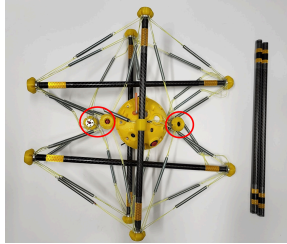


## ENROUTE / STAGING

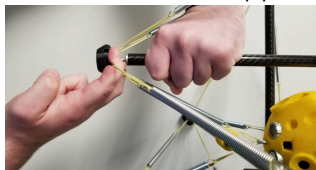
### SENSOR TEAM: ASSEMBLING SENSORS & POWERING SENSORS ON

#### ASSEMBLING SENSORS (if applicable)

If sensors have been flattened:  
Remove sensors from the storage case (if needed). Ensure sensor cables remain free and untangled. Have two unattached rods nearby.



1. Identify the four "empty" (unattached) end caps near the compressed sensor payload; each has a different color bolt—either black or red.
2. Place one of each color-marked end cap in one hand and let the two other empty end caps hang below.
3. Seat one end cap with the red bolt into the end of one rod.
4. Pull the other red bolt end cap until it can be seated into the rod's opposite end.



5. Repeat Steps 3 and 4 with the black bolt end caps.

#### POWERING SENSORS ON

NOTE: Turn sensors on as soon as possible to initiate the O2 sensor warmup.


6. Check that the battery is installed.
7. Press sensor payload's ON/OFF button (sensor beeps twice).
8. Confirm battery voltage displayed on screen is 8.1 or higher. Replace battery, if needed.
9. Inspect.

### TECH REF: STARTING UI, CONFIRMING CONNECTIVITY WITH SENSORS & COMPLETING CLEAN AIR CALIBRATION

#### STARTING UI & SENSOR CONNECTIVITY

1. Turn the Chromebook laptop on by pressing the Power button (upper right of the keyboard). Wait for the operating system to load.
2. Plug XBee antenna into one of the laptop's USB ports. Velcro antenna to the laptop screen.
3. Plug the video receiver into the laptop's other USB port. Velcro video receiver to the laptop screen.



4. Double-click the Squishy Robotics GUI icon  on the desktop.
5. Confirm sensors have successfully connected to the UI by viewing the GENERAL tab. Each connected sensor populates its own row, displaying sensor name, connectivity strength (cell phone bars), and sensor battery percentage.

#### CONFIGURING CAMERAS

6. Select the vertical tab for an individual sensor.
7. Select the Video tab and confirm video is being transmitted to the UI.
8. If video is not being transmitted and the screen displays static, press and hold one of the buttons on the video receiver (it doesn't matter which one) until the screen starts scanning across frequencies. If a "No Camera" icon appears, ensure the video receiver is properly plugged into the USB port.
9. Repeat Steps 6 through 8 for each connected sensor.

### COMPLETING CLEAN AIR CALIBRATION

A Ready to Calibrate status message must display before running calibration.

10. Select the vertical tab for an individual sensor.
11. Select the Calibration tab.
12. Select the green Select Calibration Type button and choose Clean Air Calibration from the drop-down menu.
13. Select one of the gray buttons to begin a clean air calibration for individual gas sensors or ALL 4-gas sensors at once.
14. Repeat Steps 10 through 13 for each connected sensor.
15. Notify Sensor Team when sensors have passed Clean Air Calibration and are ready for deployment by Entry Team.

Note: Unless the default is disabled in the Robot Settings tab, the O2 sensor must be warmed up in order to complete a calibration. If the oxygen sensor has not completed this action, the Calibration Status for the O2 sensor displays Sensor Not Ready.

## SENSOR DEPLOYMENT

### ENTRY TEAM: METER READINGS

NOTE: Meter readings are not displayed on sensor payload. Readings are only viewable on the UI. However, if alarms are enabled, any 4-gas reading above or below set thresholds will trigger an audible alarm from the sensor payload.

### TECH REF: DASHBOARD VIEWS, OPERATING ALARMS, CAMERAS & PLOTS, OTHER SETTINGS

#### DASHBOARD VIEWS

Once Video and Plots have been configured, the Data tab is the most functional dashboard view.

- **Vertical tabs (left side):** GENERAL tab shows all connected sensors. Select individual tabs to view each sensor.
- **Calibration tab:** Calibrate sensors.
- **Data tab:** Side-by-side view of meter readings and choice of video, map, or plots for the selected sensor payload.
- **Video tab:** Change frequencies (if needed), select camera view, turn cameras on/off.

