

Open Source Rover: Differential Pivot Assembly Instructions

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1 Machining/Fabrication

1.1 Aluminum Rods: Cutting

Table 1: Parts/Tools Necessary

| Item | Ref | Qty | Image | Item | Ref | Qty | Image |
|-------------------------|-----|-----|---|--------------------------|-----|-----|---|
| 0.5" x 3' Aluminum Tube | S16 | 1 |  | Metal Hacksaw or Bandsaw | D4 | |  |
| 0.5" x 4" Aluminum Tube | S18 | 4 |  | Vice clamp or C Clamps | D5 | |  |

Take the 3 foot piece of 0.5 inch aluminum rod **S16** and cut it into one 15 inch piece and one 13.5 inch piece. These will now be referred to as the parts **S16A** and **S16B** respectively. In addition, take two of the 4 inch aluminum rods **S18** and cut them down to 3 inches in length as well.

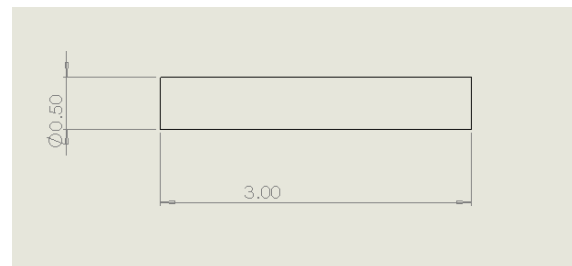


Figure 1: Aluminum Rod cutting

1.2 Aluminum Rods: Drilling

Table 2: Parts/Tools Necessary

| Item | Ref | Qty | Image | Item | Ref | Qty | Image |
|---|------|-----|---|--------------------------------------|-----|-----|---|
| 0.5" x 13.5" Aluminum Tube (Modified) | S16B | 1 |  | Hand Drill or Drill Press | D3 | |  |
| 0.5" x 3" Aluminum Tube (Modified) | S18A | 2 |  | Center punch or Starter drill bit | D7 | |  |
| Vice or V-Clamp | D8 | |  | Drill bit #23 | D6 | |  |

The turnbuckles must be attached to the differential pivot and rocker-bogie arm. We will accomplish this by drilling holes in the aluminum beam **S16** and attaching two 5-hole aluminum bars on each side.

Using a vice or clamp, firmly grab onto the 0.5 x 13.5 inch rod **S16B** with the end extending out around 2 inches from the edge of the vice/clamp. Mark the dimensions as shown in Figure 2. Carefully use a center drill to start the a center hole for these holes. It is important that the center hole is as centered as possible to prevent the bit from walking/slipping during drilling, which could result in the bit breaking. Then, use a #23 (0.154 inch diameter) drill bit and drill all the way through both sides of the rod. This makes the **S16B'** part.



Figure 2: Drilling the Differential pivot rod

Test the holes by taking the 5 Hole Aluminum Beams **S21** and screws **B7** and making sure that the screws go all the way through as shown in Figure 3. If they do not fit, you can file/drill the hole out until they do pass all the way through¹.

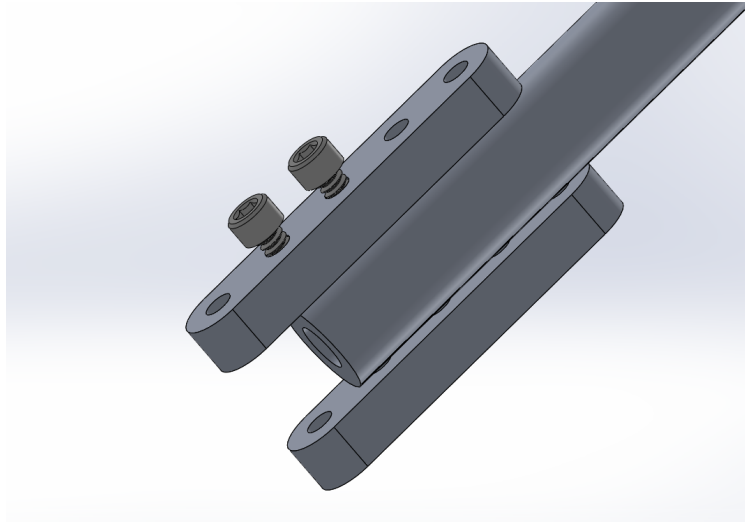


Figure 3: Testing the differential pivot holes

Flip the rod around and repeat the steps for the other side, making sure to align the holes' axes as much as possible such that the holes are all parallel to the previous set.

Next, take two of the 0.5x3 inch hollow rods **S18** and create the same set of holes as before, showed again in Figure 4 (this time, drill holes on just one end of each of the rods). Test each of the sets of holes to make sure the 5-hole aluminum beams will attach to each of the rods. These will now be the part **S18B**.

