

Box Hardware Guide

Bill of Materials: Per Unit

- 4 ft Kite String 150 lbs [buy]
- 3 ft Waxed Polyester Coarse Thread No. 150 [buy]
- 4 - Nylon Screw 8-32 1 1/2" (010832PW105) [buy]
- 4 - Nylon Nut 8-32 (NY HN 102) [buy]
- 4 - Nylon 2-56 3/4" [buy]
- 4 - Nylon Nut 2-56 [buy]
- 2 - Size 42 silicone O-Ring 70A (ZUSAS70FDA042) [buy]
- 2 - ¼" NPT-¼" tube Compression Fitting (2GUW3) [buy]
- 2 - 9/16 Diameter 1/8 Thick 50A Silicone Disk Seal [Make]
- 1 - ABS Two Sided Lid A3 [3d Print]
- 1 - ABS Two Sided Lid B3 [3d Print]
- 1 - ABS Two Sided Box 2.1 [3d Print]
- 1 - Terminator Board [Make]

Optional:

- 4130 Alloy Steel Round Tube (89955K489) [buy]

3D Printing

To print the 3 parts of the box. Use ABS at 25% infill with 5 vertical shell perimeters and 7 horizontal shells (top and bottom). These parameters are important for ensuring strength, water resistance, and providing superficial material to tap. White color is advised to reduce light absorption. Print in orientation shown (Figure 2.)

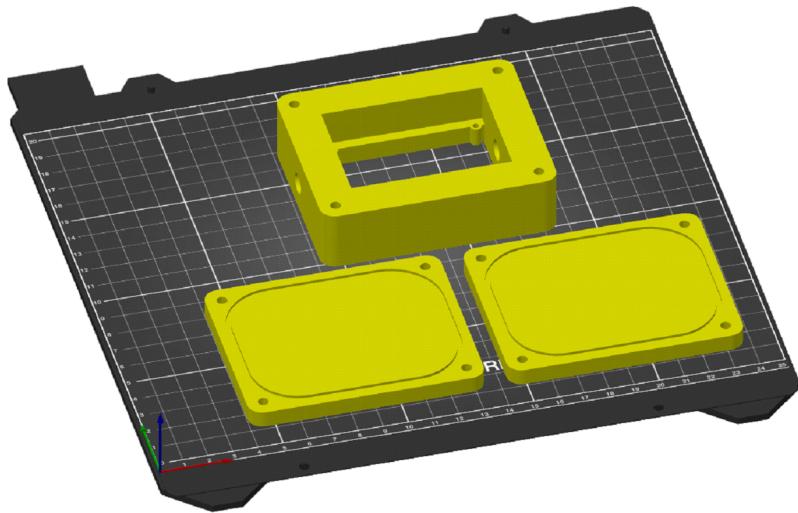


Figure 1. Suggested Printing Orientation.

3D Printing Post Processing

Remove support material then Sand "Two Sided Box 2.1" on top and bottom faces (Figure 2.) to allow for a smooth abutment for the silicone O-Ring.

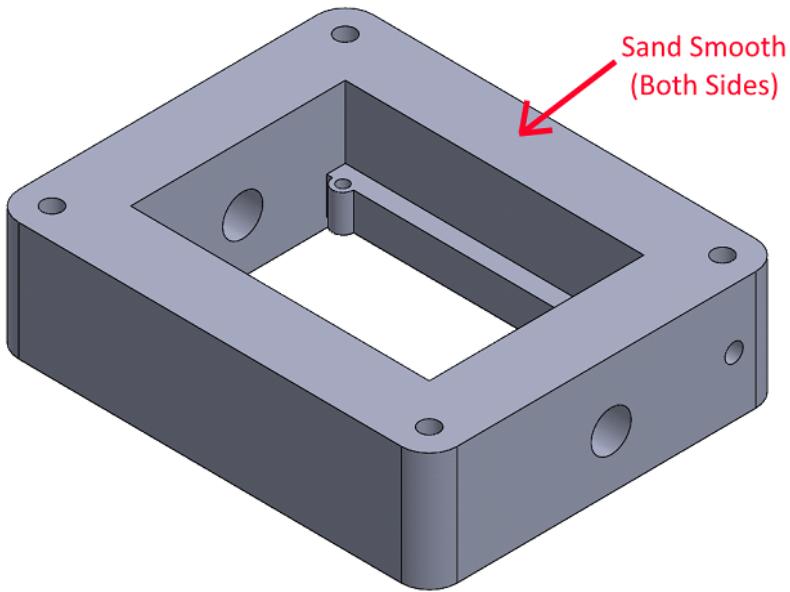


Figure 2. Two Sided Box 2.1 sanding locations.

