

Open Source Rover: Head Assembly Instructions

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1 3D printing

There are a few components that need to be 3D printed to make the head assembly. You can find the STL files necessary for these prints in the "Mechanical/Head Assembly/3D Printed Parts" folder of the repository.

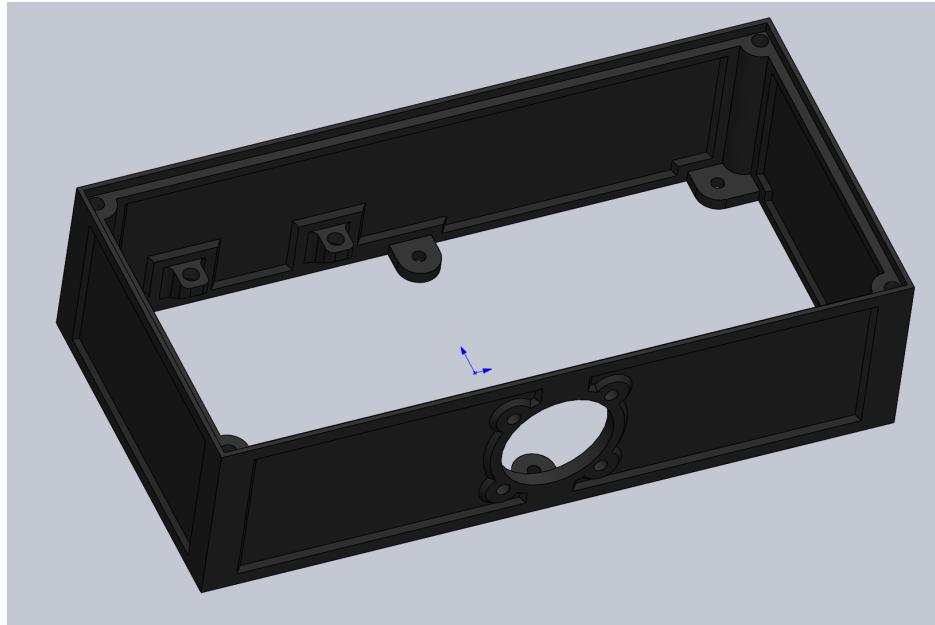


Figure 1: 3D printed Head piece

If you do not have a 3D printer there are a number of online 3D printing services available, an example of which can be found at:

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

Print the "head base.STL" piece from the "Mechanical/Head Assembly/3D Printed Parts" folder.

2 Laser Cutting

There is an acrylic plate which mounts the arduino into the head, as well as a back plate for the panel of the head. The 2D cutout files are the .DXF files and can be found in the GitHub repository in the "Mechanical/Head Assembly/Laser Cut Parts" folder.

If you do not have access to a lasers cutter there is an online service which you can order these from below:

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

To get the above parts from Sculpteo, go to Laser cutting and then upload the .DXF files (**make sure**

3 MACHINING/FABRICATION

you select mm as units!). Hit Next. Make sure scale is set to 100%, change the material to Acrylic, set thickness to 1/8 inch, and then select whatever color you wish.

3 Machining/Fabrication

3.1 Cutting the PVC Pipe

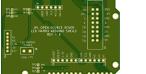
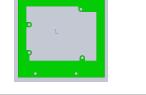
Table 1: Parts/Tools Necessary

| Item | Ref | Qty | Image | Item | Ref | Qty | Image |
|--------------------|-----|-----|---|------------------|-----|-----|---|
| 1" PCV Pipe | S29 | 1 |  | Vice or V-Clamps | D8 | |  |
| HackSaw or Bandsaw | D4 | |  | | | | |

Take the PVC pipe **S29** (this will be the "neck" of the rover) and cut it to your desired length. You can make your rover's neck as long as you'd like, but for reference we cut our "neck" PVC pipe to be roughly 6 inches long.

