

Open Source Rover: Mechanical Integration Assembly Instructions

Authors: Michael Cox, Eric Junkins Olivia Lofaro



Jet Propulsion Laboratory
California Institute of Technology

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not constitute or imply its endorsement by the United States Government or the Jet Propulsion Laboratory, California Institute of Technology. ©2018 California Institute of Technology. Government sponsorship acknowledged.

Contents

1 Mechanical/Structural Assembly	3
1.1 Mounting Wheels	4
1.2 Attaching Corner Steering Assembly	5
1.3 Attaching Corner Wheels	6
1.4 Mounting Body to Rocker-Bogie	7
1.5 Attach the Differential Pivot	7
1.6 Mounting the Head	9

1 Mechanical/Structural Assembly

At this point we have every major sub assembly created and they just need to be attached together to create the rover! In the steps in this document, we will attach all the corner motors and wheels, the rocker-bogie, the differential pivot, and the head.

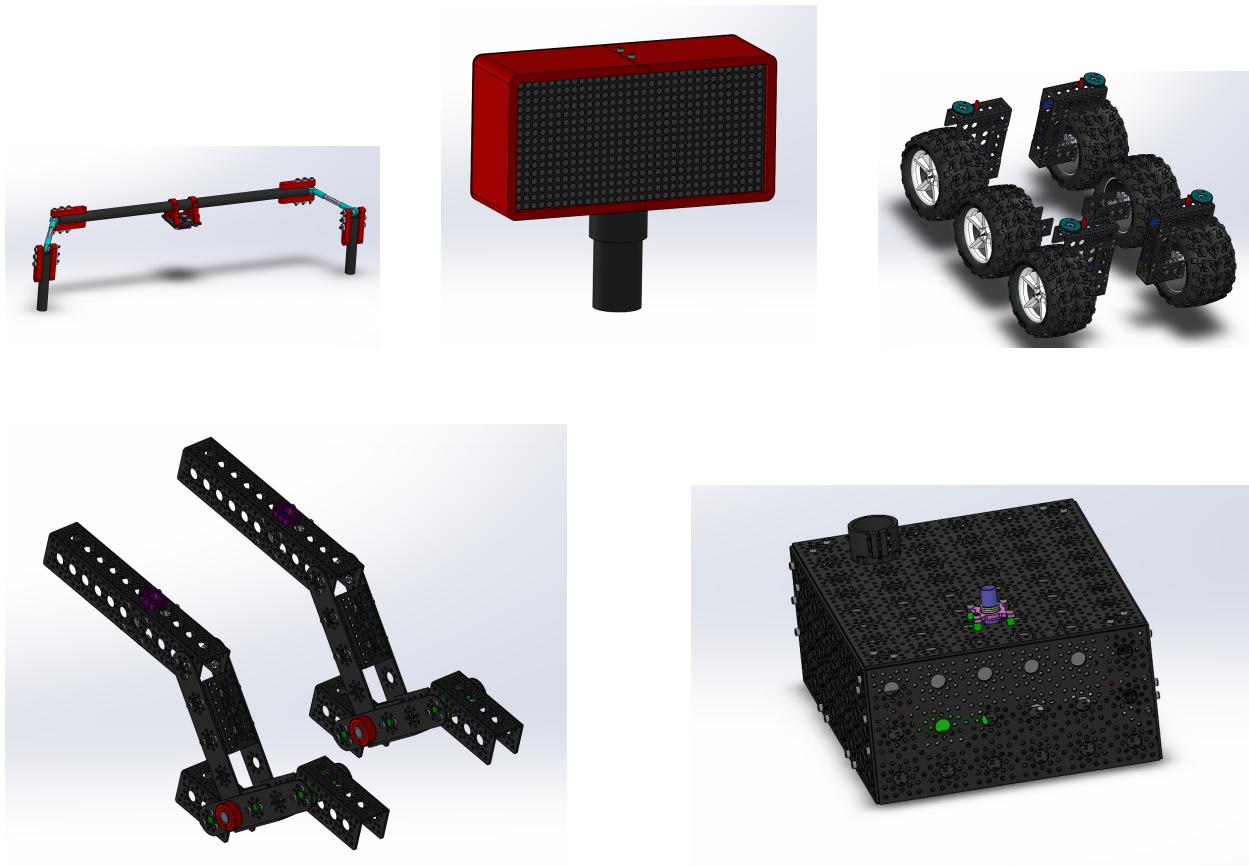


Figure 1: All subassemblies completed

Table 1: Parts/Tools Necessary

Item	Ref	Qty	Image	Item	Ref	Qty	Image
1.5" Channel	S1	2		0.5" Nylon Washer	W3	3	
Channel Connector Plate	S6	14		#6-32x1/4" Button Head Screw	B1	52	
