

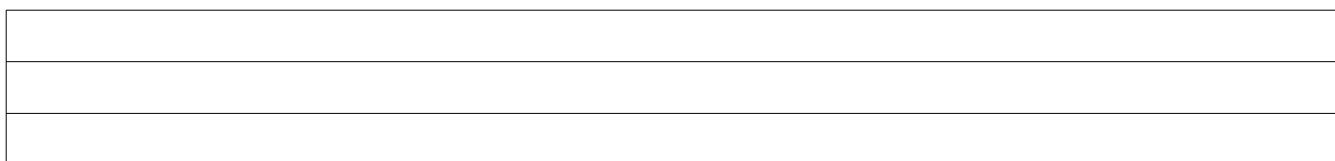
LoRaWan Sensor Node Construction

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LoRaWan Sensor Node Construction

Section 0: The Setup



LoRaWan Sensor Node Construction

Section 1: The Guts

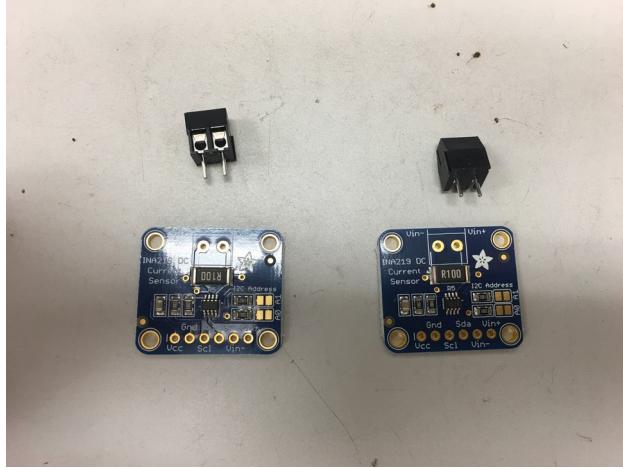
Figure 1.1: Materials



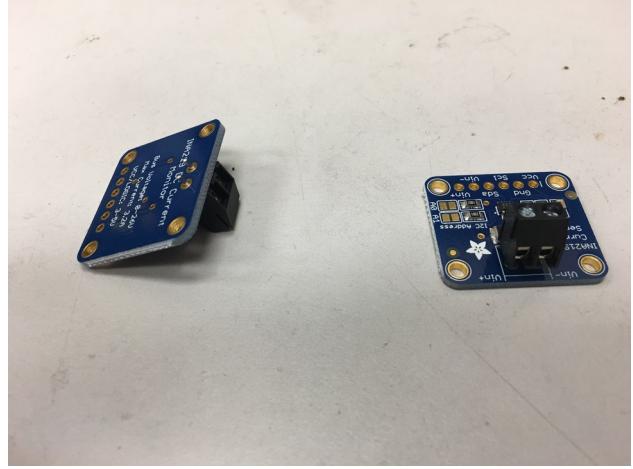
Pictured from top to bottom and left to right: a) Seeeduino LoRaWan, b) Seeeduino Base Shield, c) 2-pin connector, d) 4-pin connector, e) Sunny Buddy, and f) 2 INA219 current and voltage sensors.

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Figure 1.2: INA219s



A



B

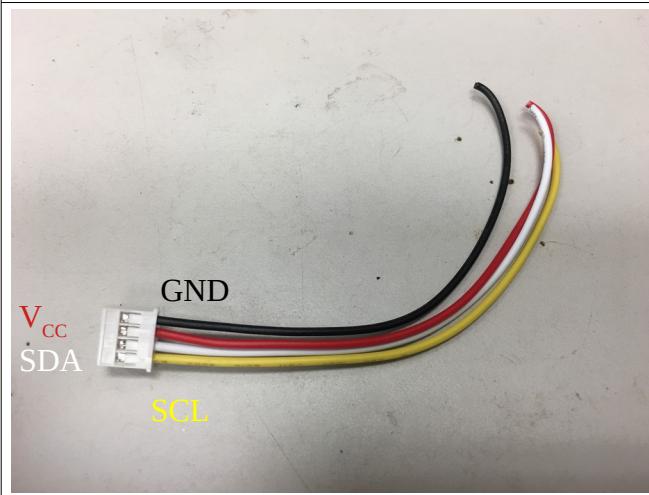


C

Remove the two INA219s from their package and insert the 2 terminal block into the two holes at the top marked “ V_{IN-} ” and “ V_{IN+} ”. Make sure the wire inserts are facing outwards as show in Figure 1.2.B: this will make it easier to position the INA219s in the 3D printed mount. Solder the 2-pin terminals as in figure 1.2.C.

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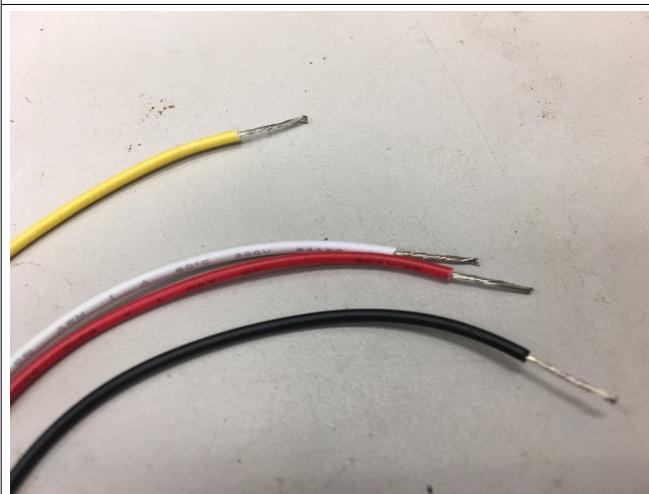
Figure 1.3: I²C Connector for the INA219s



