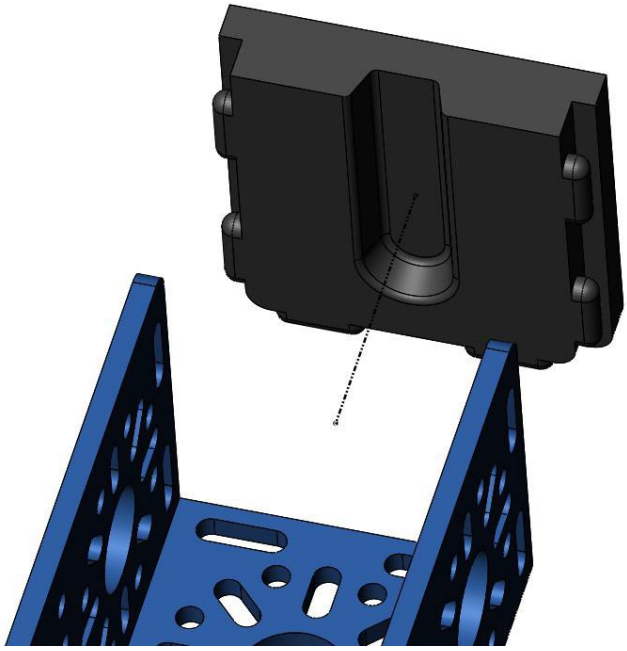
Use a Kep nut on the bottom of the 192mm U-Channel to secure the screw.

Step 10: (Optional)

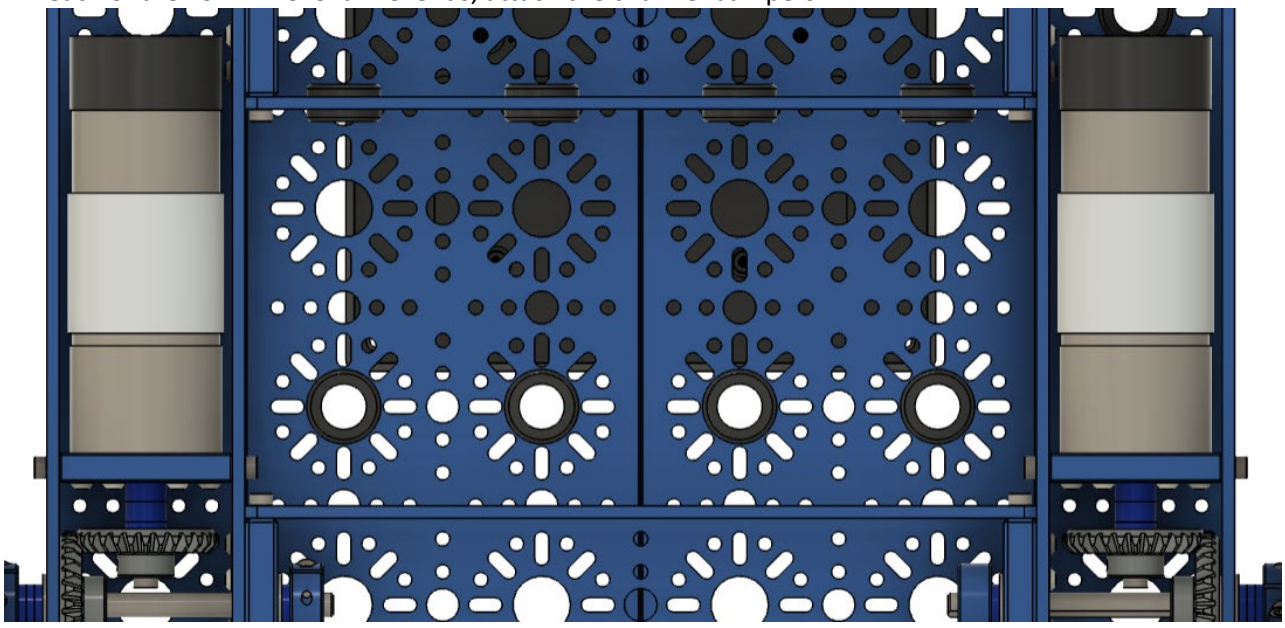
The following is optional but enhances the experience.

Parts:

- 4 x U-Channel Bumper
- Wire Grommets



In each of the 432mm U-Channel ends, attach the channel bumpers.



Place the wire grommets throughout the drive base where you think they will be required for wiring.

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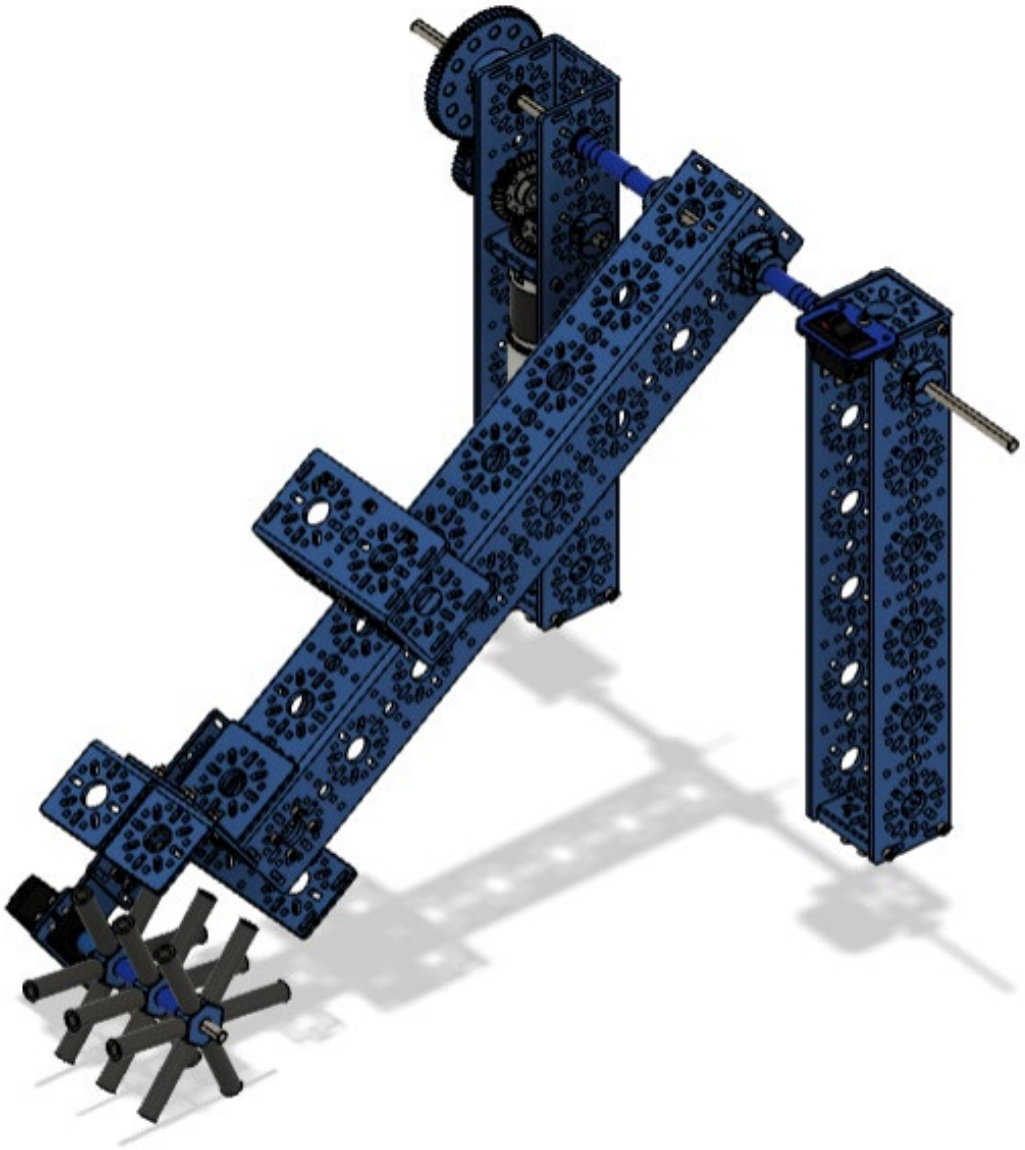


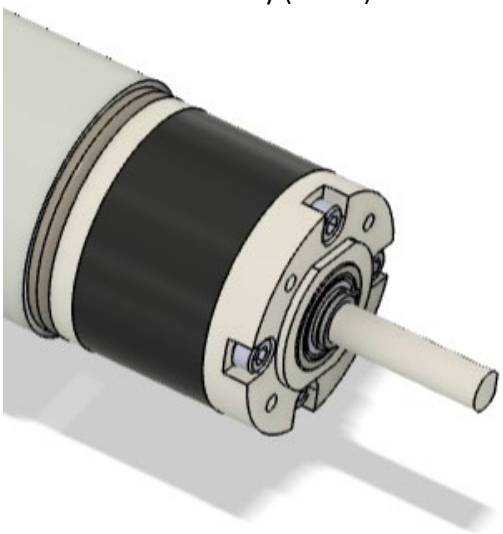
Tools Required:

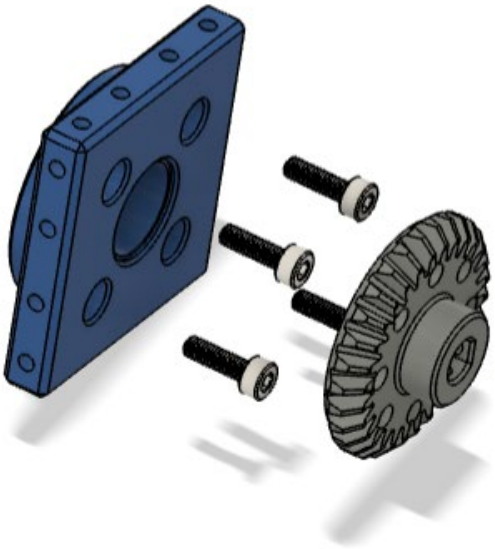
- Hex Key Metric 7 Piece Set, Part # 70144-7
- Combination Wrench, Part # 70145

Step 1:

Parts:

- 1 x Neverest Orbital 50.9.:1
- 1 x Orbital Mount
- 1 x 30 Tooth Bevel Gear
- 4 x M3 x 10mm SHCS
- 1 x 2.5mm Hex Key (Green)





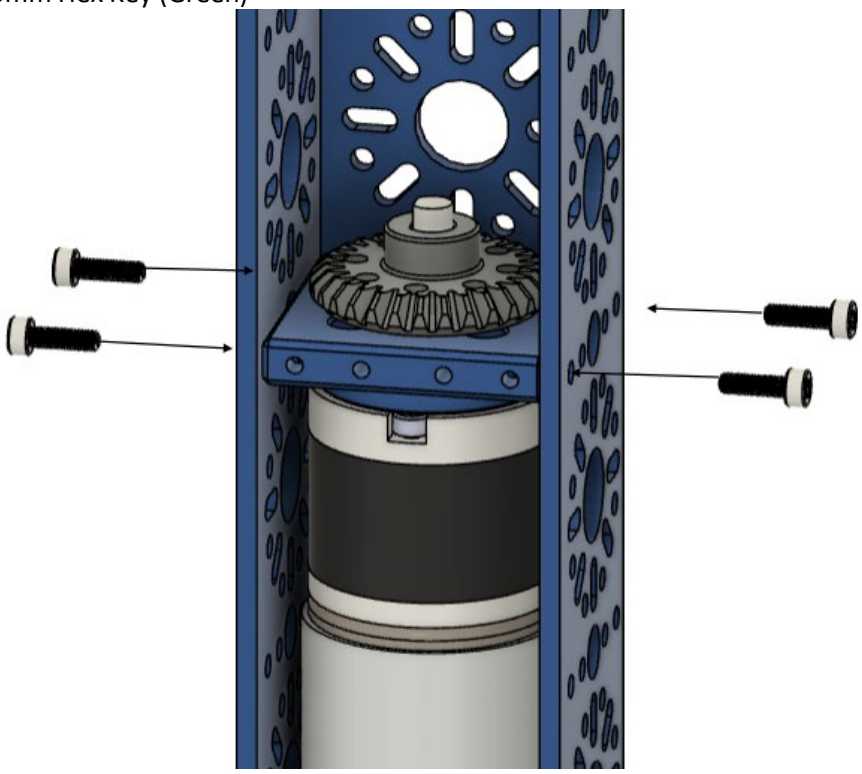
Slide the motor onto the orbital mount and screw it in using the M3 x 10mm SHCS. Slide the bearing into the bearing hole of the orbital mount and then slide the spacers and the bevel gear on top.