0.5" x 15" Aluminum Tube (Modified)	S16A	1		Allen Key Set	D2		
0.5" x 2" Aluminum Tube	S19	1		Wrench Set	D1		
0.5" Collar Clamp	S22	7					

1.1 Mounting Wheels

- 1. Mounting the Middle Wheel:** Mount one base wheel (not the corner wheels) to the lowest arm of each of the two rocker bogie subassemblies using a 1.5 inch channel **S1** and channel connectors **S6**. See Figures 2 and 3. Note that you should mirror the wheels so that they are both on the "outside" of the rocker bogey subassemblies.



Figure 2: Mounting the middle wheel



Figure 3: Attaching the middle wheels

1.2 Attaching Corner Steering Assembly

2. Attach one of your corner steering assemblies to the rocker bogie assembly using channel connectors **S6** and screws **B1** as shown in Figure 4. Make sure that you pick a corner steering assembly that has the encoder facing outwards (on the same side as the middle wheel from the previous step).

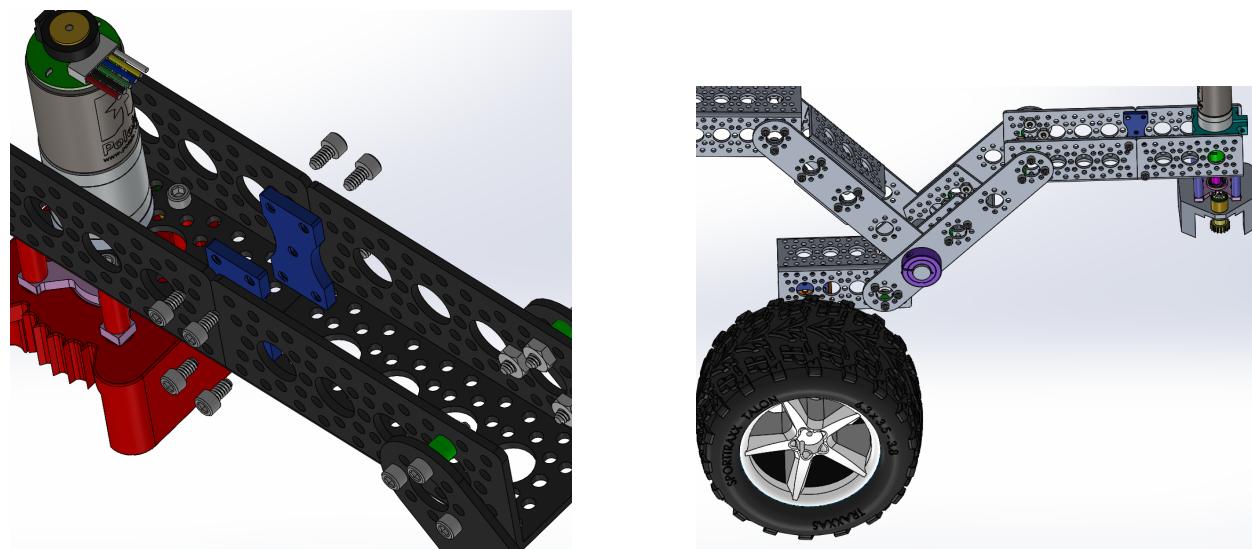


Figure 4: Attaching the corner steering assembly

3. Repeat the steps above to mount the remaining corner steering assemblies to the other

1 MECHANICAL/STRUCTURAL ASSEMBLY.3 Attaching Corner Wheels

rocker bogie assembly, again making sure to select the encoder mounts such that the encoders wind up on the outside of the rover.

