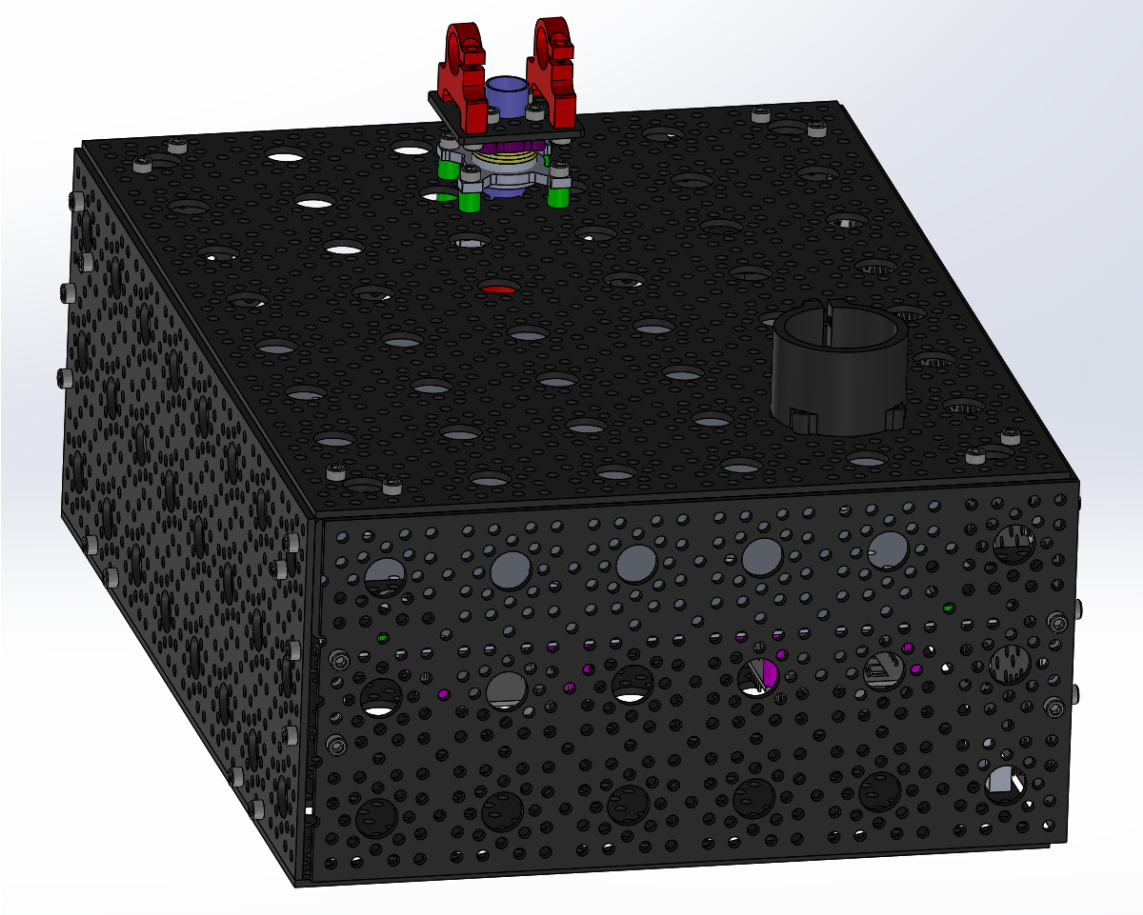

Open Source Rover: Body Assembly Instructions

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Contents

1 Machining/Fabrication Steps

1.1 Front/Back Aluminum Plates cuts

First you need to cut the 4.5x12 inch aluminum plate. Follow Figure 1 to cut it correctly to dimensions listed.