Repeat this step for the other motor.

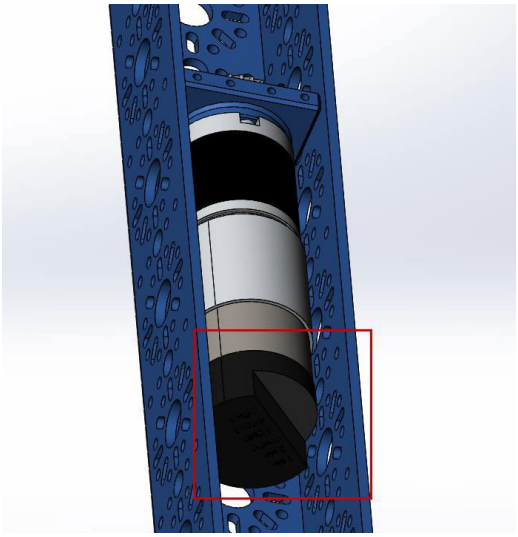
Step 2:

Parts:

- Assembly from Step 1.
- 288mm U-Channel
- 4 x M3 x 10mm SHCS
- 1 x 2.5mm Hex Key (Green)



Screw the orbital mount into the 288mm U-Channel using four, M3 x 10mm SHCS.

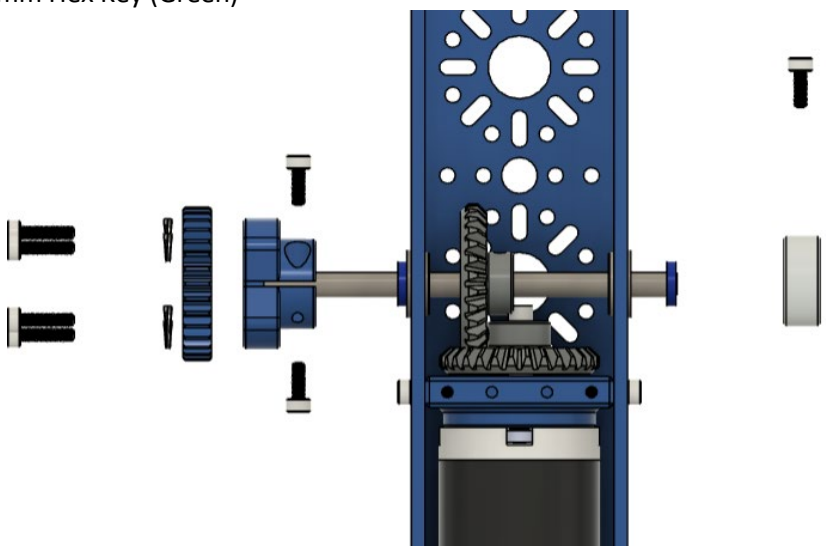


NOTE: THE ENCODER CAP SHOULD HAVE THE FLAT FACING THE OPEN.

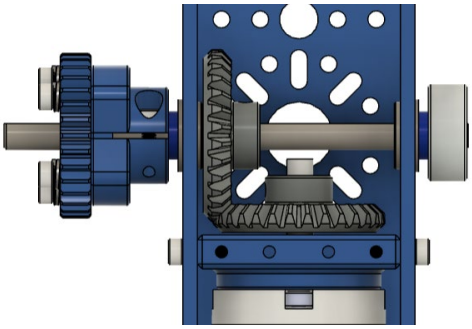
Step 3:

Parts:

- 6 x M3 x 12mm SHCS
- 6 x M3 Stainless Steel Split Washers
- 1 x 32 Tooth Gear
- 1 x Clamping Shaft Hub V2
- 1 x 96mm D-Shaft
- 2 x 2mm Shaft Spacer
- 1 x 30 Tooth Bevel Gear
- 2 x 14mm Flange Bearing
- 1 x Collar Clamp
- 1 x 2.5mm Hex Key (Green)



Start by screwing the 32-tooth gear into the clamping shaft hub. Slide a bearing onto the 96mm shaft. Slide the 5mm and 1mm spacer onto the shaft and up to the bearing. The spacers should be on the side of the bearing, which does not have a flange. Place the bevel gear against the channel, slide down, and mesh with the other gear. Slide the shaft with the bearings and spacers through the channel hole and the bevel gear. Place the other bearing on the other side with a 2mm spacer and the collar clamp. Tighten the collar clamp with the shaft being flush with the edge of the clamp. Place a 2mm spacer with the clamping shaft hub on the other side. Pull the collar clamp and clamping shaft hub together and tighten the clamping shaft hub to the shaft.

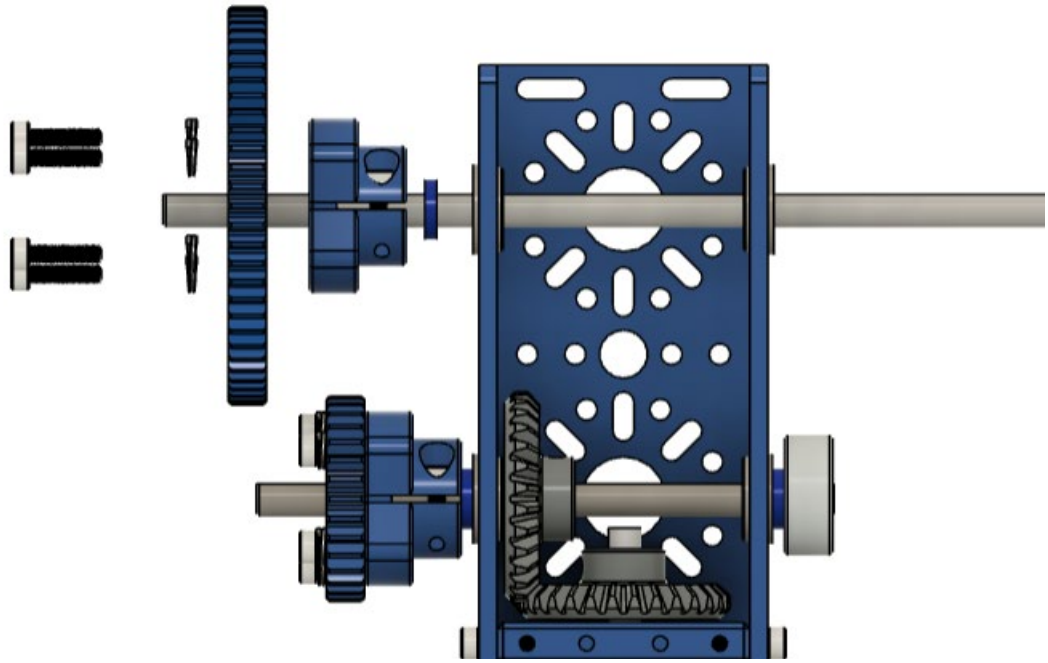


The gearbox should look like this.

Step 4:

Parts:

- 1 x 432mm D-Shaft
- 2 x 14mm Flange Bearing
- 1 x Clamping Shaft Hub V2
- 1 x 64 Tooth Gear
- 6 x M3 x 12mm SHCS
- 6 x M3 Stainless Steel Split Washers
- 1 x 2mm Shaft Spacer
- 1 x 2.5mm Hex Key (Green)

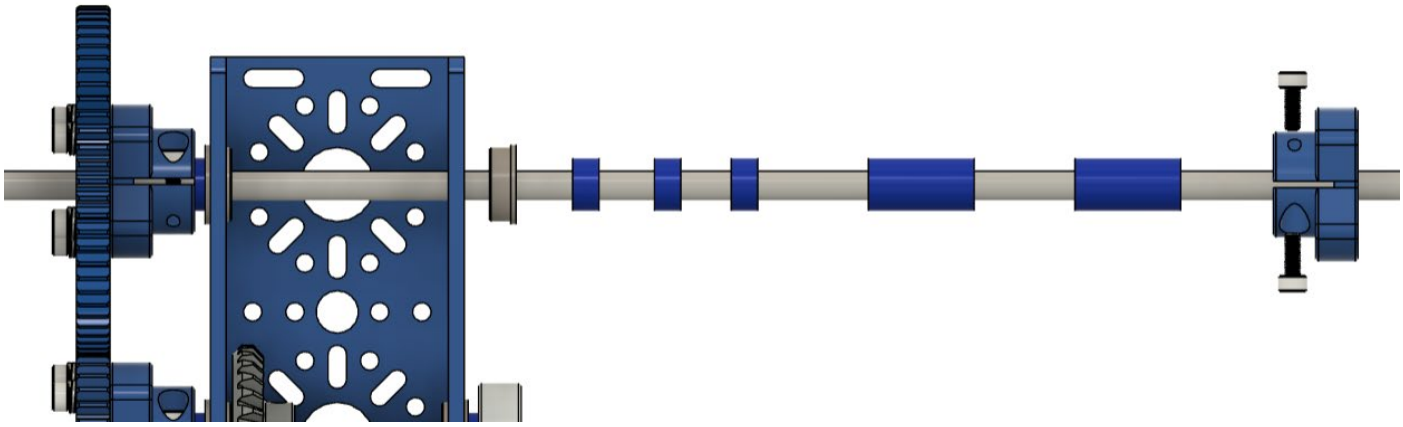


Attach the 64-tooth gear to the clamping shaft hub just as we did in the previous step with the 32-tooth gear. Slide the shaft hub, a spacer, and a bearing onto the 432mm U-Channel. Place the other bearing on the other side of the channel and slide the shaft through. Do not tighten the shaft hub yet.