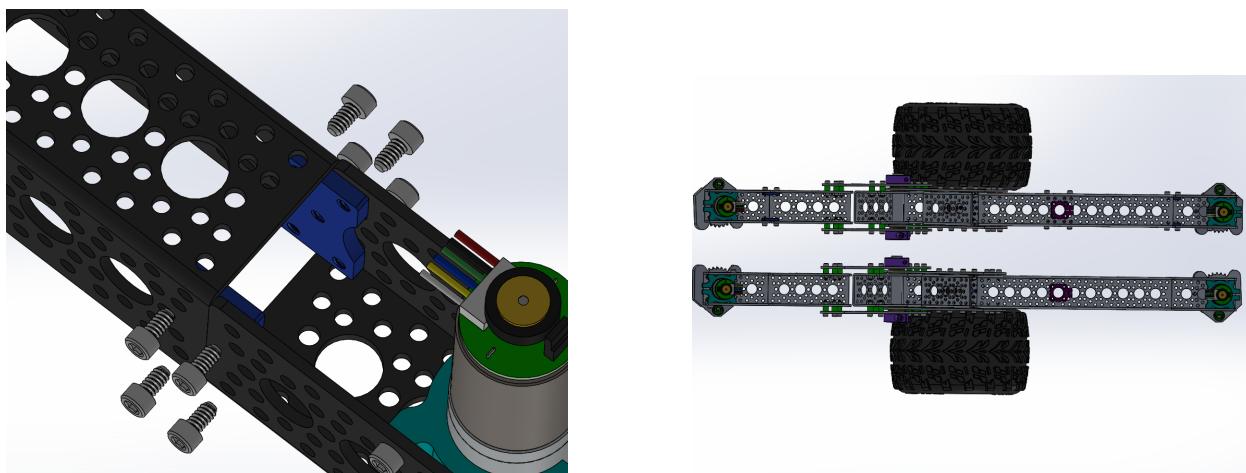


Figure 5: All corner steering assemblies attached

1.3 Attaching Corner Wheels

4. Attach the four corner wheel assemblies to the corner steering assemblies. They are all symmetric. You may need to spin the encoder gears to mesh with the motor shaft gears if they are not aligned initially. See Figure 6



Figure 6: Attaching the wheels

1.4 Mounting Body to Rocker-Bogie

5. Mount the main body of the rover to the two separate rocker-bogie legs using 15 inch aluminum rod **S16A** and collar clamps **S22** as shown in Figure 7. Make sure to maintain the order of the collar clamps shown in Figure 7 to fully lock all assemblies along the rod. The rod will go through the pillow blocks on each rocker-bogie leg, and it should pass through the 4th from the back and 2nd up hole on the body as shown in Figure 7.