4 Mechanical Assembly

Table 2: Parts/Tools Necessary

| Item | Ref | Qty | Image | Item | Ref | Qty | Image |
|--------------------------------|------|-----|---|------------------------------|-----|-----|---|
| 3D Printed Head | S43 | 1 |  | #6-32x3/8" Button Head Screw | B2 | 4 |  |
| LED Matrix | E37 | 1 |  | #4-40x1/4" Button Head Screw | B8 | 12 |  |
| Bore Clamping Hub for 1" PVC | S24 | 1 |  | M2.5 x 6mm | B10 | 8 |  |
| PVC Pipe (Modified) | S29A | 1 |  | Arduino Sheild | E2 | 1 |  |
| M3 x 6mm Socket Head Cap screw | B14 | 6 |  | Laser Cut Arduino Plate | S44 | 1 |  |
| Laser Cut Head Back Panel | S42 | 1 |  | Arduino Uno | E24 | 1 |  |
| M2.5 x 10mm | T10 | 4 |  | #4-40 Heat Set Insert | I1 | 8 |  |

- Assemble the Arduino Stack:** Begin by stacking together the Arduino Uno **E24**, Arduino Shield **E2**, Standoffs **T10**, Screws **B10**, and Arduino Plate **S44** and fastening them as shown in Figure 2.

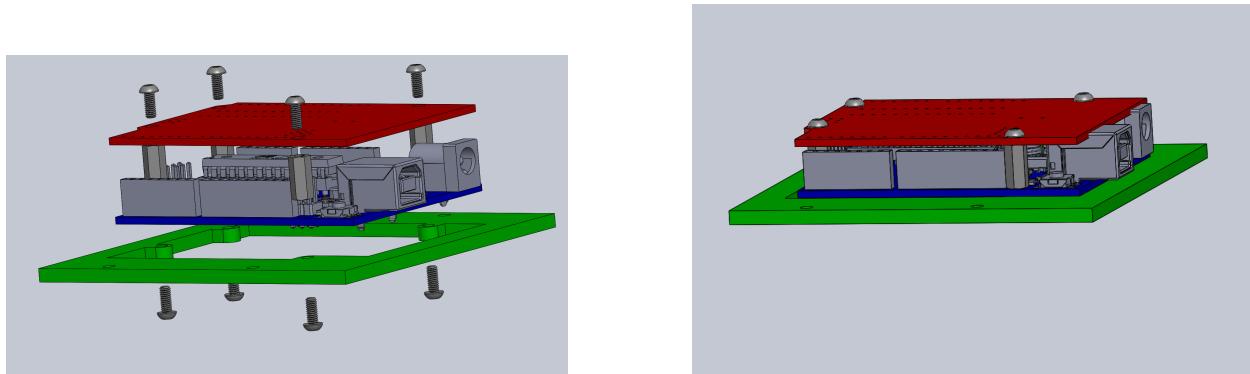


Figure 2: Building Arduino Stack

- Inserting the Heat set inserts:** Insert the # 4-40 Heat Set Inserts **I1** into the 3D printed head (using a Solder Iron at 460 degrees F) in the locations shown in Figures 3 and 4. For more information

4 MECHANICAL ASSEMBLY

on using heat set inserts, see:

- <https://www.lulzbot.com/learn/tutorials/heat-set-inserts-tips-and-tricks>

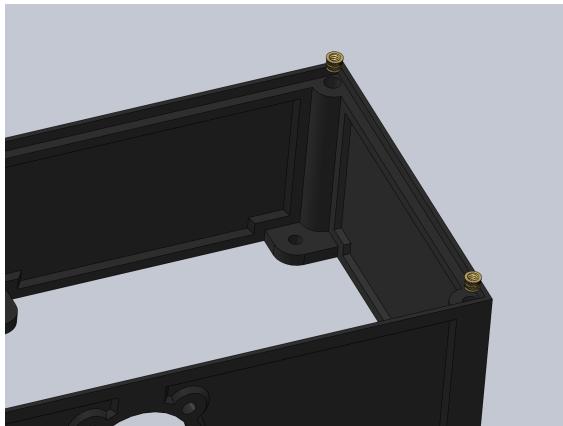


Figure 3: Back panel Inserts

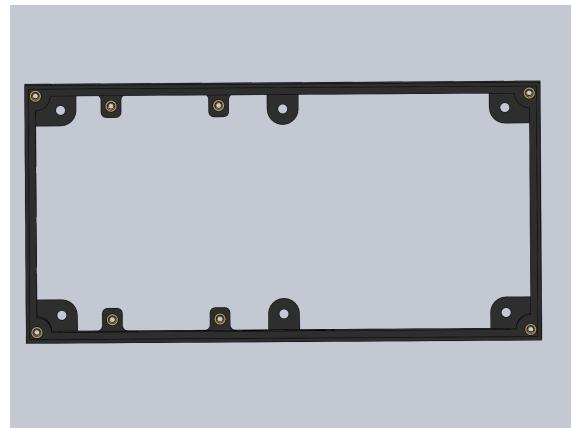


Figure 4: Arduino Inserts

3. **Mount the PVC clamping hub:** Using screws **B2**, attach the PVC clamping hub to the bottom of the 3D printed head.

