



DemoSat Payload Construction Tutorial

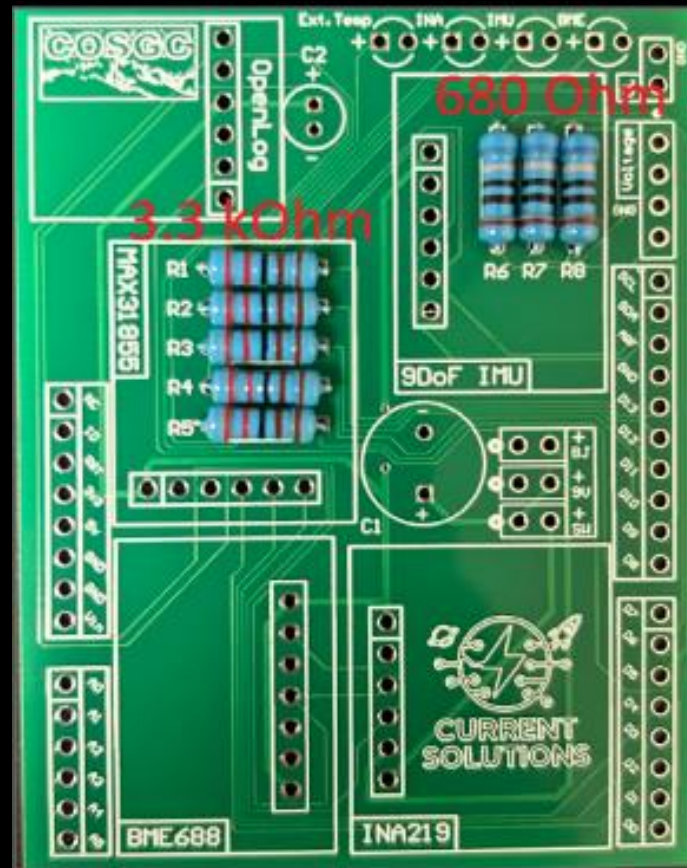
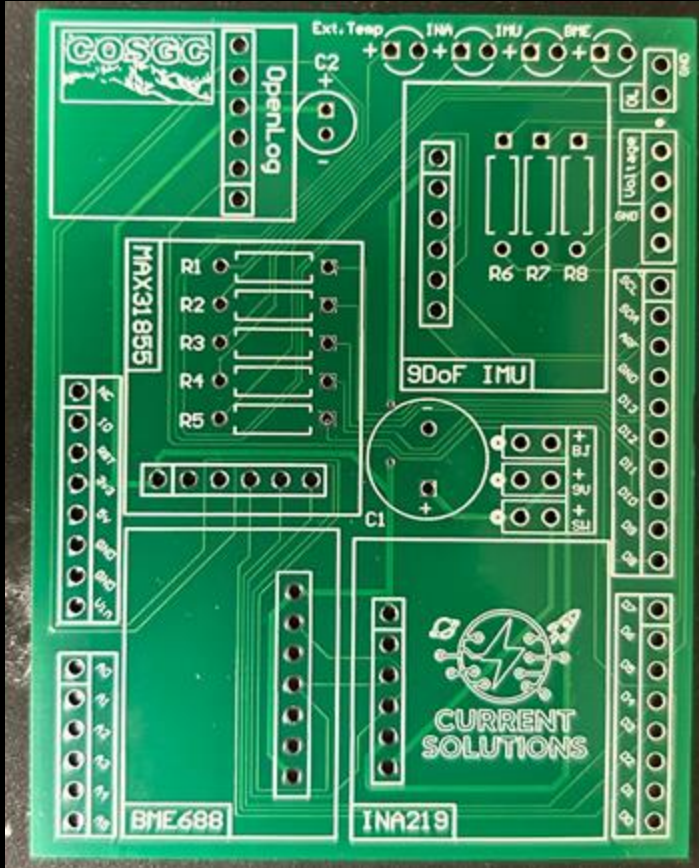
Colorado Space Grant Consortium



University of Colorado
Boulder

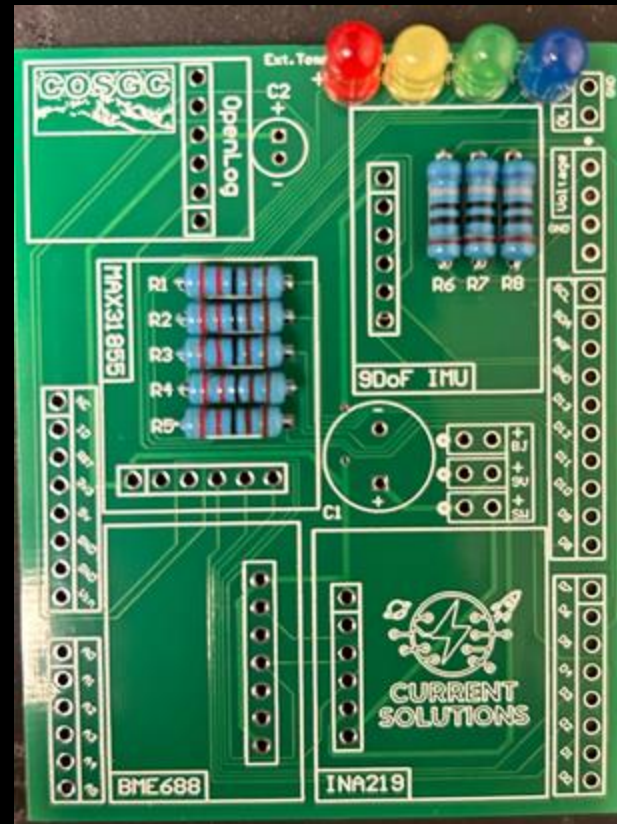
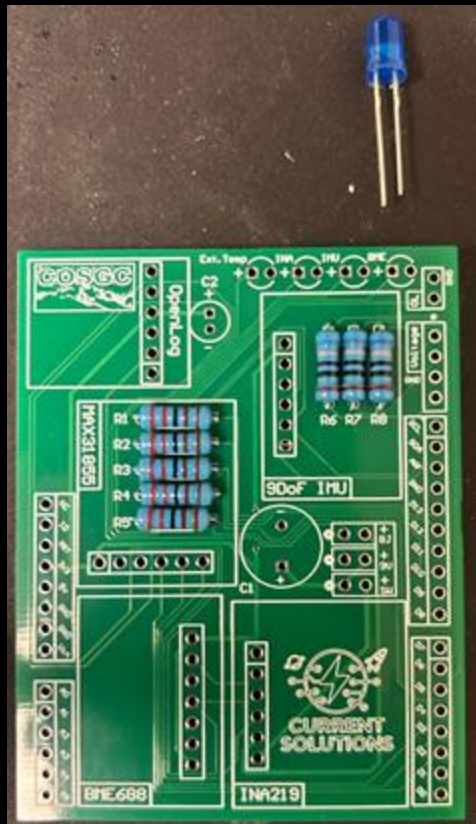
Step 1: Solder resistors