Tap the two large holes on either end of the "Two Sided Box 2.1" using a 1/8-27 NPT tap for the Compression Fittings.

Making the Silicone Disk Seal

Method 1: Cut the material

From a 1/8 thick 50A silicone sheet cut a 9/16 diameter disk. This can be accomplished with a punch or a razor blade. Ensure that this disk fits the inner diameter of the compression fitting. This method will not make a very circular disk seal.

Method 2: Make a Punch

Purchase the optional 4130 Alloy Steel Round Tube (89955K489). Sharpen the pipe in a Laythe or with more effort a file (see Figure 3). Place the 1/8 thick 50A silicone sheet on a rigid surface push and subsequently twist the punch into the material creating a circular disk of 9/16 diameter.

Assembly

Secure the Terminator board such that the battery side is recessed into the larger cavity of the box. Use the 2-56 hardware to accomplish this. Directionality of the board is not important.

Tie a Figure eight knot in one end of the kite string. Tie the other end in a Figure eight knot around the seatbelt attachment point see Figure 4.

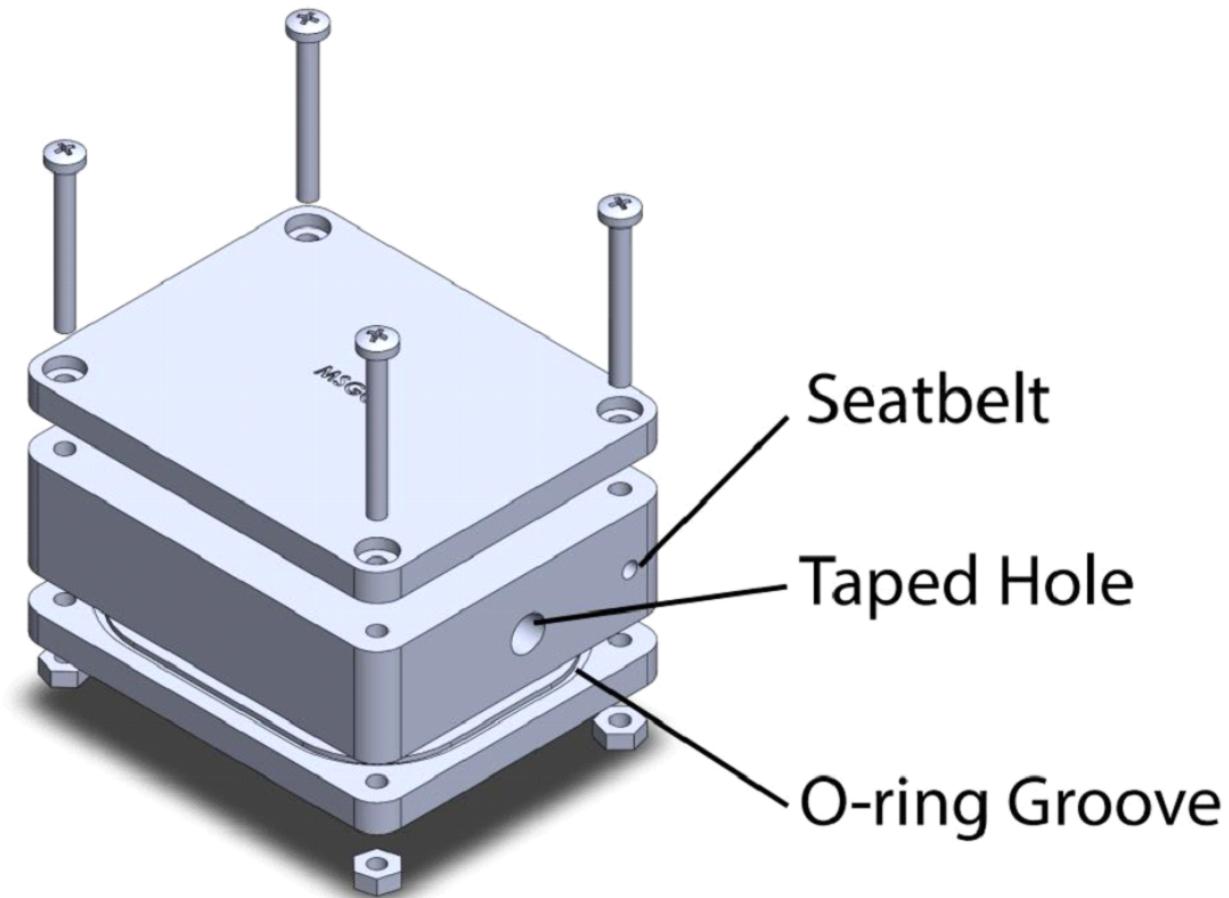


Figure 4. Annotated Assembly.

Screw the two $\frac{1}{4}$ " NPT- $\frac{1}{4}$ " tube Compression Fittings (2GUW3) into the tapped holes until flush. For both: remove the compression fitting cap and remove and discard the internally retained plastic washer. Thread a needle with the "Waxed Polyester Coarse Thread No. 150" and run it through the cap and metal grommet ensuring the convex side of the grommet points outward and away from the box. Puncture the center of the Silicone disk with the needle and thread the wax thread through. With this completed remove the needle from the end of the thread and pull some slack though the cap and disk. Next push the end of the string through the remaining part of the compression fitting and small o-ring. Using tweezers to recover the end of the string on the inside of the box your assembly should now look like Figure 5. The string being pulled through should be put though the first wire gate then over the nichrome wire then through the gate on the other side (see Figure 7 for reference). Pull slack though and finally push the string out the other compression fitting repeating the steps above in the reverse order and again using the needle to puncture a hole in that side's silicone disk (See Figure 6 for reverse side threading). Once this has been done the caps on each side can be hand tightened down sandwiching the Silicone disk seals. The Unit should now look lagely like Figure 7.

