Purpose:

The purpose of this document is to act as a guide to replicate a prototype water resistant wireless charging case for a 433MHz RileyLink (**OmniPod Version**). This case has *not* been tested with a 916MHz (Medtronic) RileyLink.

Means of Manufacture:

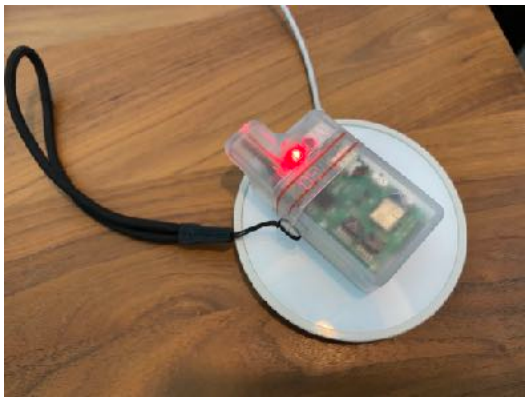
The original design was created using a FormLabs Form 2 (SLA 3D Printer). I highly recommend using an SLA type printer with better than 100µm accuracy. This design is too precise for a run of the mill FDM, and the surface finish quality of FDM will not result in an acceptable gasket mating surface. Higher durability models may be made with other means of manufacturing such as resin casting or injection molding.

Water Resistance:

If the design is made as intended, I would conservatively rate it to IPX4 (Protects from splashing water, no matter the direction). **Do not go swimming with this case, set your basal rates correctly and leave it on shore!**

Wireless Charging:

The wireless charging functionality is designed for use with Qi Wireless chargers. However, it is not extremely tolerant to placement inaccuracy - i.e. you must find the “sweet spot” location on the wireless charging pad that results in the RileyLink charge indicator shining the brightest. If you place it too far outside of the “sweet spot”, the device will stop charging after 30s or so. The receiver coil in the case must be aligned directly above the coil in your charging pad ±5mm for optimal results. You will notice the LED on the RileyLink shine brightest when you’ve found the “sweet spot”.



Bill of Materials:

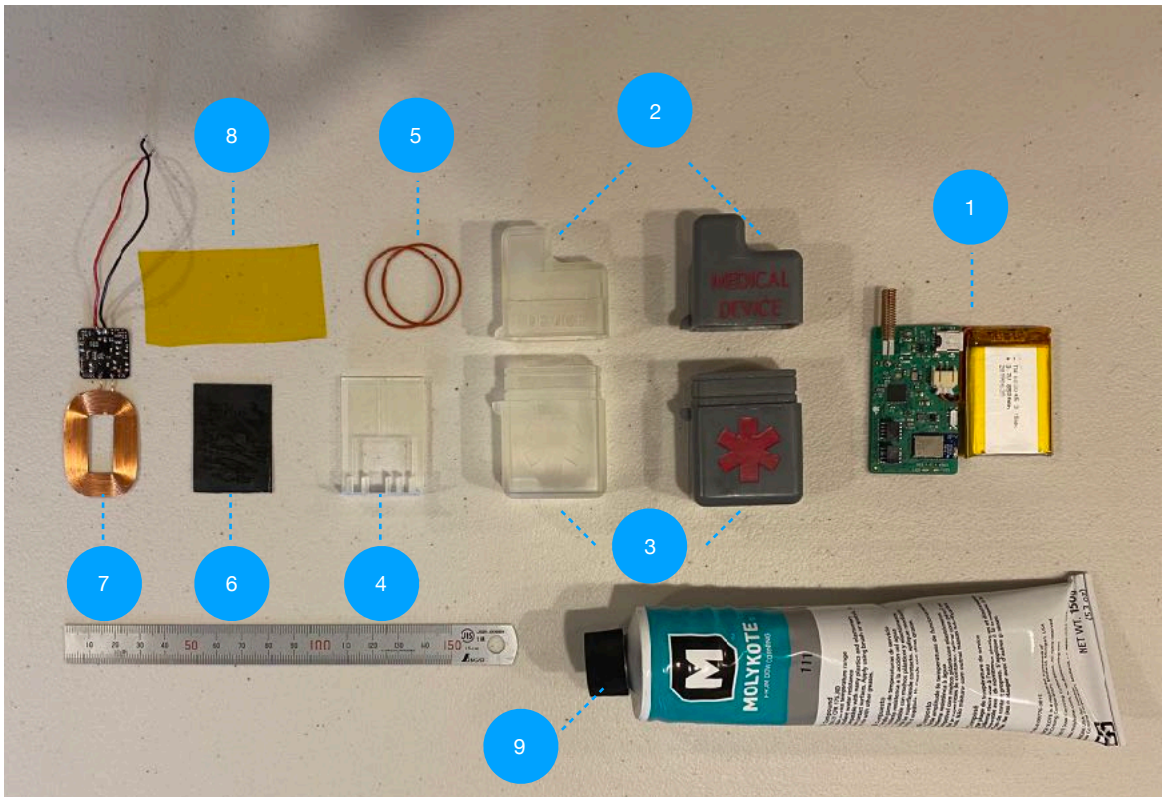
Besides the cost of the 3D printed hard shells, the device can be constructed with approximately $200 of materials, including the cost of the RileyLink. (which includes a battery and Lanyard) Links to all materials are included in the BOM table below.