4 MECHANICAL ASSEMBLY

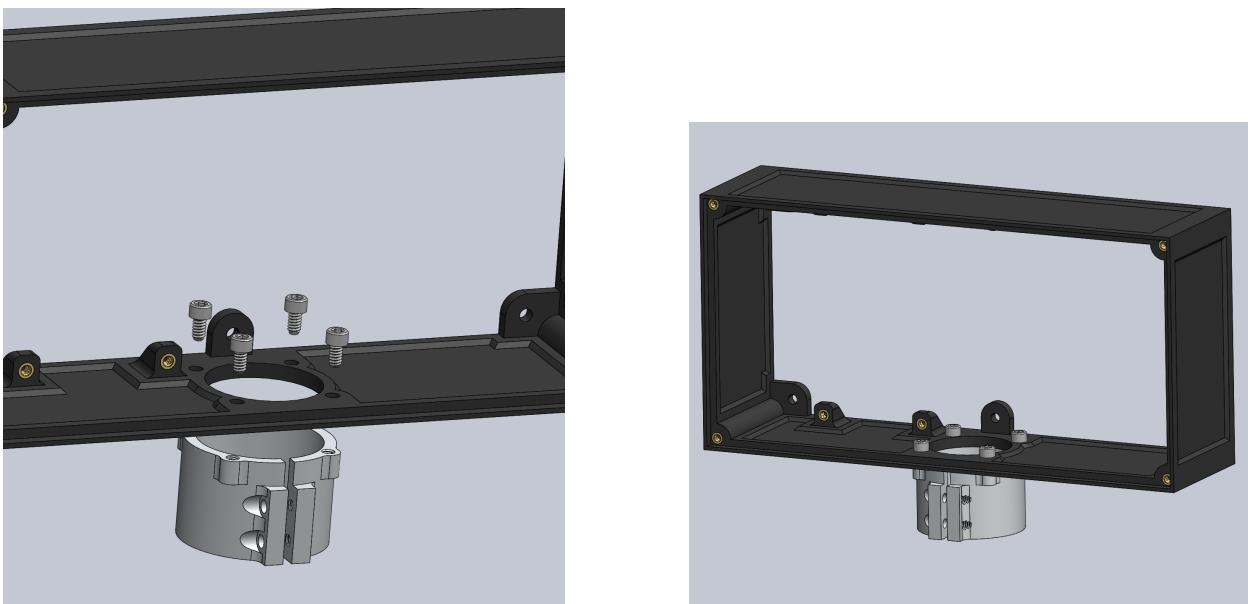


Figure 5: PVC Clamping hub Mount

4. **Attach PVC Pipe:** Slot the PVC pipe **S29** into the clamping hub and then tighten down the screws on the clamping hub