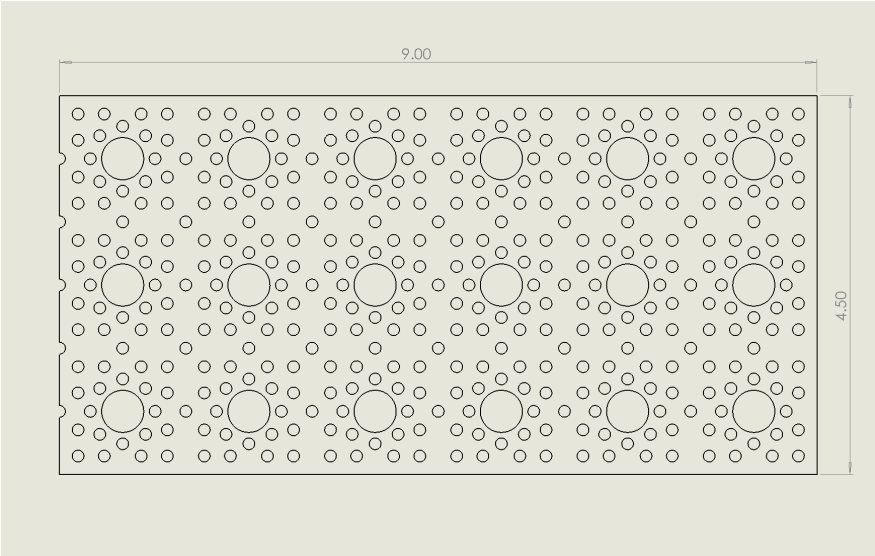


Figure 1: Cutting the front and back panels of the body

1.2 Laser Cut parts

In order to put the electronics inside the robot body we need an electronics board, one easy solution for this is to order a laser cut piece of acrylic. In the Body Assembly there is a folder for Laser cut parts. This contains two .DxF files which are 2D path files for the laser cutter. There are many inexpensive laser cutting website services, one example is:

- https://www.sculpteo.com

To get these parts from Sculpteo go to Laser cutting, and then upload these files, with mm selected as units. then hit next. Make sure scale is set to 100%, change the material to Acrylic, have thickness to 1/8, and then select whatever color you wish.

1.3 9x12 Aluminum Plate Drilling

Next we need to drill a hole in one of the 9x12 Aluminum plates **S35**. The reason for this is that we will need a hole of slightly greater than 0.5 in diameter for the differential pivot mount. There is already a hole drilled in the location we are wanting to use, it just needs to be widened. Start with the drill # 23, drill the hole shown by the figure 2. Repeat this with drill sizes stepping up until you get to drill of 0.5 in or slightly greater. Take the 0.5 in hallow rod **S19** and make sure it spins freely in the hole created. If not drill slightly larger or sand/file until it spins with no resistance [1]