The resistors can be soldered as through hole components. Be sure to check the bands of the resistors as they specify the resistance

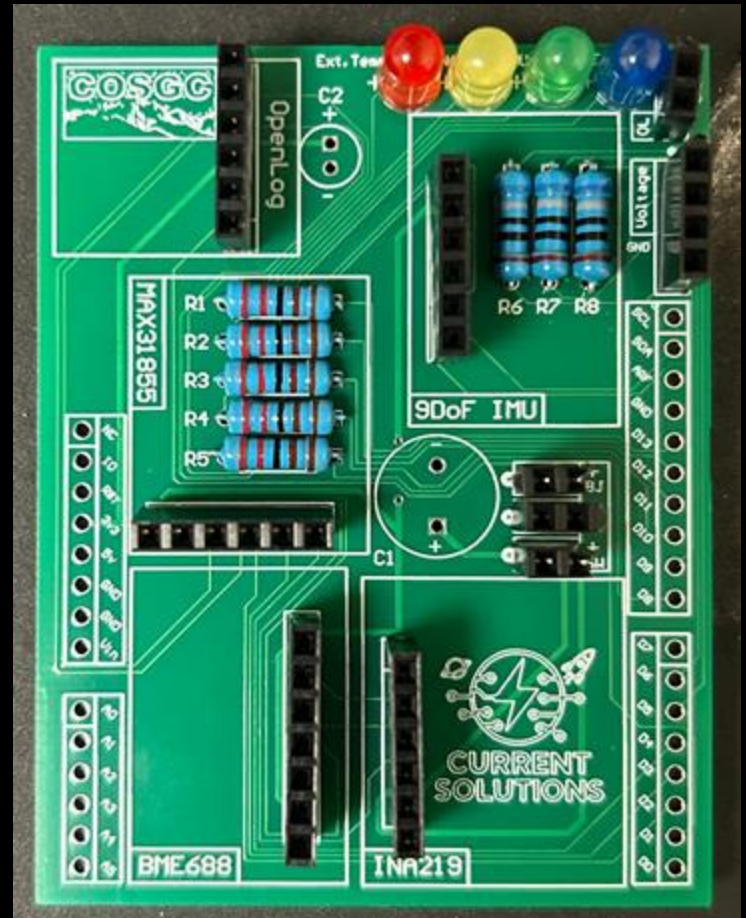
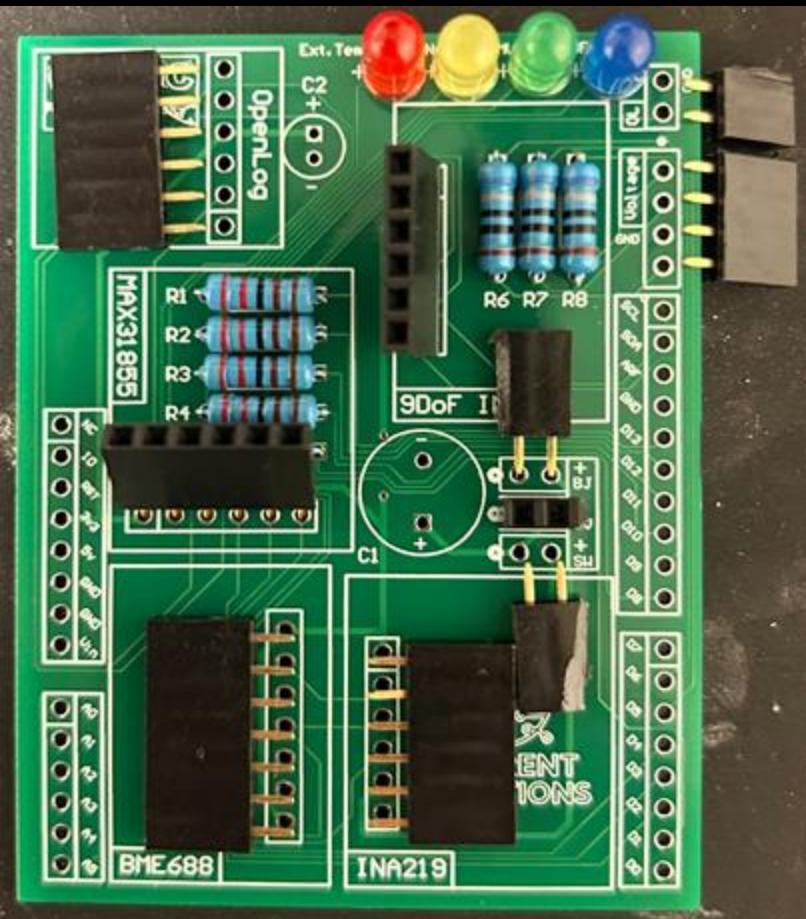


Step 2: Solder LEDs

The LEDs must be soldered with polarity in mind. The short leg represents the negative side. The PCB clarifies which hole is the negative and which is the positive.