Bill of Materials

Part	No Per Unit	Manufacturer	Part No	Description	Vendor	Link	MOQ	No of Units per MOQ	Cost Per MOQ
Rileylink	1	RileyLink		433MHz OmniPod	RileyLink	https://getrileylink.org/product/rileylink433	1	1	$150.00
Top Shell	1	DS-LLC		Wireless Charging Case Top Shell	TBD, SLA	https://github.com/ian-dee/RileyLink-Water-Resistant-Wireless-Charging-Case/tree/master	N/A	1	N/A
Bottom Shell	1	DS-LLC		Wireless Charging Case Bottom Shell	TBD, SLA				
Insert	1	DS-LLC		Wireless Charging Case Insert Frame	TBD, SLA				
O Ring	2	USA Sealing	ZUSAS70 FDA1X28	28mm x Ø1.0mm Silicone Gasket	McMaster Carr	https://www.mcmaster.com/5233t123	25	12	$8.45
Ferrite	1	Wurth	364104	RF Ferrite Sheet 60mm x 60mm x 0.5mm with PSA backer	DigiKey	https://www.digikey.com/products/en?mpart=364104&v=732	1	2	$8.74
Wireless Coil	1	VEEAII	N/A	VEEAII Qi Standard Wireless Charging DIY Coil Receiver Module	Ali Express (Qi Charger Store)	https://www.aliexpress.com/item/33002939788.html	1	1	$3.68
Kapton Tape	1	Dupont		Kapton® Polyimide Plastic 63µm Thickness	McMaster Carr	https://www.mcmaster.com/7648a735	15ft	60	$12.75
Molykote 111	1	Dow Corning	111	Dow Molykote 111 Silicone Lubricant	Amazon	https://www.amazon.com/1310476-Molykote-Valve-Lubricant-Sealant/dp/B00IKUIO82/	1	200	$15.74
	Subtotal Cost, not including 3D Printed Parts								$199.36

1.0 Assembly Tutorial

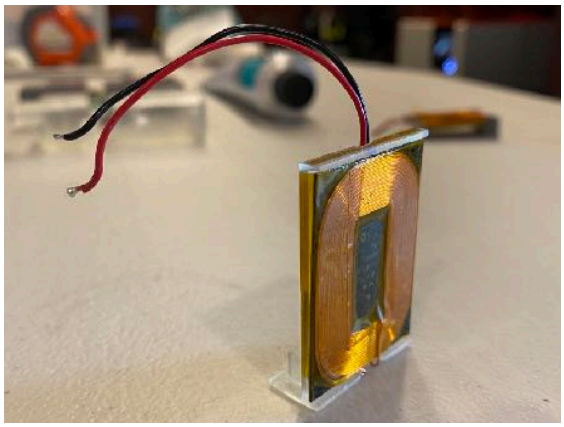
Everything in your Bill of Materials shown in the image below. Two sets of case shells for illustration purposes.