¹The hole size on the Aluminum Beam **S21** is halfway between a # 4 and # 6 screw; we used the # 6 screws and just used a hex key to drive the screw through the holes in beam, effectively tapping them as well.

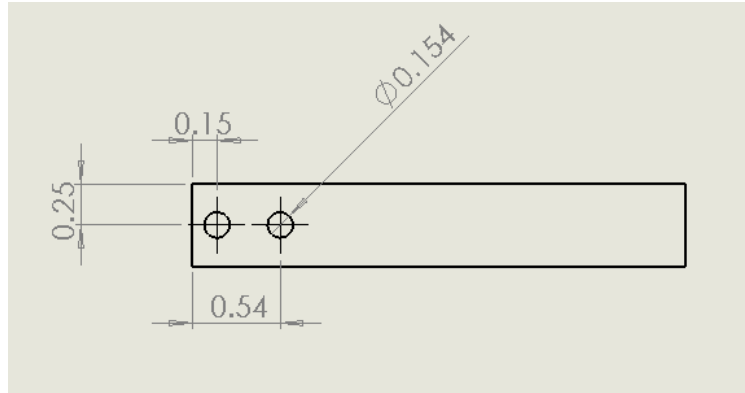

















Figure 4: Drilling the smaller rods

2 Mechanical Assembly

Table 3: Parts/Tools Necessary

| Item | Ref | Qty | Image | Item | Ref | Qty | Image |
|---------------------------------------|------|-----|---|-------------------------------|-----|-----|---|
| Single Pattern Bracket | S8 | 1 |  | #6-32x1.25" Button Head Screw | B7 | 8 |  |
| 0.5" Circular Clamping Hub | S13 | 1 |  | #4-40x1.25" Button Head Screw | B9 | 4 |  |
| 0.5" Bottom Bore Clamp | S20 | 2 |  | #6-32 Locking Hex Nut | B11 | 8 |  |
| 0.5" x 13.5" Aluminum Tube (Modified) | S16B | 1 |  | #4-40 Locking Hex Nut | B12 | 4 |  |
| 0.5" x 3" Aluminum Tube (Modified) | S18B | 2 |  | #4-40 Washer | W2 | 24 |  |
| 5 Hole Aluminum Beam | S21 | 8 |  | Allen Key Set | D2 | |  |
| RC Turnbuckles | S32 | 2 |  | Wrench Set | D1 | |  |
| #6-32x1/4" Button Head Screw | B1 | 8 |  | | | | |

1. **Build clamping hub assembly:** Attach the the bottom bore clamping hubs **S20** to the single pattern bracket **S8** using screws **B1**. Then mount the 0.5" clamping hub **S13** to the bottom of this assembly using **B1** screws.

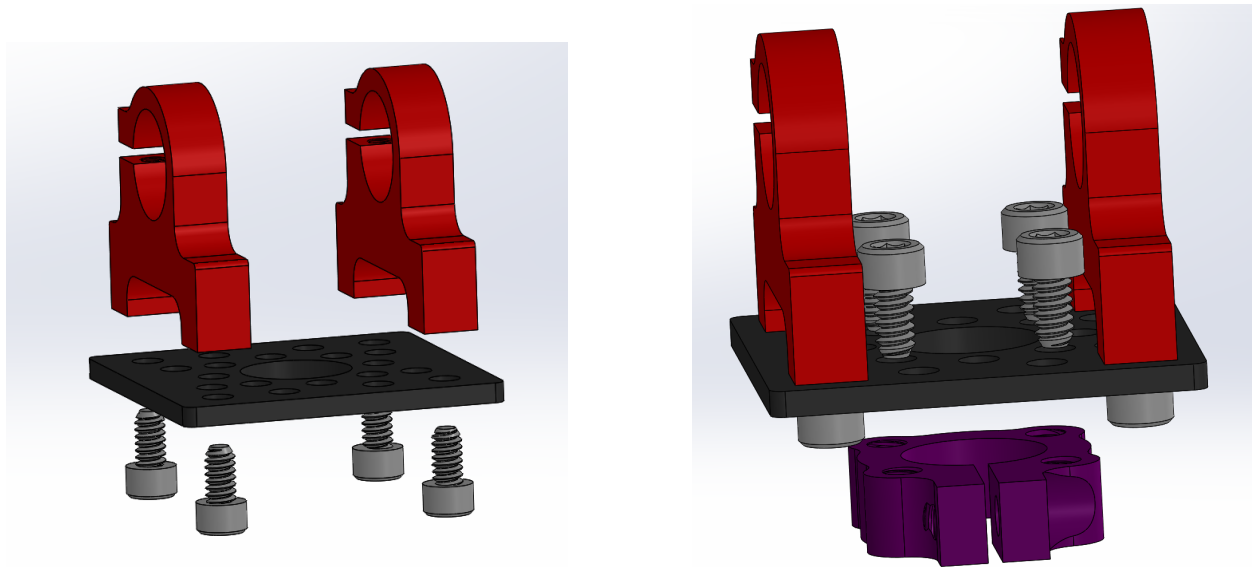


Figure 5: Attaching clamping hub

2. **Differential Pivot:** Attach the turnbuckle **S32** to the modified 13.5-inch aluminum rod **S16B** as shown using the 5-hole aluminum bars **S21**, washers **W2**, screws **B7** and **B9**, hex nuts **B11** and **B12**. The outermost screw is the #4 screw, the others are #6.

