Life V2.0

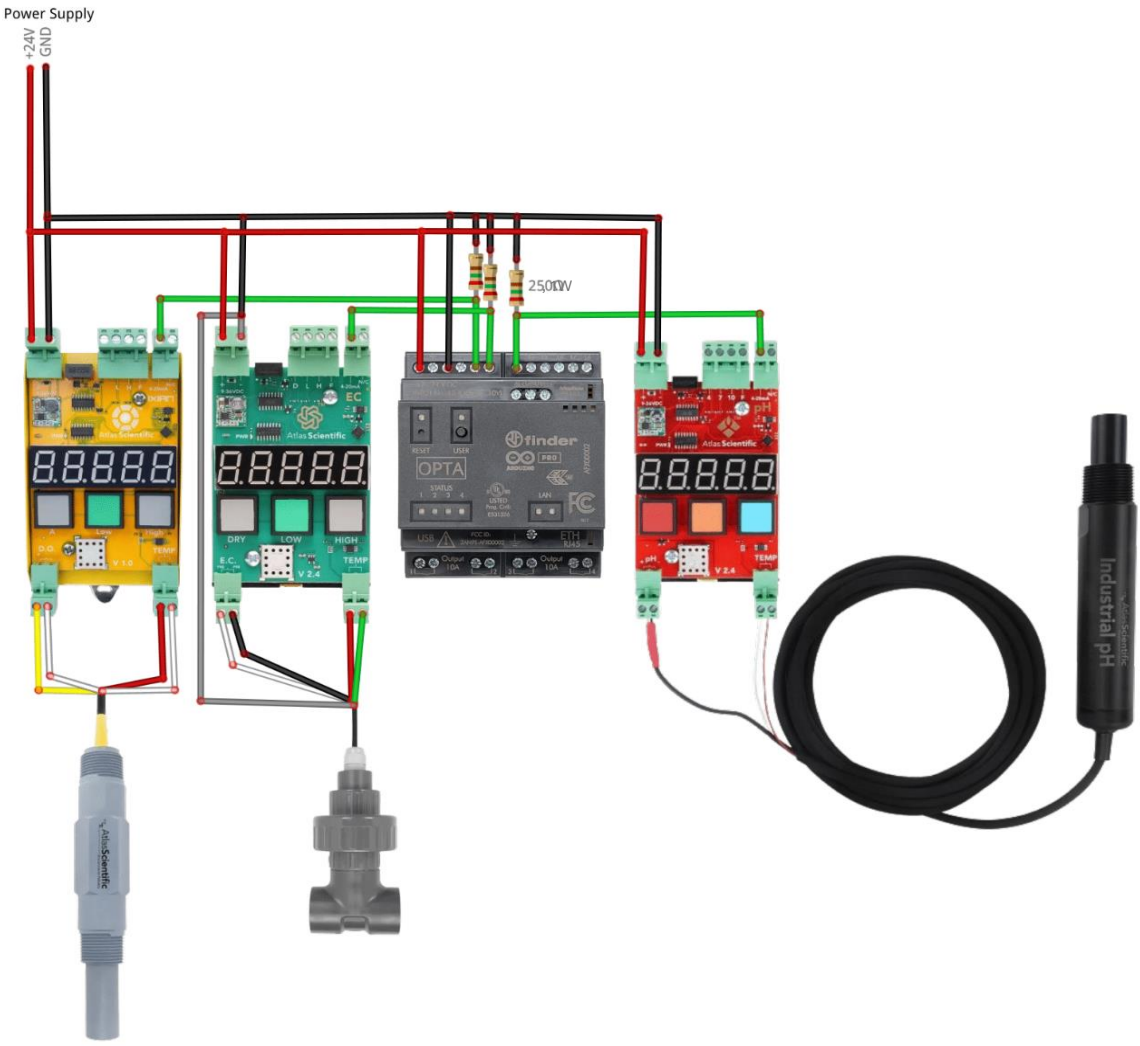
Overview

Life V2.0 is an innovative project aimed at real-time monitoring of crucial environmental parameters using state-of-the-art sensor technology. By integrating an Industrial Dissolved Oxygen Kit, Industrial Conductivity Kit K 1.0, and Industrial pH Kit with an Arduino Opta Wi-Fi PLC, the project enables seamless data collection. The collected data is then transmitted to a server for storage and analysis. A user-friendly dashboard provides a comprehensive display of the sensor data, allowing for easy interpretation, data visualization and monitoring. This project serves as a vital tool for environmental monitoring and management, facilitating informed actions towards sustainability and resource conservation.