Step 3: Solder short header pins

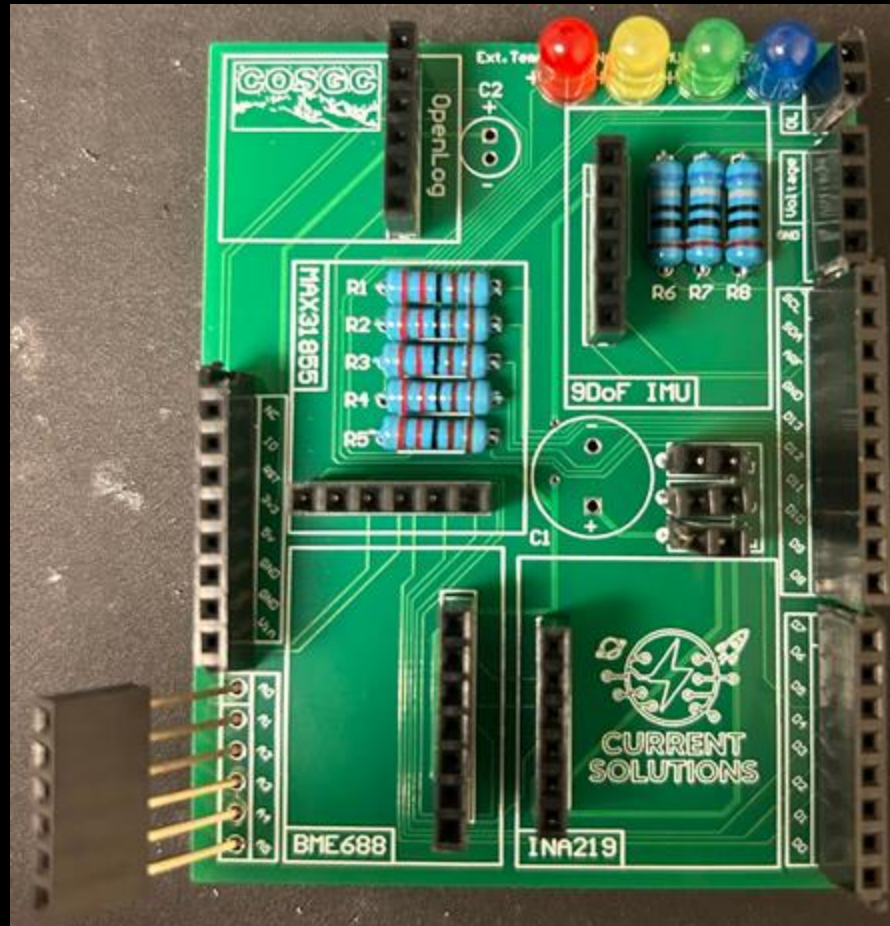


Note: These must be the short header pins



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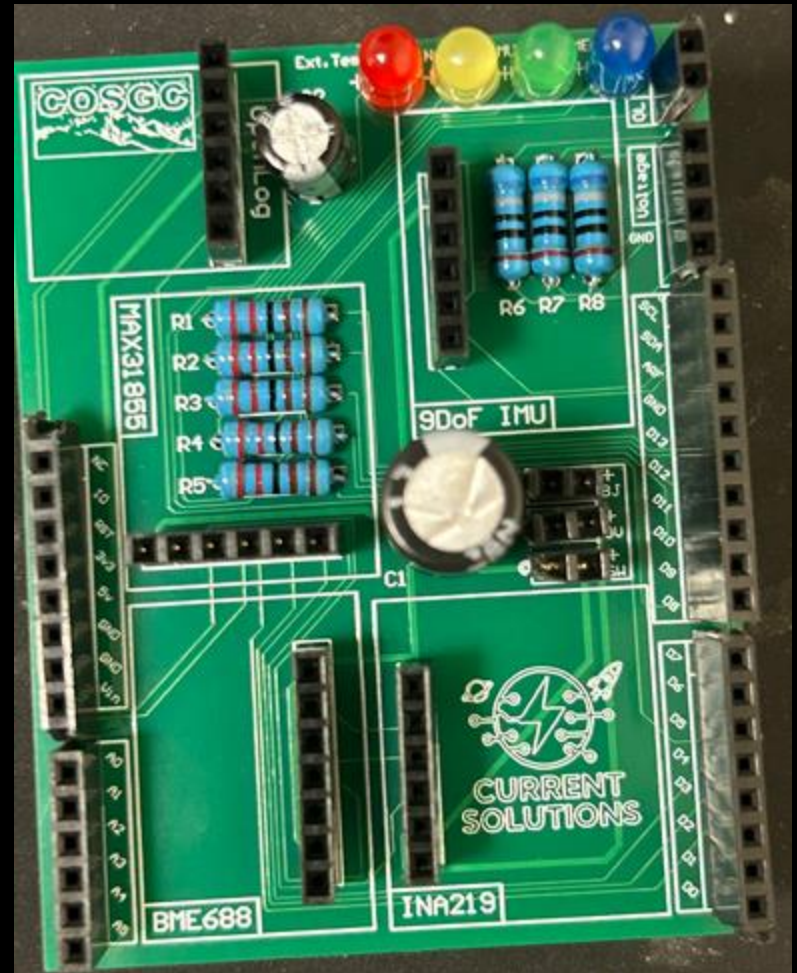
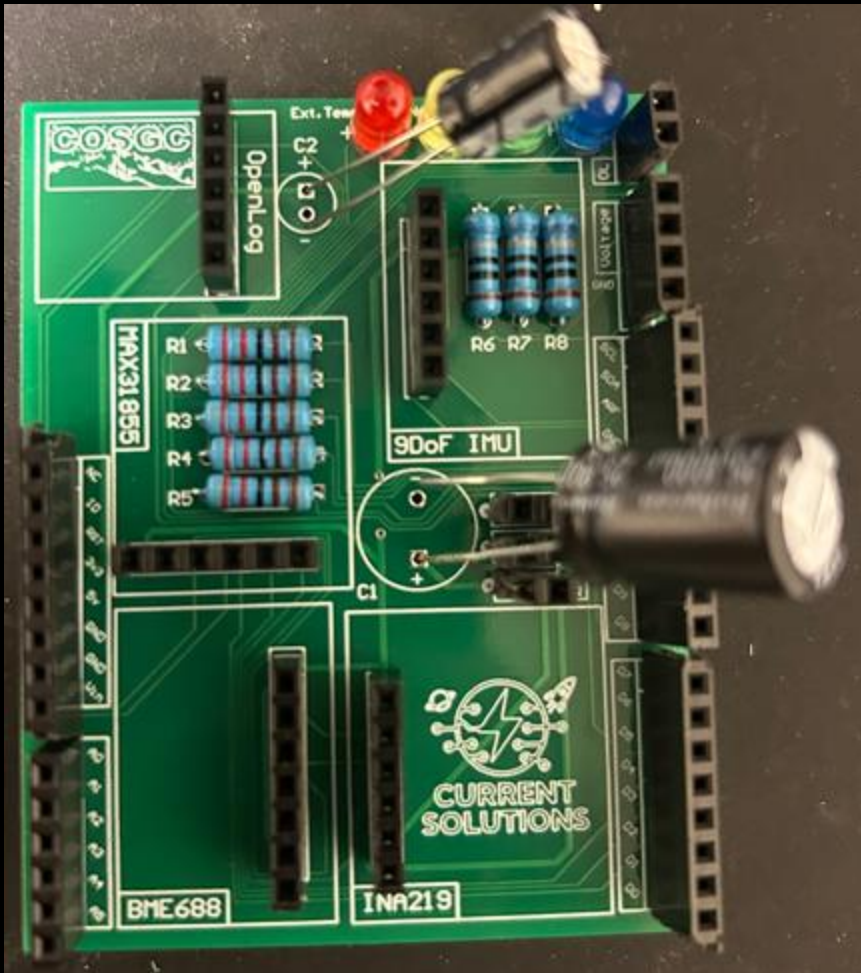
Step 4: Solder long header pins



Note: Make sure the header pins are the long pins, as these will need to connect to the arduino



Step 5: Solder capacitors



Note: The capacitors are also polarized. Make sure to connect the longer leg to the “+”.