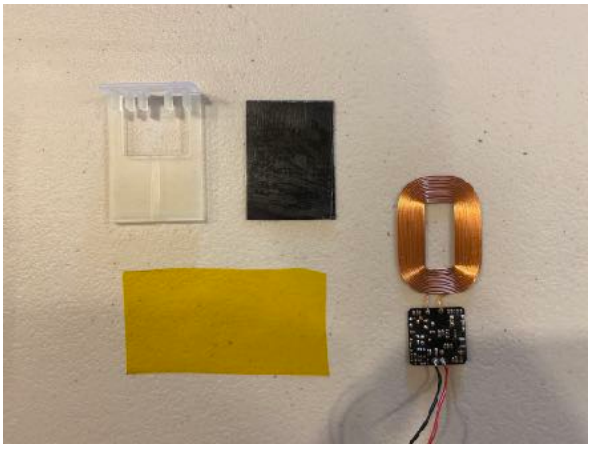
1. RileyLink with Battery
2. Top Shell
3. Bottom Shell
4. Insert Frame
5. O-Rings
6. Ferrite
7. Wireless Coil + PCB
8. Kapton Tape
9. MolyKote 111

2.0 Build the Wireless Charging Subassembly Insert

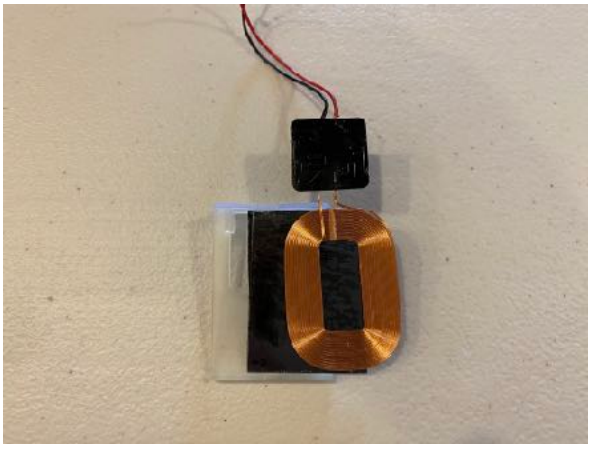
We are going to start by building the subassembly insert. This module is comprised of the insert frame, a piece of 0.5mm thick ferrite with PSA backing cut to 31mm x 41mm, the wireless charging coil assembly, and some Kapton tape.



