

# Open Source Rover

## Body Assembly Instructions



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# 1 Machining/Fabrication Steps

## 1.1 Front/Back Aluminum Plates cuts

If you use the 4.5x12 inch aluminum Plates for the front/back plates of the body of the rover then they will need to be cut down to fit the rest of the body.

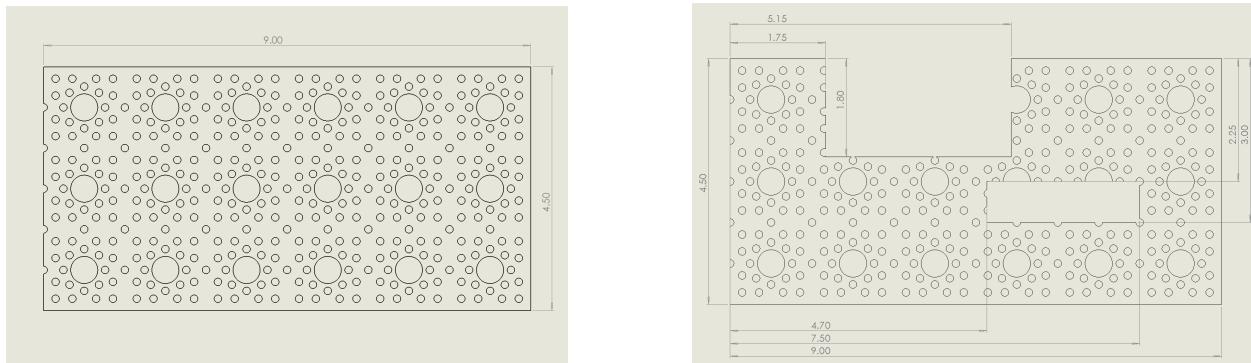


Figure 1: Cutting the front and back panels of the body

## 1.2 Electronics Board

In order to mount all the electronics on the inside of the rover we will want to drill some holes in the 8 x 11 Aluminum Plate **S28**. As it is the same size as a standard piece of paper we suggest the best way to do this is printing out the drawing in [add file for print layout](#) and marking the holes that way.

## 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

## **1 MACHINING/FABRICATION STEPS 1.3 9x12 Aluminum Plate Drilling**

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or sand/file until it spins with no resistance <sup>1</sup>

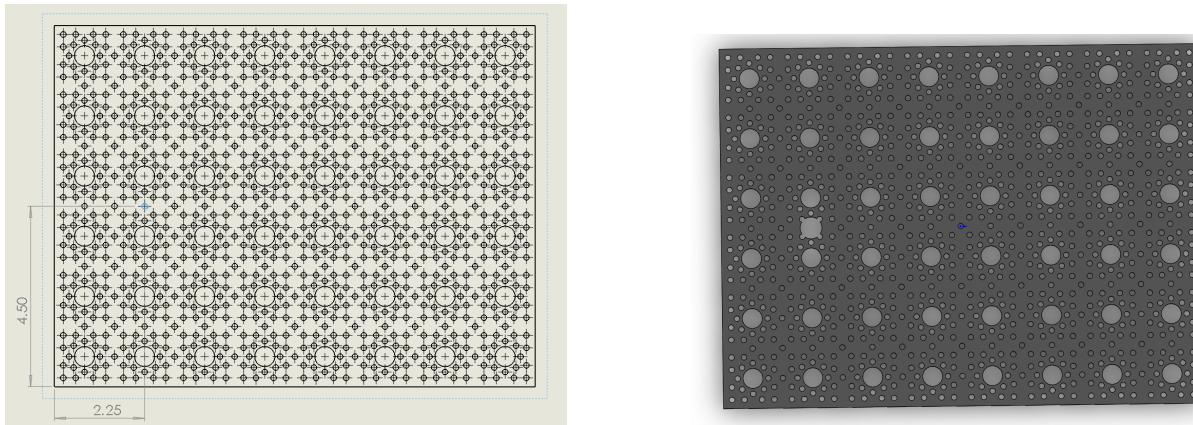


Figure 2: Drilling the Aluminum Plate

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<sup>1</sup>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

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## 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 ¾ 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 outer ones, where there won't be enough clearance for the hex nut.