Step 6.1: Battery Switch

1. Connect black wire to 'O' side of the switch
2. Connect red wire to 'I' side of the switch
3. Cut ~6cm of black & red solid wire (22 AWG type)
4. Strip ~1cm from each side of solid wire
5. Spiral one end of the switch copper wire onto the solid wire

See (Copper to Solid Wire Tutorial Video)

1. Solder the two ends together

See (Soldering 101 Copper to Solid Wire)

1. Apply Heat Shrink

See (Heat Shrink Tutorial)



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Apply Heat Shrink

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Step 6.2: Power Jack

Connect black wire to black wire of the Power Jack

Connect red wire to red wire wire of the Power Jack

Cut ~6cm of black & red solid wire (22 AWG type)

Strip ~1cm from each side of solid wire

5. Spiral one end of the switch copper wire onto the solid wire

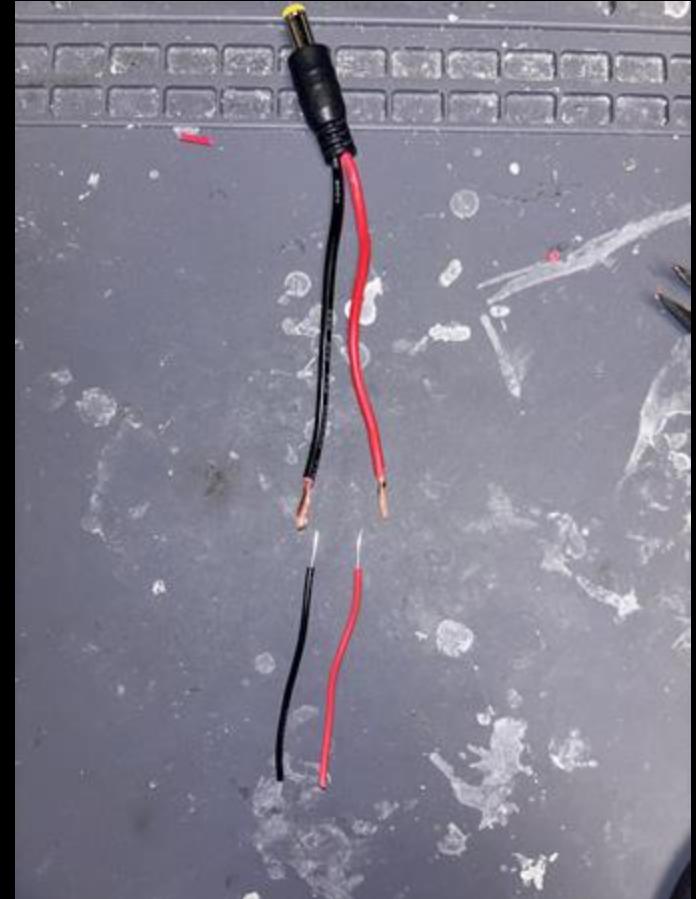
See (Copper to Solid Wire Tutorial Video)

1. Solder the two ends together

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2. Connect red wire to red wire wire of the Power Jack
3. Cut ~6cm of black & red solid wire (22 AWG type)
4. Strip ~1cm from each side of solid wire

Spiral one end of the switch copper wire onto the solid wire

See (Copper to Solid Wire Tutorial Video)

Solder the two ends together

See (Soldering 101 Copper to Solid Wire)

Apply Heat Shrink

See (Heat Shrink Tutorial)



Step 6.3: 9V Connection

1. Strip ~1cm both black & red wire from the 9V connection
2. Cut ~6cm of black & red solid wire (22 AWG type)
3. Strip ~1cm from each side of solid wire
4. Spiral one end of the wire onto the solid wire

See (Copper to Solid Wire Tutorial Video)

1. Solder the two ends together

See (Soldering 101 Copper to Solid Wire)

1. Apply Heat Shrink

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Step 6.3: 9V Connection

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See (Copper to Solid Wire Tutorial Video)

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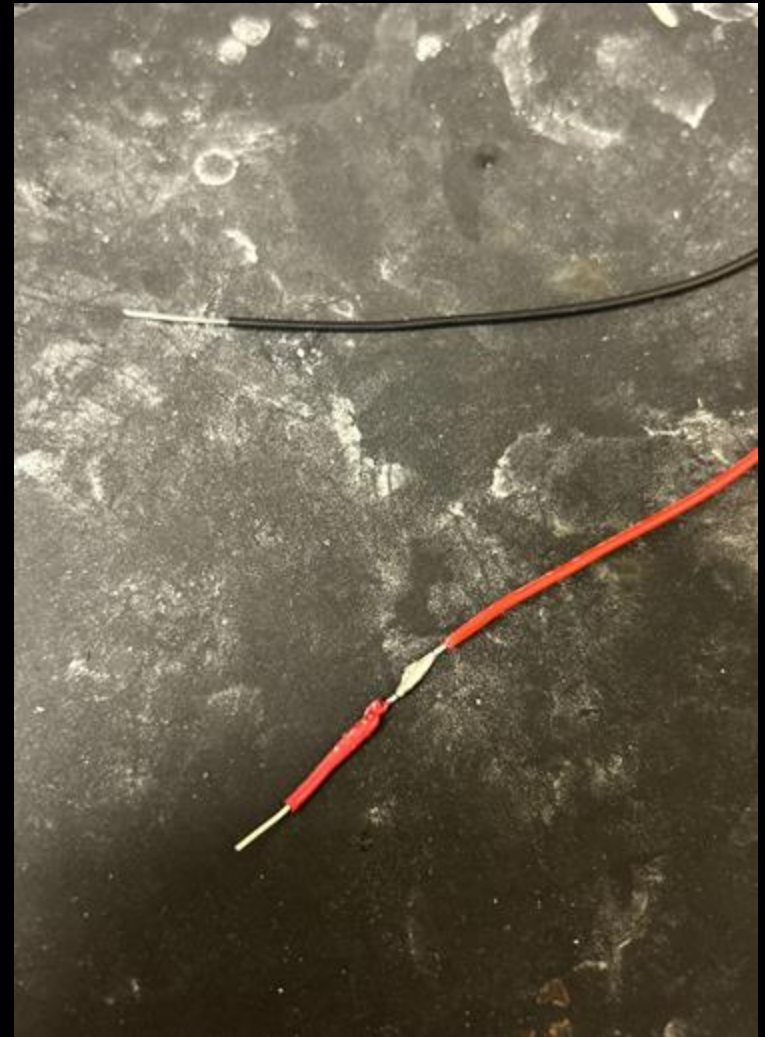
See (Copper to Solid Wire Tutorial Video)