Components List

SL No	***Name***	***Details***	***Quantity***	***Purchases Link***
1	Arduino Opta Wi-Fi	Arduino Opta Wi-Fi is a secure, easy-to-use micro-PLC with Industrial IoT capabilities.	1	Arduino
2	Dissolved Oxygen Kit	Atlas Scientific Industrial dissolved oxygen testing kit	1	Atlas scientific
3	Conductivity Kit	Atlas Scientific industrial conductivity sensor	1	Atlas scientific
4	pH Kit	Atlas Scientific pH sensor	1	Atlas scientific
5	Power Supply	24V, 10A Switching Mode Power Supply	1	Amazon
6	Resistor	250 Ohm, 1W	3	-
7	Cable	Connecting cable	-	-

Wiring Diagram



Components Details

Arduino Opta Wi-Fi

The Arduino Opta Wi-Fi is a compact and secure micro-PLC (Programmable Logic Controller) designed for industrial IoT applications. With its user-friendly interface and built-in Wi-Fi capabilities, it offers seamless connectivity and control in industrial environments.

Figure 1: Arduino Opta

Dissolved Oxygen Kit

The Atlas Scientific Industrial Dissolved Oxygen Testing Kit is a comprehensive solution for accurately measuring dissolved oxygen levels in various industrial settings. Designed with precision and reliability in mind, it provides essential data for monitoring water quality and environmental conditions.

Figure 2: Dissolved Oxygen Testing Kit

Conductivity Kit

The Atlas Scientific Industrial Conductivity Sensor Kit is a robust solution for measuring conductivity in industrial processes. Engineered for durability and accuracy, it enables precise monitoring of conductivity levels in liquids, ensuring optimal performance and quality control.

Figure 3: Conductivity Sensor Kit

pH Kit

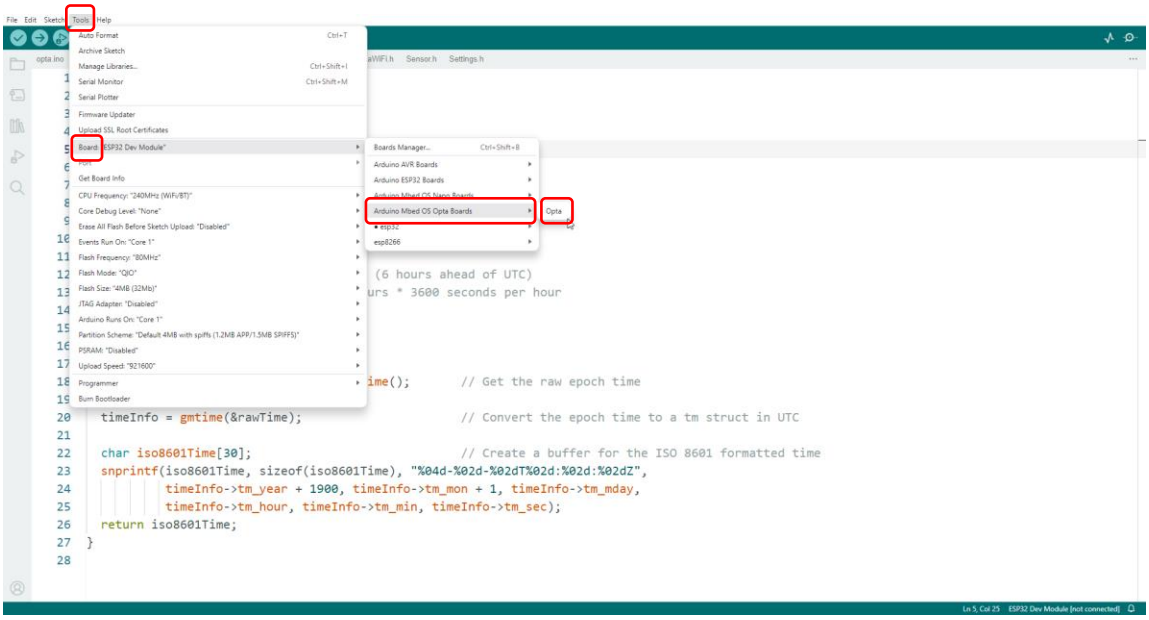
The Atlas Scientific pH Sensor Kit offers precise pH measurement capabilities for industrial applications. With its high accuracy and reliability, it provides essential data for monitoring and controlling pH levels in diverse industrial processes, ensuring optimal performance and product quality.