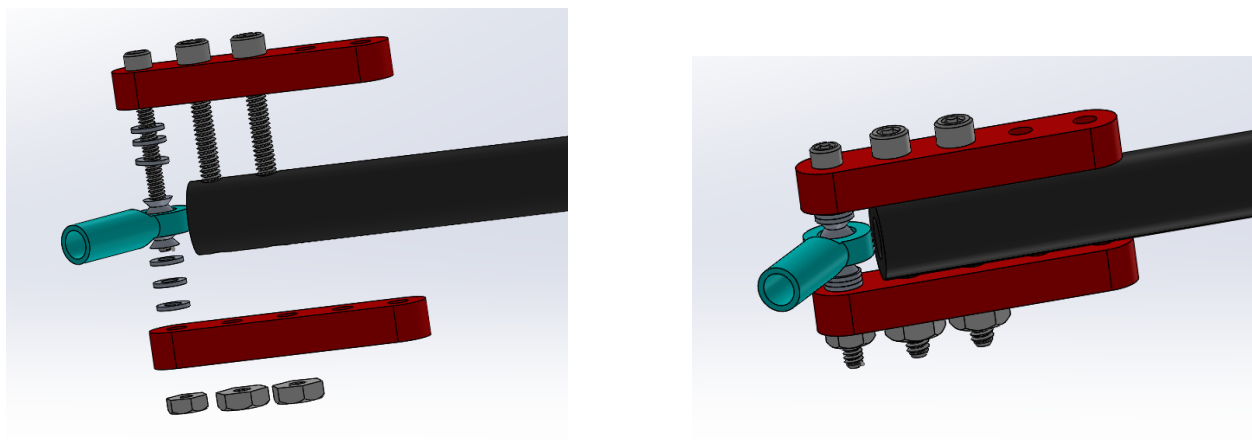


Figure 6: Attaching the turnbuckle

3. **Differential Pivot continued:** Pass the 13.5inch rod through the clamping hub assembly, making sure to center it as much as possible. Then repeat step 2 for the other side of the differential pivot. If necessary, unscrew the turnbuckles (by twisting

the middle) to insert the rods into place, then screw the turnbuckle back together.

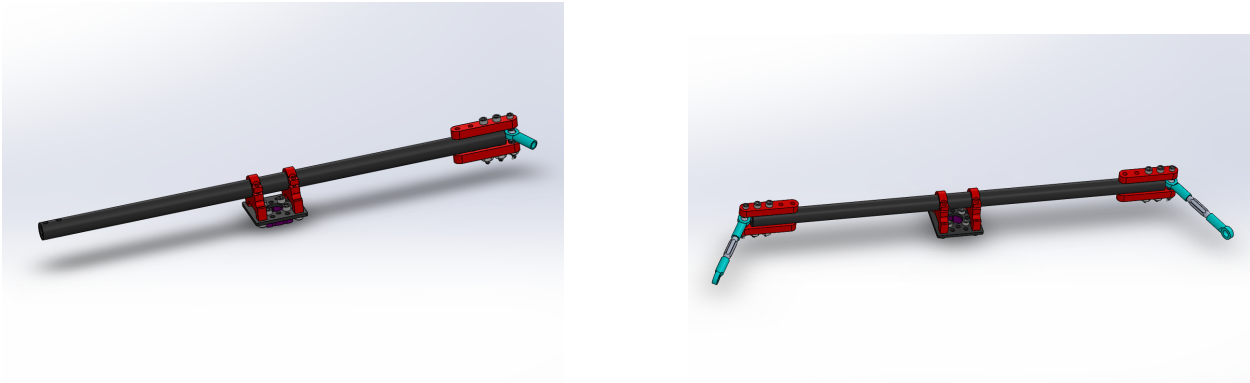


Figure 7: Attaching the top of the Differential Pivot

4. **Differential Pivot Vertical rods:** Repeat step 2 on each of the the 3 inch aluminum rods **S18B**. Finally, attach all the pieces of the turnbuckles together. Your differential pivot is now complete.



Figure 8: Final Differential Pivot Assembly