Solder the two ends together

See (Soldering 101 Copper to Solid Wire)

1. Apply Heat Shrink

See (Heat Shrink Tutorial)



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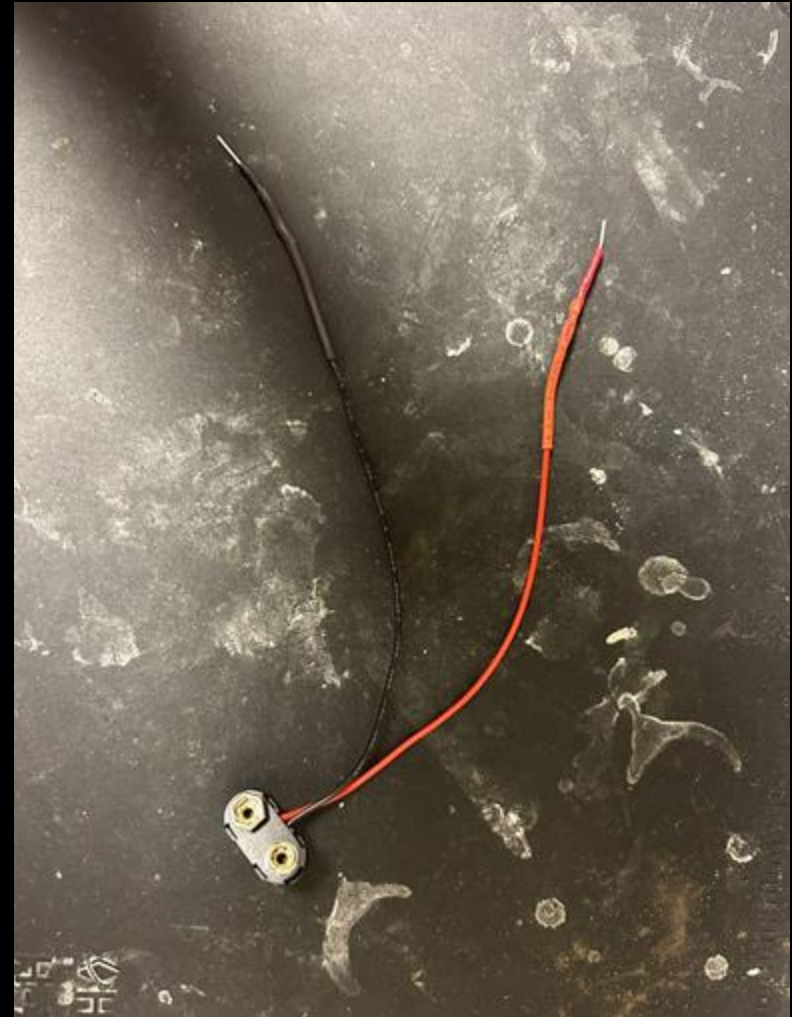
See (Copper to Solid Wire Tutorial Video)

1. Solder the two ends together

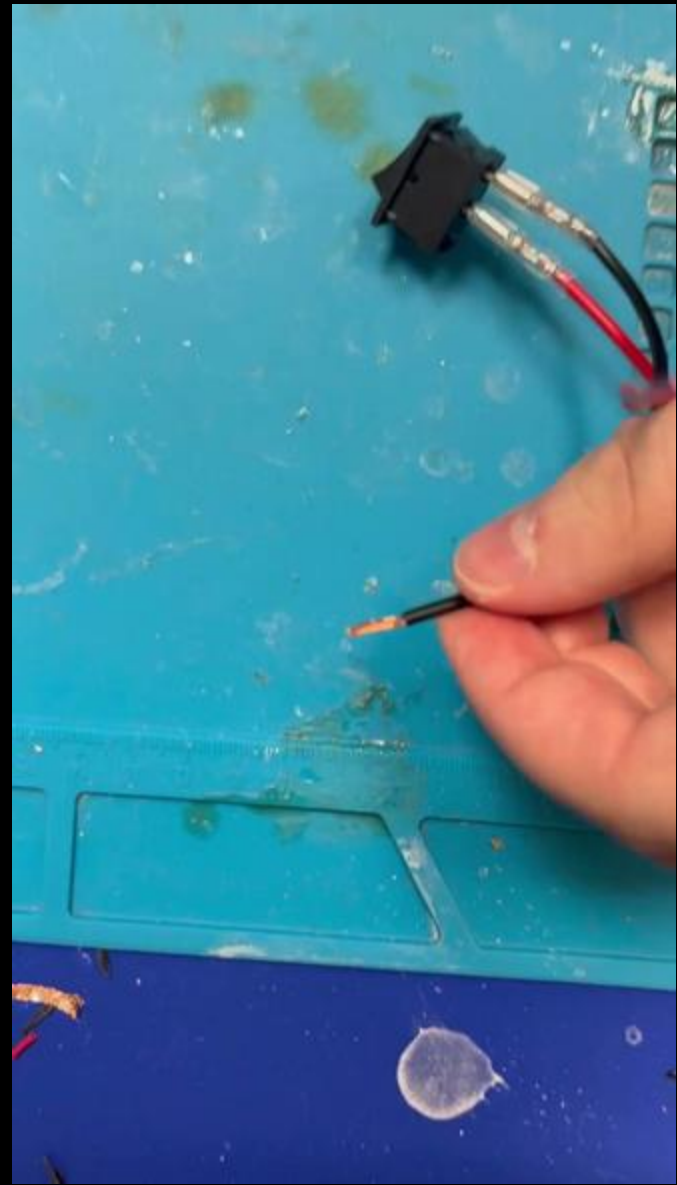
See (Soldering 101 Copper to Solid Wire)

Apply Heat Shrink

See (Heat Shrink Tutorial)



Wire to Wire Soldering Tutorial (Video)

