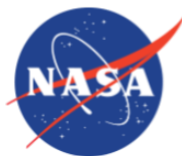


# Open Source Rover: Corner Steering Assembly Instructions

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## 1 3D printing

First, print the 3D printed encoder mounts. The STL files for this are located in the Corner Steering Assembly folder, under 3D Printed Parts. If you do not have a 3D printer there are many online 3D printing services available. One such service is:






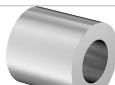






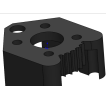

- <https://www.makexyz.com>

To order these parts from Makexyz upload the STL file, select FDM under process, and PLA for Material, and then your desired color. **You will need a total of 4 of these encoder mount pieces.**

## 2 Mechanical/Structural Assembly

The Corner Steering assembly contains the steering motors which allow the rover to utilize Ackerman steering. One important aspect of this assembly is the use of the bearing blocks. These blocks help to take forces on the motor shaft against the gearbox and minimize lateral moments applied against the motor shaft. By using the bearing blocks, we help protect the motor and motor shaft from these forces that could otherwise damage the motor and its gearbox. The lever arm for the corner steering system is much farther away from the motor than at the drive motors, where we can get away with directly attaching the load path to the motor shaft.

**Table 1: Parts/Tools Necessary**

Item	Ref	Qty	Image	Item	Ref	Qty	Image
3" Channel	S2	4		Motor (Corner Motor)	E46	4	
Motor Mount	S9	4		Absolute Encoder	E47	4	
0.25" Pillow Block	S10	8		#6-32x1/4" Spacer	T1	16	
0.25" D-Shaft	S15	4		#6-32 x 1.25" Threaded Standoff	T9	16	
0.25" to 6mm Clamping Shaft Coupler	S38	4		#6-32x1/4" Button Head Screw	B1	24	
1/8" Bore Pinion Gear	S27	4		#6-32x3/4" Button Head Screw	B5	16	
3D Printed Encoder Mount	S31	4		Allen Key Set	D2		

1. **Motor Mount:** Begin by mounting the motor mount **S9** to the motor **E6** using the screws procured with the mount. Once completed, insert the **B5** screws that will be used to connect the mount through the 3-inch channel. Due to the orientation of the motor inside of the 3-inch channel, adding these screws later is difficult. See Figure 1.