Step 5:

Parts:

- 3 x 5mm Shaft Spacer
- 2 x 20mm Shaft Spacer
- 1 x Clamping Shaft Hub V2
- 1 x 2.5mm Hex Key (Green)

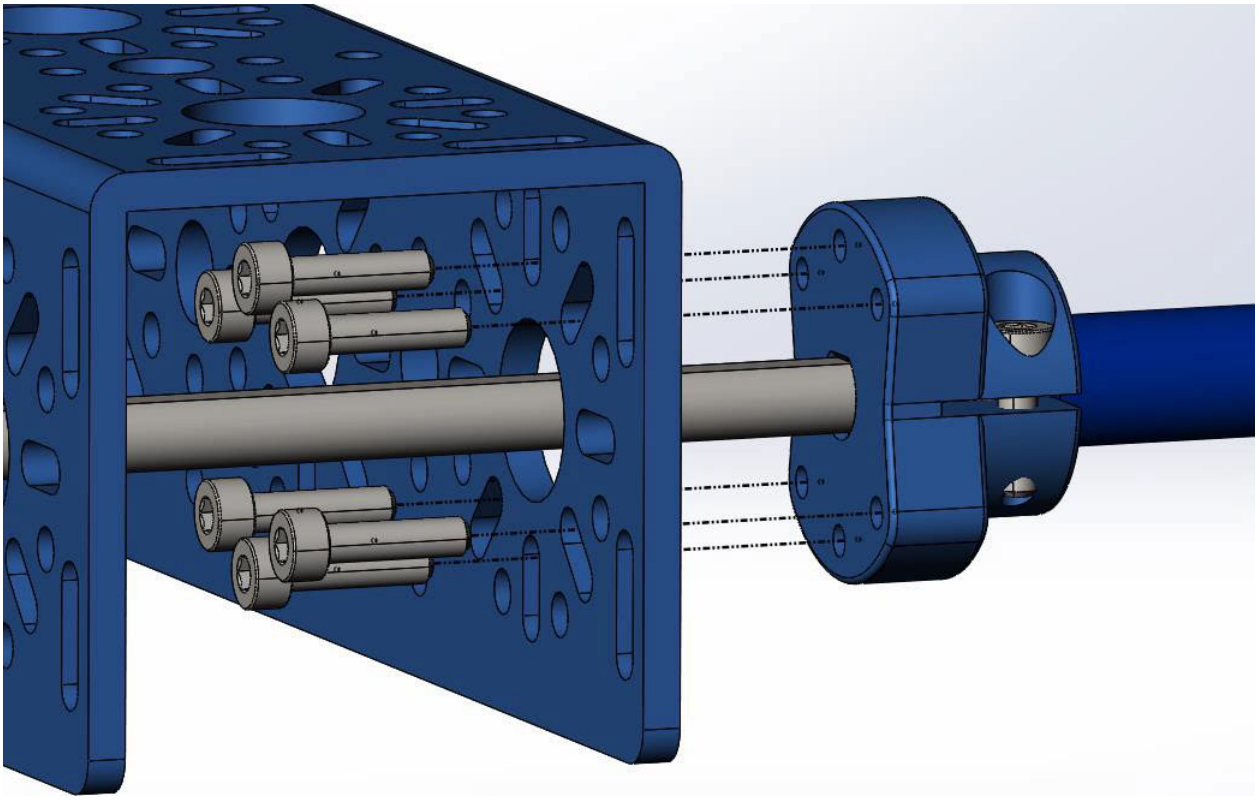


Slide the five spacers onto the shaft from the other side along with the clamping shaft hub.

Step 6:

Parts:

- 1 x 384mm U-Channel
- 6 x M3 x 12mm SHCS
- 1 x 2.5mm Hex Key (Green)

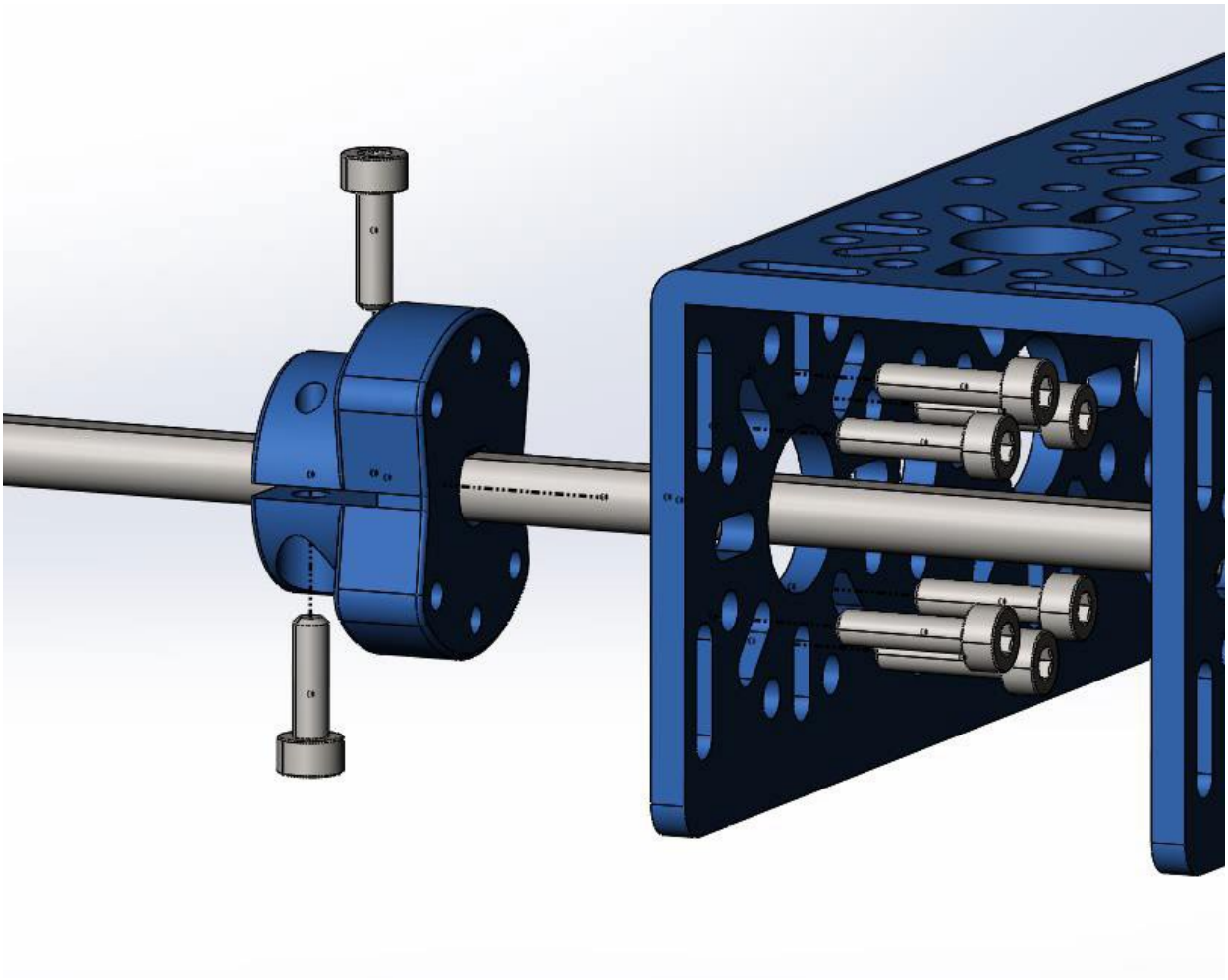


Using the M3 screws, screw the 384mm U-Channel into the clamping shaft hub.

Step 7:

Parts:

- 1 x Clamping Shaft Hub V2
- 6x M3 x 12mm SHCS
- 1 x 2.5mm Hex Key (Green)

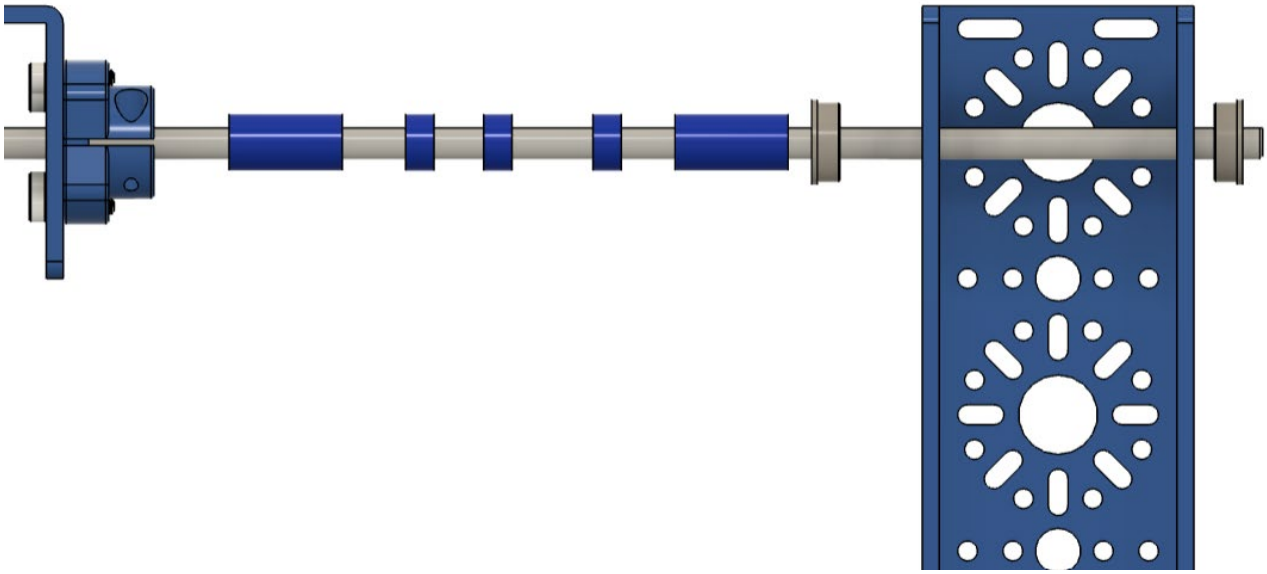


Slide the clamping shaft hub from the other side of the shaft and screw it into the 384mm U-Channel.

Step 8:

Parts:

- 2 x 20mm Shaft Spacer
- 3 x 5mm Shaft Spacer
- 1 x 14mm Flange Bearing
- 1 x 288mm U-Channel

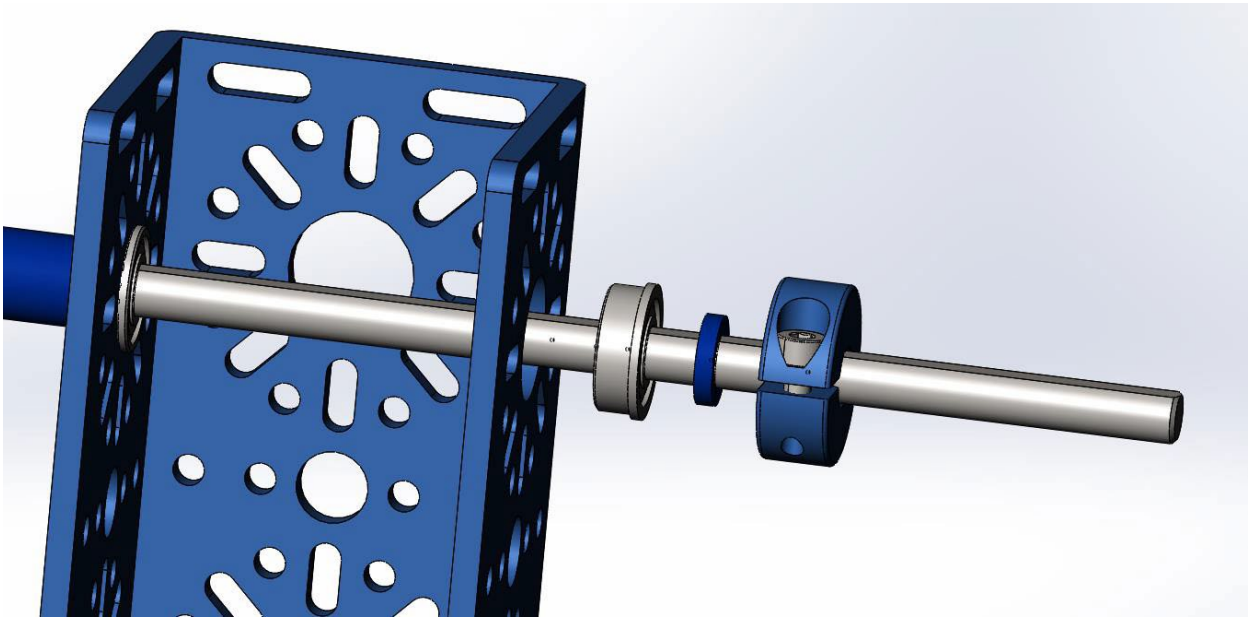


Slide the spacers, bearing and U-Channel together as shown.