4 MECHANICAL ASSEMBLY

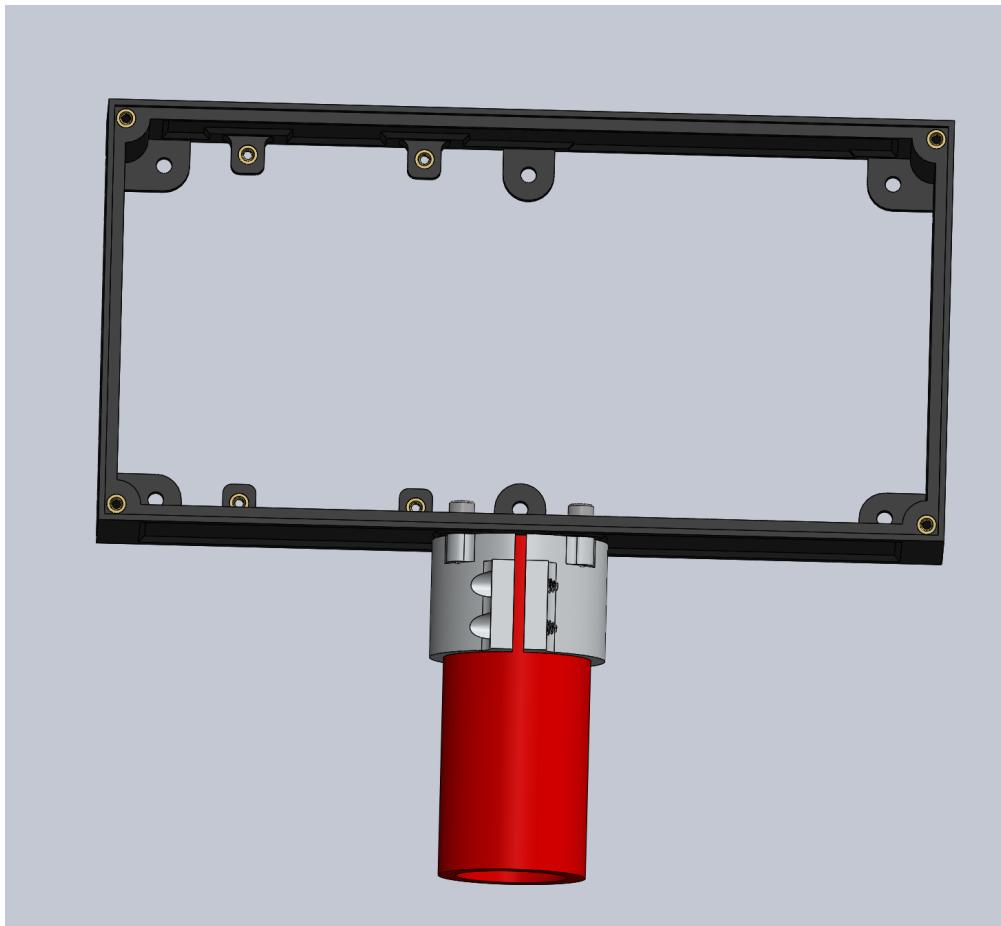


Figure 6: Neck Attachment

5. **Attaching the LED Matrix:** Attach the LED Matrix **E37** to the front of the head assembly using Screws **B14**.

4 MECHANICAL ASSEMBLY

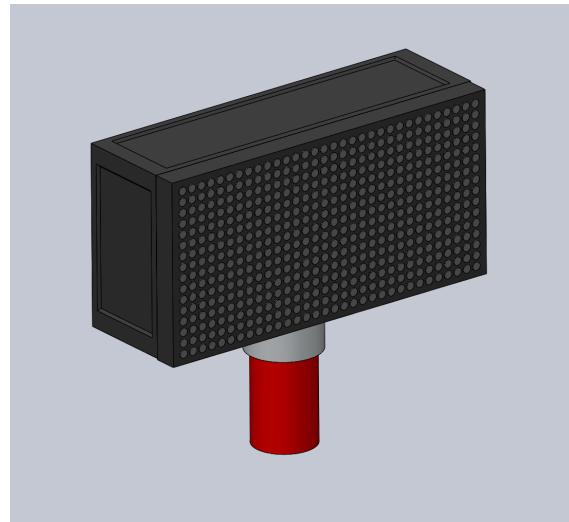
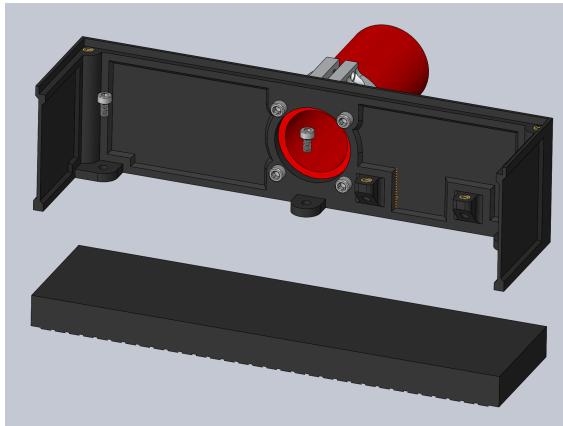


Figure 7: LED Matrix Attachment

6. **Mount the Arduino Stack:** Take the Arduino Plate assembly and mount it using screws **B8** to the heat set inserts on the posts inside the head as shown in Figure 8