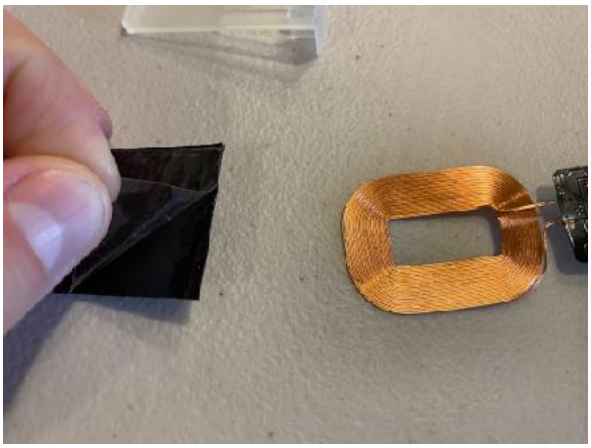
2.0 Wireless Charging Subassembly



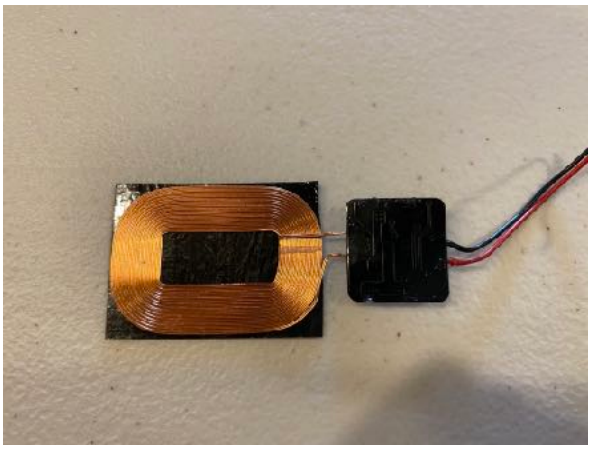
2.1 Materials Required



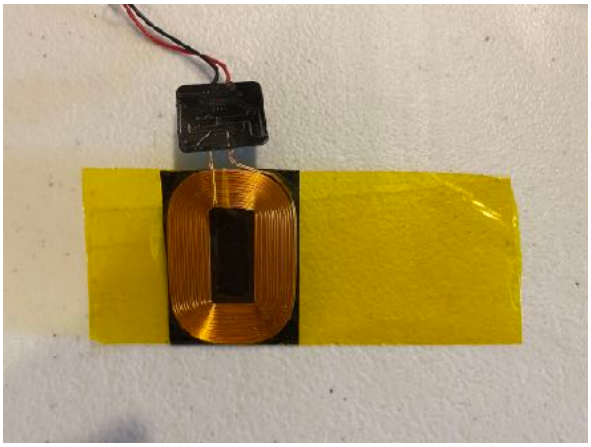
2.2 How the materials will be stacked up



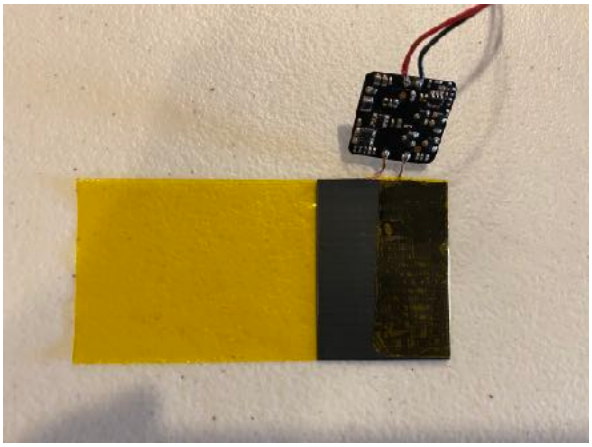
2.3 Peel the protective backer off the sticky side of the Ferrite



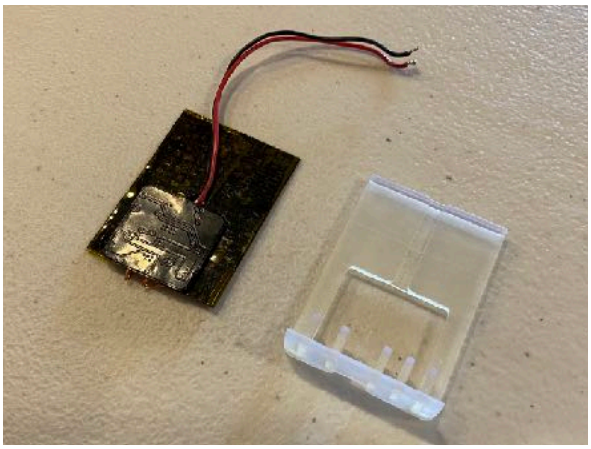
2.4 Center the charge coil on the sticky side of the Ferrite. Note which direction the PCB is facing.



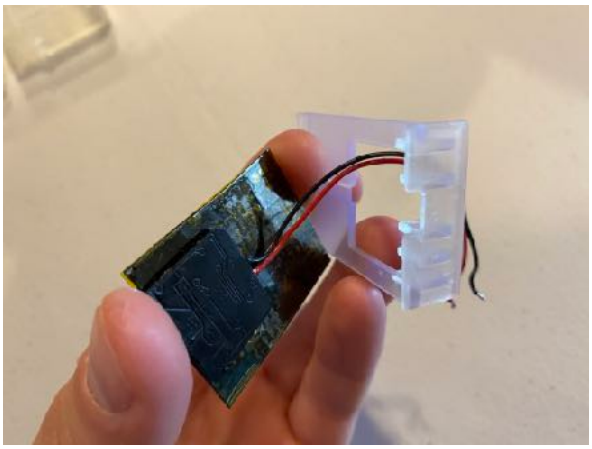
2.5 Wrap up the coil + ferrite with your Kapton Tape