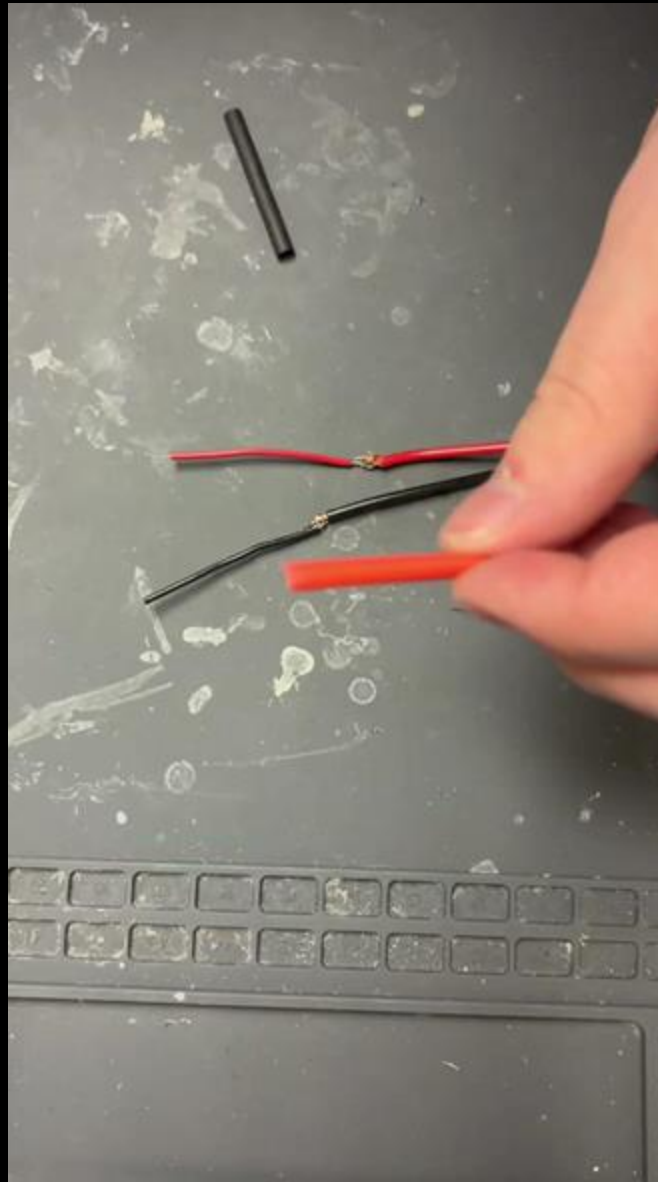


Soldering 101: Copper to Solid Wire (Video)

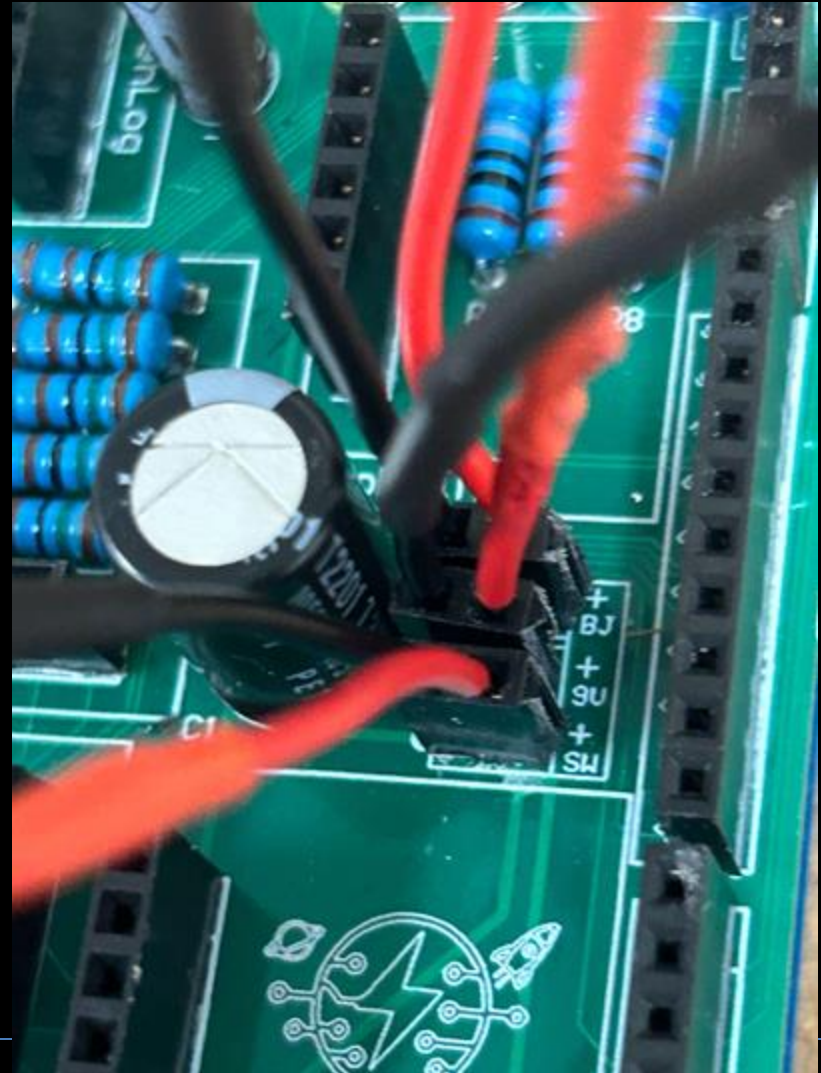


Heat Shrink Tutorial (Video)