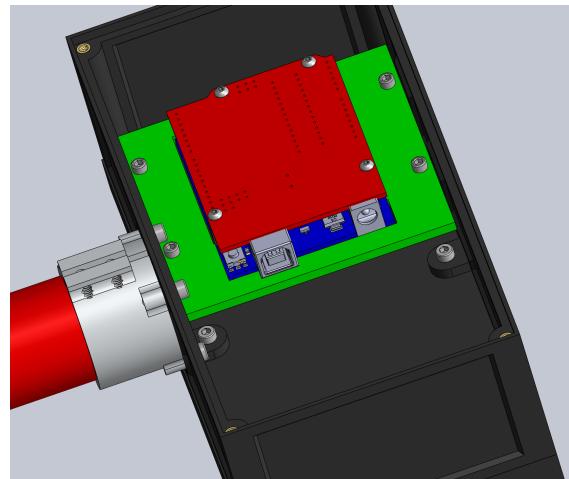
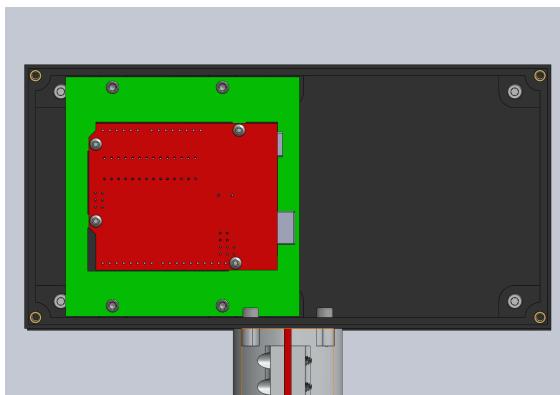


Figure 8: Arduino Plate Integration

7. **Back Plate Attachment:** Attach the Laser Cut Back Plate **S42** onto the back of the head assembly using screws **B12**.

4 MECHANICAL ASSEMBLY

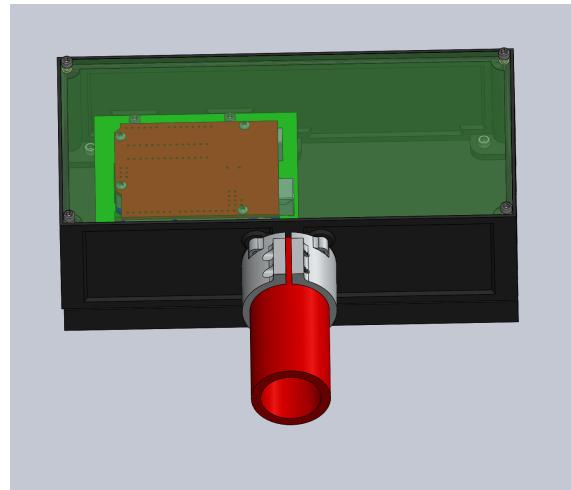
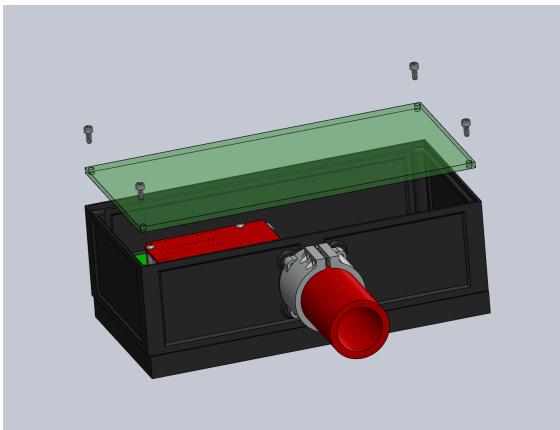


Figure 9: Back Panel Assembly

The head is now finished!

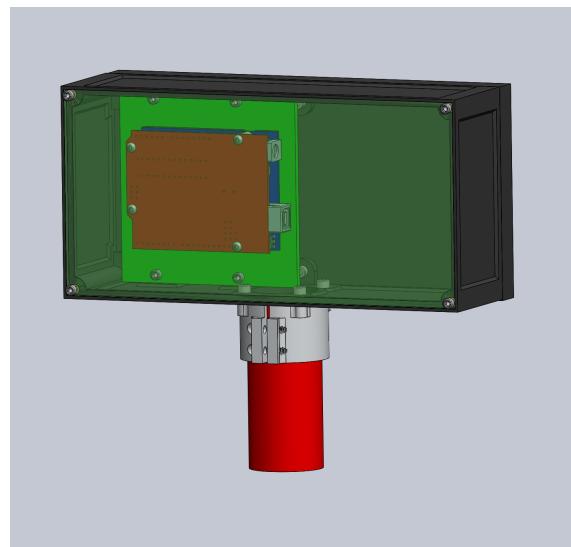


Figure 10: Finished Head Assembly