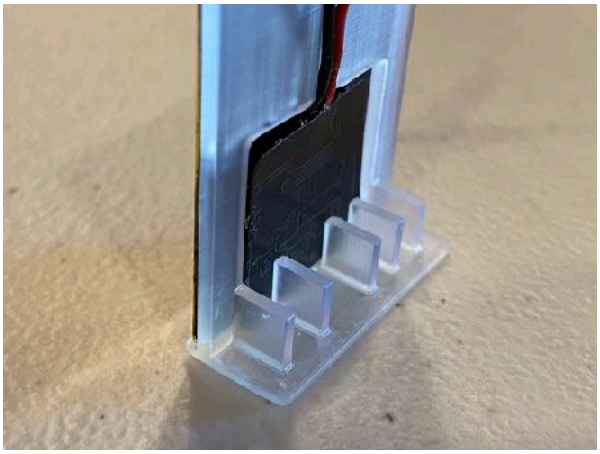
2.6 Wrap up the coil + ferrite with your Kapton Tape



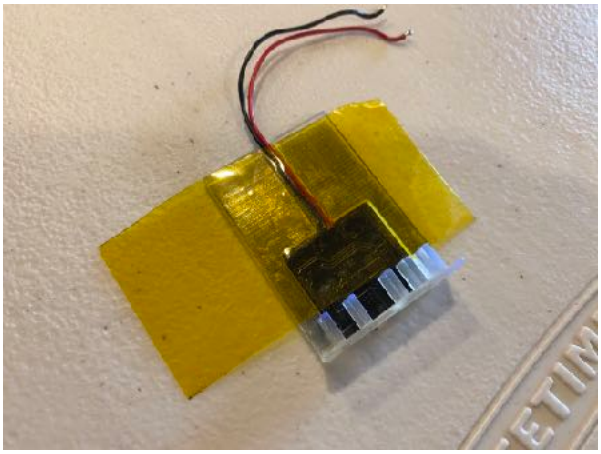
2.7 Fold the PCB up against the Ferrite sheet. The PCB will fit in the window of the Frame.



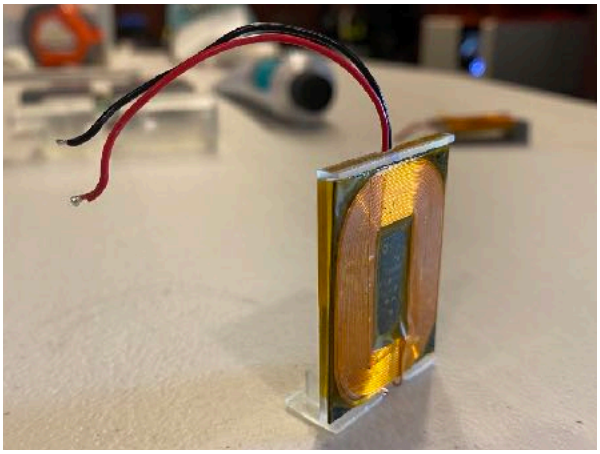
2.8 Slide the wires through the window



2.9 This is what you are going for. The PCB in the window and the wires in the slot.



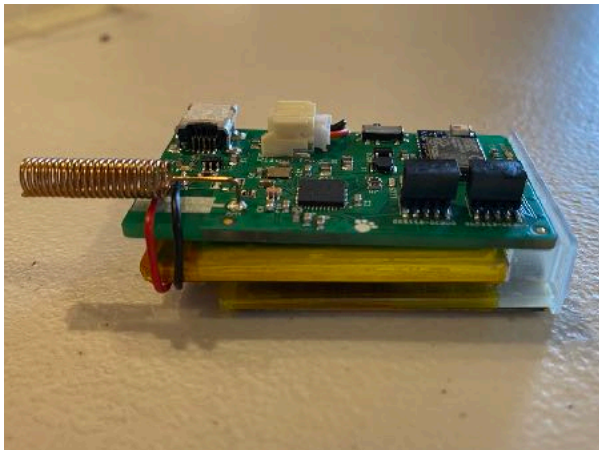
2.10 Add some caption tape to secure the wires into the slot, the PCB inline to the frame, and wrap the tap around to secure the coil + ferrite to the frame.