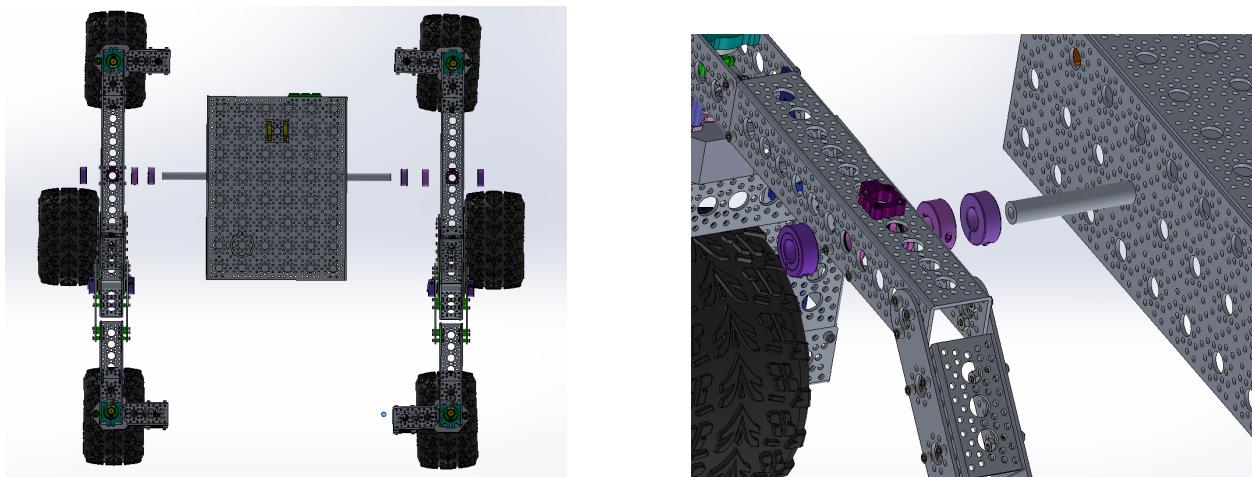


Figure 7: Mounting Body to Rocker-Bogie

1.5 Attach the Differential Pivot

Table 2: Parts/Tools Necessary

Item	Ref	Qty	Image	Item	Ref	Qty	Image
0.5" Hollow aluminum tube 2" long	S18	1		0.5" Collar clamp	S22	1	
0.5" Nylon Washer	W3	5					

1 MECHANICAL/STRUCTURAL ASSEMBLY Attach the Differential Pivot

6. **Mounting the differential pivot center:** Mount a collar clamp **S22** onto the end of the 2" Aluminum Rod **S19** as well as two of the 0.5" Nylon washers **W3** as shown in Figure 8. Then, insert this rod into the pillow bearing blocks from the inside of the body assembly. Add three more nylon washers on the outside / top and then attach the clamping assembly on the middle of the differential pivot (see Figure 8).

