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Task no.	Steps
1	Ensure that the thermistor is properly soldered to the flexible PCB cord. Using a multimeter, set it to measure resistance (Figure 1). Place one multimeter probe on one of the middle two pins (#**1** in Figure 2). Place the other probe on the rightmost pin (#**2** in Figure 2). The multimeter should read a resistance of 90-130 kΩ depending on the ambient temperature. An example reading is shown in Figure 3.

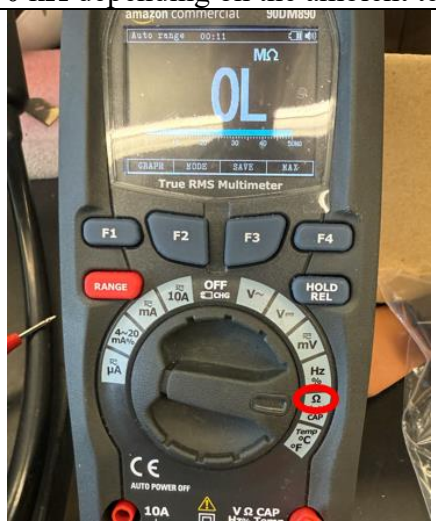


Figure 1. Proper multimeter configuration

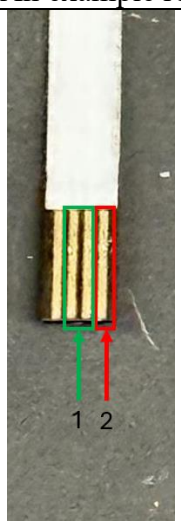


Figure 2. Multimeter probe placement

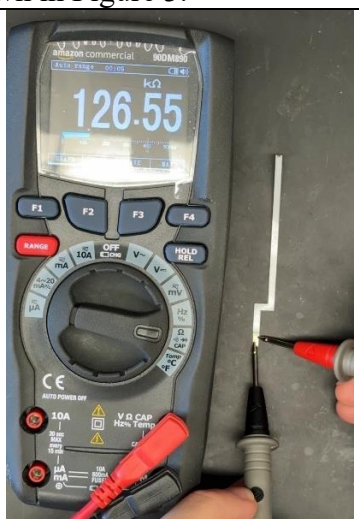


Figure 3. Example resistance reading

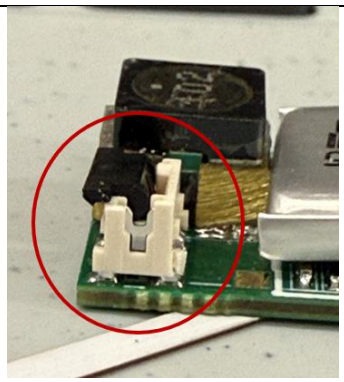
2	Use silicone sealant to encapsulate the thermistor. This can be done by dispensing a dollop of silicone and then lightly dipping the thermistor into it. Wipe off the excess (can be done with hands while wearing rubber gloves or with a toothpick) so that only enough remains to cover the thermistor. Figures 4 and 5 show the silicone sealant applied onto the thermistor. Allow 1 hour for sealant to dry completely.

Figure 4. Thermistor with silicone applied (top view)

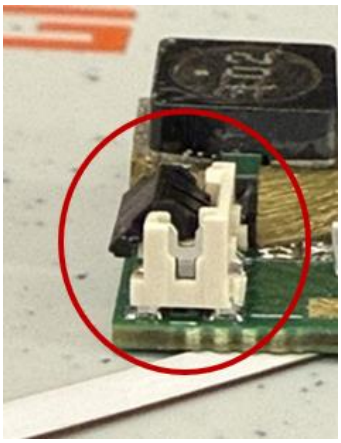
Figure 5. Thermistor with silicone applied (side view)

3	Insert the thermistor into the FRIENDS device. Make sure the gold pins are oriented as shown in Figure 6. To insert the thermistor, open the connector on the board using something long and narrow (like a paper clip or a small screwdriver). The open position is shown in Figure 7(a). Put the thermistor into the open connector. Make sure it is inserted as far as possible. Then, using a long and narrow tool, close the connector. The closed position is shown in Figure 7(b). When the thermistor is properly locked in place, you should be able to lightly tug on the cord without it moving. Figure 8 shows a proper connection up-close.

Figure 6. Proper orientation for thermistor cord installation



(a)



(b)

Figure 7. Connector in (a) open position, (b) closed position

Figure 8. Thermistor cord properly inserted into FRIENDS device

4

Test the thermistor connection. This can be done using a vape device that is puffed using a button, such as the Smok Nord 2 or the Logic Power Vape. Place the FRIENDS sensor against the device with the thermistor cord connected. The thermistor does not need to be placed anywhere specific. Trigger 1-3 puffs on the vape, ensuring that the FRIENDS device detected the puffs. Then, read the data using FRIENDS GUI and view the generated plot. The temperature data will appear below each puff. If the temperature readings are around 500, this means the thermistor was properly inserted. If the readings are around 1000, this means you should redo step 3. Figure 8 shows a plot generated by doing one puff with the thermistor inserted, and one with it removed.