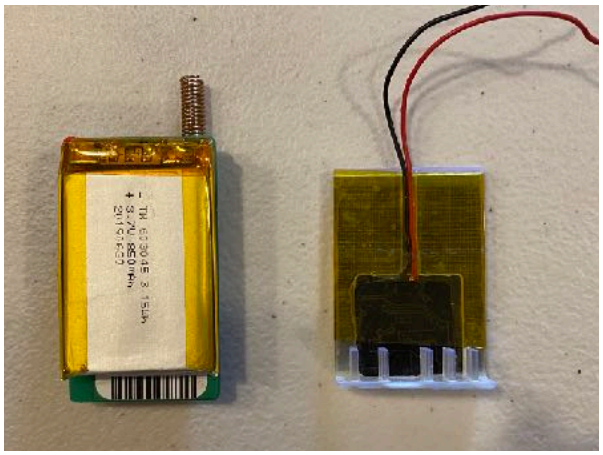


2.11 A nice little wireless charging coil subassembly package. Now would be a good time to test it with the MultiMeter on your charging pad before moving to the next step.

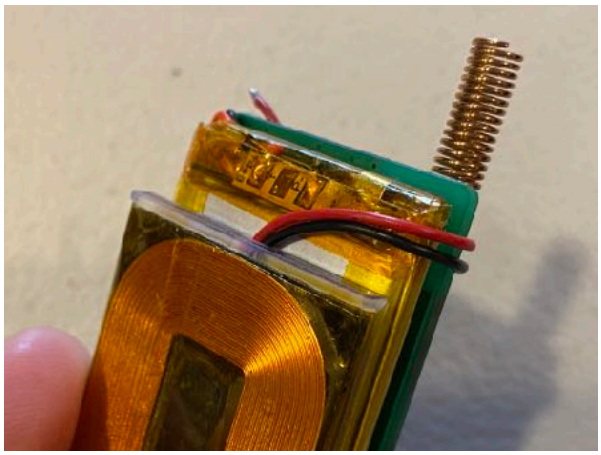
3.0 Assembling the Charging Coil to your RileyLink

Next step is to make a sandwich out of the wireless charging subassembly you just built, the Battery, and the RileyLink Board. Soldering will be required for this step.