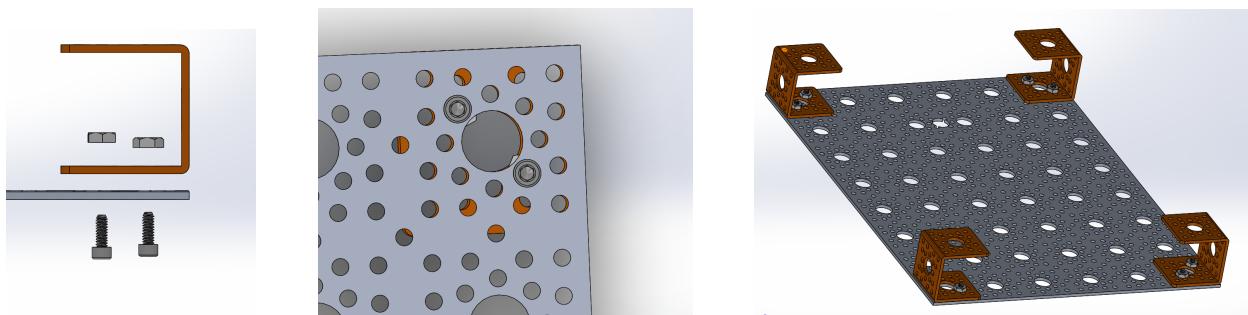


Figure 3: Attaching channels to aluminum plate

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

## **2 MECHANICAL/STRUCTURAL ASSEMBLY 2.2 Differential Pivot Block**

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nuts.

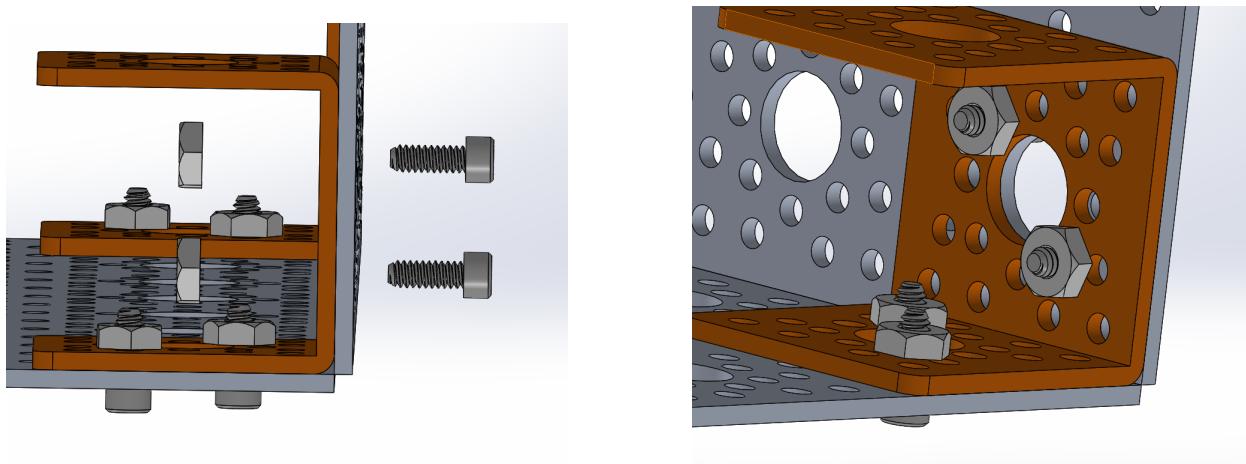


Figure 4: Attach the side panels

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.