A



B

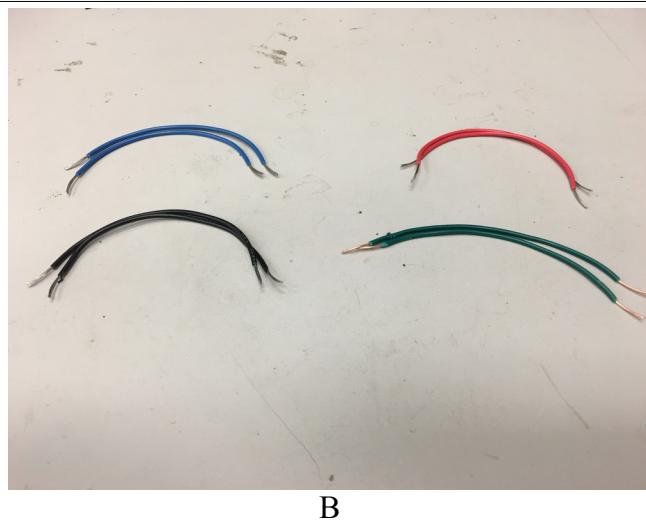
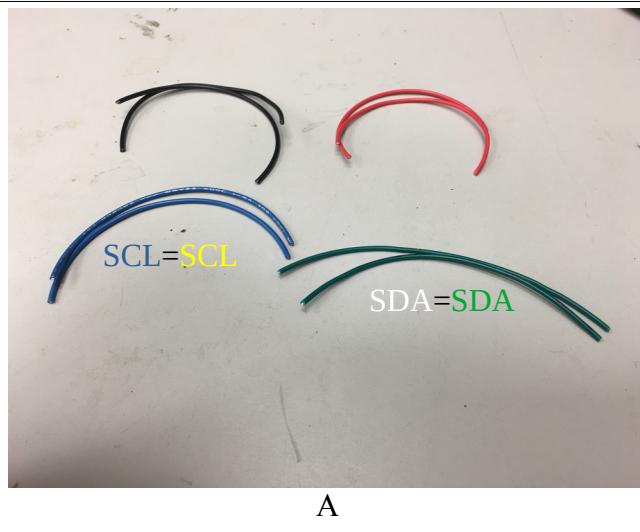


C

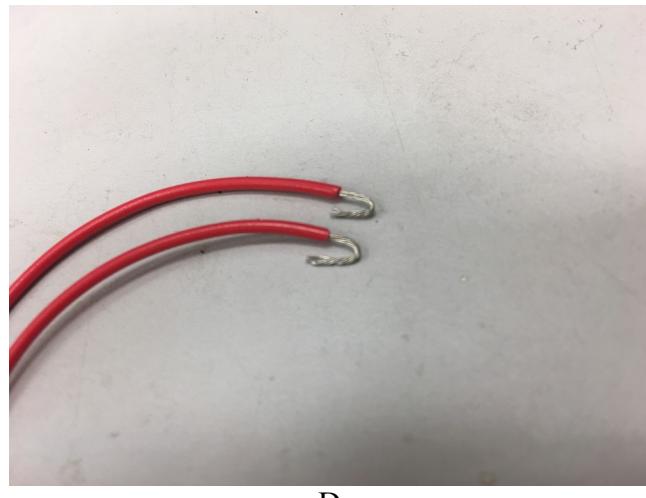
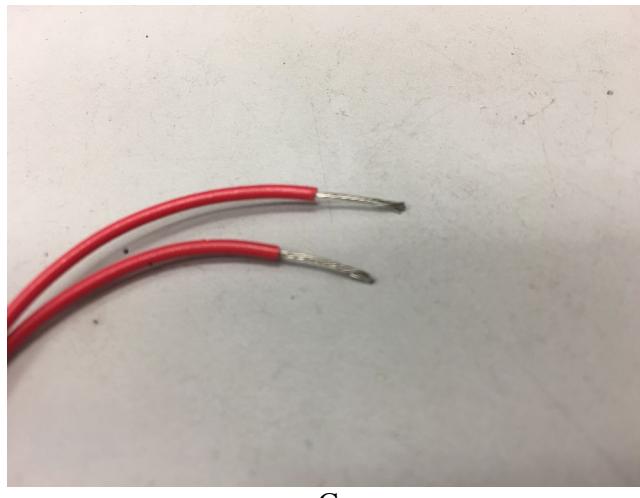
You will need a 4-pin connector as shown in figure 1.3.A as well as extra wire in order to create a split in the wire: this will connect both INA219s to the I²C outputs of the Seeeduino base shield. The color diagram for the wires is also given in figure 1.3.A and is color coded. Strip wires to remove about 1 cm from the end as shown in figure 1.3.B. If you are using wire has many small conductive fibers, then you will want to twist them into a tight bundle as shown in figure 1.3.C: this will make it much easier to make the necessary connections in the following steps.