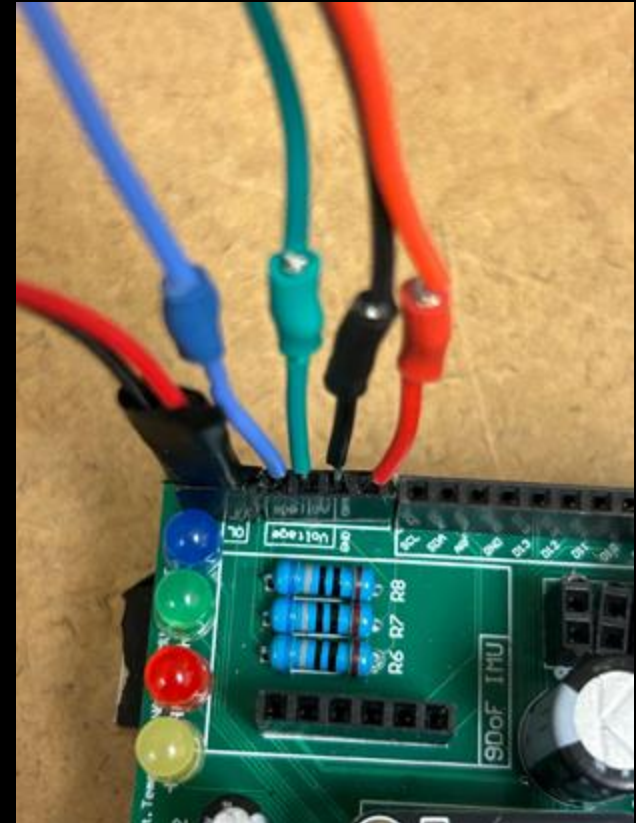
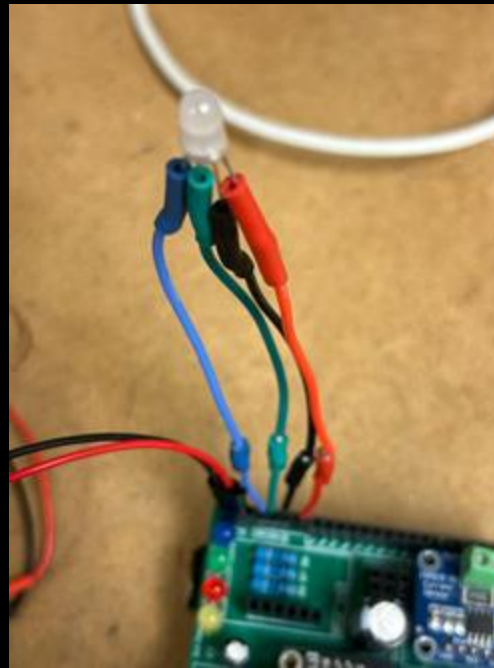
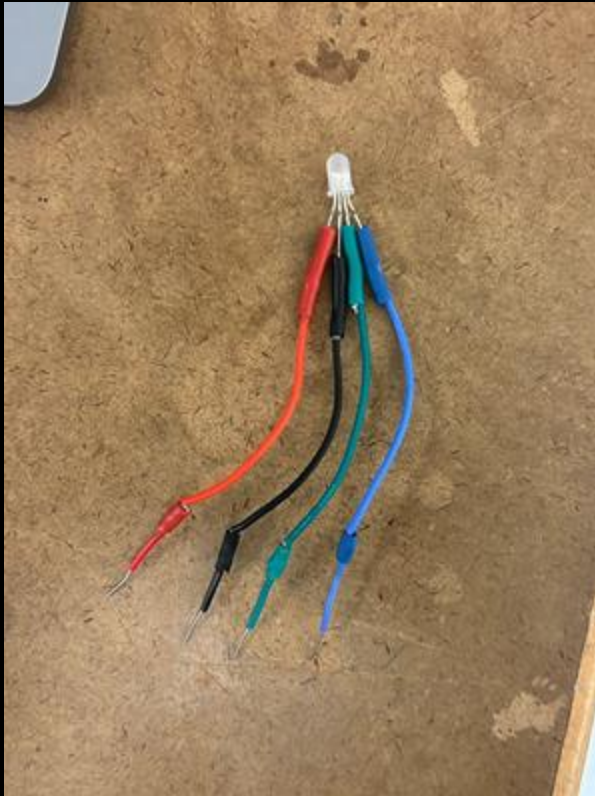
Note: This can also be done with a heat gun or blow dryer.



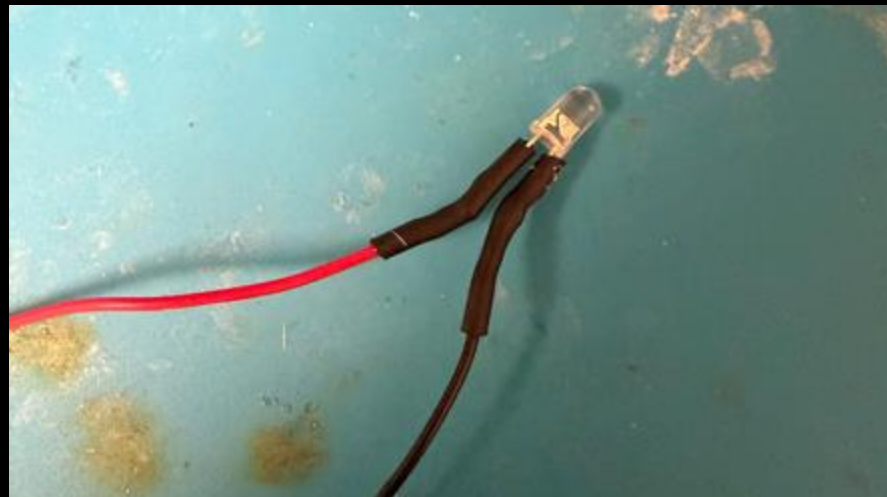
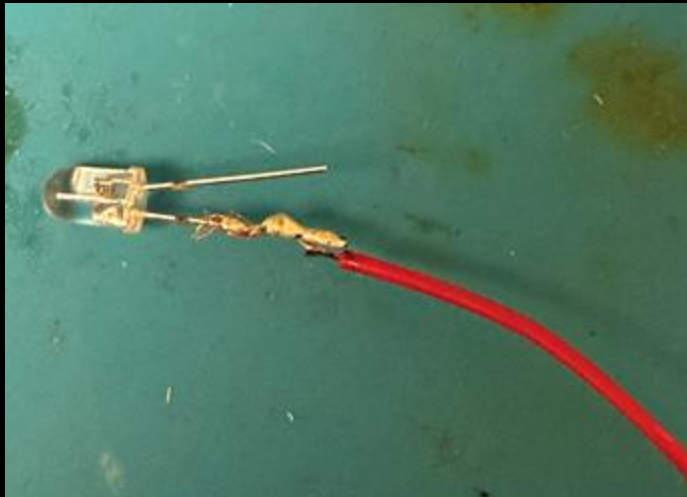
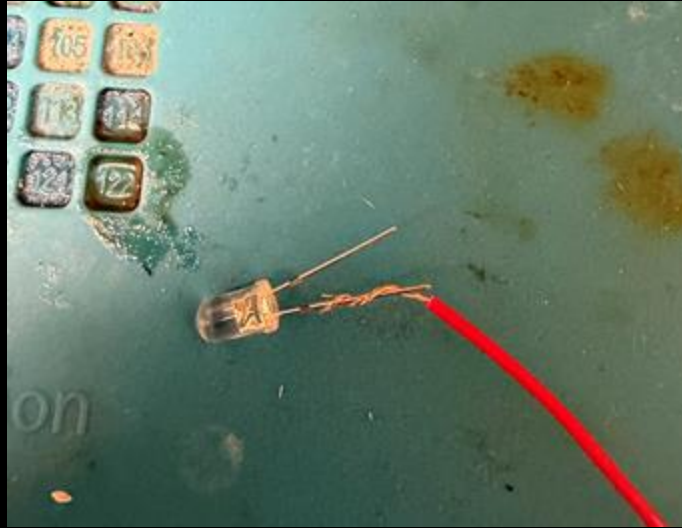
Step 8: BJ 9V SW Connection