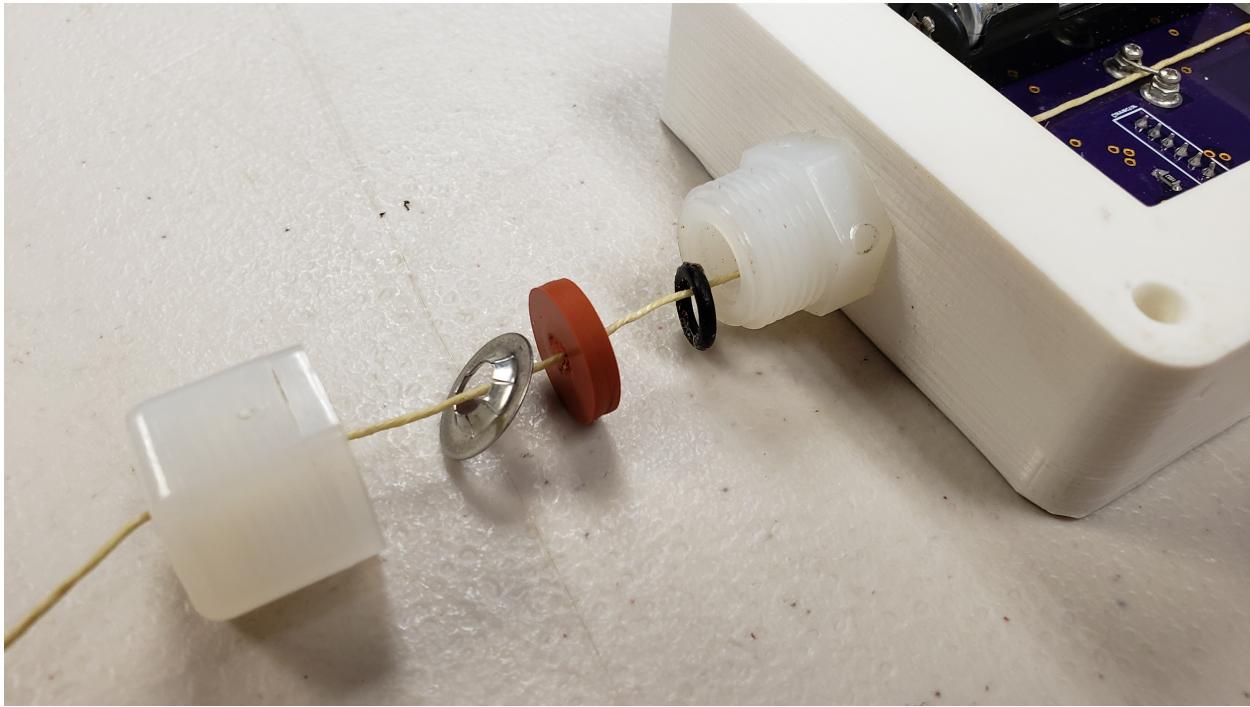


Figure 5. The disconstruced string sealing assembly.