Figure 4: pH Sensor Kit

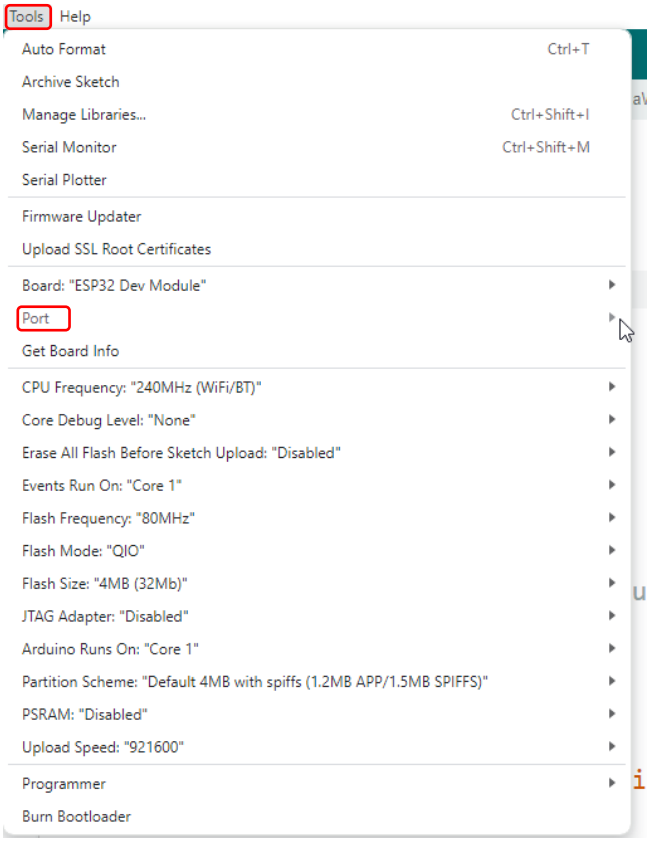
Arduino IDE Setup and Code Run

1. Open your Arduino IDE, then go to the board manager and search for **“opta”**. You will find **“Arduino Mbed OS Opta Boards”** Select the newer version and install it on your IDE.

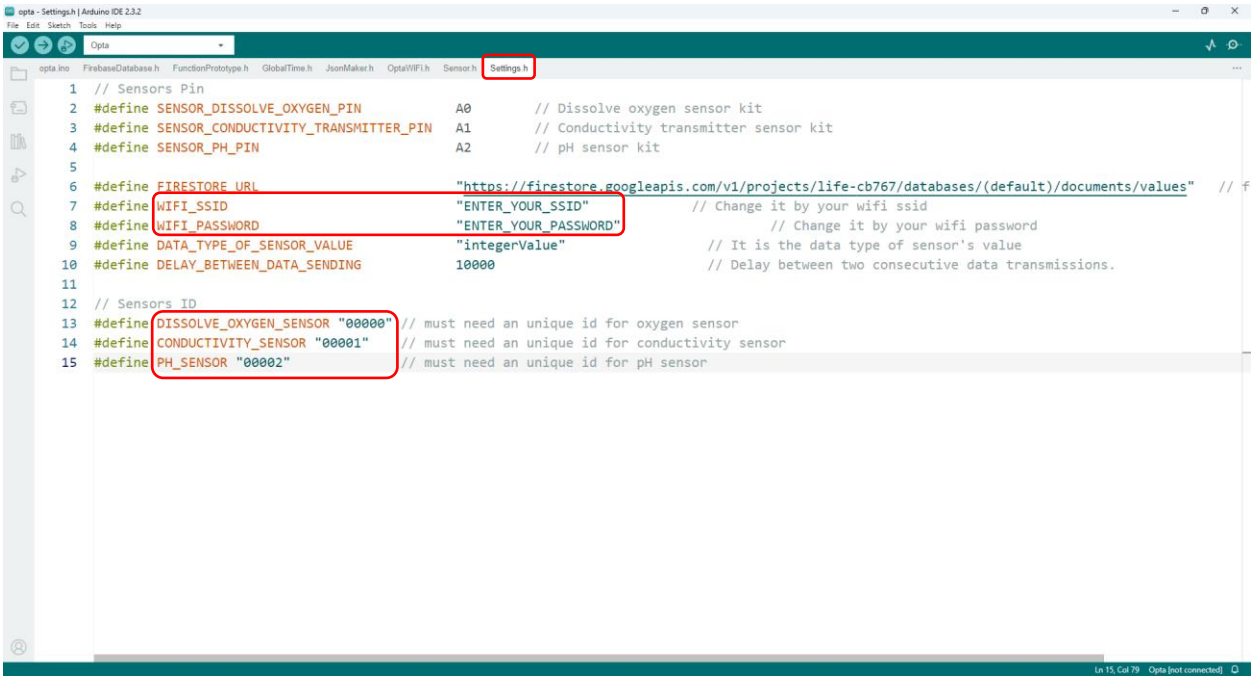
2. To select your Arduino Opta board from the board manager, go to ***Tools > Board > Arduino Mbed OS Opta Boards > Opta***, now select the Opta board.