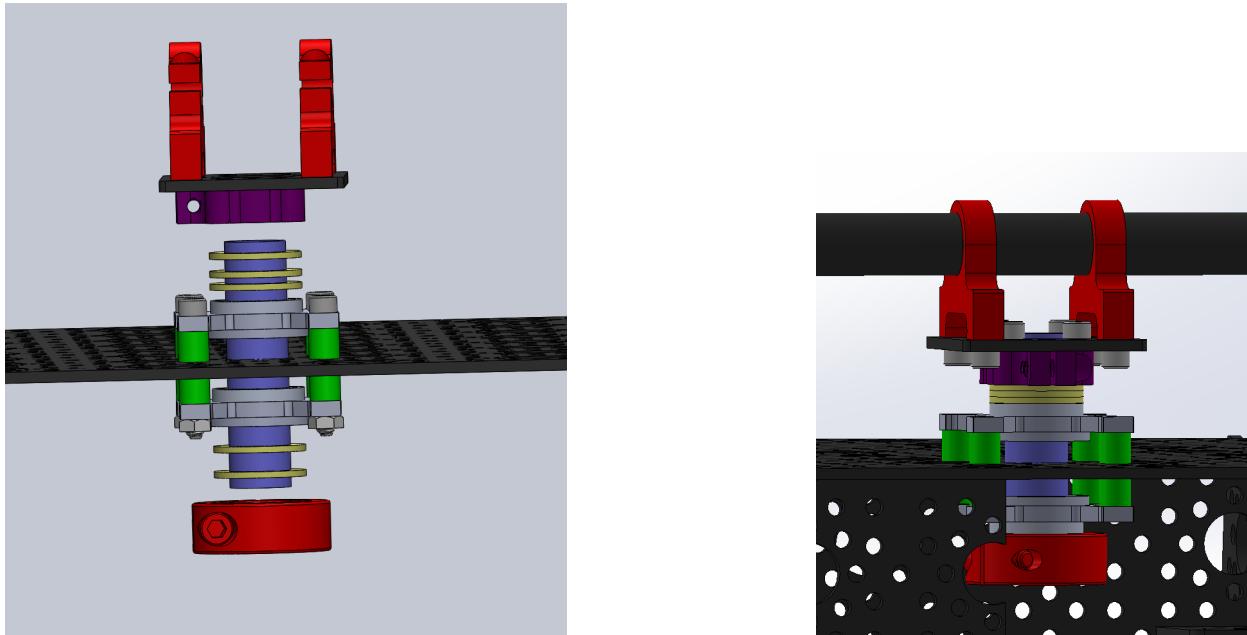


Figure 8: Inserting differential pivot joint

7. **Attaching the differential pivot arms:** Attach the the bottom sections of the differential pivot to the 0.5 inch clamping hubs on each of the Rocker-Bogie attachments. Once these are all in place, tighten down each of the screws on all of the clamping hubs as shown in Figure 9.

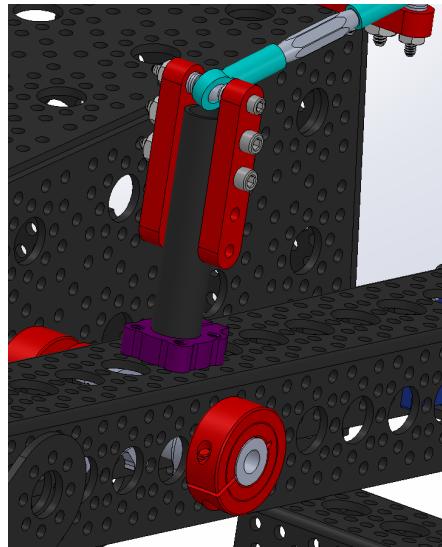


Figure 9: Attaching the differential pivot

1.6 Mounting the Head

8. **Mounting the head to the body:** Slide the PVC pipe at the bottom of the head into the PVC clamping hub on the rover body and tighten down the clamping screws.