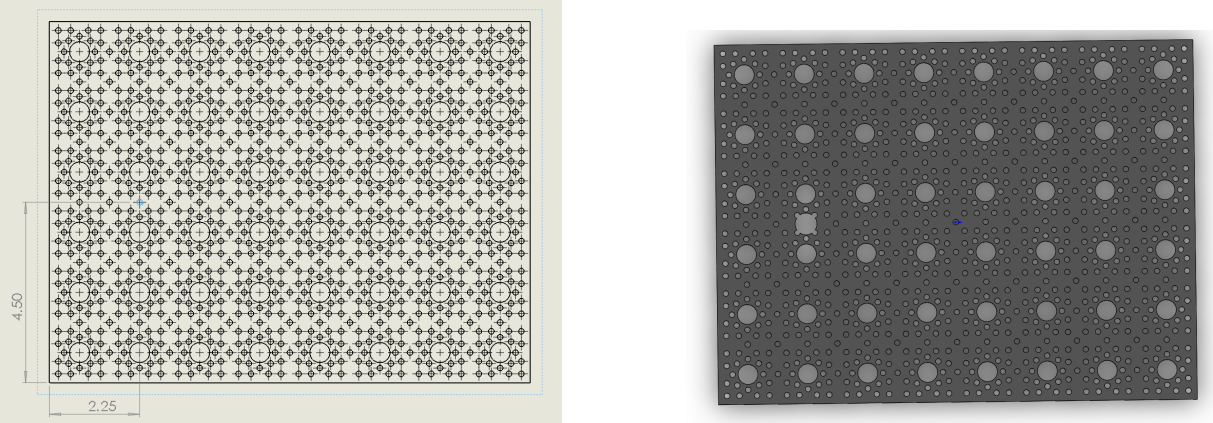


Figure 2: Drilling the Aluminum Plate

[1]The 0.5 in hallow rod must free spin while mounted inside the bearing blocks (See step 2.2 Differential pivot for example), it might help to follow 2.2 to test if there is enough clearance

2 Mechanical/Structural Assembly

2.1 Chassis

Parts/Tools Necessary

Item	Ref	Qty	Image	Item	Ref	Qty	Image
1.5 Inch Channel	S1	4		#6-32 x ⅜ Button head Screw	B2	16	
4.5x12 Aluminum Plate	S37	2		#6-32 x 1.0 Button head Screw	B6	4	
1 Inch PVC Clamp	S24	1		#6-32 Locking Hex Nut	B11	20	
12x9 Aluminum Plate	S35A	1		Allen Key set	N/A	1	
#6-32 x ¼ Button head Screw	B1	4		5/16 Wrench	NA	1	

1. **Attach the channels to the Top panel:** Take the modified 9x12 Aluminum plate **S35A** and attach the four 1.5inch channel connectors **S1** using screws **B2** at each of the corners as shown in 3. Make sure to use the inner circle as your holes for attaching and not the outter ones, where there won't be enough clearance for the hex nut.

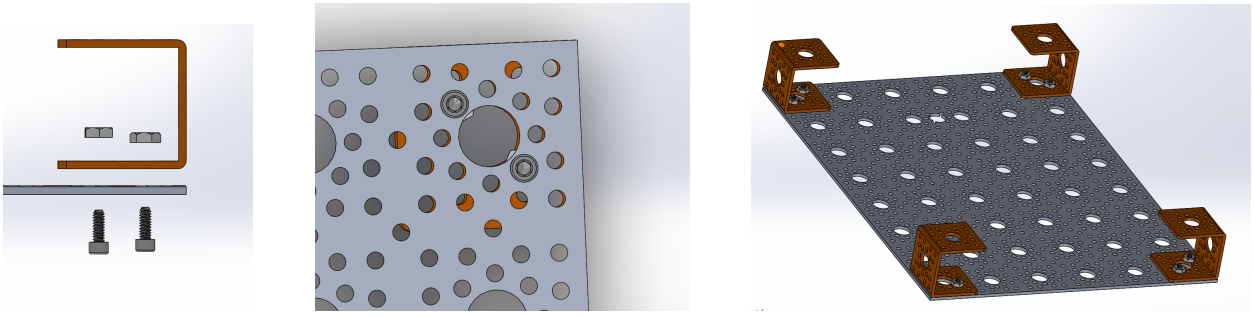


Figure 3: Attaching channels to aluminum plate

2. **Attach the side panels:** Attach the 4.5x12 plates **S37** to the channels using screws **B2** and hex nuts **B11**, again using the middle circle of holes for the screws and hex

nuts.