Step 9:

Parts:

- 1 x 14mm Flange Bearing
- 1 x 2mm Shaft Spacer
- 1 x Collar Clamp
- 1 x 2.5mm Hex Key (Green)

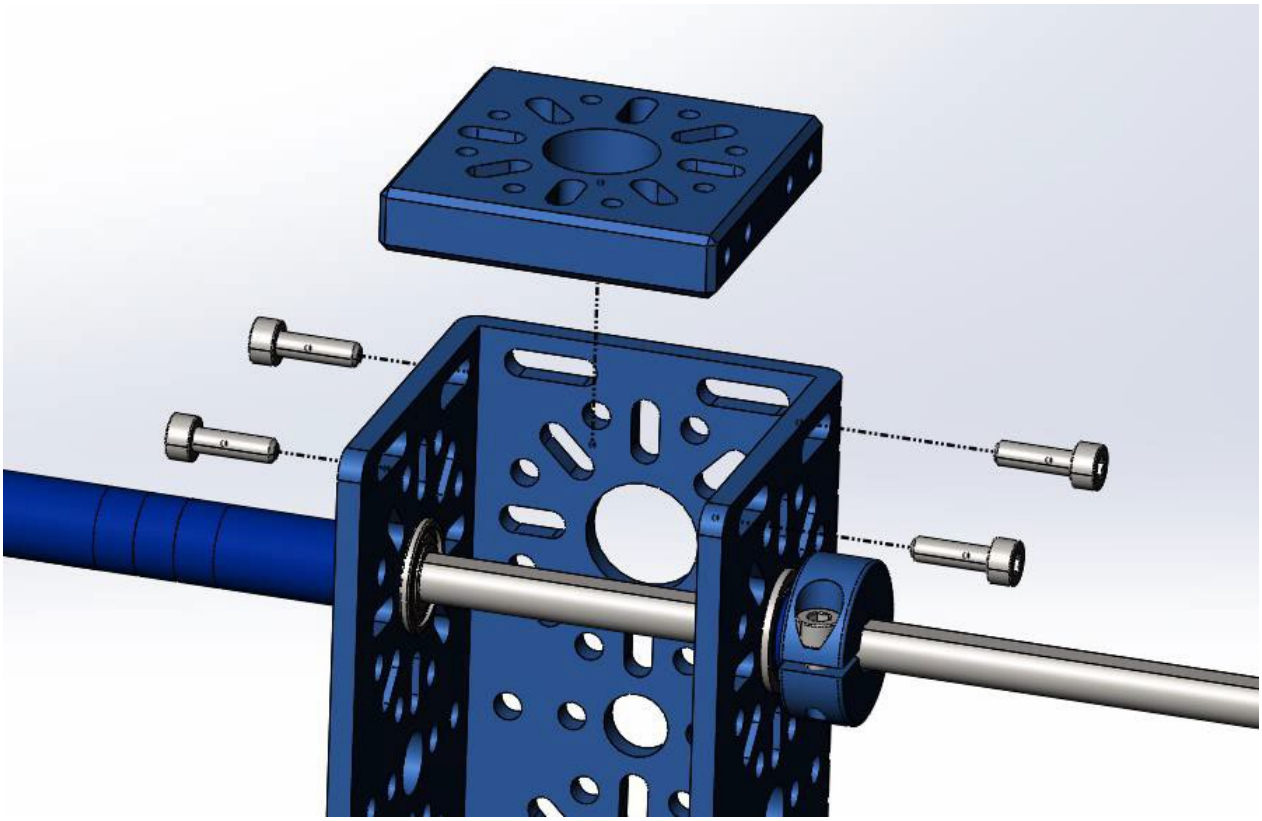


Slide the bearing, spacer, and collar clamp onto the shaft and into the 288mm U-Channel. With everything on the shaft, tighten all the hubs and collars.

Step 10:

Parts:

- 1 x End Piece Plate
- 4 x M3 x 10mm SHCS
- 1 x 2.5mm Hex Key (Green)

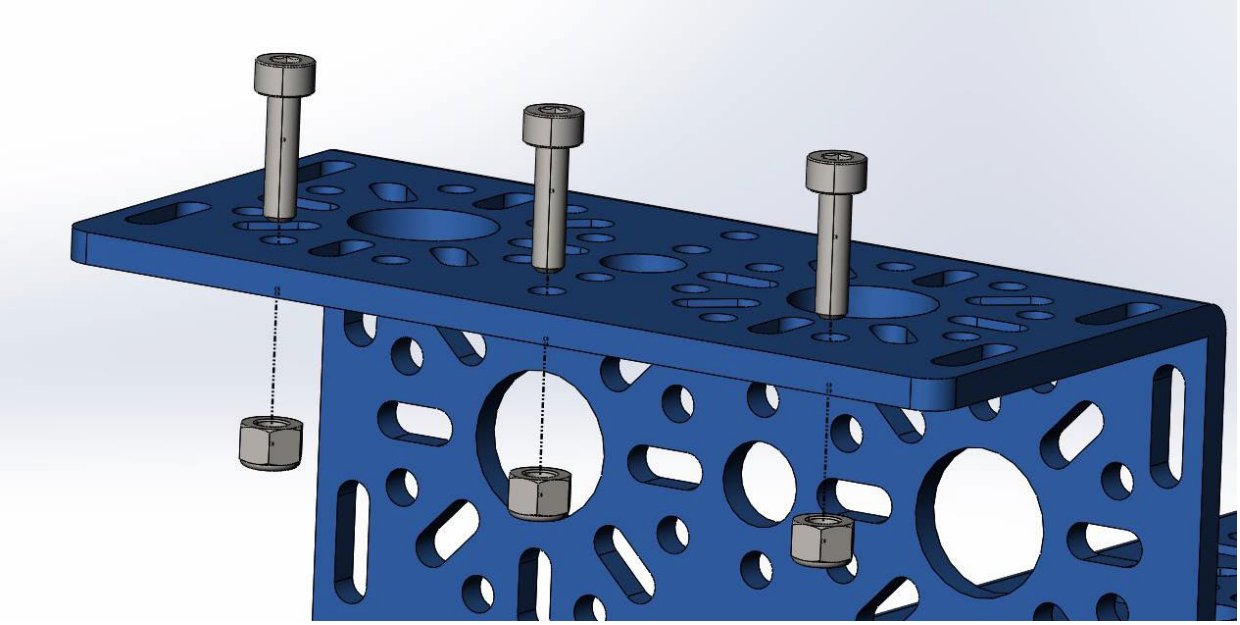


At the top of the 288mm U-Channel, screw in an end piece plate.

Step 11:

Parts:

- 1 x 96mm U-Channel
- 3 x M3 x 12mm SHCS
- 3 x M3 Nyloc
- 1 x 2.5mm Hex Key (Green)
- 1 x Combination Wrench

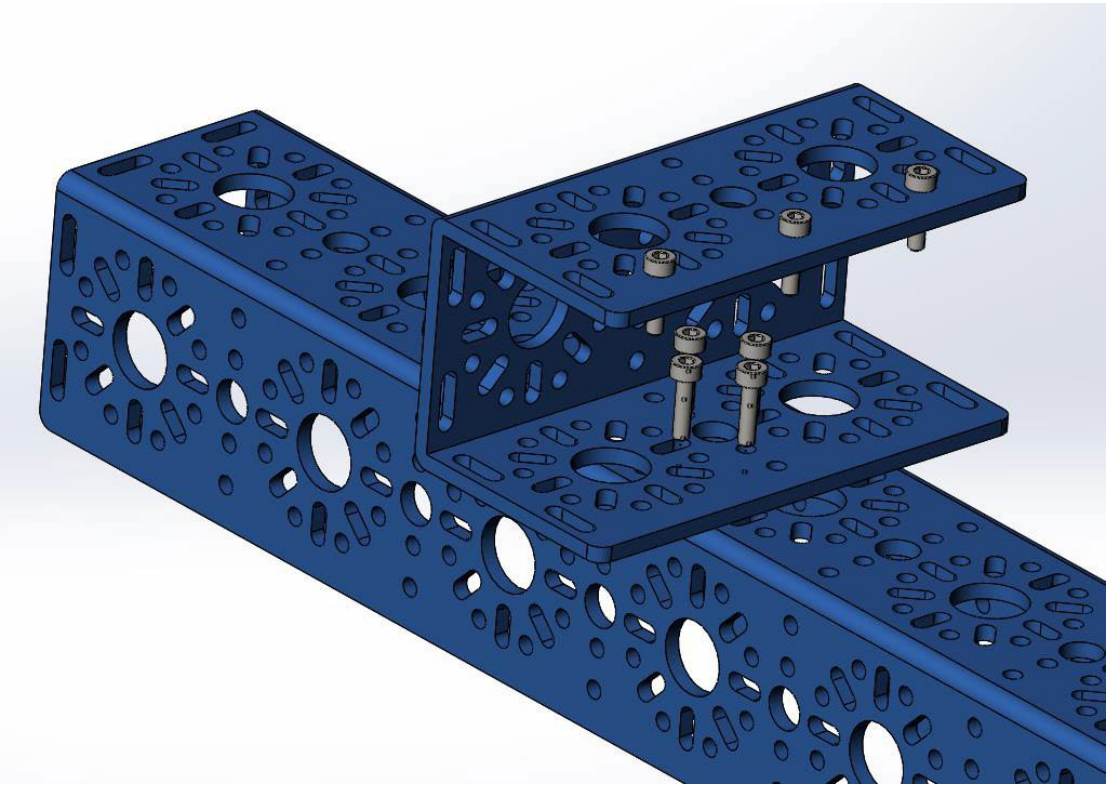


Screw the three screws into the 96mm U-Channel while using Nyloc nuts to keep them tight and locked in.