Figure 6. The needle punching the disk seal

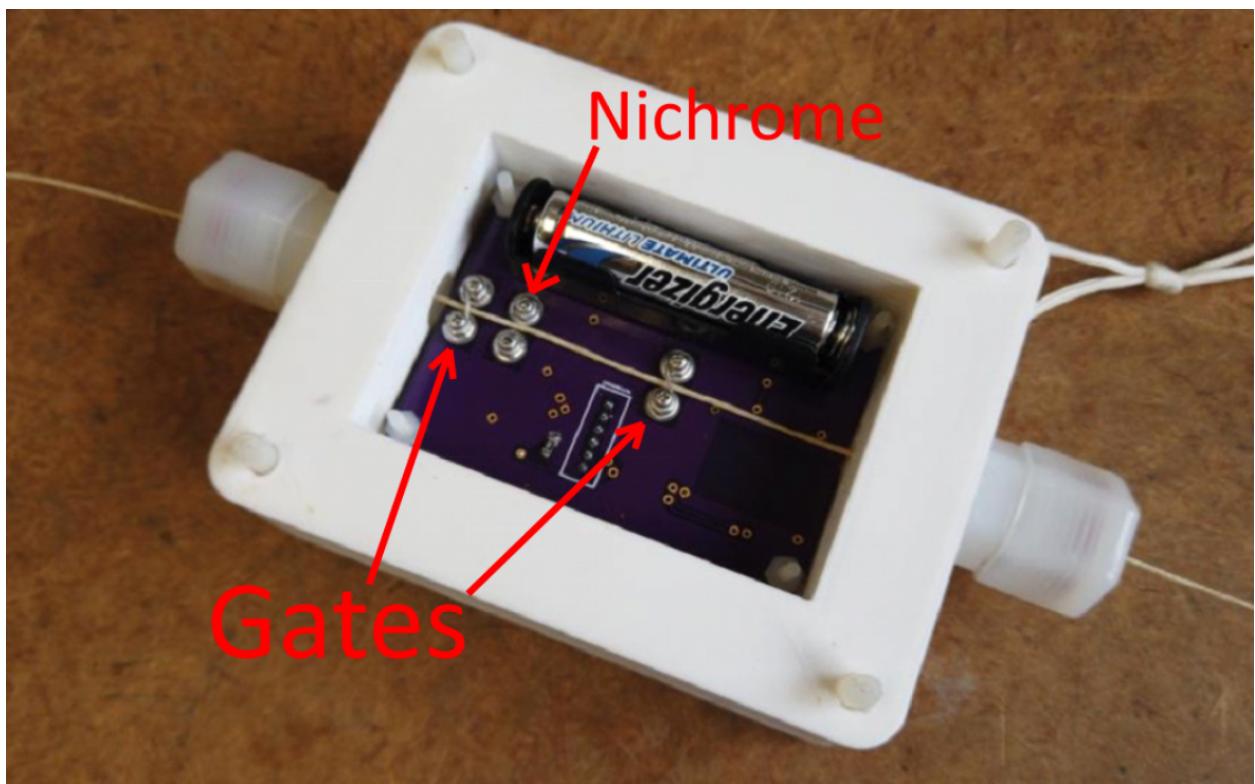


Figure 7. Assembly With Lid A3 removed.