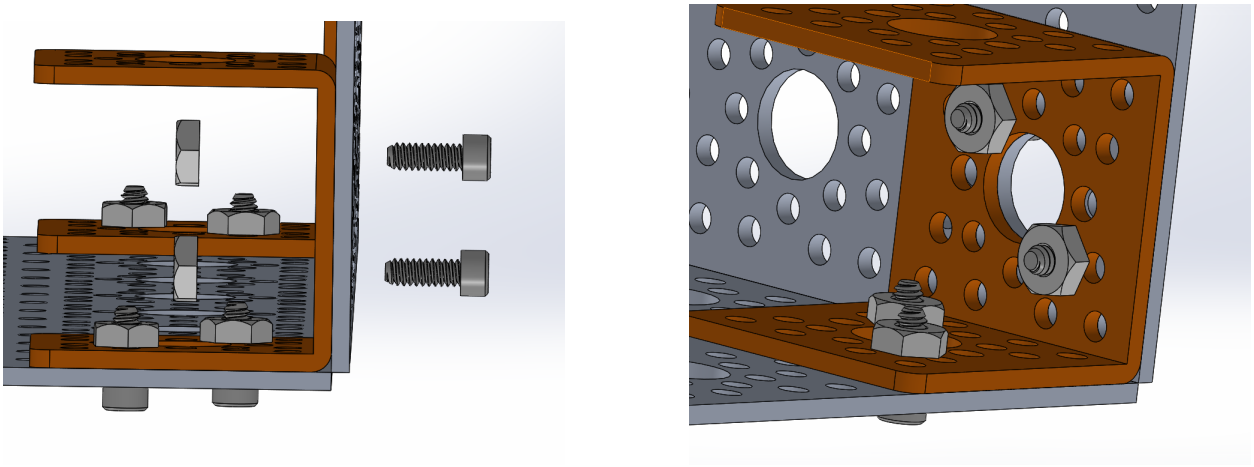


Figure 4: Attach the side panels

3. **Attach the PVC clamping hub:** Attach the 1' PVC bore clamping hub **S24** to the top plate of the body using screws **B1**. Figure 5 shows where we chose to mount ours.

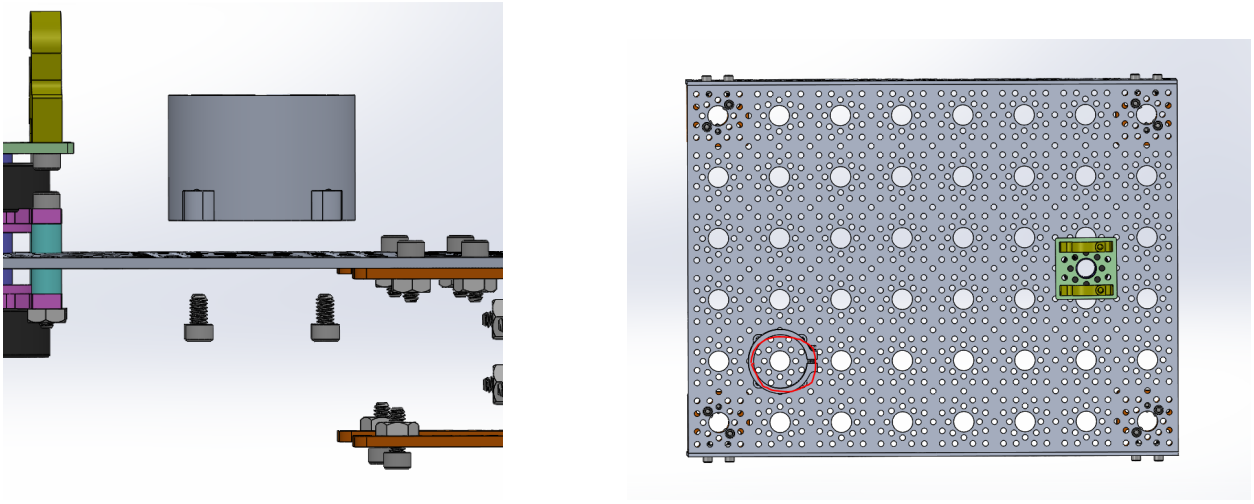


Figure 5: Attach the PVC clamp to top plate

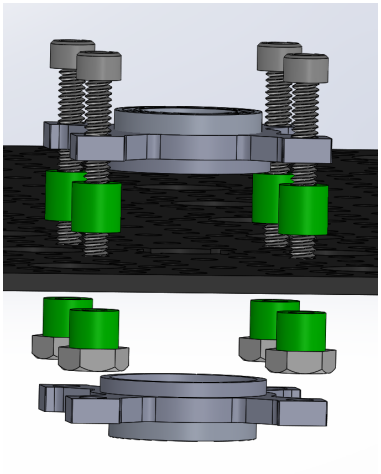
2.2 Differential Pivot Block

The differential pivot is used to transfer weight off of the wheel that is currently climbing to the other front wheel, allowing the rover to climb easier. Additionally it serves as a second contact point such that the body does not rotate freely about the cross rod.