Step 7: LED Battery Indicator



Step 8: LED OpenLog Indicator



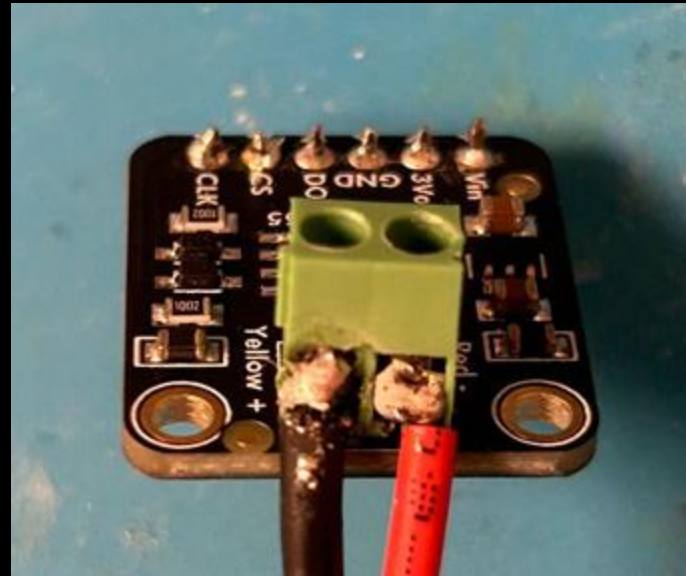
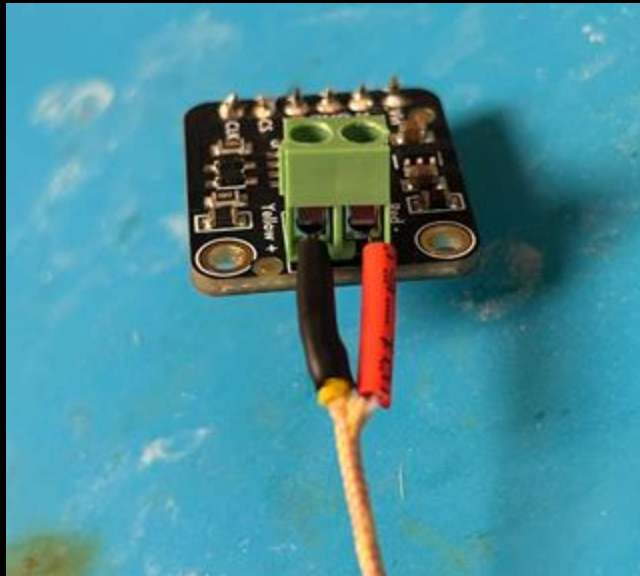
External Temp. Sensor, Part 1

1. Proceed with caution as the internal wires of the probe are very thin.
2. Strip and separate the yellow and red wires.
3. To ensure there is no contact between the wires, add heat shrink.

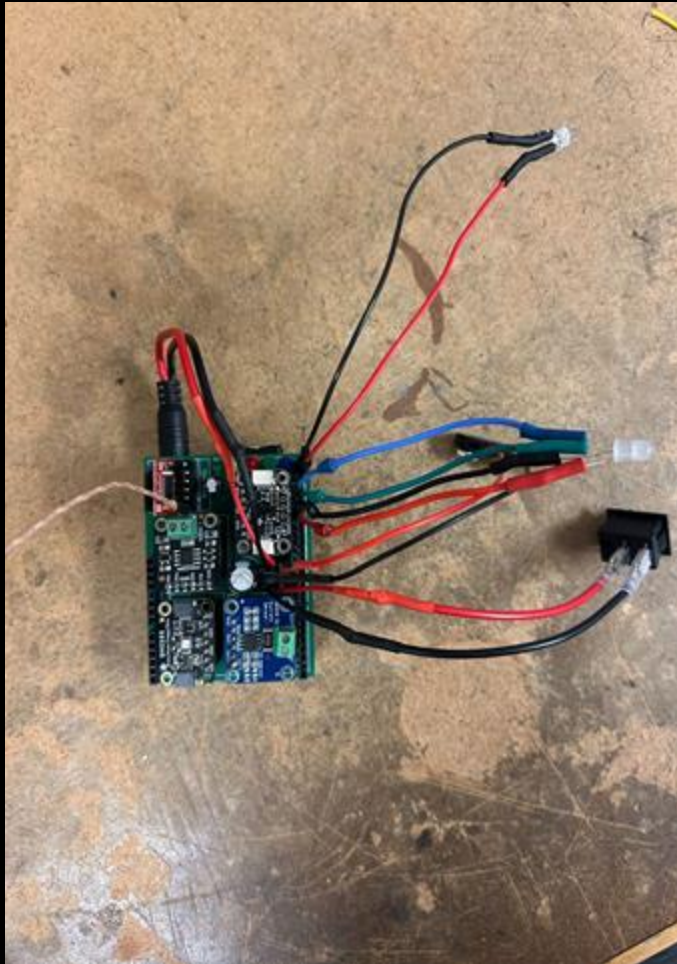


External Temp. Sensor, Part 2

1. Unscrew the screw terminal to loosen the terminal.
2. Insert the red wire into the terminal labeled "red".
3. Insert the yellow wire into the terminal labeled "yellow".
4. Tighten both terminals, ensuring they are tight.
5. For best results, place hot glue or melt solder into terminals to make certain the wires remain in contact with the terminals.



Sensors



Installing the Sensors:

1. Plug the **BME688** environmental sensor into its designated short header pins in the BME688 footprint area.
2. Plug the **9DoF IMU** (LSM6DSOX + LIS3MDL) into its designated header location in the IMU footprint area.
3. Plug the **INA219** current/voltage sensor into its designated header pins in the INA219 footprint area.
4. Plug the **MAX31855** thermocouple amplifier into its designated SPI header location. Ensure the external thermocouple probe is already connected to its screw terminals before seating the module.
5. Plug the **OpenLog** data logger into its UART header, ensuring orientation is correct.



Code

- Once your payload has been fully assembled it is time to upload your code to verify functionality of all sensors.
- Code can be found [here](#) or is available online at the COSGC website
- Download the file, open it in Arduino IDE then upload to the arduino. Navigate to the serial monitor and watch as your data flows in. If any sensor is not working error message will be displayed.
- Read through the code and follow along with the comments to learn more about functionality.



IMPORTANT NOTE:

When installing the balloon shield onto the Arduino, the bottom of the LEDs and the top of the Arduino USB port **may connect and cause a short.** To prevent the short from occurring, cover both parts with electrical tape or another piece of insulated material as shown below.