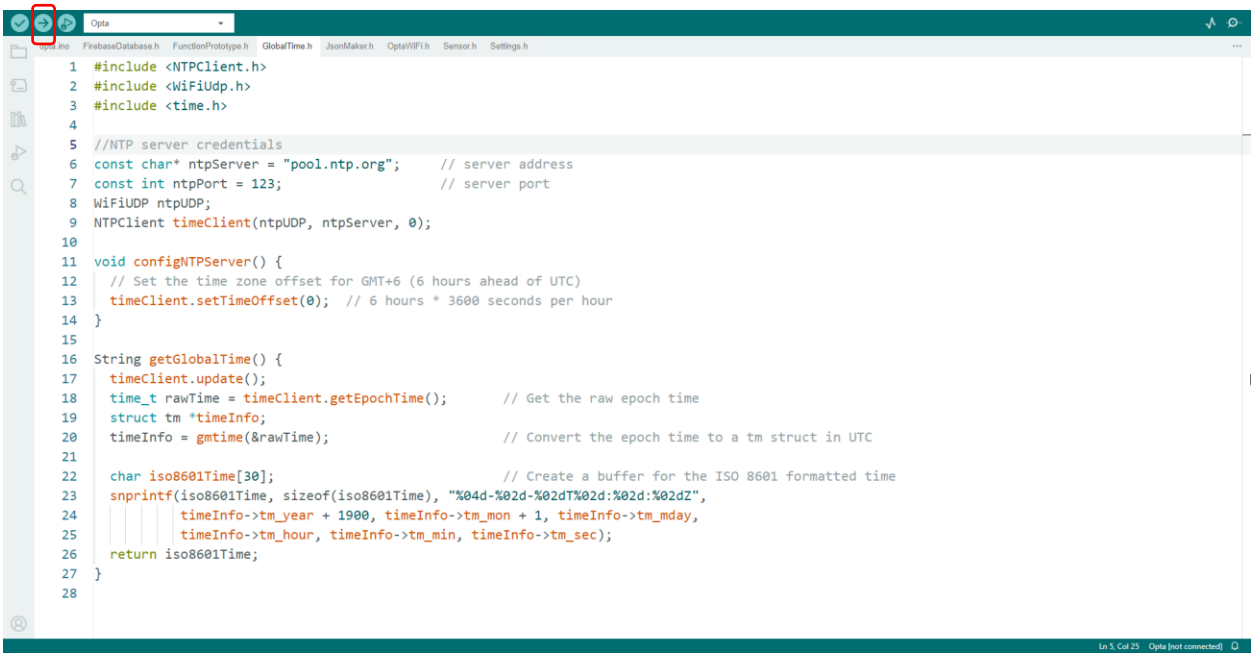
Similarly, to select the Opta board port, first, connect your board to the PC and then select your port from ***Tools > Port > [Your device port name].***



3. To update your Wi-Fi and sensor credentials, navigate to the **Settings.h** header file. Modify the **Wi-Fi SSID and password**, as well as the **sensor ID**. Ensure each sensor has a unique ID that hasn't been configured on the server yet.

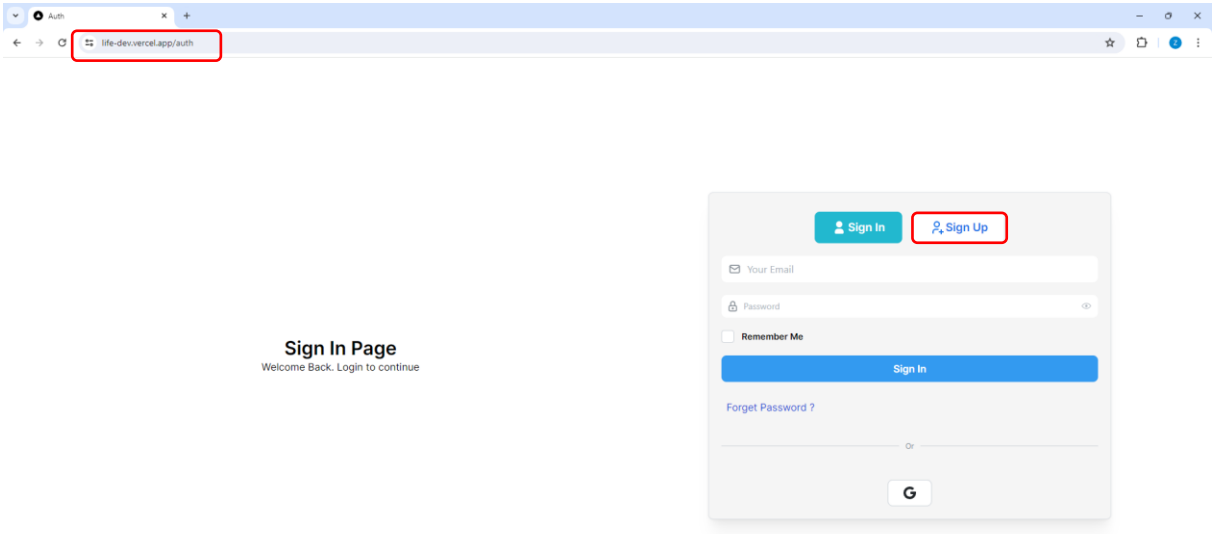


4. To upload the code to the Arduino Opta PLC, simply click on the upload button. The code will compile and then automatically upload. Occasionally, this process may take a few minutes to complete.