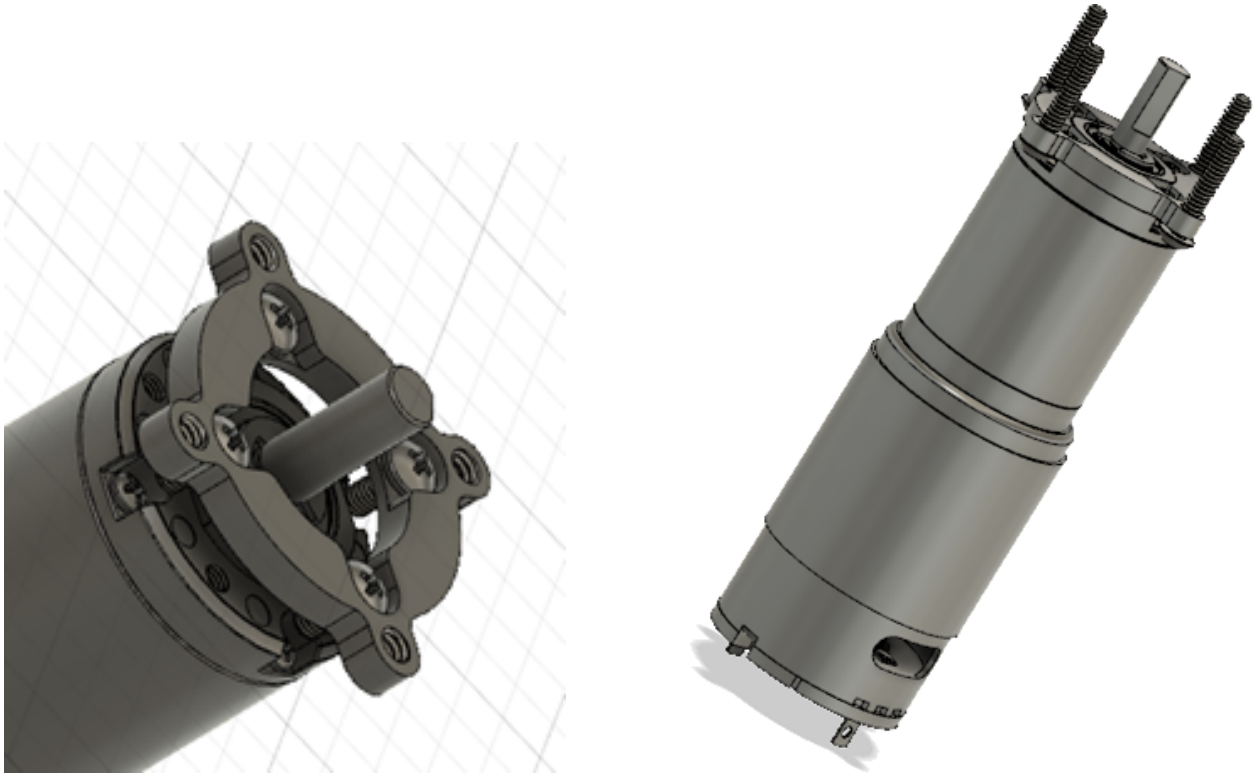


Figure 1: Corner Steering Motor Mount attachment (left) and **B5** screw insertion (right)

2. **3-inch Channel Attachment:** Attach the motor and motor mount to the 3-inch channel using the threaded standoffs **T9** as seen in Figure 2.



Figure 2: Slide the **B5** screws through the 3-inch channel and screw down the standoffs. Note the motor is "inside" the channel.

3. **Shaft Coupler/Standoffs Attachment:** Using the shaft coupler **S38**, attach the motor shaft to the 0.25 inch D-shaft **S15**. Figure 3

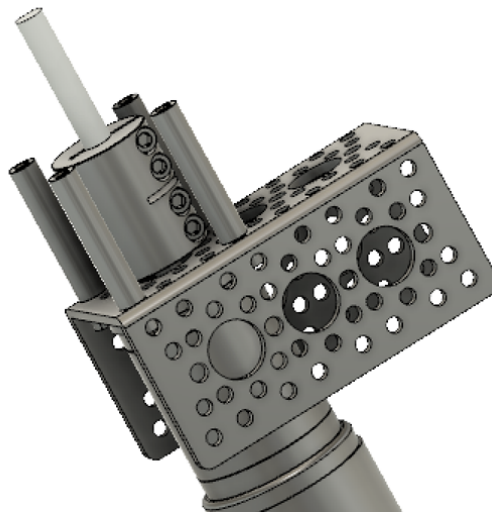


Figure 3: Shaft coupler installation

4. **Encoder Mount:** The size and tolerance of the holes will vary slightly based on different 3D printers and materials. Press the 0.25 inch spacers **T1** into the 3D printed encoder mount **S31**. If they do not fit easily, tapping them with a small hammer may help. If the wholes are still too small, you can drill or file out the holes slightly until the spacers fit as shown in Figure 4.

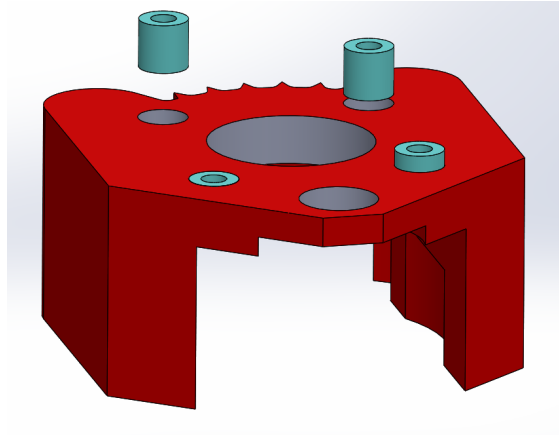


Figure 4: Shaft coupler installation

Next, attach the 0.25 inch pillow bearing blocks **S10** and encoder mount **S31** using the **B5** screws into the threaded standoffs **T3** as seen in Figure 5.