Parts/Tools Necessary

Item	Ref	Qty	Image	Item	Ref	Qty	Image
Single Hole Pattern Bracket	S8	1		#6 x ¼ Spacer	T1	8	
0.5 Inch Pillow Bearing Block	S11	2		6-32 x 1/4 Button head Screw	B1	6	
0.5 Circular Clamping Hub	S13	1		6-32 x 1.0 Button head Screw	B6	4	
0.5 x 2 Inch Aluminum Rod	S19	1		0.5 Inch Plastic Washer	W3	3	
0.5 Inch Bottom Bore Clamp	S20	2		Allen Key set	N/A	1	
Collar Clamp	S22	1		5/16 Wrench	N/A	1	

1. **Mount the pillow bearing blocks:** Using spacers **T1**, screws **B6** and hex nut **B11** mount pillow blocks **S11** to the top of the body in the indicated location, over the hole we drilled in the plate earlier.



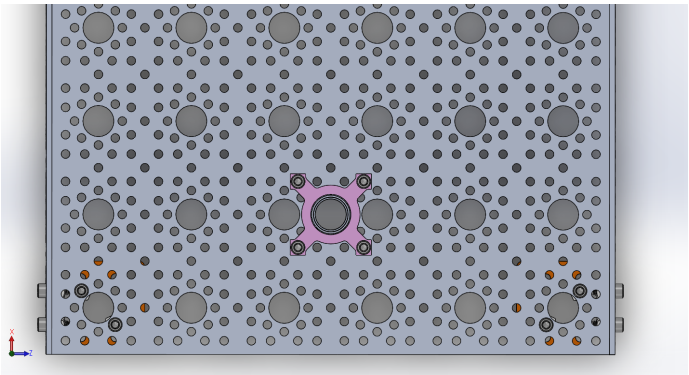


Figure 6: Mounting the pillow blocks

2.3 Electronics Board

Next is preparing the electronics board. This is where all the electrical components live, it will have the Raspberry Pi, all 5 RoboClaw Motor controllers, and the voltage regulators.

Parts/Tools Necessary

Item	Ref	Qty	Image	Item	Ref	Qty	Image
Raspberry Pi 3 Model B	E1	1		#2-56 x ⅜ Threaded Standoff	T8	2	
RoboClaw	E2	5		6-32 x ½ Socket Head Cap Screw	B3	4	
5V Regulator	E4	1		4-40 x 1/4 Button head Screw	B8	72	
#6 x ¼ Spacer	T1	4		M2.5 x 11mm Screw	B10	12	
4-40 x ¼ Threaded Standoff	T4	8		#2-56 x 3/16 Button head Screw	B13	4	
4-40 x ½ Threaded Standoff	T5	12		6-32 Locking Hex Nut	B11	4	
4-40 x ¾ Threaded Standoff	T6	8		6-32 Washer	W1	12	
M2.5 x 11mm	T7	4		Alley Key set	N/A	1	
				5/16 Wrench	N/A	1	

1. **Attaching the Standoffs** There are a few different standoffs here. The height differences are to allow access to the micro USB port on the RoboClaws, and the Raspberry Pi has it's own different standoffs as it's metric. In the below picture the colors correspond as follows: Green:**T4**, Blue:**T5**, Pink:**T6**, Cyan:**T7**, Yellow:**T8**. Use the screw that corresponds to the spacer used.