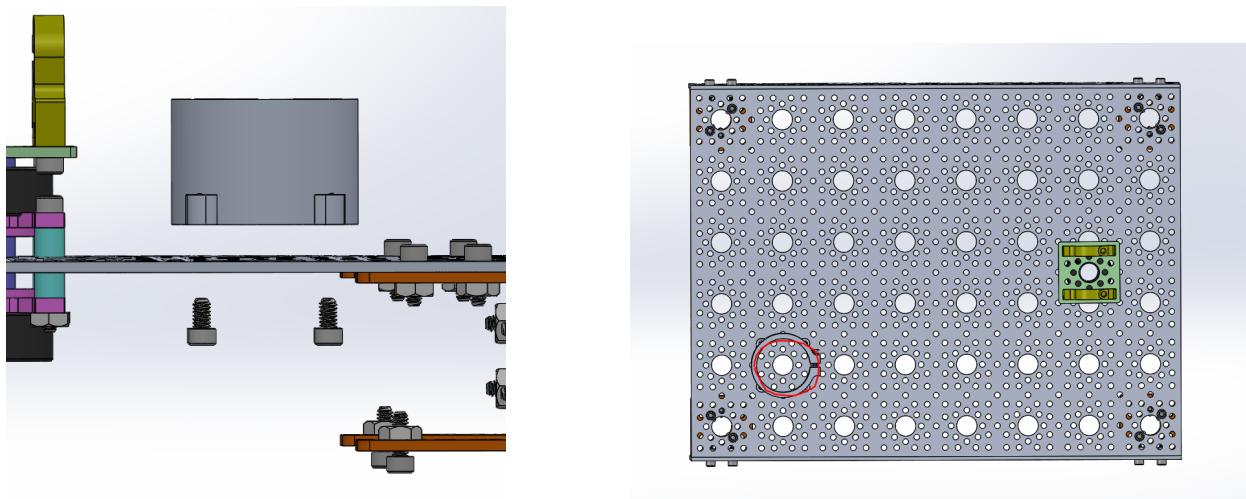


Figure 5: Attach the PVC clamp to top plate

### **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 1/4 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.

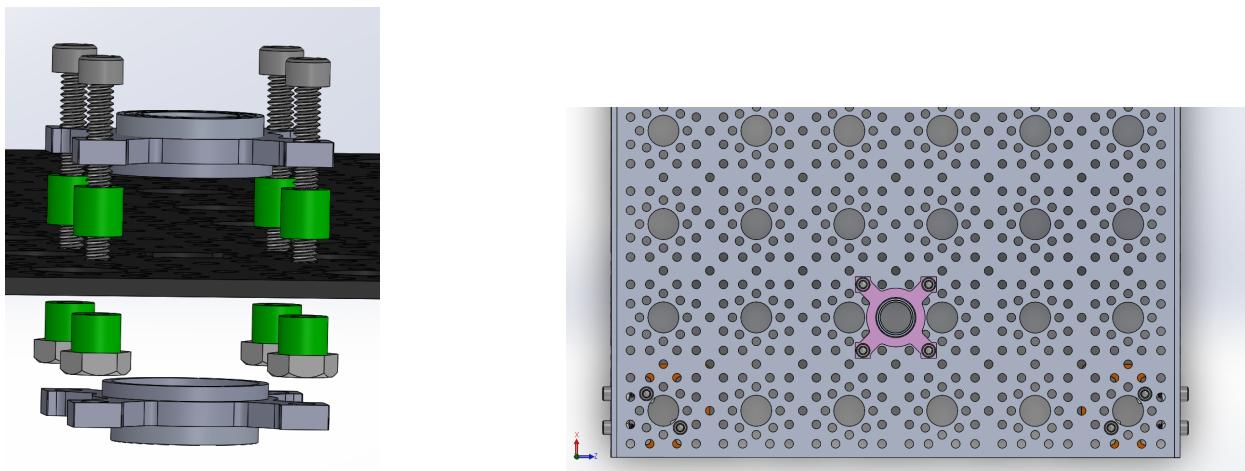


Figure 6: Mounting the pillow blocks

## 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 3/8 Threaded Standoff	T8	2	
RoboClaw	E2	5		6-32 x 1/2 Socket Head Cap Screw	B3	4	
12V Buck Boost Regulator	E3	1		4-40 x 1/4 Button head Screw	B8	72	
5V Regulator	E4	1		M2.5 x 11mm Screw	B10	12	
#6 x 1/4 Spacer	T1	4		#2-56 x 3/16 Button head Screw	B13	4	
4-40 x 1/4 Threaded Standoff	T4	8		6-32 Locking Hex Nut	B11	4	
4-40 x 1/2 Threaded Standoff	T5	12		6-32 Washer	W1	12	
4-40 x 3/4 Threaded Standoff	T6	8		Alley Key set	N/A	1	
M2.5 x 11mm	T7	4		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 its 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.