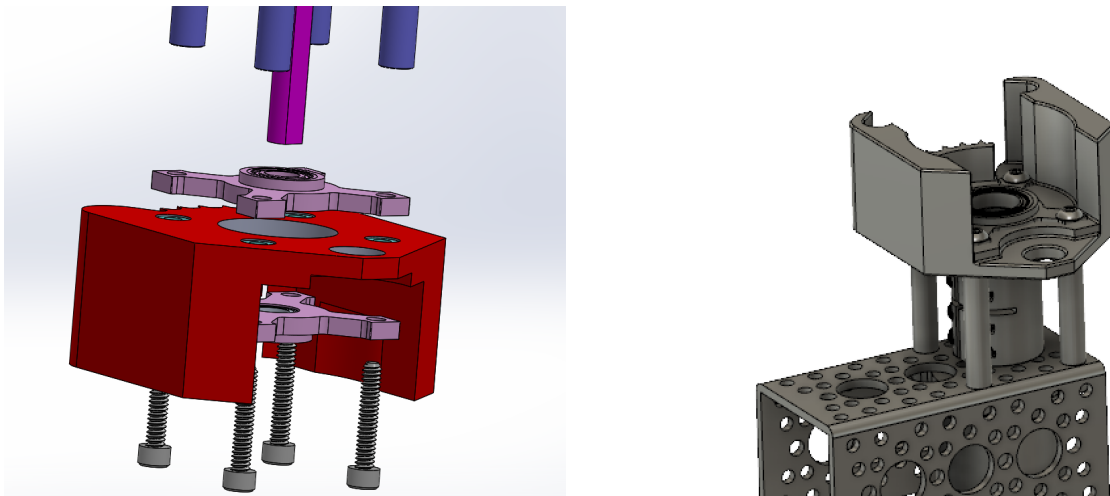


Figure 5: Encoder mount installation

5. **Encoder:** Attach the encoder **E7** to the encoder mount **S31** and then attach the

12-tooth gear **S27** to the encoder shaft as shown in Figure 6. We will worry about its exact position later on.

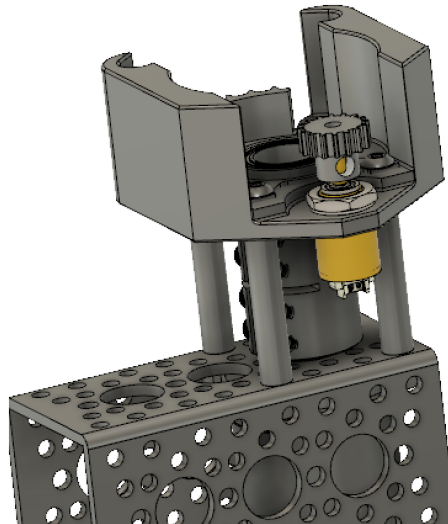


Figure 6: Encoder and gear installed

You should now have one finished corner steering assembly. Repeat the steps above to build the other 3 corner steering assemblies. **Note: unlike other assemblies, this assembly isn't identical for all four. You will need to build two versions (one for the left side of the rover, one for the right side) where the encoder mount is mirrored left to right. The absolute encoder should be on the 'outside' of the rover in all cases (see Figure 7 for an example).**

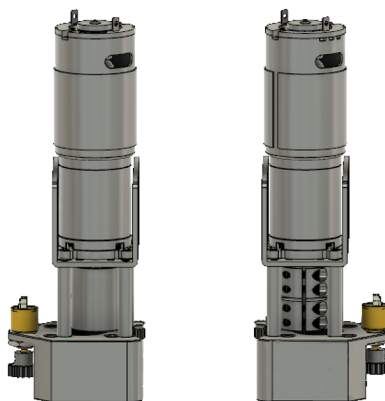


Figure 7: Mirrored steering assemblies