Finally place the silicon o-rings in the grooves on A3 and B3 (as pictured in Figure 3) it should then look like A3 in figure 8.

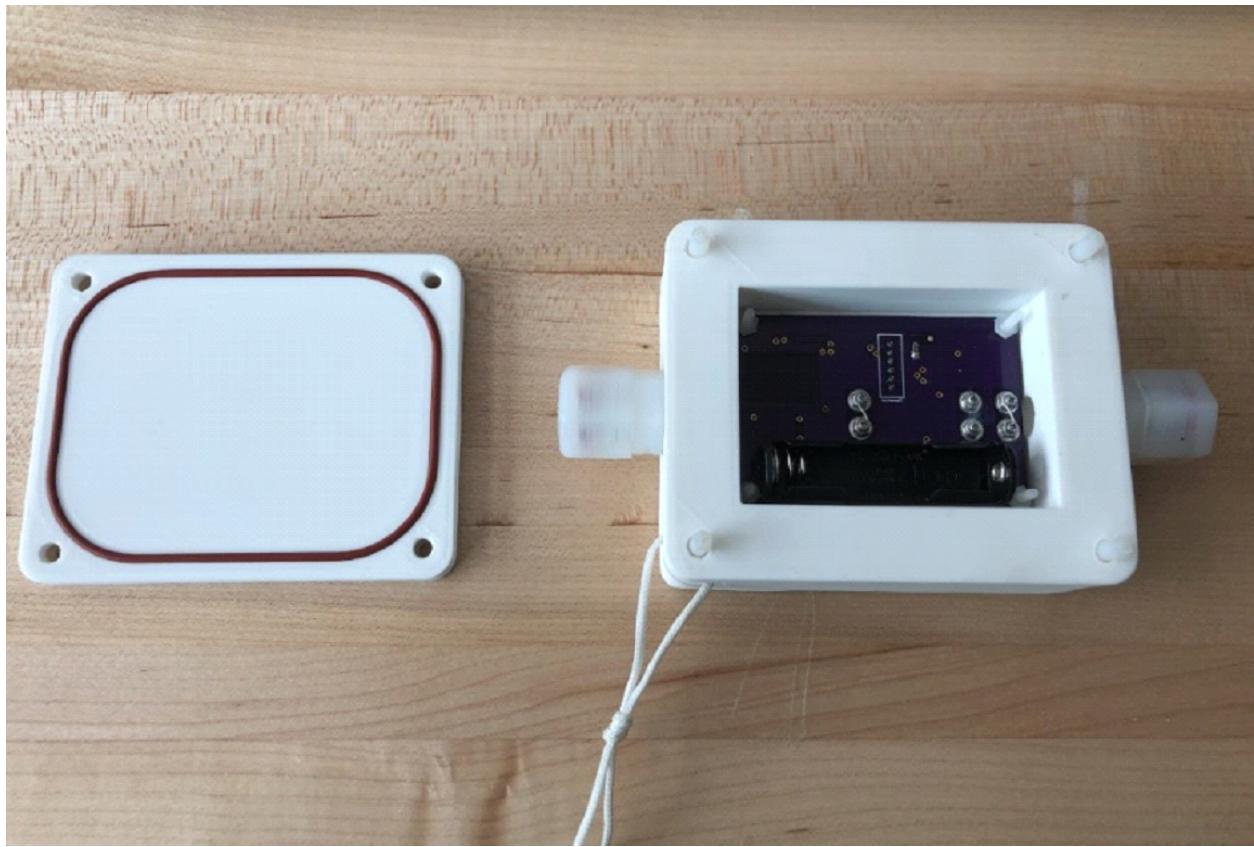


Figure 8. Assembly With Two Sided Lid A3 pictured on the left.

Using the 8-32 hardware attach A3 and B3 on each side of the Box. Evenly tighten and don't over tighten to ensure that there is an even distribution of pressure on the o-rings.

Lastly tie two figure eight knots in the wax string to attach to the payload and balloon.