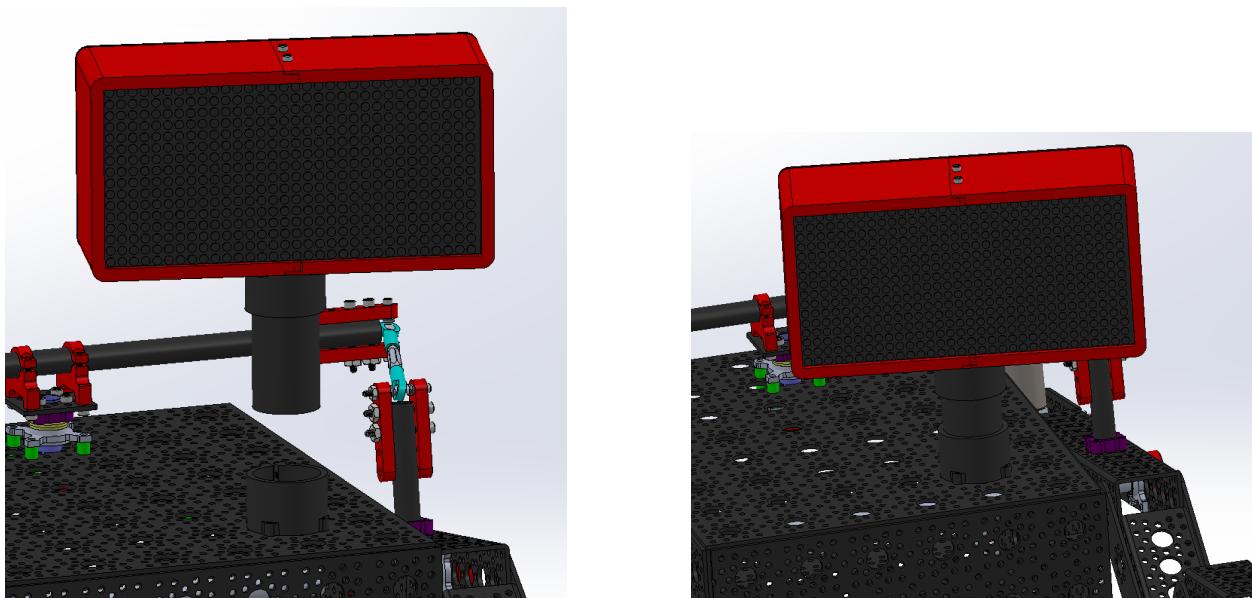


Figure 10: Attaching the head

9. **Checkpoint:** Your rover should now be fully assembled! Verify that your rover looks

like the rover in Figure 11.

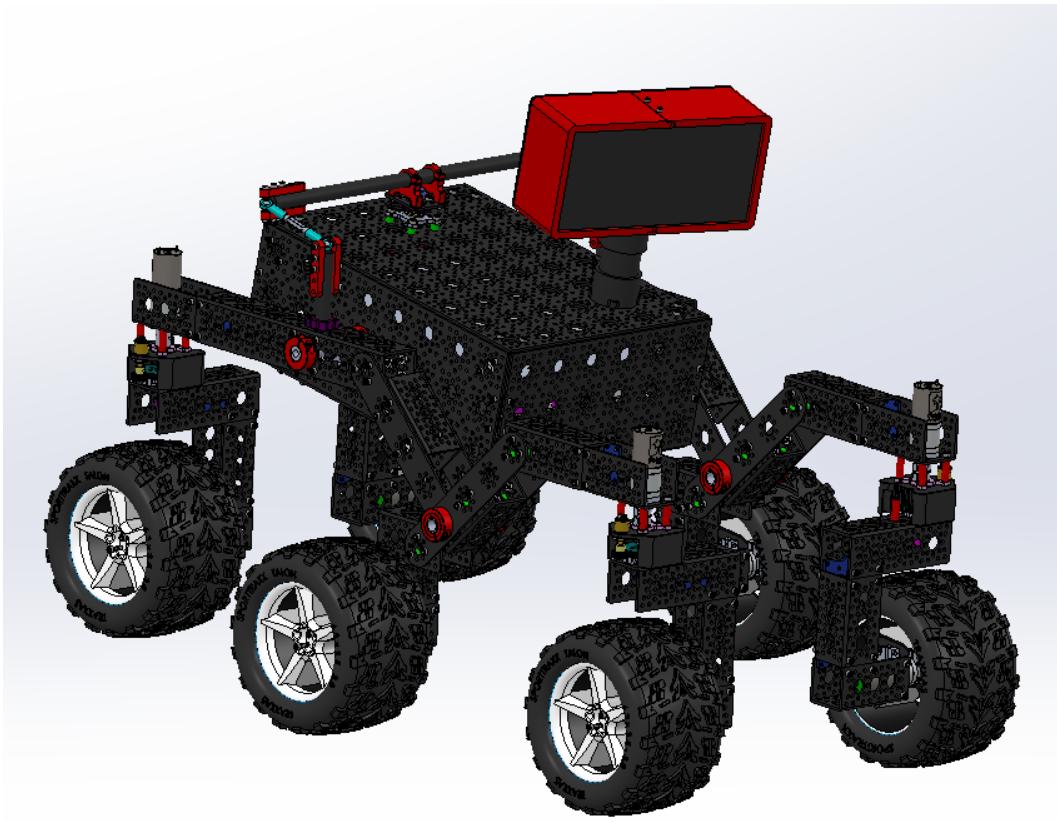


Figure 11: Final Mechanical Rover