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Figure 1.4: 4 Pairs of Matching Wire



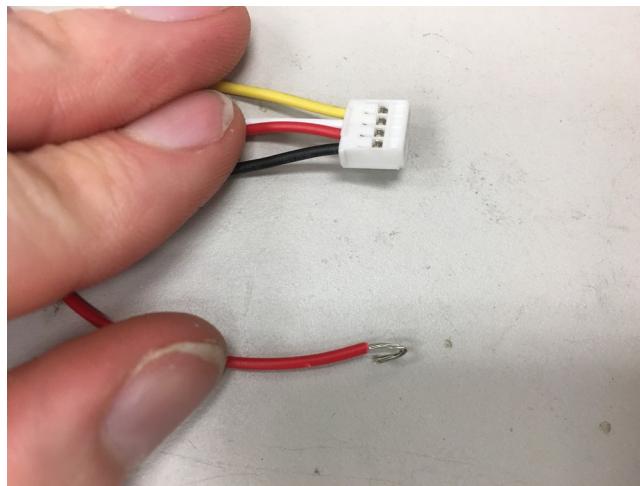
You will also need to cut 8 pieces of wire: we will use this to create the cable split. Note for the purposes of this section that blue wire will be used to connect to yellow and green will be used to connect to white wire. Strip the wires leaving about 1 cm of wire exposed at either end. Remember to twist any wire with many fibers together so they are easier to work with.



Take two of the wires (preferably in pairs of matching colors). For brevity's sake, this guide will simply show the construction of one wire split (for V_{CC}) as the remaining wire splits are identical. To create the hooks shown in figure 1.4.D, you can either position the nail of your thumb in the middle of the exposed section of wire or simply use a small screw driver and fold the exposed wire over.

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Figure 1.5: V_{CC} Wire of the 4-pin Connector with Exposed Wire Formed into a Hook



A

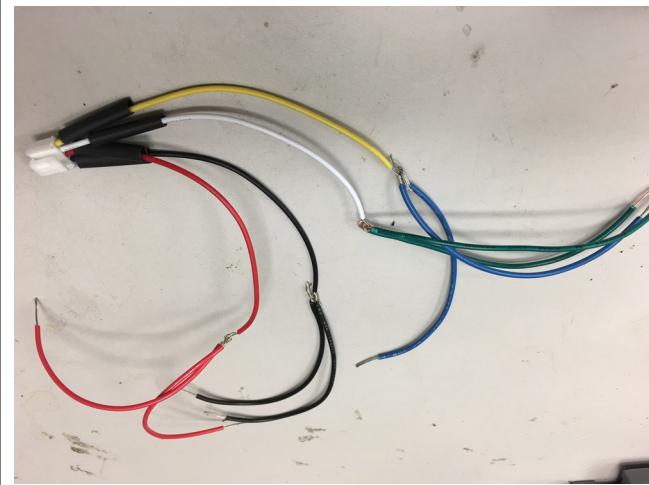


B

Just as in the previous step, form the exposed portion of the corresponding wire of the 4-pin connector into a hook. In order to construct the split, you'll want to connect all three hooks. First take the two wires from figure 1.4.D and hook one onto the 4-pin connector, then hook the other wire with its hook facing the opposite direction. Fold the exposed wire of the 4-pin connector against itself and hold it firmly, then tightly press the hooks of the two wires from figure 1.4.D to close them. Now, twist the exposed portion of the two wires clockwise and the exposed portion of the 4-pin connector counter-clockwise. The result should be similar to Figure 1.5.B.