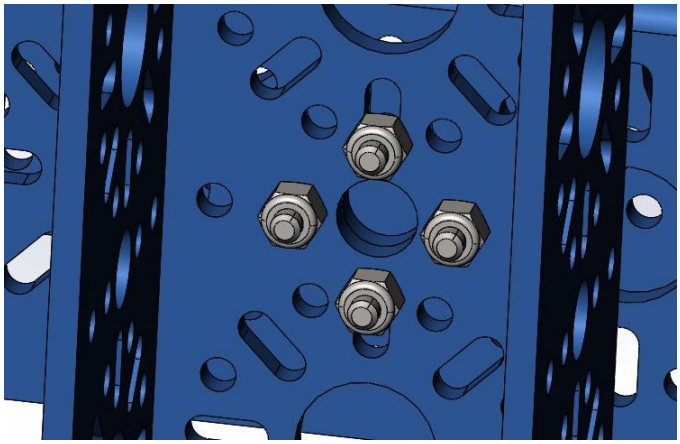
Step 12:

Parts:

- 4 x M3 x 12mm SHCS
- 4 x M3 Nyloc Nuts
- 1 x 2.5mm Hex Key (Green)
- 1 x Combination Wrench



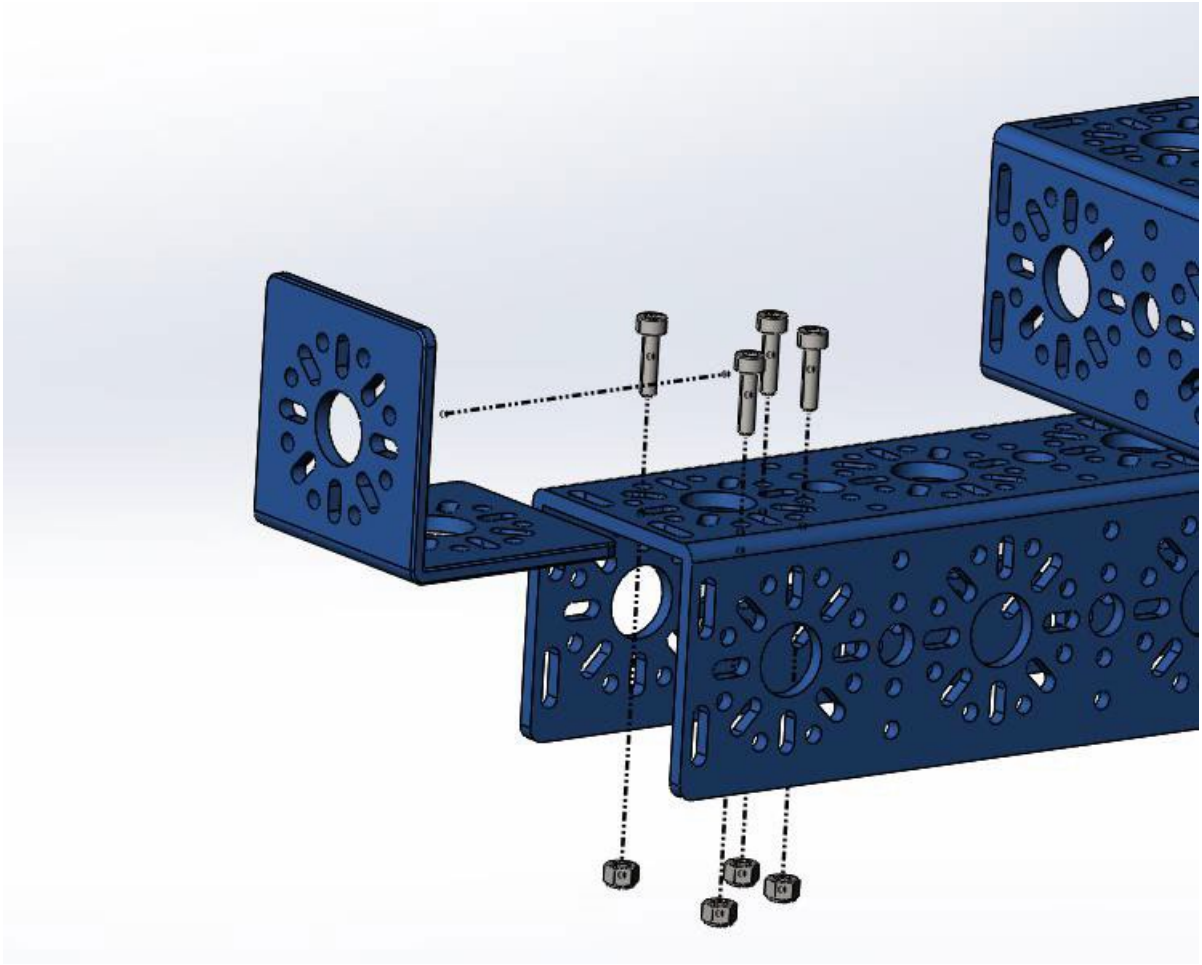
Screw the 96mm U-Channel into the 384mm U-Channel. The Small 8mm hole should line up with the third small 8mm hole from the end of the 384mm U-Channel.



Step 13:

Parts:

- 1 x L Bracket
- 4 x M3 x 12mm SHCS
- 4 x M3 Nyloc Nut
- 1 x 2.5mm Hex Key (Green)
- 1 x Combination Wrench

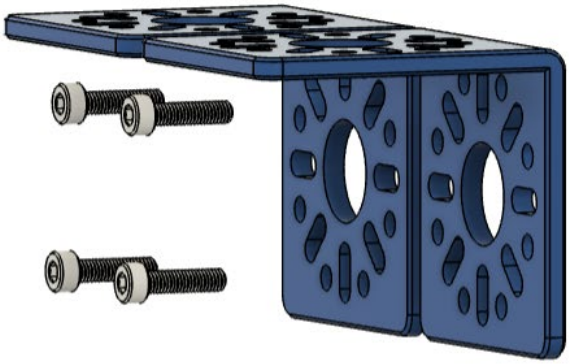


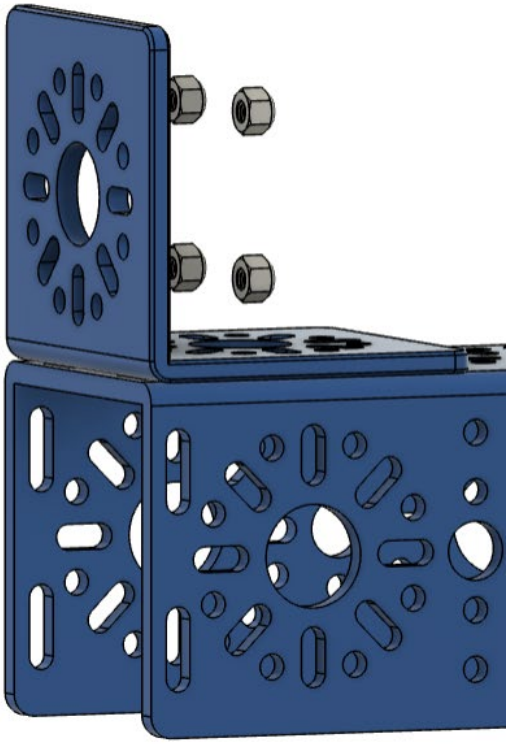
Screw the L bracket to the end of the 384mm U-Channel using four, M3 x 12mm SHCS with Nyloc Nuts.

Step 14:

Parts:

- 2 x Inside L Bracket
- 4 x M3 x 12mm SHCS
- 4 x M3 Nyloc Nuts
- 1 x 2.5mm Hex Key (Green)
- 1 x Combination Wrench



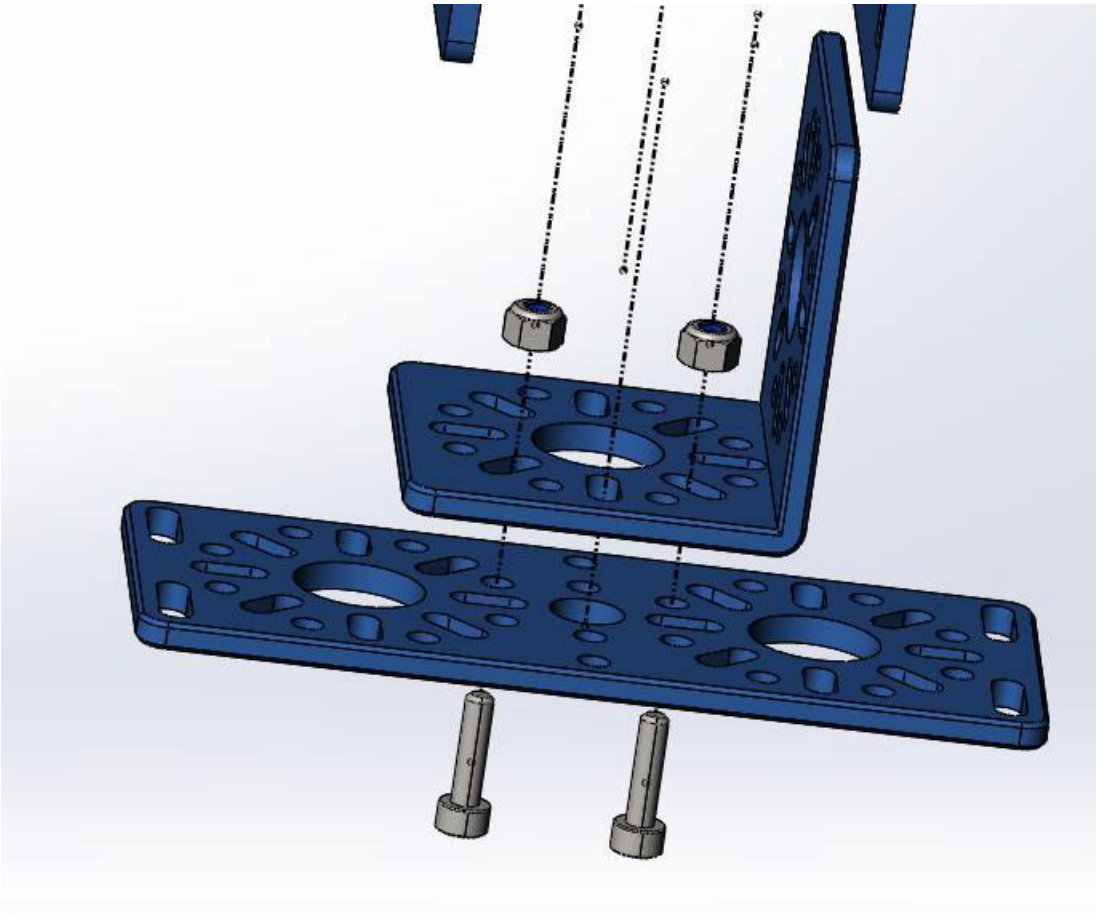


Screw the two inside L brackets to the L bracket on the 384mm U-Channel.

Step 15:

Part:

- 1 x Inside L Bracket
- 1 x 96mm x 40mm Flat
- 2 x M3 x 12mm SHCS
- 2 x M3 Nyloc Nut
- 1 x 2.5mm Hex Key (Green)
- 1 x Combination Wrench