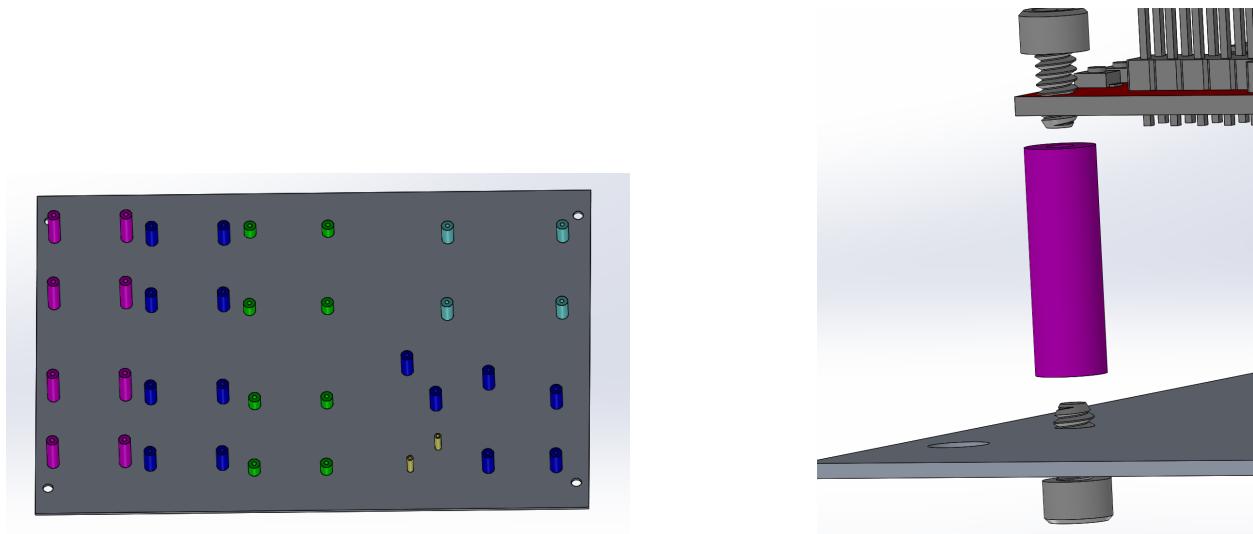


Figure 7: Electronics Board Step 1

**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.

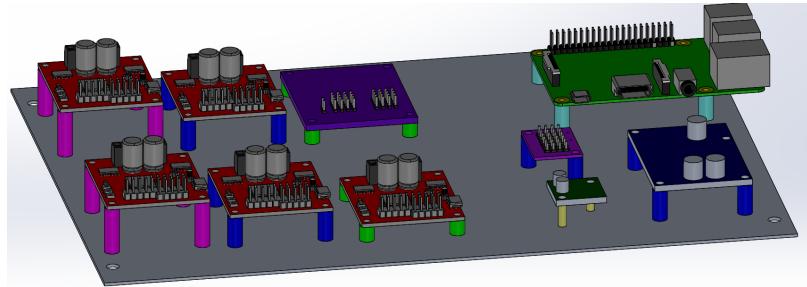


Figure 8: Electronics Board Step 2

**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 <sup>2</sup>

<sup>2</sup>The washers are to give small amount of space more needed to put the Voltage monitor in the system.  
add pics of clearance

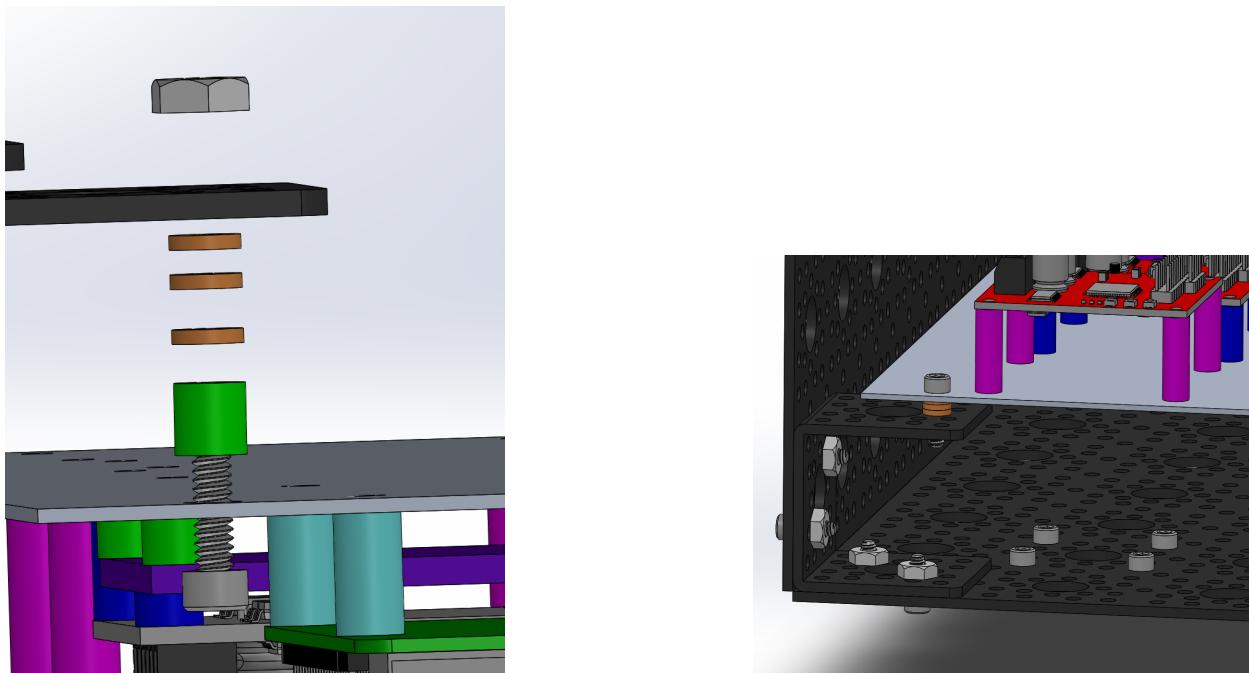


Figure 9: Electronics Board Step 3

## 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 1/4 Button head Screw	B1	24	
4.5x9 Aluminum Plate (Modified)	S37A	1		6-32 x 3/8 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.

