Experiment Config Instructions

This guide will go over exactly how the pi was assembled.

Materials:

* 1x Custom Designed PCB board
* 1x Shortened Connecter Configuration
* 1x SPS30
* 1x PI 3B+ (not needed for soldering)

Tools:

* Soldering Iron
* Clamps (something to hold parts steady while soldering)
* Solder
* Soldering Iron Stand
* Wet Sponge (clean soldering iron)
* Multimeter
* Table protector

Recommended Safety Equipment

* Fire Extinguisher
* N95 Mask
* Protective Gloves
* Fume Hood
* Safety Glasses/Goggles
* Lab Coat (protect clothing)

Testing Schedule

Heat Test - 2/10/21

Chill Test - 2/17/21

Rumble Test - 2/24/21

Vacuum Test - 3/04/21

**Testing Instructions:**

**HEAT TEST**

Equipment Phase:

1. Put on flame-resistant lab coats, safety goggles, heat resistant gloves/mitts, and N95 masks.
2. Remove any jewelry
3. If any tester has hair longer than 5 inches or hair that may cause a hazard, instruct the tester to put their hair up and out of the way.
4. Verify testers are dressed appropriately for the given test, including having closed-toed shoes.
5. Verify that all testers handling the Pi are electrically neutral, ie: do not pose a threat due to electrostatic discharge (ESD)
   1. ESD mats, wristbands, and bonding cables all work to meet this step.
6. Make sure that the proper safety equipment is nearby and working properly
   1. Fume hood (highly recommended)
   2. Fire extinguisher (highly recommended)
   3. Backup Personal Protective Equipment (PPE) (recommended)
   4. First Aid Kit (recommended)
   5. This is not an all encompassing list, it is the responsibility of the testing team to determine what is necessary to ensure the safety of the experiment and the testers.

Preparation Phase

1. Place Oven in fume hood
2. Turn the oven to broil (max temperature) for 20 minutes
   1. (to remove residue from manufacturing process)
3. IMMEDIATELY after turning the oven to broil, close the fume hood completely and turn on the fume hood
   1. Ensure proper ventilation of the fume hood.

Use fume hood, oven may smoke

Testing Phase

1. Seperate each part of the payload, the PCB board, the sps30, the pi and the connector wires for individual testing.
2. Set the Toaster oven to 95 degrees Celsius, allowing the temperature to stabilize.
3. Place one part in the oven for an hour.
4. Repeat the process with each part and then let cool.
5. Check for any damage and report any concerns.
6. Assemble into payload configuration, repeat testing while fully operational.

Chill Test:

Prior to testing, the freezer should be set to -20℃ if possible. The payload will be put into an air-tight container and then put into a freezer with a thermocouple overnight. Once removed from the freezer the payload will be run and the data will be compared to data collected at room temperature. Afterwards the payload will be set until it reaches room temperature before further testing can occur.

Rumble test:

The raspberry pi will be checked for any loose or hanging wires prior to testing ( a snapshot/photo would be great here), after the initial check the payload will be strapped into the accelerometer which will run for 3 hours straight. A photo after the accelerometer is run would be great, and the payload will be checked for any stray, disheveled or broken parts. If nothing has moved, run the payload inside the accelerometer and compare the data with data collected in a normal environment.

Vacuum Test:

The vacuum chamber will be cleaned and inspected for cracks and any abnormalities prior to testing. Afterwards the payload will be strapped and put in a secure location within the vacuum chamber. The payload will be subjected to vacuum-like conditions and ran for 2 hours. After the 2 hours, the payload will be taken out of the vacuum chamber and data collected during testing will be compared to data collected in a normal environment.

**Miscellaneous Stuff**

When I first began programming, I needed a way to interface with my sensor to test my programming. To do this, I purchased female to female GPIO pin connectors similar to these → [link](https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.amazon.com%2Fuxcell-30CM-Length-Female-Connector%2Fdp%2FB007Q84AUU&psig=AOvVaw2214pADVE8ZYDmcZ5CwFCB&ust=1612621278431000&source=images&cd=vfe&ved=0CA0QjhxqFwoTCNivkMf40u4CFQAAAAAdAAAAABAD). I also purchased the 5 pin connector for the SPS30, but unfortunately it was a 5 pin connector to 5 pin connector cable, so I had to make some modifications. I cut both wires in half, and striped about a half-inch of insulation off of the wire. I then soldered the wires together and tested the connection with a multimeter.

This wire configuration was used before our PCB board was printed. The soldered wire configuration was simply used for initial programming and troubleshooting, **NOT** for testing purposes.