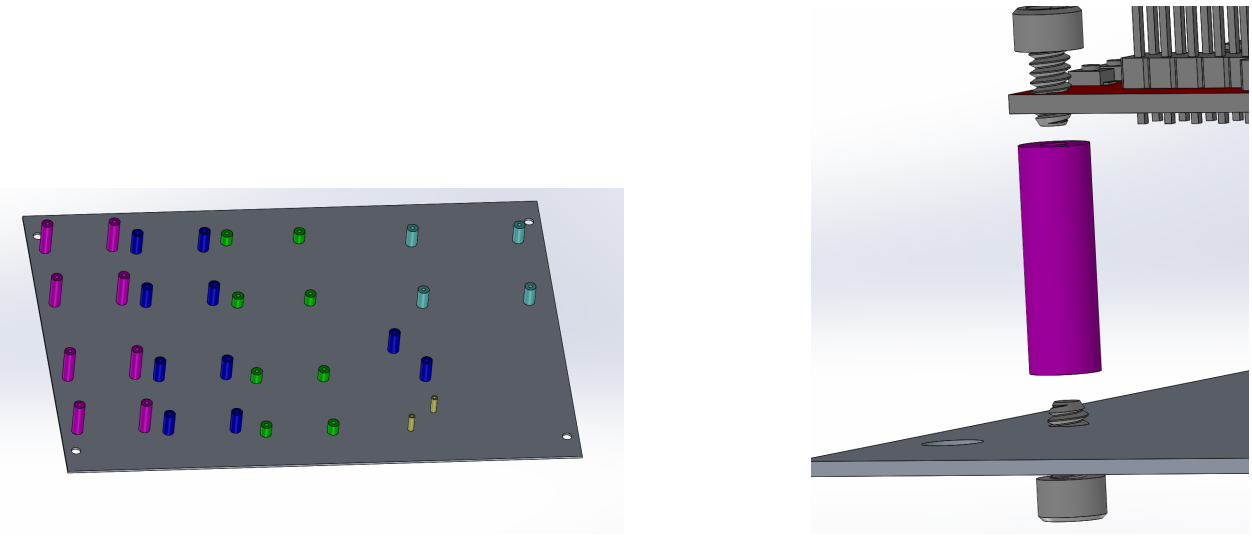


Figure 7: Electronics Board Step 1

2. **Mounting the Electronics:** Take the Raspberry Pi **E1**, RoboClaws **E2**, and voltage regulators **E3 and E4** and mount them in the locations designated by the below picture, again using the screws **B8 and B10** corresponding with each standoff.

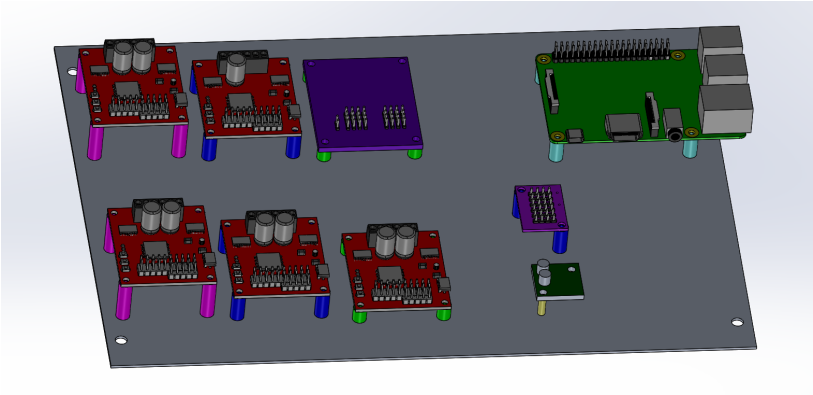


Figure 8: Electronics Board Step 2

3. **Mounting Electronics into Chassis:** Now that the electronics are on the board we can mount it into the Chassis. Using screws **B3**, 3x washers **W1** per corner, and hex nuts **B11** attach the electronics board to the chassis [2]

[2]The washers are to give small amount of space more needed to put the Voltage monitor in the system. add pics of clearance