C

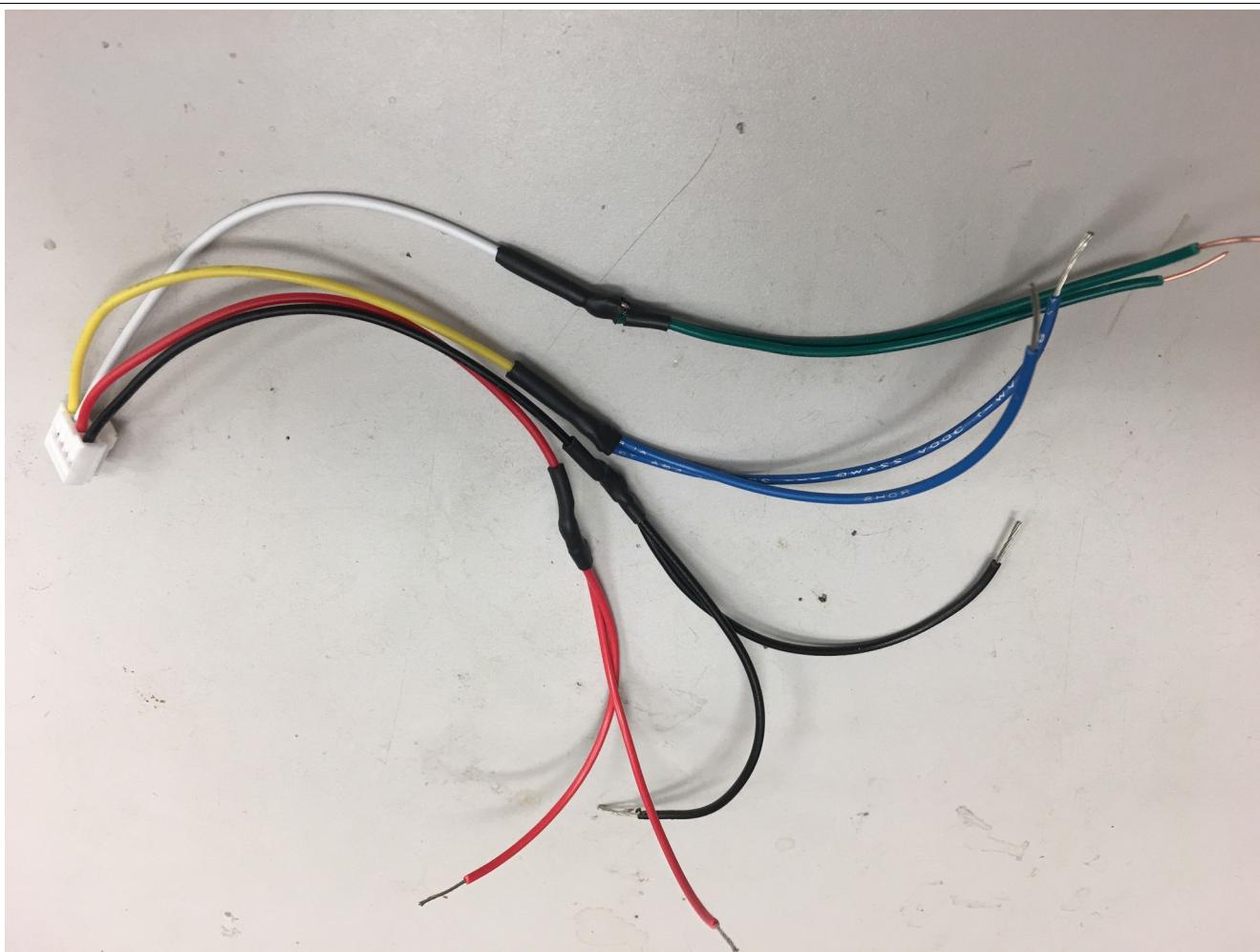


D

Cut 4 pieces of heat shrink: this will seal the wire split after we finish soldering the connection. Repeat the process for the other wires of the 4 pin connectors. Now we are ready to solder the connections. After soldering the connections, then apply the heat shrink to the exposed joint to cover them.

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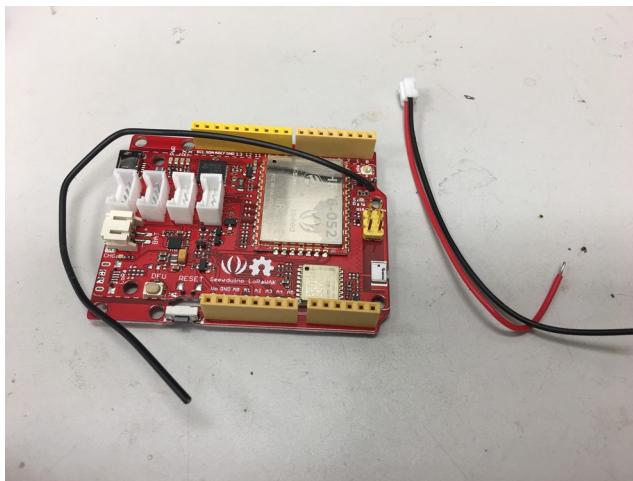
Figure 1.6: Completed 4-pin Connector Split



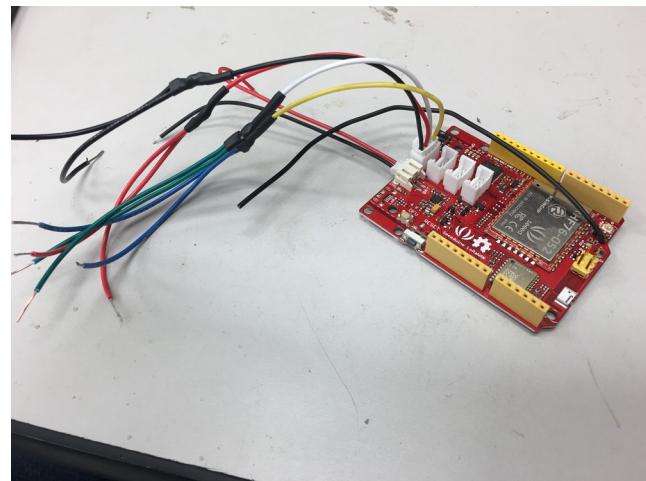
The 4-pin connector cable for the INA219s is now complete.

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Figure 1.7: Seeeduino LoRaWAN

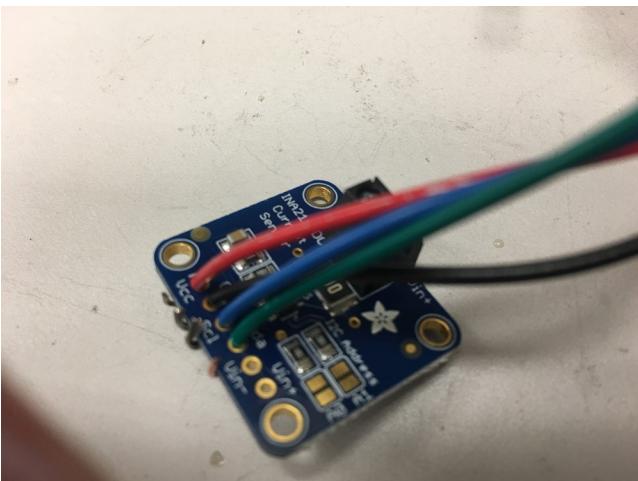


A

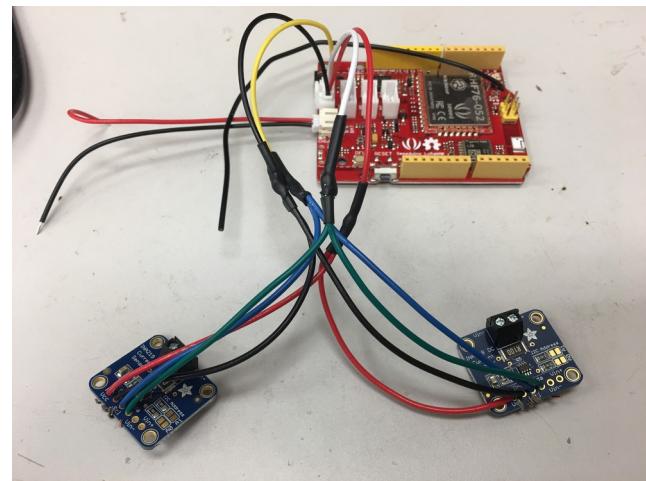


B

Plug in the 4-pin connector cable into the outermost I²C port on the Seeeduino.