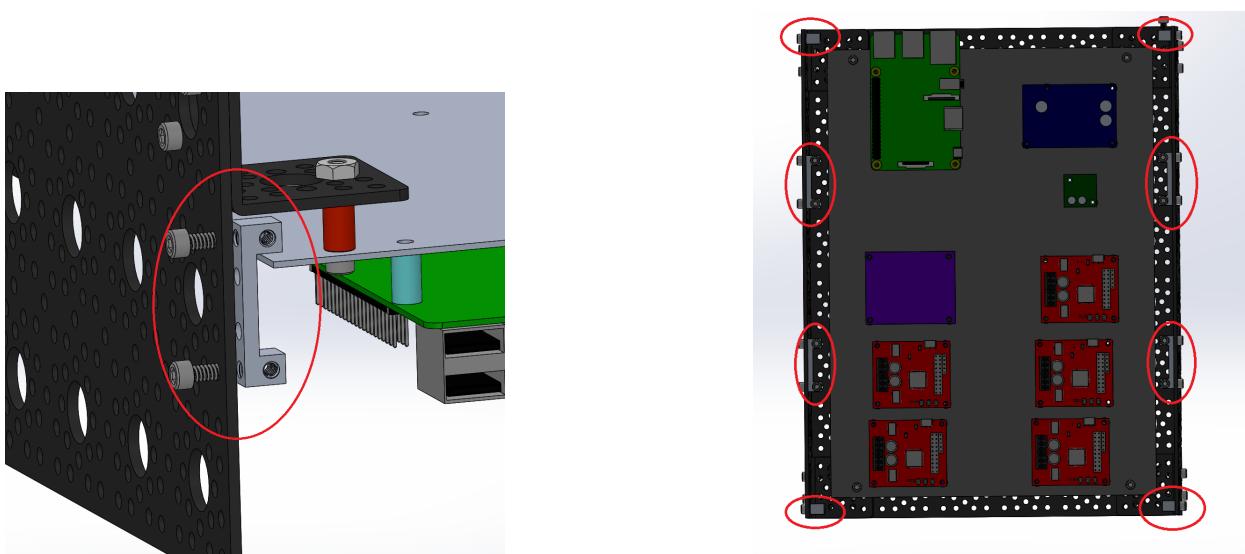


Figure 10: Dual Side Mount A locations

2. **Attach the front/back panel:** Attach the 4.5x9 Aluminum Plate (Modified) **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. Repeate 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.

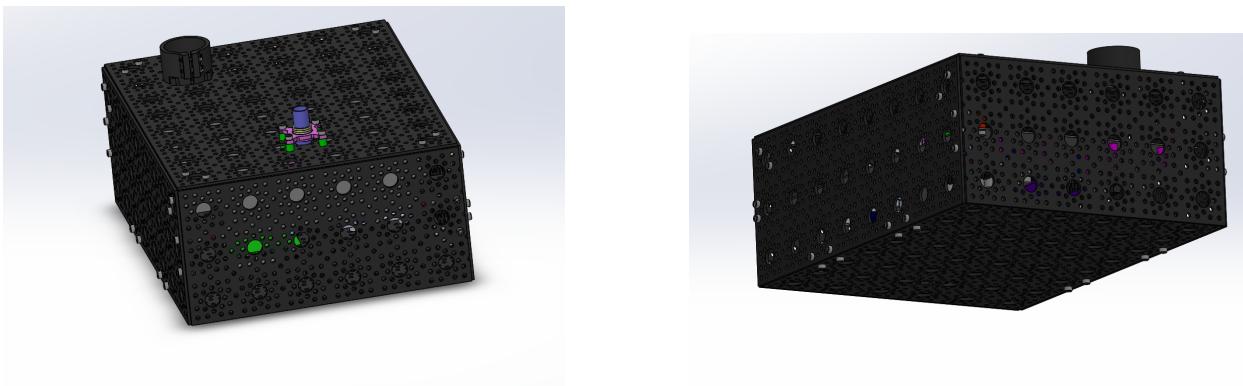


Figure 12: Finished Body Assembly