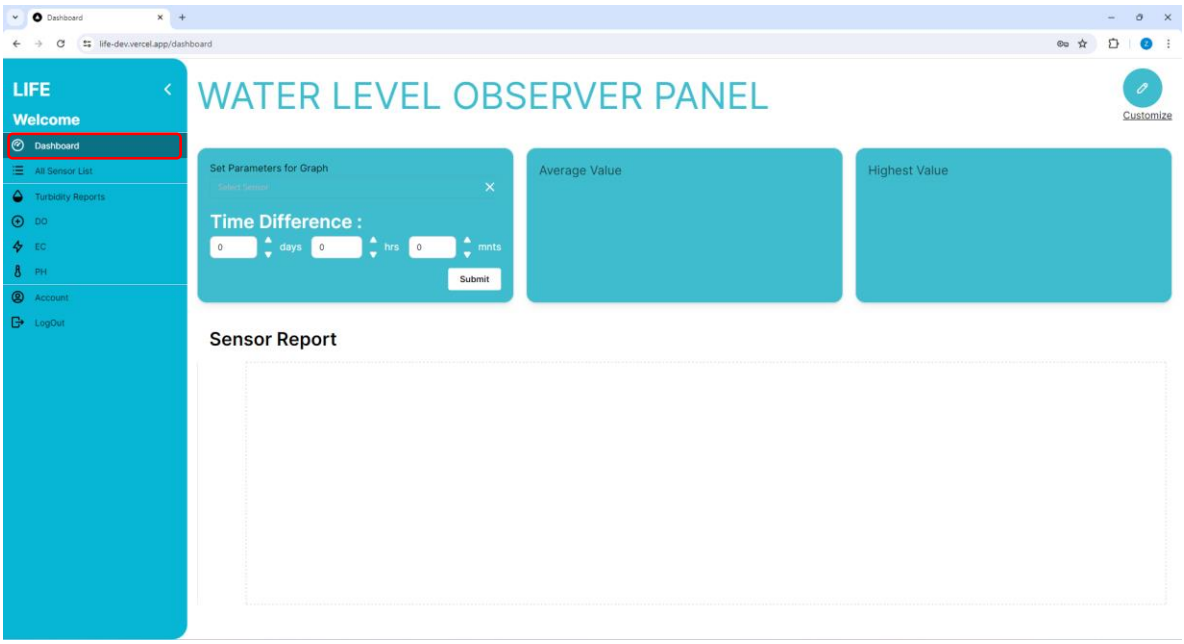


Web dashboard setup

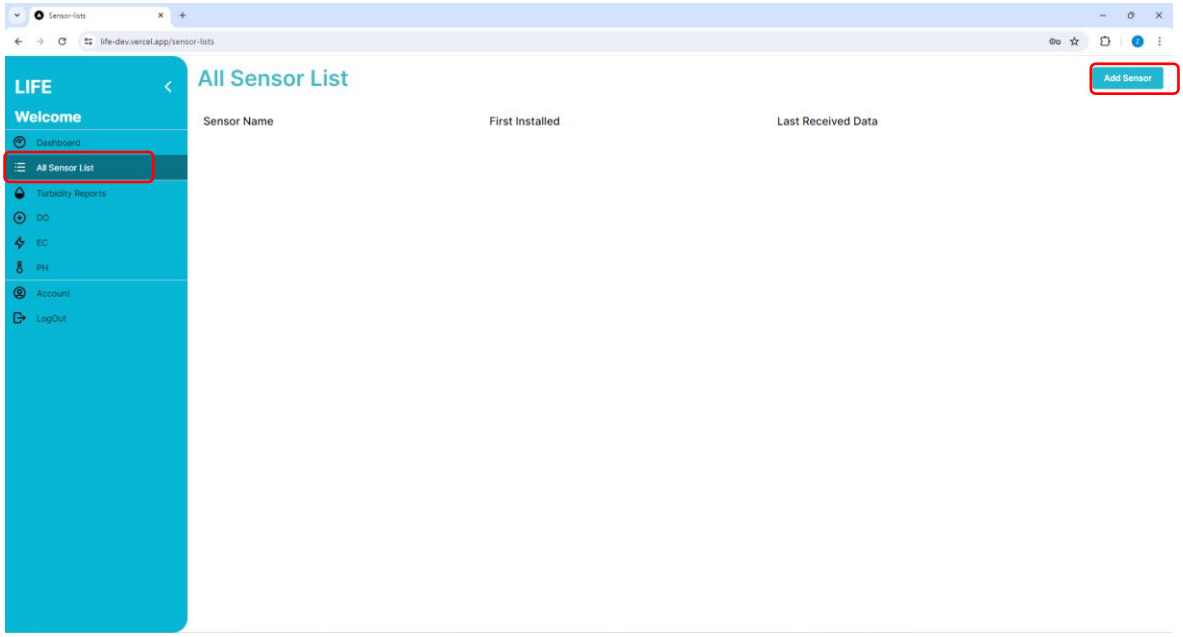
1. Visit the link https://life-dev.vercel.app/auth to create a new user account using your email address.