C



D

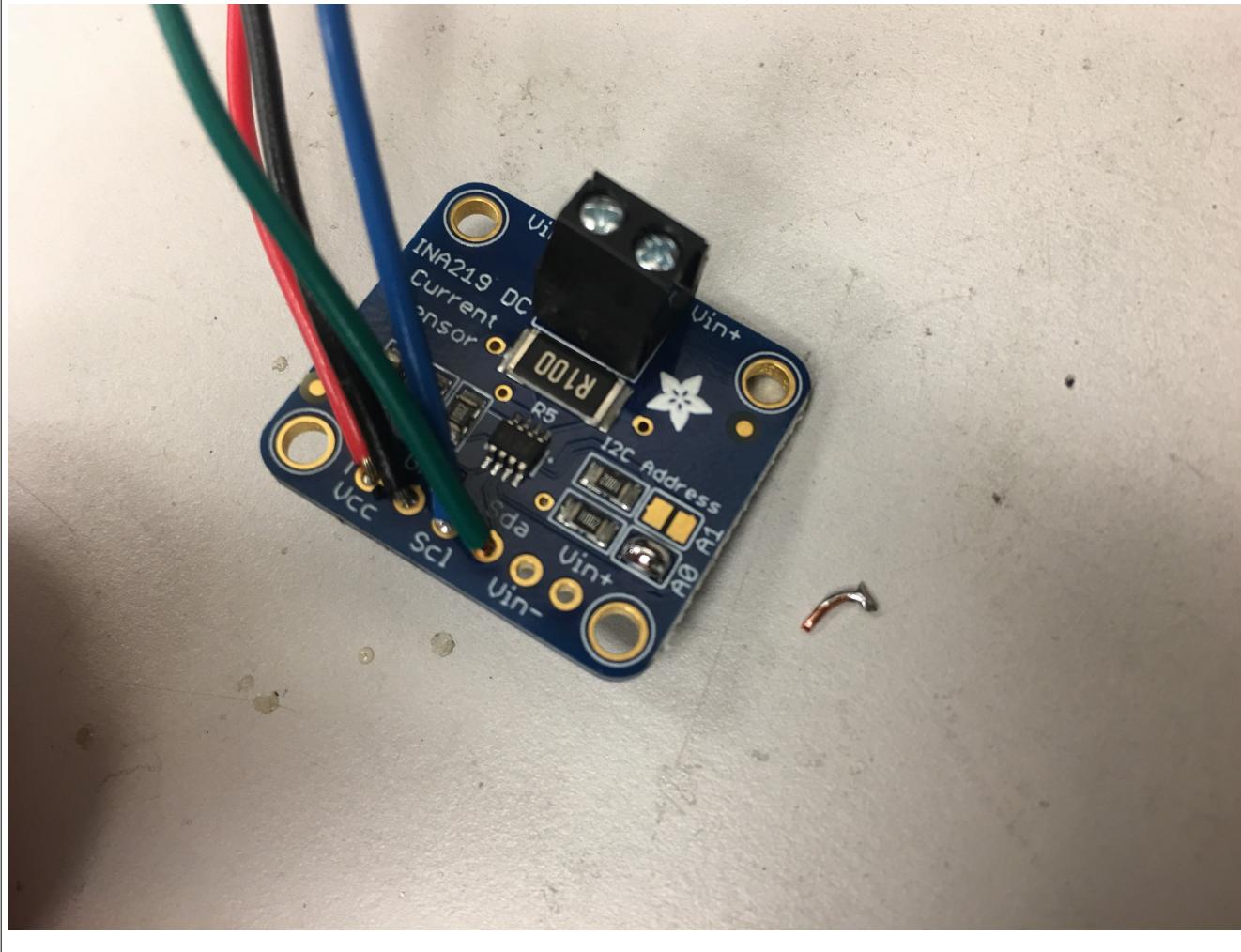
Connect the 4 pin connector cable to each INA219 paying special attention to where each wire goes.

Remember: Green/White = SDA, Red = V_{cc}, Black = Ground, and Blue/Yellow = SCL

Solder each connection on the back of the INA219s. We're not quite finished yet though. We need to solder the two points on the right most INA219 (looking at figure 1.7.D) together in order to change its address to distinguish between reading the battery current/voltage and the solar panels' current/voltage.