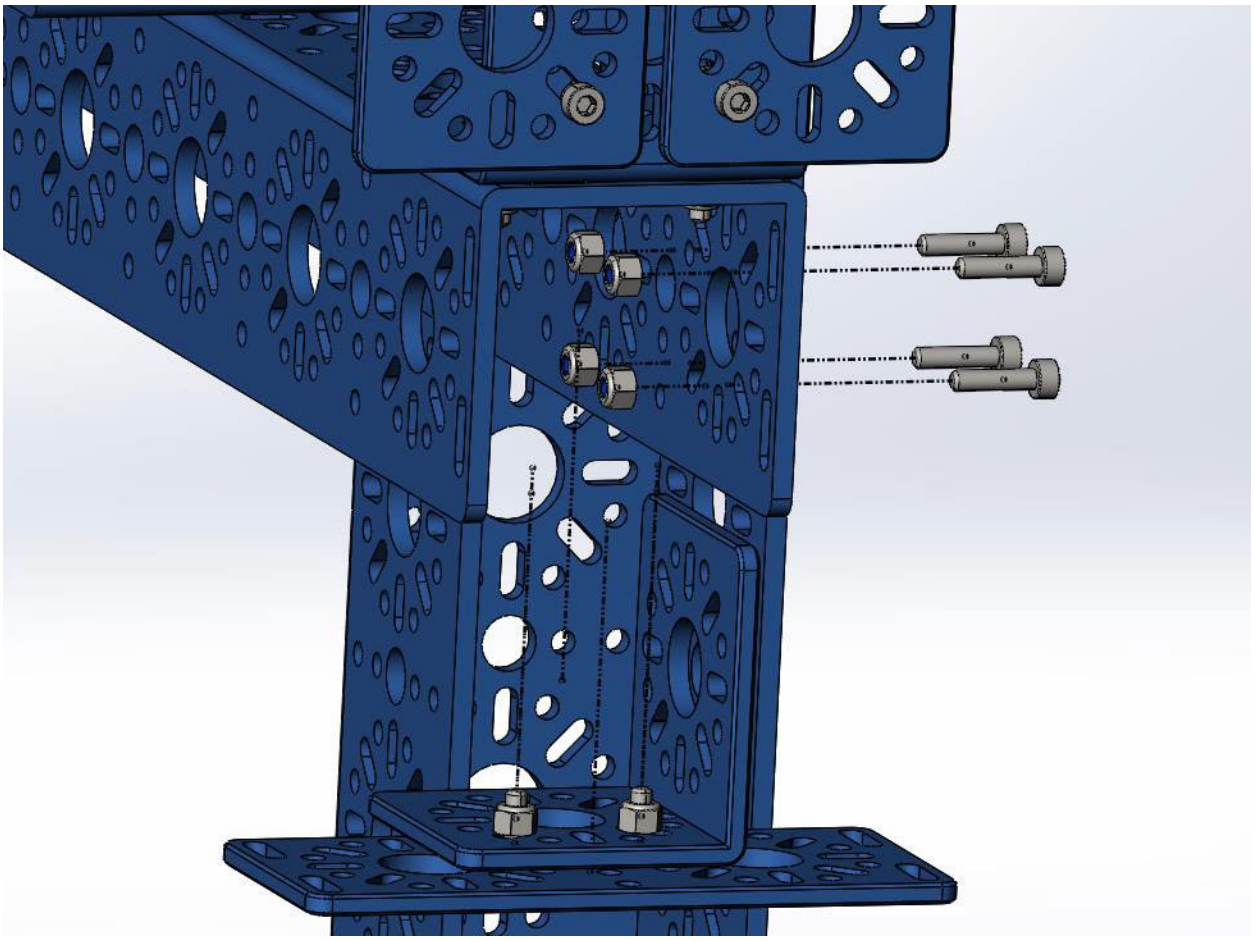


Screw a 96mm x 40mm flat into an inside L bracket.

Step 16:

Parts:

- Assembly from Step 15
- 4 x M3 x 12mm SHCS
- 4 x M3 Nyloc Nut
- 1 x 2.5mm Hex Key (Green)
- 1 x Combination Wrench

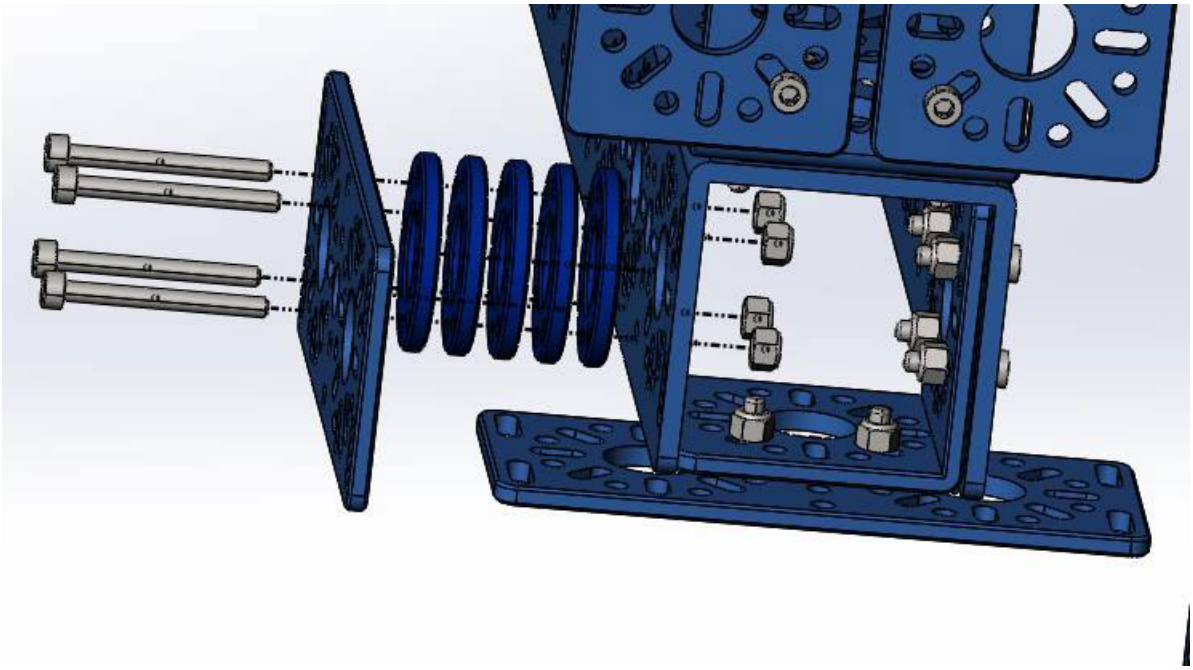


Screw the assembly from step 16 into the 384mm U-Channel.

Step 17:

Parts:

- 4 x M3 x 30mm SHCS
- 1 x 96mm x 40mm Flat
- 5 x Pattern Spacer
- 4 x M3 Nyloc Nut
- 1 x 2.5mm Hex Key (Green)
- 1 x Combination Wrench

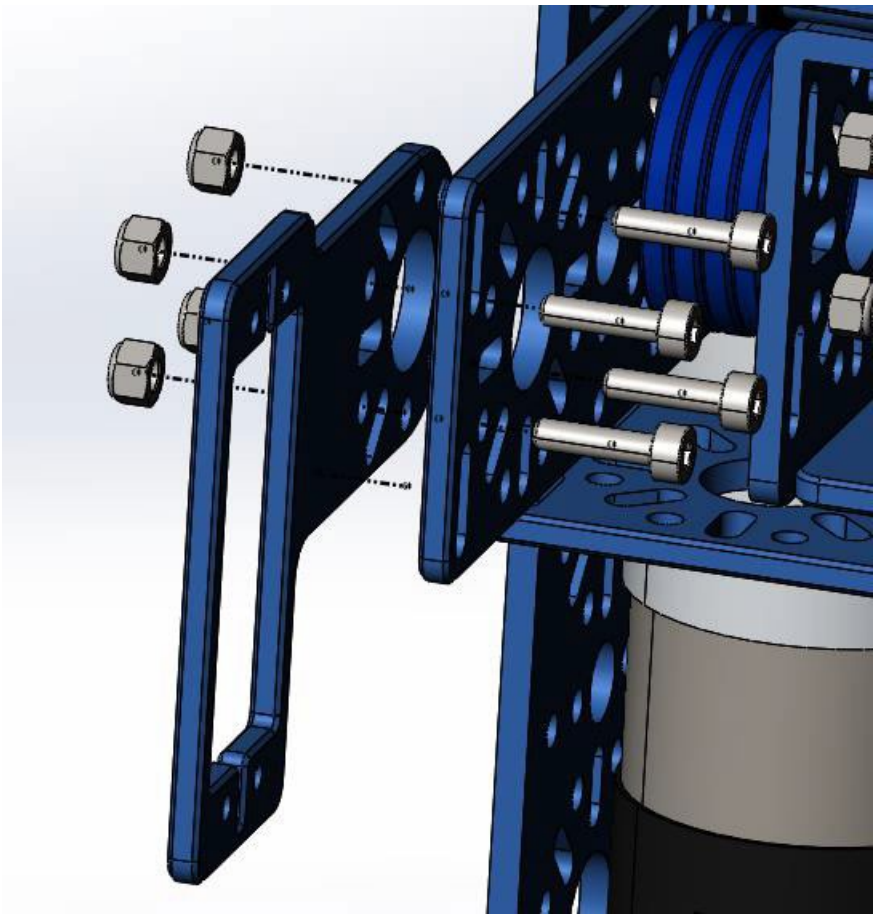


Slide the screws through the 96mm flat and five pattern spacers into the 384mm U-Channel. Lock them in place with Nyloc nuts.

Step 18:

Parts:

- 4 x M3 x 12mm SHCS
- 4 x M3 Nyloc Nut
- 1 x Servo Offset Plate
- 1 x 2.5mm Hex Key (Green)
- 1 x Combination Wrench

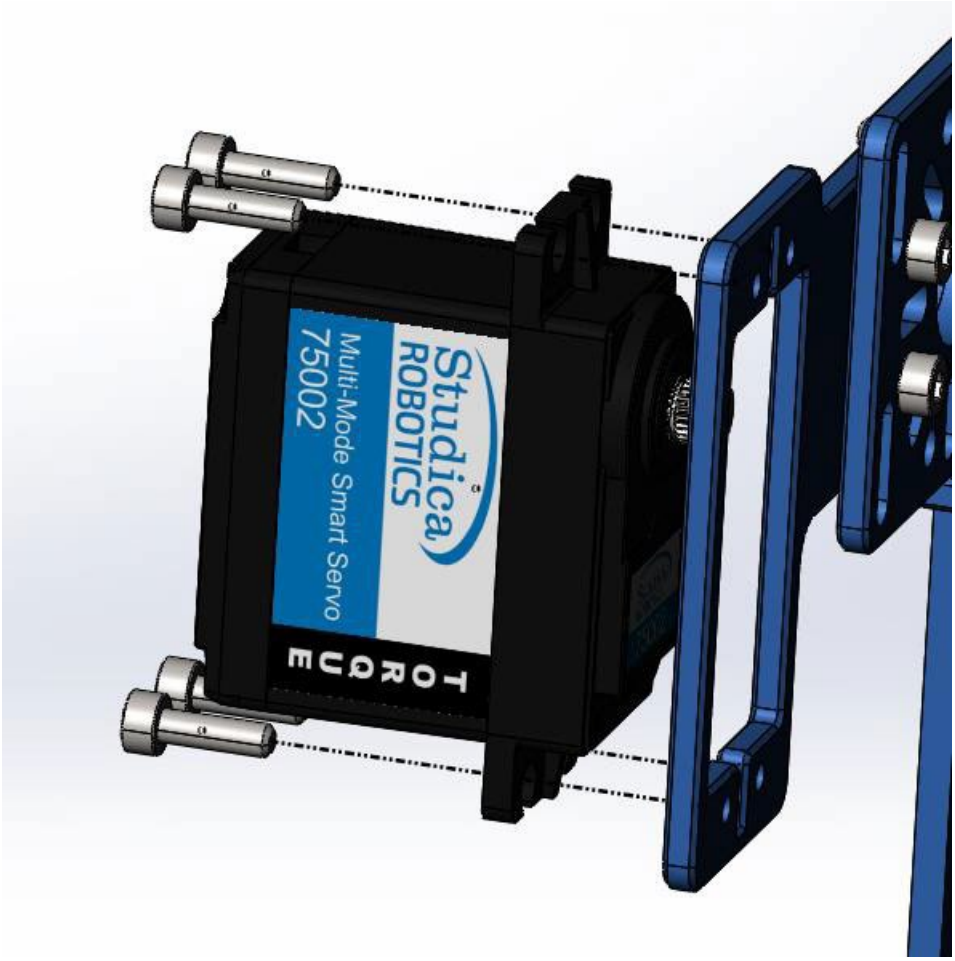


Screw the offset plate into the 96mm flat.