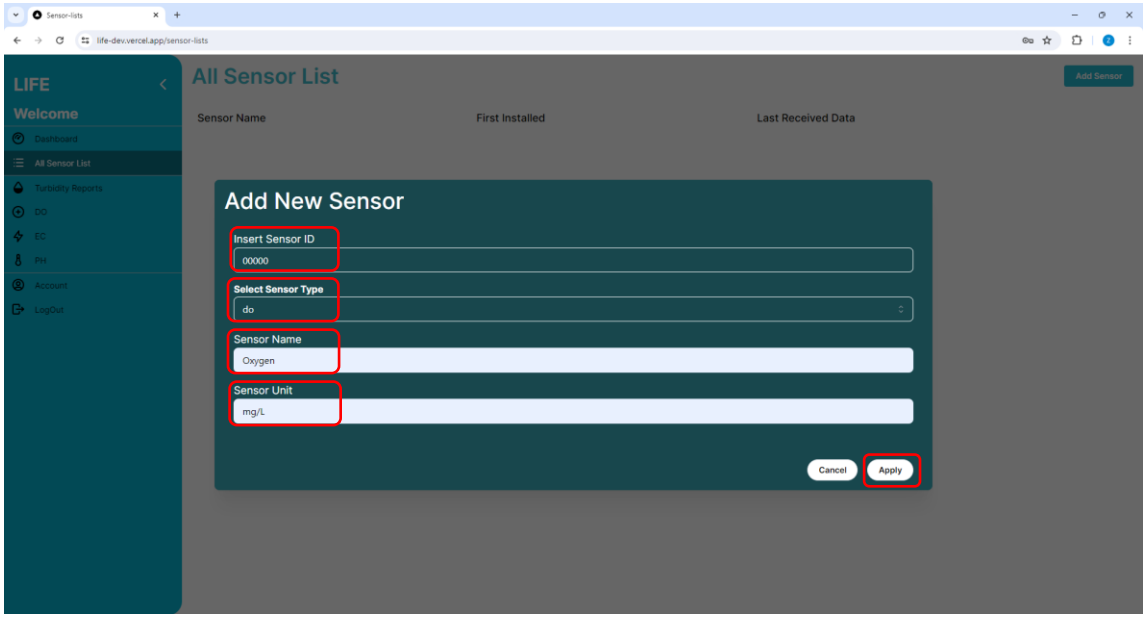
2. Upon logging into the dashboard, you will be greeted with a layout resembling the dashboard window.



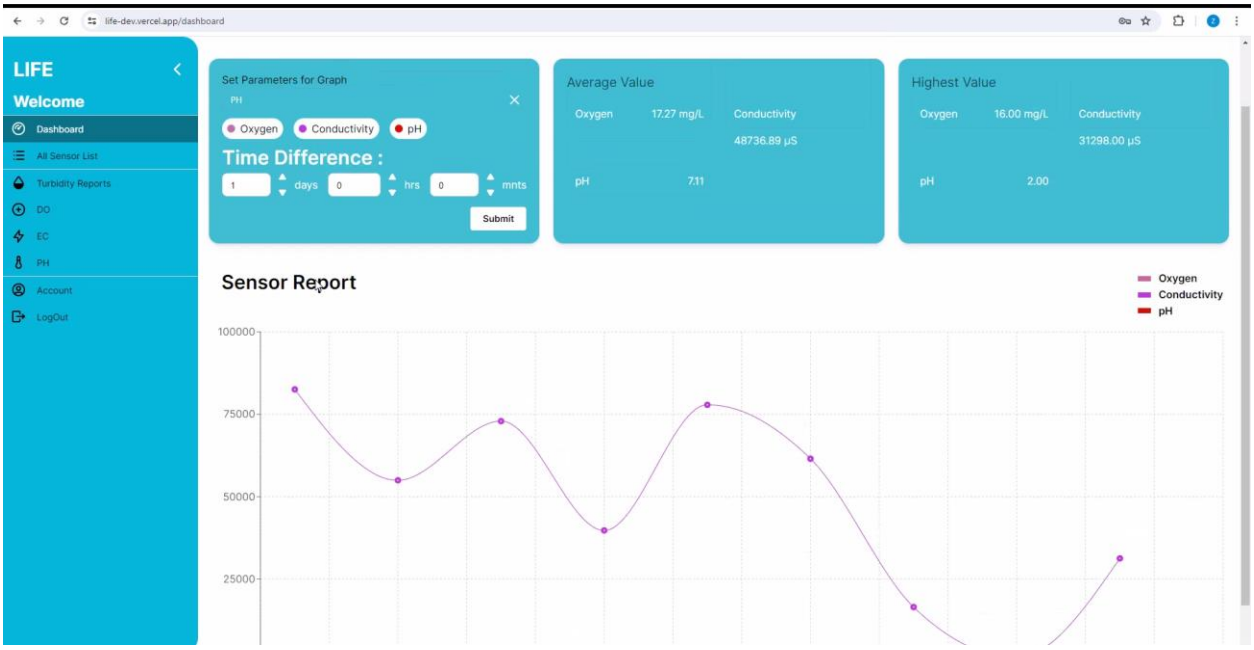
3. To add a new sensor on the dashboard, go to **“All Sensor List”** and add a new sensor.



4. To add a sensor, click on the "Add Sensor" button. Enter the sensor ID (matching the one in the settings.h header file), select the sensor type, provide a new sensor name, choose the sensor unit, and click the "Apply" button. Repeat these steps to add additional sensors. Refer to the example picture below for guidance.