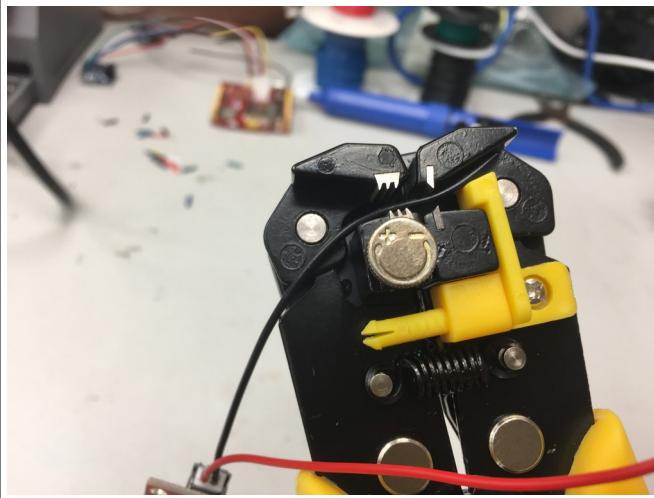
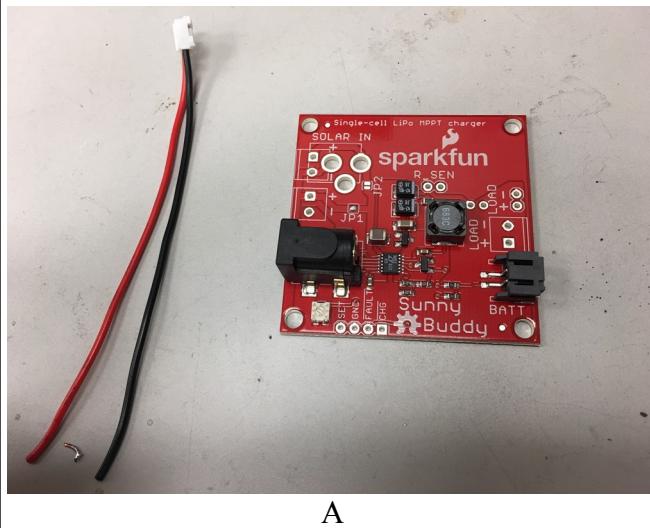
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Figure 1.8: A0 on the Right Most INA219 Soldered.



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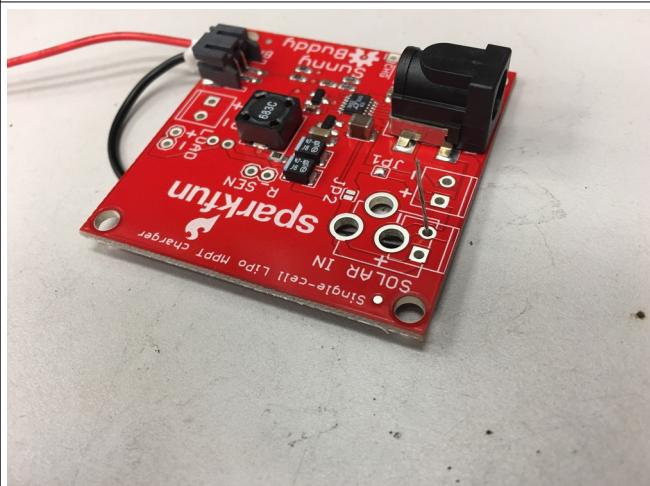
Figure 1.9: Wiring the Sunny Buddy



A

B

First, strip the wires as shown in Figure 1.9.B. Ensure, that the ground wire has a little extra stripped off: we'll need this for the common ground wire for the power wire later on.



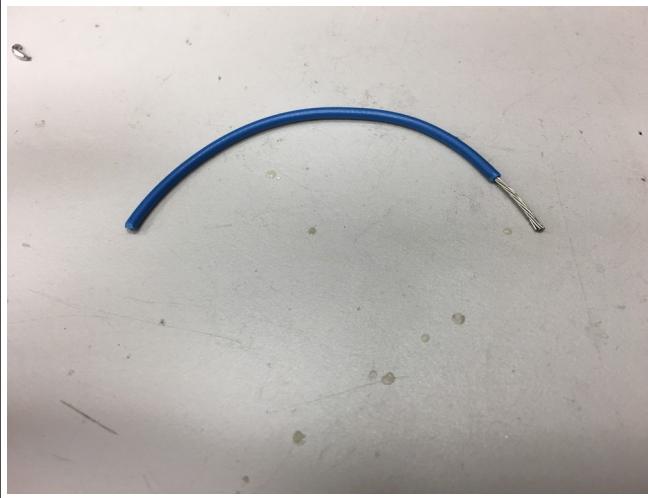
C

D

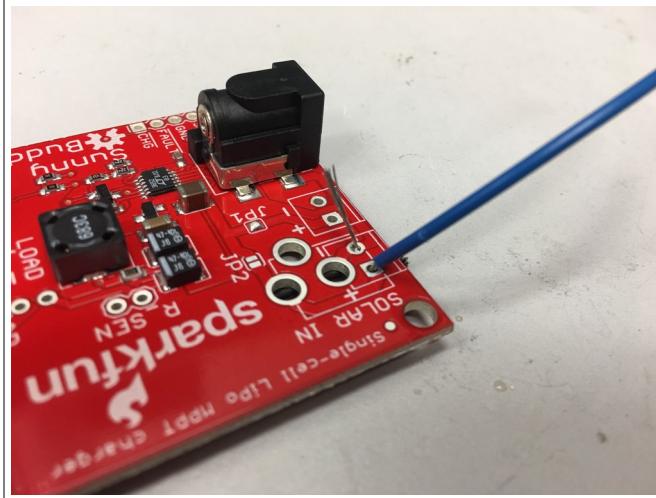
Now, twist the fibers of the wire and thread it through the “Solar -” pin as shown in figure 1.9.C, then solder it on the back of the board as shown in figure 1.9.D.