Step 19:

Parts:

- 1 x Either Torque Servo (75002) or Fast Servo (75007)
- 4 x M3 x 10mm SHCS
- 1 x 2.5mm Hex Key (Green)

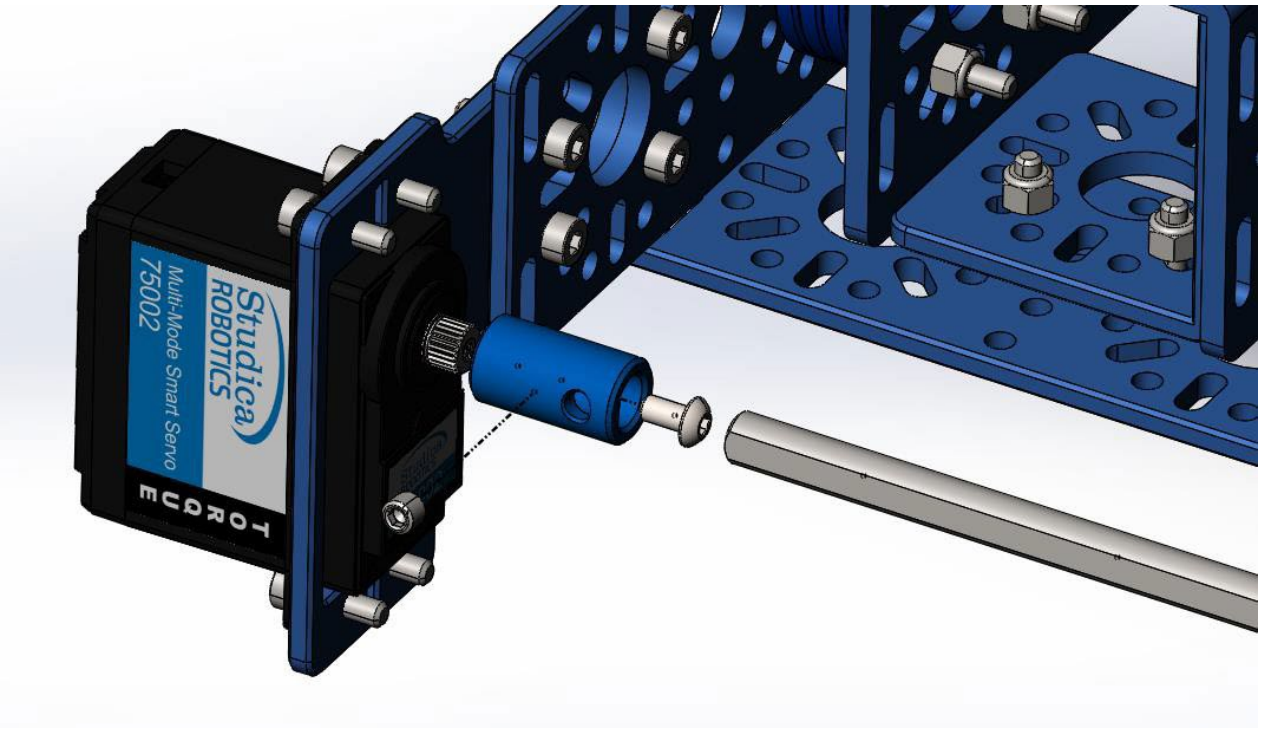


Screw the servo into the servo bracket.

Step 20:

Parts:

- 1 x 25T to 6mm
- 1 x M3 x 6mm BHCS (Inside the servo bag)
- 1 x 96mm D-Shaft
- 1 x 2mm Hex Key (Pink)
- 1 x Philips Screwdriver (Not always required, but the 6mm screw head is random)

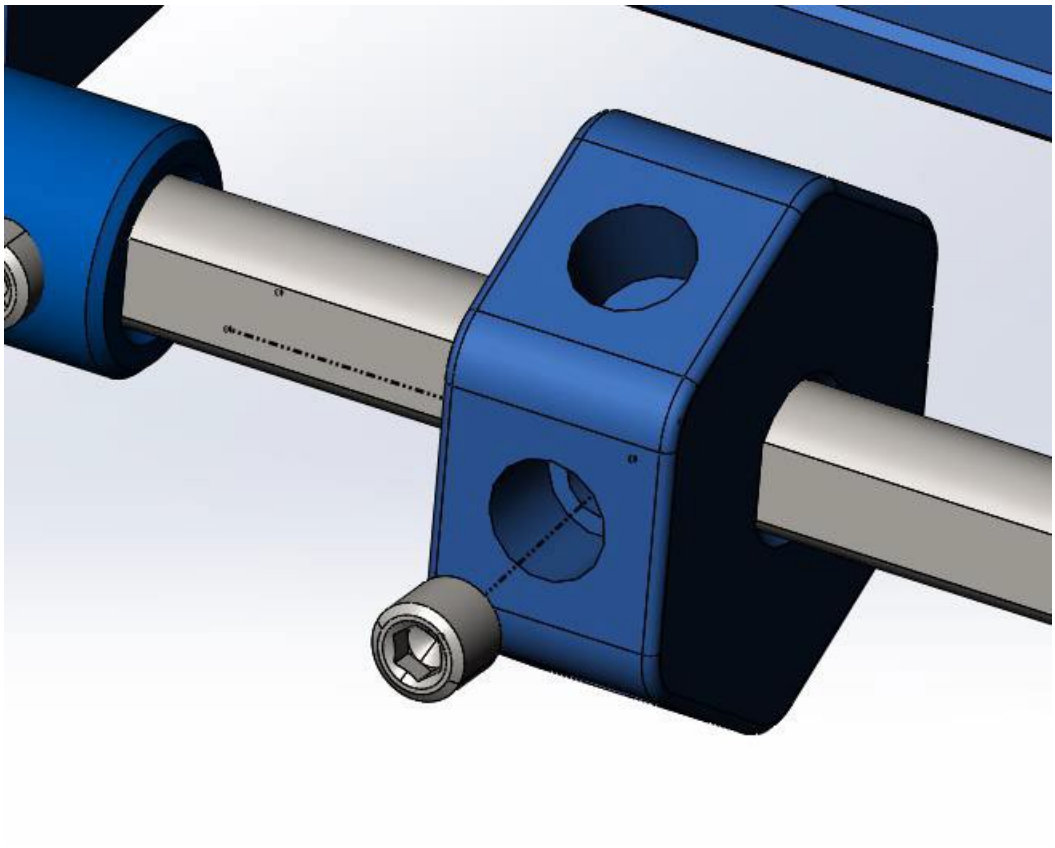


Slide the 25T to 6mm hub onto the servo's output shaft. Using the BHCS, screw the hub into the servo. Slide the D-Shaft into the hub and tighten it down with the set screw.

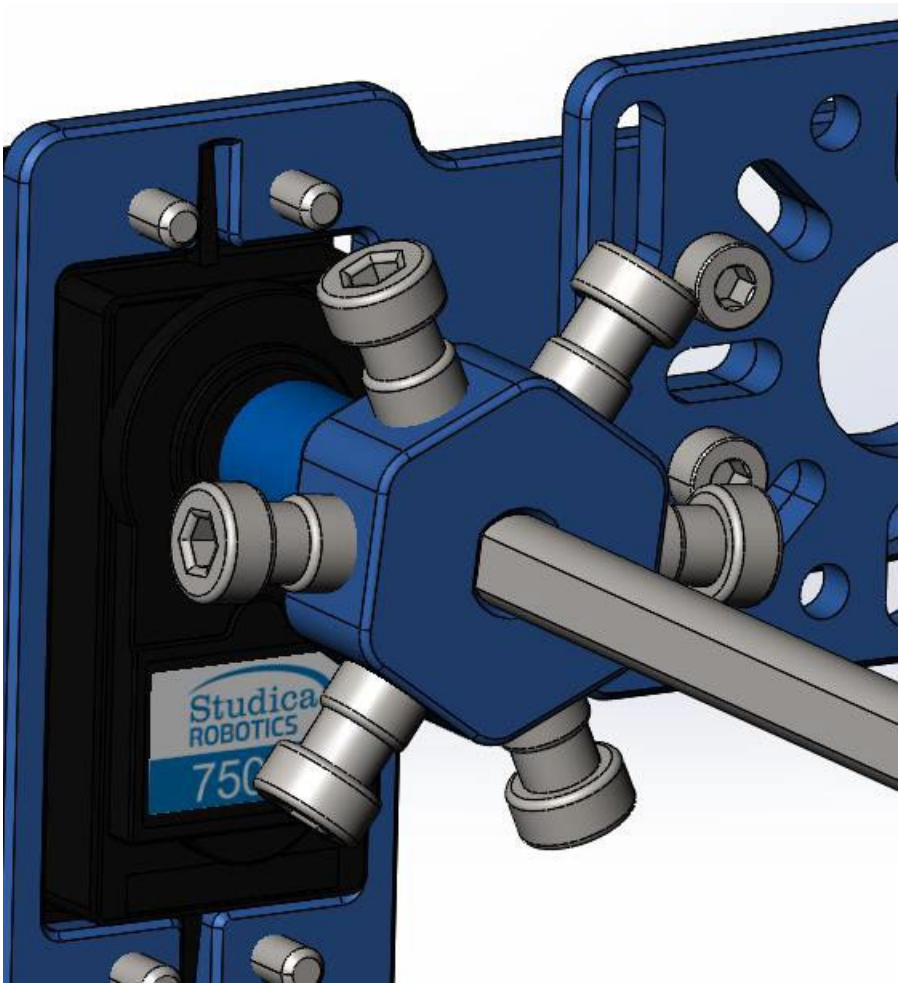
Step 21:

Parts:

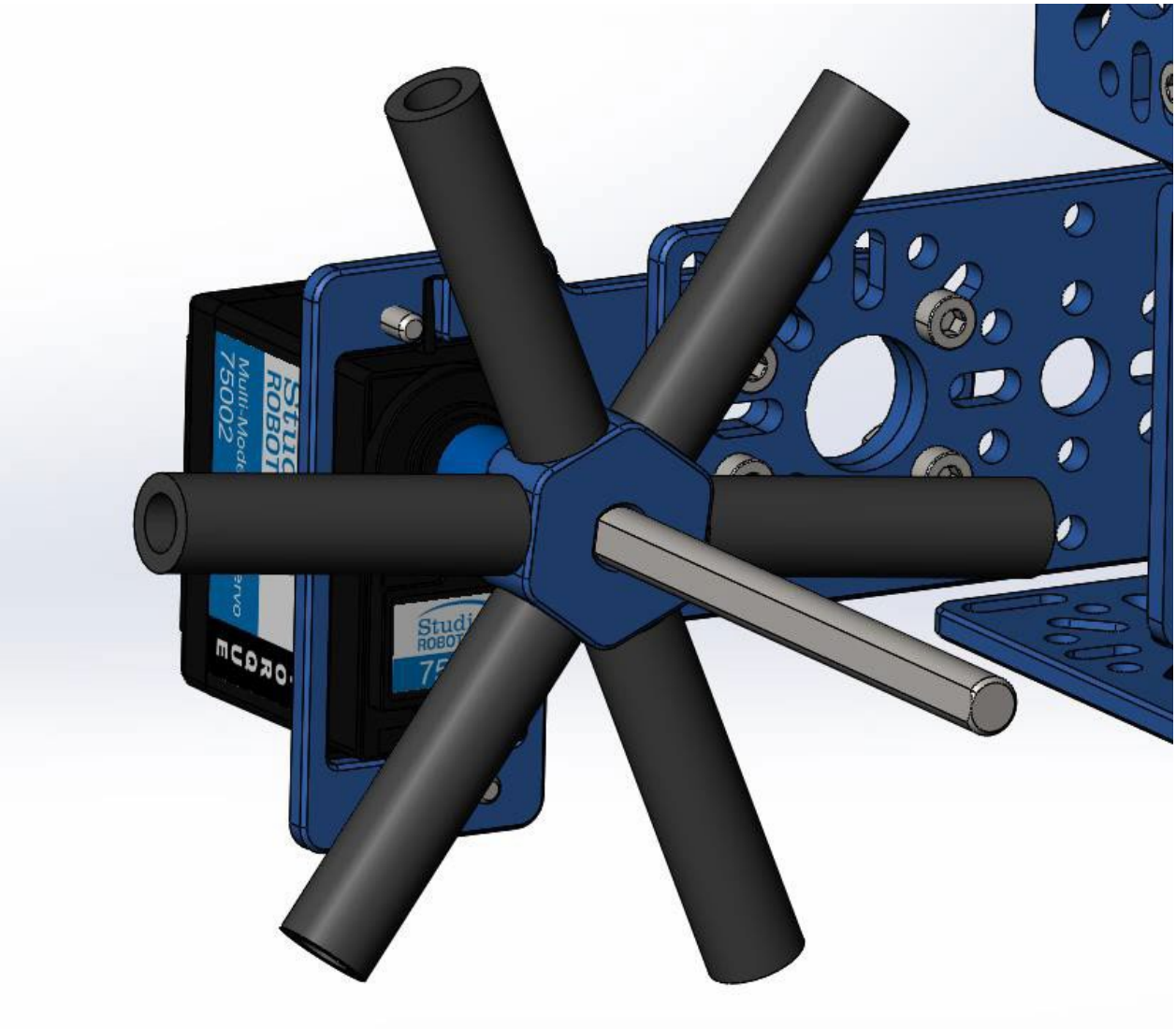
- 1 x Intake Hub Kit
- 6 x Zip Ties
- 6 x 25mm Length Tubing
- 1 x 2mm Hex Key (Pink)
- 1 x 4mm Hex Key (Yellow)