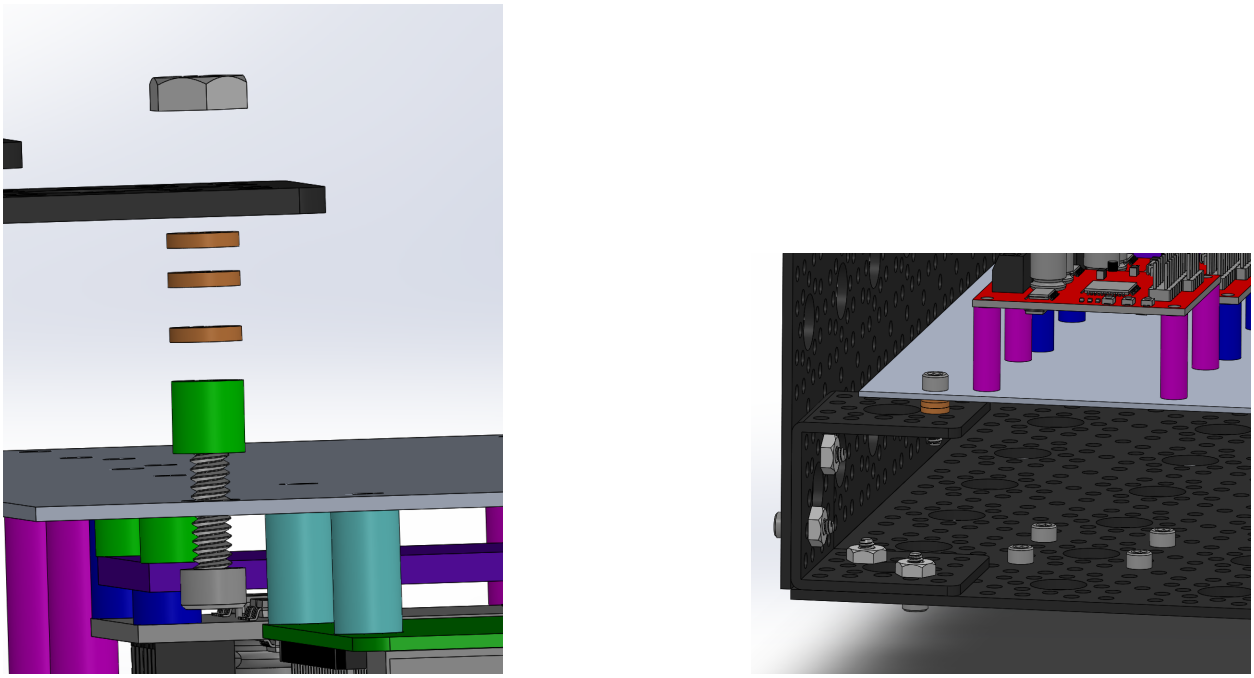


Figure 9: Electronics Board Step 3

2.4 Closing the Body

Parts/Tools Necessary

Item	Ref	Qty	Image	Item	Ref	Qty	Image
Dual Side Mount A	S17	8		6-32 x ¼ Button head Screw	B1	24	
4.5x9 Aluminum Plate (Modified)	S37A	1		6-32 x ⅜ Button head Screw	B2	8	
4.5x9 Aluminum Plate (Modified)	S37B	1		Allen Key set	N/A	1	
9x12 Aluminum Plate	S35	1					

1. **Attach the Dual Side Mounts:** Put Dual Side Mounts A **S17**, and screws **B1** in the locations shown in Figures 10.