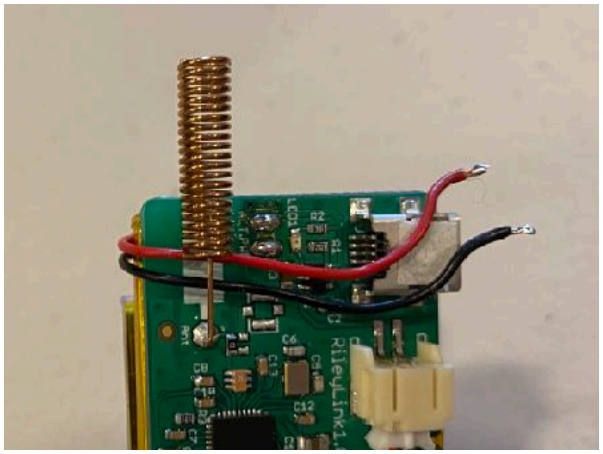




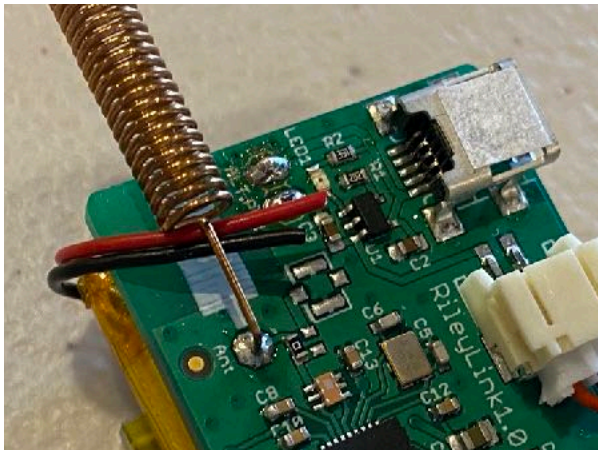
3.1 The parts required



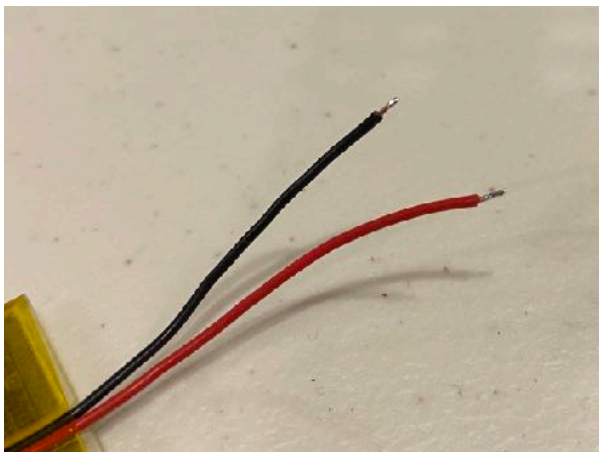
3.2 Route the wires as shown. Around the wide of the board with the antenna



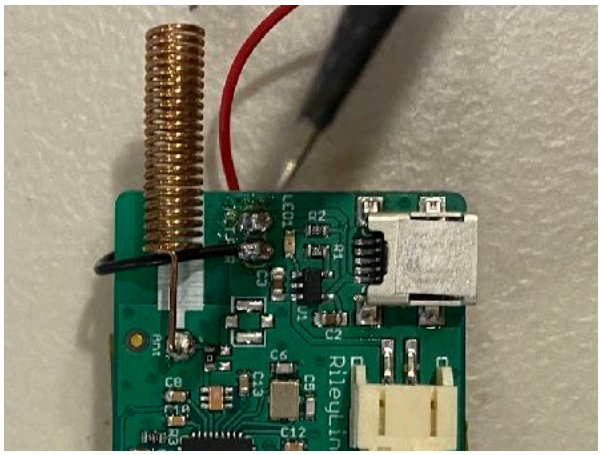
3.3 Route the wires as shown. They will go under the antenna lead.



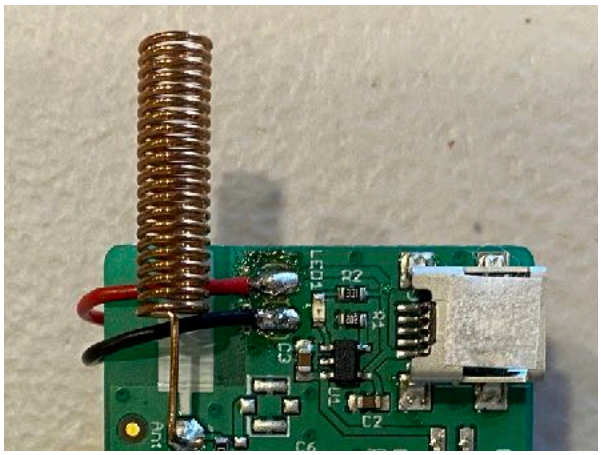
3.4 Trim to length. Make sure to be as accurate as possible here. Any excess wire can get caught in the case later. Too short and you will need to replace the wires at the coil and try again.



3.5 Tin the leads with 1-2mm of exposed core.



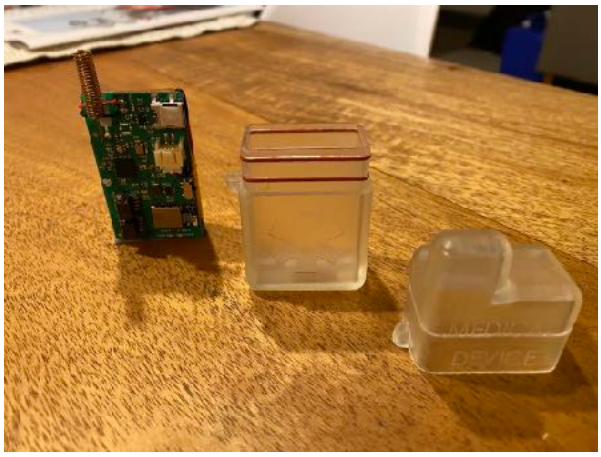
3.6 **Make sure the board is off and battery is disconnected.** Solder the Black (-) Lead to the lower auxiliary power input pad on the RileyLink Board, and the Red (+) Lead to the upper. It is easier to solder black then red due to board layout and proximity to other components.