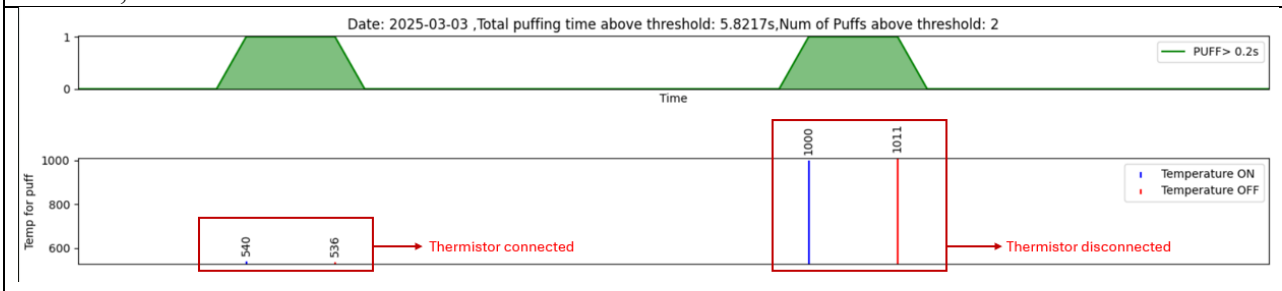
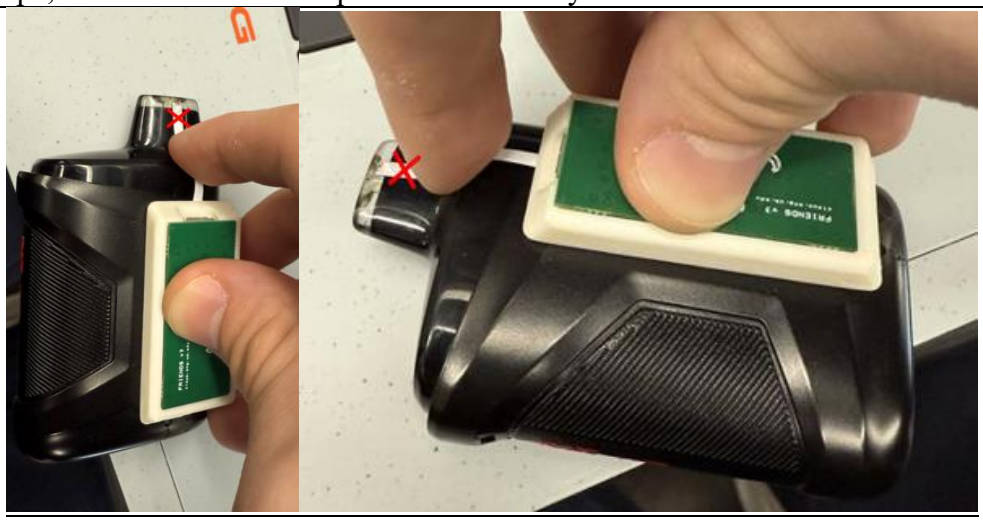


Figure 9. FRIENDS GUI plots showing good thermistor connection (left) and no thermistor connection (right)

5	Determine the placement of the mouthpiece drill hole. The thermistor must be inserted into the mouthpiece through a hole you will drill. Place the FRIENDS device in the recommended location based on the FRIENDS Vape Library. Press the thermistor flat and find where it will reach on the mouthpiece. The drill position will be slightly below this. Figure 10 shows the FRIENDS device with a thermistor placed onto a vape, with the desired drill position marked by a red 'X'.
	 **Figure 10. Thermistor placed on vape with desired drill hole position marked with a red 'X'**
6	Drill the hole in the mouthpiece. Use a 3.5mm diameter drill bit. Place the vape onto the drill press platform. Line the drill up with the desired hole placement determined in step 5. This can be done by lowering the powered off drill until it contacts the vape (Figure 11). Once you have positioned the vape correctly on the platform, secure the vape using clamps or something that will ensure no movement during the drilling process (Figure 12). Remove hands from the area of operation. Turn the drill press on and slowly lower it. Carefully drill a hole through one side of the vape mouthpiece. The result should look like Figure 13. Any excess plastic should be removed using tweezers and/or a cotton swab.
	 **Figure 11. Determine vape position on platform using powered-off drill press**  **Figure 12. Secure vape to platform using clamps**  **Figure 13. Thermistor hole on mouthpiece after drilling**
7	Install FRIENDS device with thermistor onto the vape Remove the backing from the adhesive on the FRIENDS Device and the thermistor cord. Place the FRIENDS Device and thermistor onto the vape in the desired location. Ensure that the thermistor cable lines up properly with the hole drilled in step 6 and push

	the thermistor through. Figure 14 shows the FRIENDS Device and thermistor installed onto the vape. Figure 15 shows the thermistor in the mouthpiece. The goal is for the thermistor to block as little of the airway as possible.
	 **Figure 14. FRIENDS Device installed on vape**
	 **Figure 15. View of thermistor inside mouthpiece after installation**
8	<u>Seal the thermistor hole with dental beads.</u> Insert something with a similar diameter to the mouthpiece into the mouthpiece to secure the thermistor in place and stop sealant from leaking into the airway while drying (Figure 16). Place a dental bead over the hole and apply heat (about 110°C) until the bead melts and seals the drill hole, preventing any vapor from escaping. Figure 18 shows the vape with the fully installed FRIENDS Device and thermistor.
	 **Figure 16. Vape with tubing inserted into mouthpiece for sealant application**
	 **Figure 17. Thermistor hole sealed with dental bead**
	 **Figure 18. Vape with FRIENDS Device & thermistor installed**