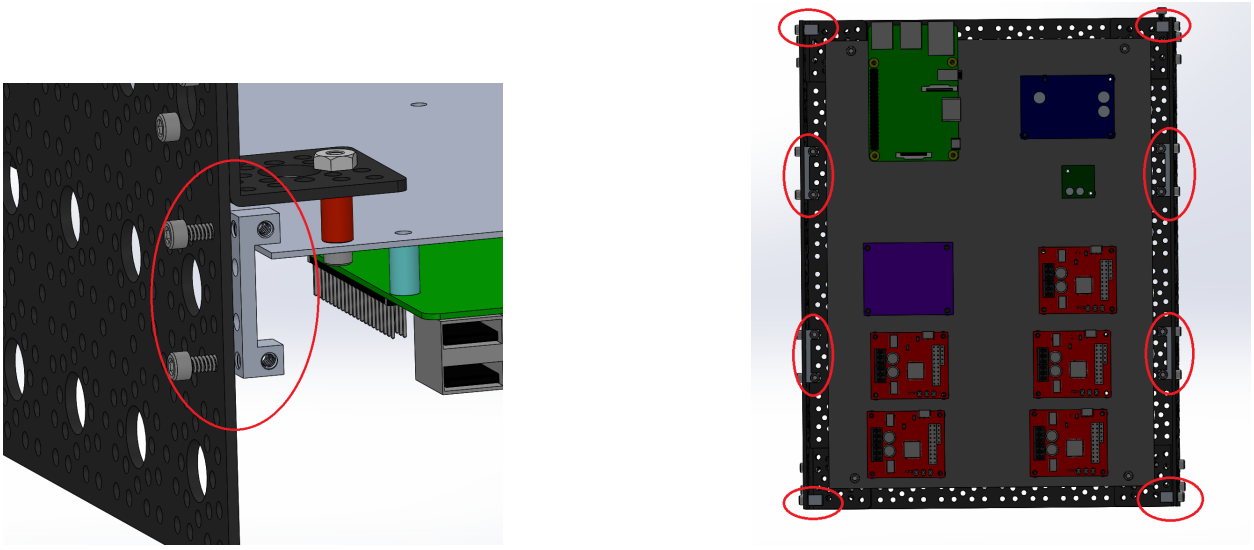


Figure 10: Dual Side Mount A locations

2. **Attach the front/back panel:** Attach the Acrylic back panel **S37B** to the "back" of the body using screws **B2**, the side with the raspberry pi. The cutout should line up with the USB ports. Repeat this with the front of the body with **S37A**

Figure 11: Mounting the front/back panels

3. **Attach the bottom panel:** Attach the 9x12 Aluminum Plate **S35** using screws **B1**.

   At this point the body should be complete with the differential pivot mount, electronics, and chassis, and should look like the following.

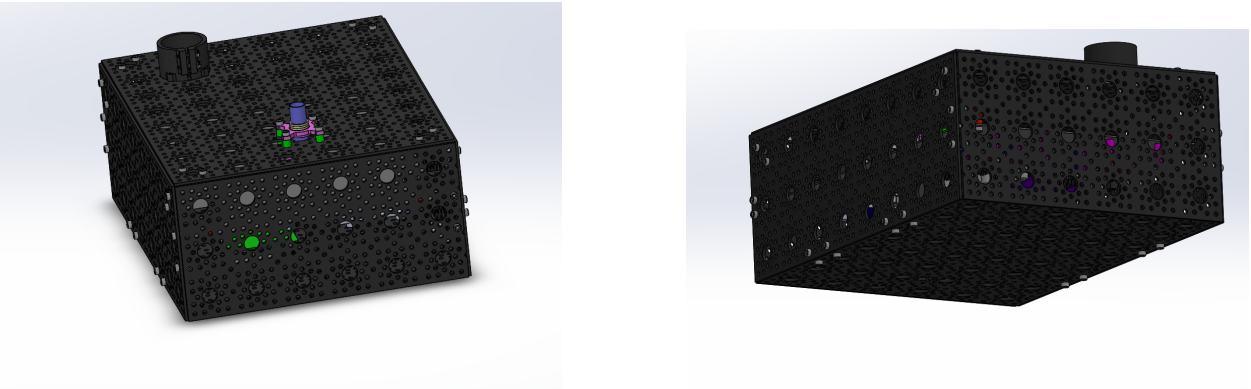


Figure 12: Finished Body Assembly