## SENSOR DEPLOYMENT (CONT'D)

- **Plots tab:** Configure plot settings.
- **Alarms tab:** Change alarm thresholds, enable/disable alarms.
- **Logging tab:** Start/stop data logging of gas meter readings to the micro SD card.
- **Settings tab:** Individual sensor settings, Remotely turn off sensors (NOTE: Once a sensor has been remotely turned off, it cannot be remotely turned back on.)

### OPERATING ALARMS

Current **Lower Limit/Upper Limit** values are displayed as light gray text in each text box.

*Enabling Alarms/Changing sensor alarm limits:*

1. Select the vertical tab for an individual sensor.
2. Select the **Alarms** tab.
3. Type numbers into the two white text boxes for a specific sensor alarm.
4. Select the associated **Save** button.
5. Click the **ALARM STATUS** button (far right) until the green **Alarm Enabled** is shown for each or select the green **Enable ALL Alarms** button (upper right).
6. Repeat steps 1-5 for each sensor payload.

*Disabling Alarms:*

1. If an alarm is active: click **Exit** to close the **ALARM NOTIFICATION** pop-up window.
2. Select the **Data** tab and view which meter reading(s) has activated the alarm.
3. Select the **Alarms** tab and click the **ALARM STATUS** button (far right) for the activated alarm until it displays red **Alarm Disabled** or use the red **Disable ALL Alarms** button (upper right).

*Alarm Notifications include:*

- Audible alarms from the deployed sensor and (if laptop sound is enabled) from the Chromebook laptop.
- The dashboard's vertical sensor tab for the activated sensor changes color to red.
- The **Data** tab screen displays a red **Activated** in the **Alarms** column.
- **ALARM NOTIFICATION** pop-up window shows the deployed sensor's name and which 4-gas reading alarm is activated.

## CONFIGURING PLOTS

1. Select the vertical tab for an individual sensor.
2. Select the **Plots** tab.
3. Click the **Select Data** button and select the desired specific sensor from the drop-down menu.
4. To change the plotted **Data Timespan**, click the **All** button and select the desired timespan from the drop-down menu.

NOTE: You can move the horizontal time scroll bar (below the graph) to view past data.

## POST DEPLOYMENT

### ENTRY TEAM: POWERING SENSORS OFF

1. Press and hold sensor payload's ON/OFF button until sensor beeps. All flashing lights should turn off.

### DECON TEAM: DECONTAMINATING SENSORS (if needed)

1. Ensure the sensor payload is powered off (i.e., not in power-saving mode and no flashing lights).
2. Position sensor payload with the **battery slot facing down**.
3. Proceed with dry or wet decon protocol.

NOTE: Sensors ARE NOT submersible in liquid nor power washable. For wet decon, spritz with decon solution and wipe down.

### SENSOR TEAM: INSPECTING SENSORS FOR WEAR AND TEAR

Spring extension, snapped cables, broken rods are considered normal wear and tear; such deterioration reveals how these parts are critical in protecting the sensor payload from damage. Maintenance and repair are expected after 1+ drops (depending on drop conditions).

Visually inspect sensors by checking if:

1. All springs (24 exterior springs and 12 payload springs) are still attached.
2. Each spring is approximately in the center of its cable. Gently pull spring to slide to the center, if needed.

3. Springs have over extended and need to be replaced.



Good springs, do not need to be replaced

Springs show some wear, should be replaced soon

Springs are overextended, need to be replaced

4. If needed, refer to the user manual for instructions to replace cables and/or springs. User manuals can be accessed at [squishy-robotics.com/customer-resources/](https://squishy-robotics.com/customer-resources/)

Only use the provided spare springs, cables, and rods. If additional parts are needed, contact Squishy Robotics (info@squishy-robotics.com).

## SENSOR MAINTENANCE

Squishy Robotics recommends that a Span Calibration is performed at least once a month.

### PERFORMING SPAN CALIBRATION

1. Complete "Powering Sensors On" steps and "Starting UI & Sensor Connectivity" steps (both found on p. 1).
2. Select the vertical tab for an individual sensor.
3. Select the **Calibration** tab.
4. Select **Span Calibration**.
5. Ensure calibration constants match the cal-gas being used. If needed, update calibration constants by clicking the **Robot Settings** tab then **Update Configuration**.
6. Confirm that the O2 sensor is ready.
7. Attach calibration cap to sensor payload.
8. Attach the constant flow regulator to the cal-gas cylinder, then connect tubing.
9. Open the cal-gas nozzle and wait until the readings on UI stabilize (approx. 1 min.).
10. Select one of the gray buttons to begin span calibration, either a button for a single gas sensor or **ALL**.
11. When calibration is completed, turn the cal-gas nozzle to stop flow.
12. Remove calibration cap from sensor.
13. Remove tubing from the flow regulator and the flow regulator from cal-gas.
14. Repeat steps 2 through 12 for each sensor.