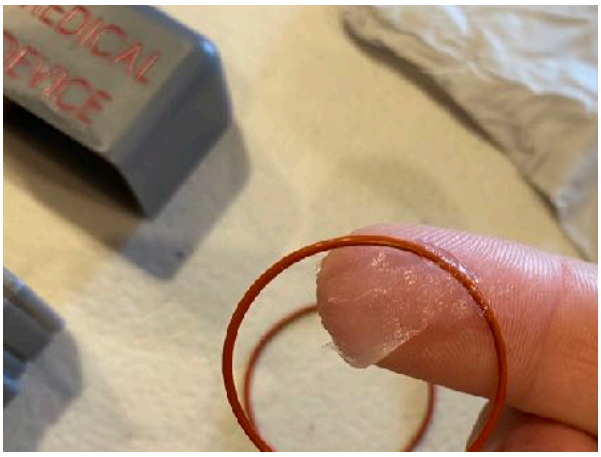
3.7 All Done

4.0 Assembling the Enclosure

In this step we are going to grease and put on the O Rings, slide the wireless subassembly into the case, put the cap on, and test the device.



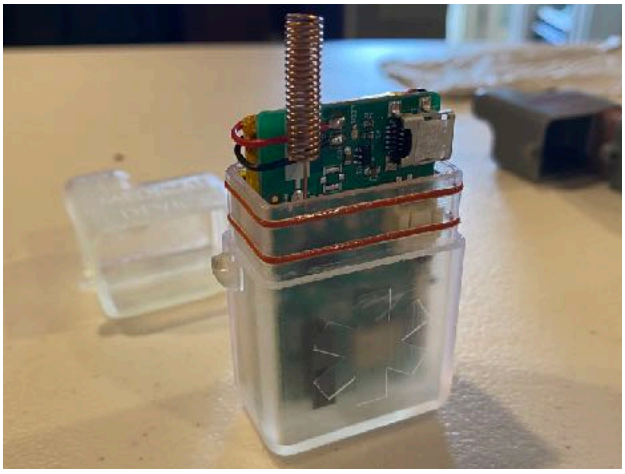
4.1 The parts needed



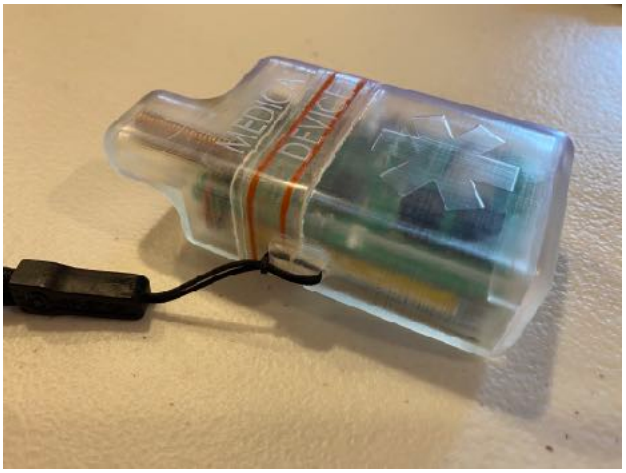
4.2 Put a dab of Molykote 111 on your finger (wear gloves, don't follow my example) and evenly coat the O-Rings.

4.3 Grease evenly applied to the O-Rings, sitting on the glove I forgot to wear.

4.4 Place the O-Rings into the glands on the bottom case by stretching over the top. Be sure not to twist the O-Rings.



4.5 Carefully slide the Wireless Subassembly into the case, with the RileyLink PCB facing towards the “Star of Life”, and the charging coil side facing away. The wireless subassembly won’t fully seat, and your top won’t close if you try to put it in the case backwards.



4.6 Put the top on and install the Lanyard if desired. **Note:** The seal between upper and lower halves may be so good that the case builds pressure when assembling the top. It may try to push the top off. Try rocking the cap left and right to “burp” the pressure out (let the internal air go past the seals) while putting the top on. The pressure will equalize over time. I am not sure how this case will work on an airplane, the pressure delta may work to force the top off if no Lanyard is used.

4.7 All finished! **Note:** I would not advocate hanging this device on the outside of a bag or otherwise with the lanyard. I would only use it to secure it to the inside of your bag (like to a key clip in a backpack) or locate the device more easily. It is certainly possible in the right situation the lanyard clip could break off, resulting in loss of your device.