5. Return to the dashboard, then select the available sensors to view their current sensor data.

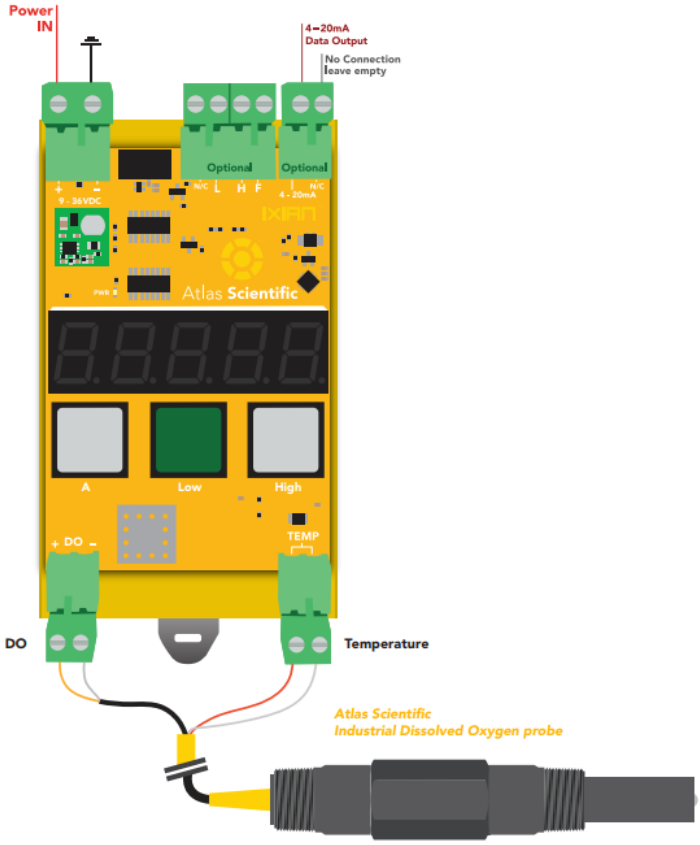


Sensor Calibration

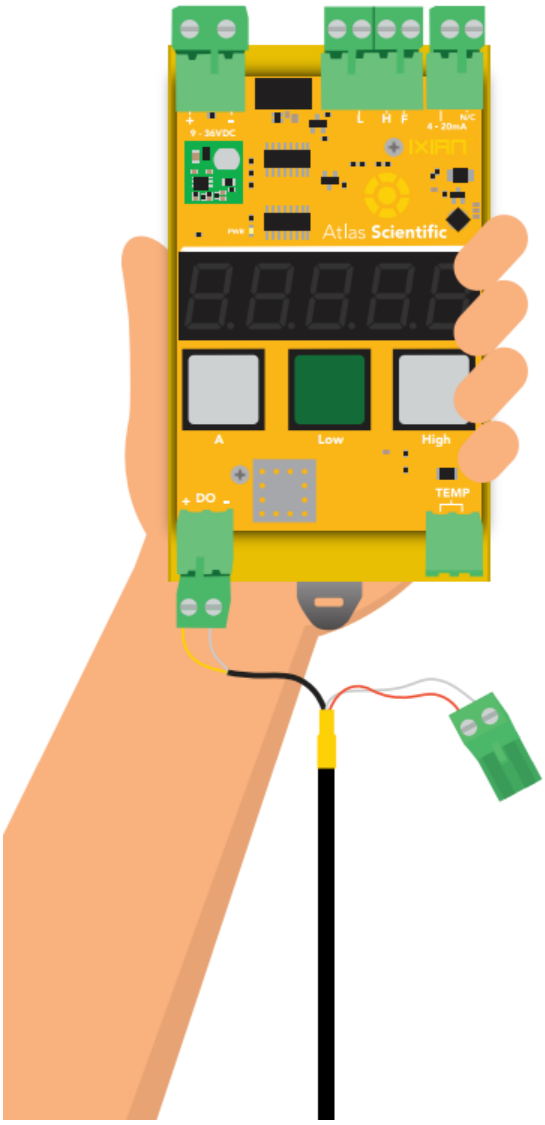
Please follow the steps below to calibrate the sensors.

Dissolved Oxygen Sensor Calibration

1. Connect the Oxygen Sensor probe with the controller board according to the illustration provided.



2. The Industrial Dissolved Oxygen Transmitter uses two-point calibration: low and high.
    - High point calibration is the only necessary calibration point.
    - Low point calibration is only required if high accuracy measurements are needed when the dissolved oxygen levels are less than 1.5 mg/L.



Calibration tips

Don't breathe directly on the probe when calibrating. The probe can detect that.

Moving the probe around, touching the sensing area, and putting the probe in water will cause the readings to jump up. This is normal; the readings will return to the proper level after a few minutes.