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Figure 1.10: Attaching the “Solar +” Wire

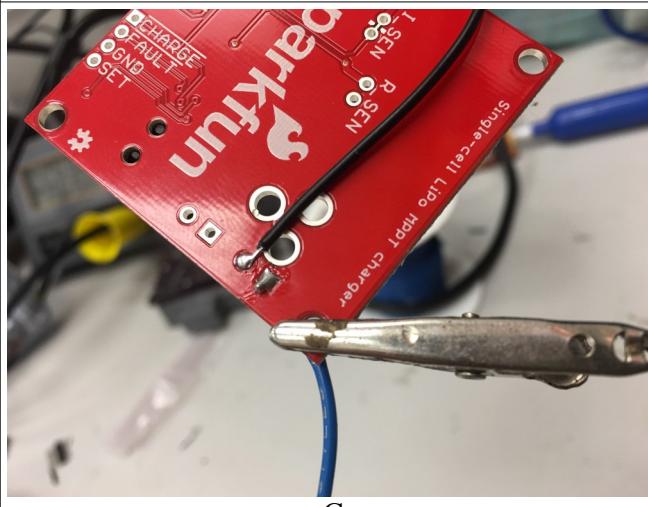


A

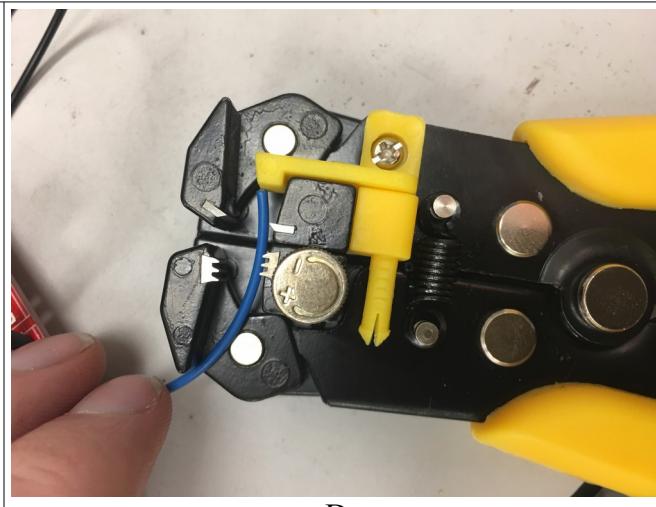


B

Now, cut a small piece of wire and attach it to the “Solar +” pin as shown in figure 1.10.B. Finally, solder it to the back of the sunny buddy as we did with the ground wire (shown in figure 1.10.C).



C

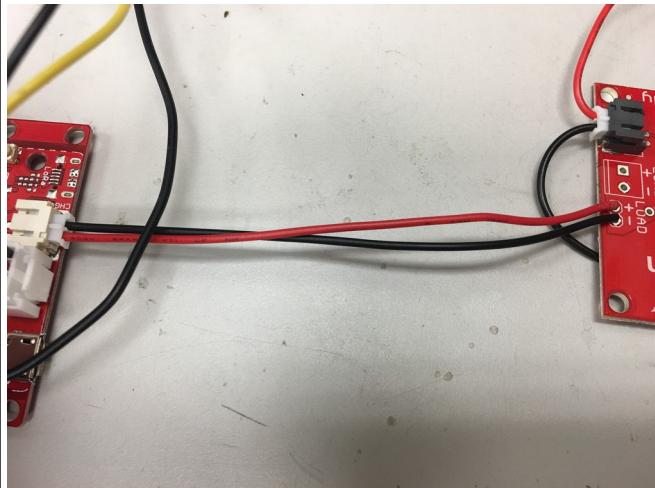


D

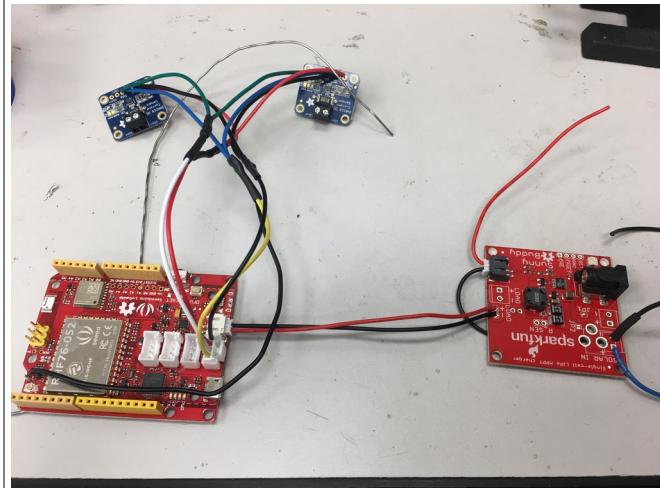
Now strip the blue wire as shown in figure 1.10.D.