Slide the intake hub down the shaft to the servo hub and tighten it down.



Insert the spokes and tighten down. Cut 6 x 25mm length strips of the rubber tube.

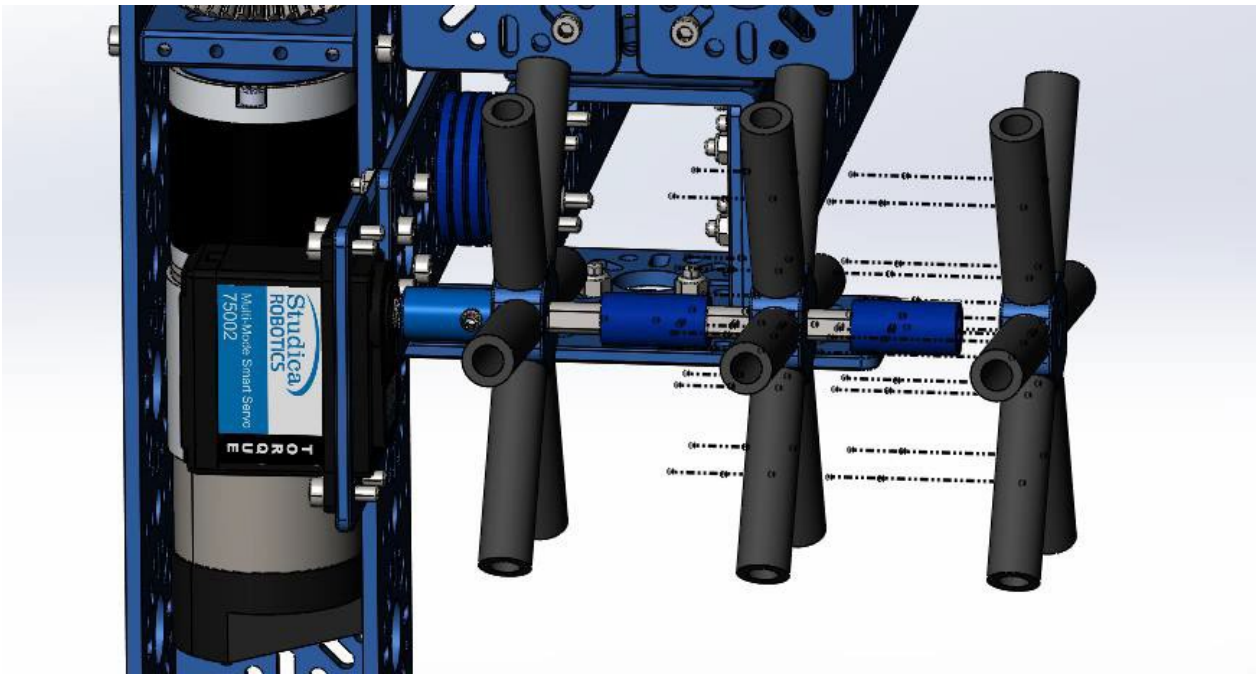


Slide the tubing onto the spokes and lock it into place with a zip tie at the ends.

Step 22:

Parts:

- 2 x Step 21
- 2 x 20mm Shaft Spacer

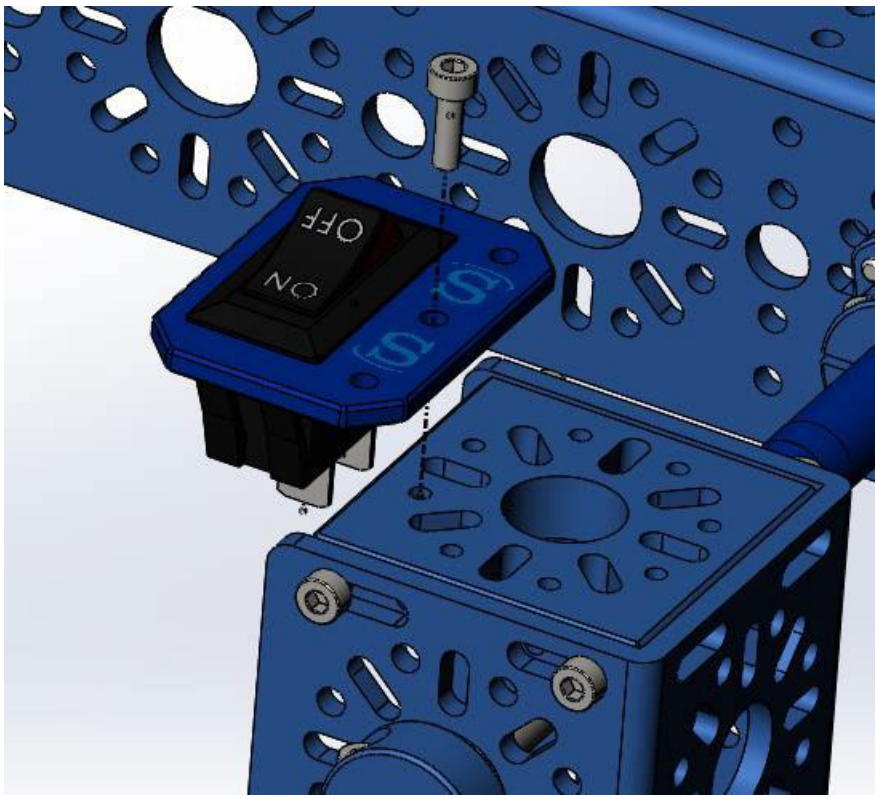


Repeat step 21, 2 times to create two more intakes. Use a 20mm spacer to separate the intakes on the shaft.

Step 23:

Parts:

- 1 x Studica On/Off Switch (Wires Included)
- 1 x M3 x 10mm SHCS
- 1 x 2.5mm Hex Key (Green)



Screw the On/Off switch into the end piece plate.

Step 24:

Parts:

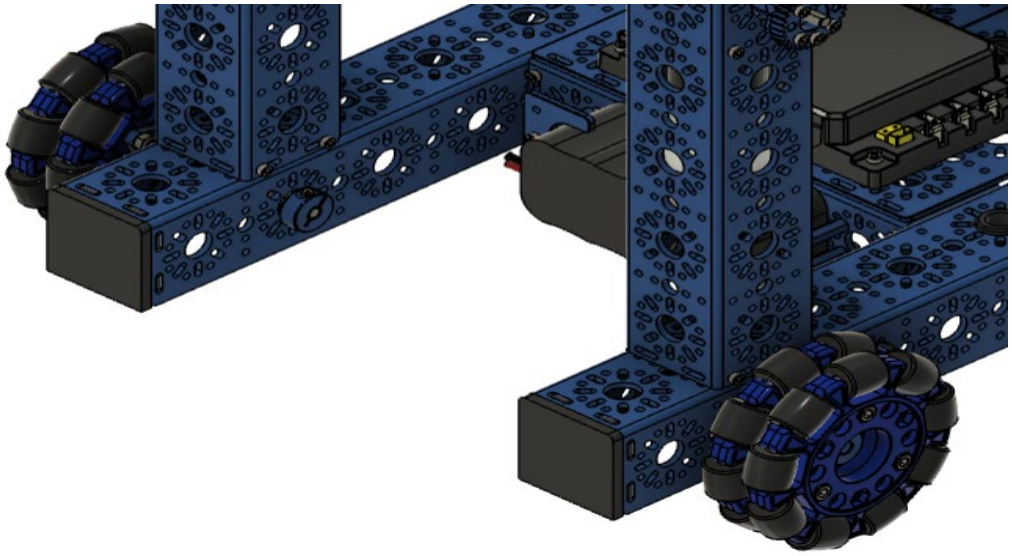
- 2 x End Piece Plates
- 8 x M3 x 10mm SHCS
- 1 x 2.5mm Hex Key (Green)

Screw end piece plates into the bottoms of the two 288mm U-Channels.

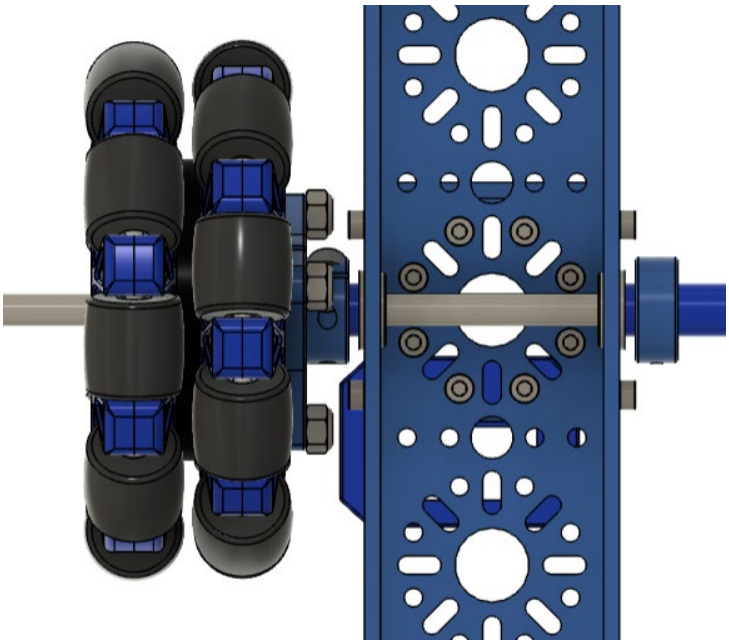
Final Assembly

Parts:

- 1 x Drive Base
- 1 x ARM and OMS
- 16 x M3 x 12mm SHCS
- 1 x 2.5mm Hex Key (Green)



Line up the ARM and OMS with the drive base. The 2, 288 U-Channels should be over the shafts of the omni wheels.



Using the screws, screw in the arm and oms to the drive base. Repeat on the other side.