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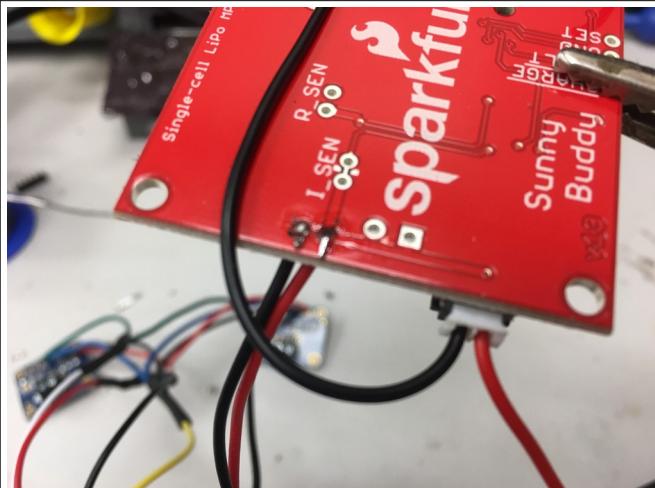
Figure 1.11: Attaching the Load Wires



A



B

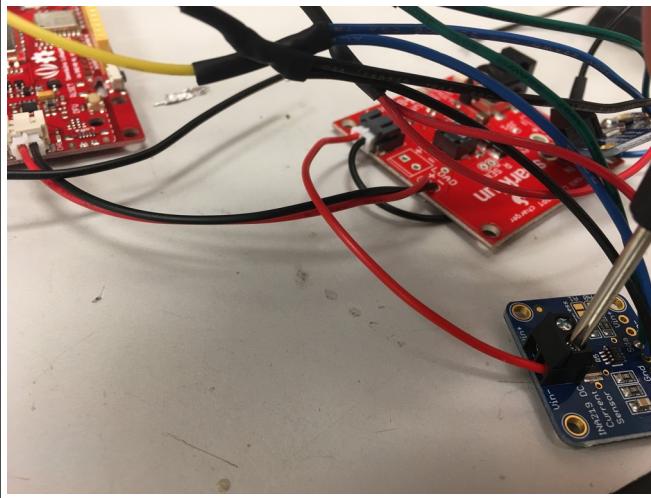


C

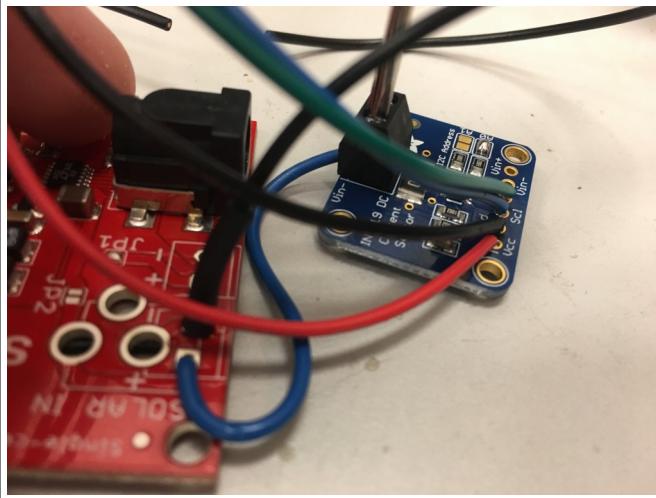
Attach a 2-pin connector as shown in figure 1.11.A: with the red wire threading through “Load +” and the black wire threading through “Load -”. The whole “guts” should now look as they appear in figure 1.11.B. Now, solder the load wires to the back of the Sunny Buddy as in figure 1.11.C.

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Figure 12: Finishing the Guts

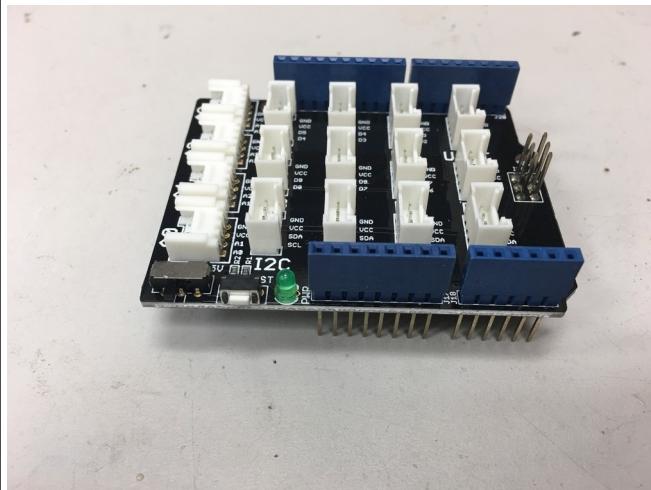


A

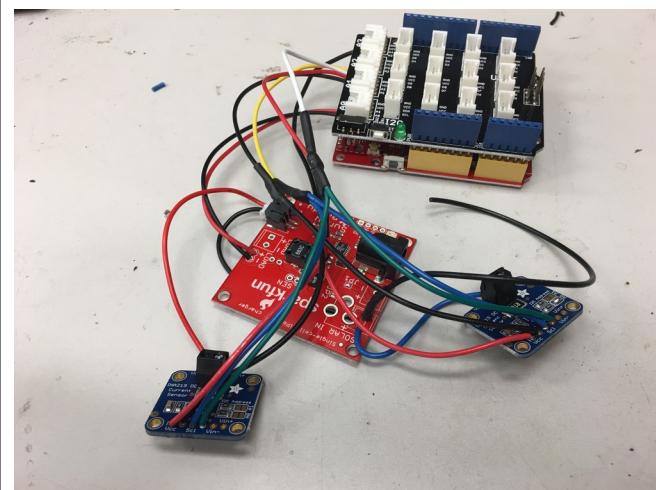


B

On the left most INA219, connect the red wire from the “Bat” connector on the Sunny Buddy to “Vin -”. Now, on the right most INA219, connect the blue wire from the “Solar +” to “Vin -”.



C



D

Finally, attach the base shield to the Sunny Buddy and the final result should look like figure 1.12.D.