Before calibrating the probe, disconnect the temperature probe from the transmitter. Temperature **compensation** is not part of **calibration**. Disconnecting the temperature probe makes the calibration process easier. Leaving the temperature probe connected, does not invalidate the calibration. It just makes it harder to tell if calibration was done correctly.

Temperature disconnected

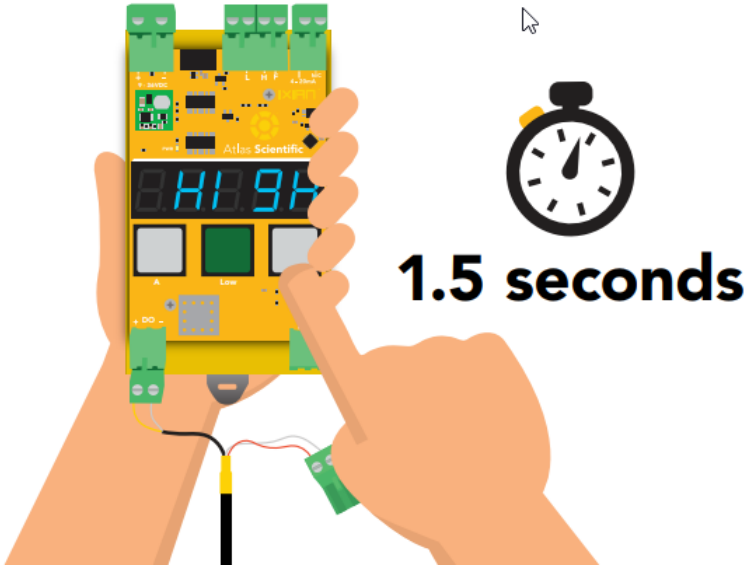
Air temperature is not part of a dissolved oxygen reading. When a calibration button is pressed, 20°C is used as the temperature.

If you leave the temp probe connected, immediately after calibration the air temp will be used to give a dissolved oxygen reading. Unless the air temp is also 20°C you will not see a predicted value indicating calibration was done correctly.

3. **High point calibration:** With the dissolved oxygen probe sitting out in the air, and the temp sensor disconnected, let the readings stabilize. This usually takes no more than a few minutes; once the readings have stabilized, press, and hold the "High" button for 1.5 seconds.

When high point calibration is complete, the readings will be:

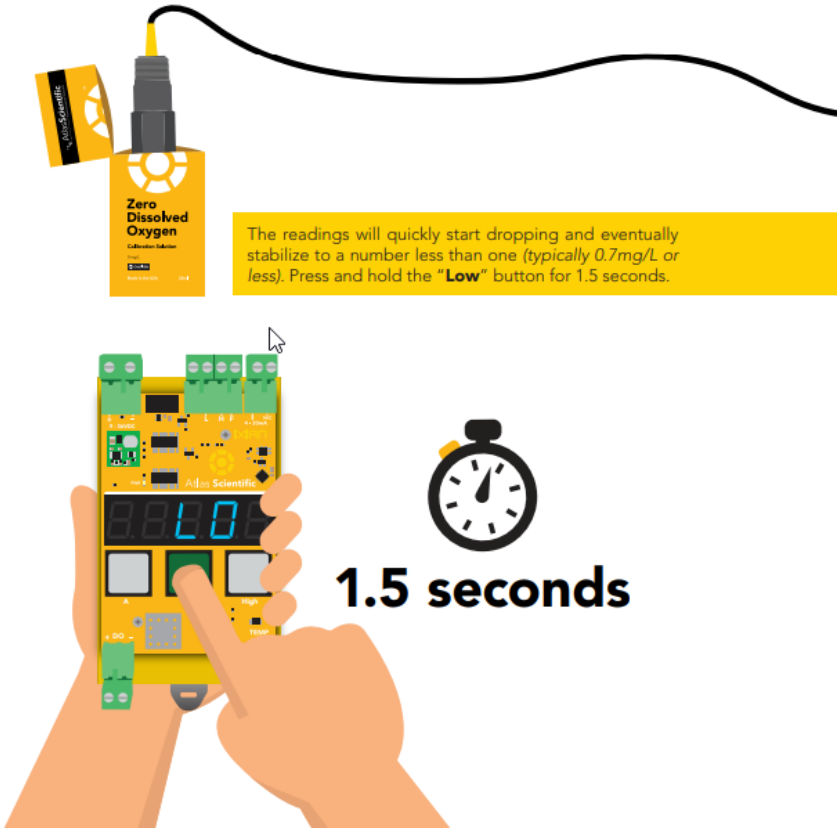
Freshwater mode	Seawater mode
9.09 +/- 0.02	**7.47 +/- 0.02**



Note

You may see the readings start to rise slowly after calibration. This is not uncommon. Simply press "high" calibration button again. This can be done many times; each time, your calibration will become more accurate. "Prefect Calibration" does not exist. It's a psychological trap. Limit high point calibration attempts to no more than 10 minutes.

4. **Low point calibration:** This step is only needed if high accuracy measurements are required for dissolved oxygen readings less than 1.5 mg/L. Place the probe in the zero dissolved oxygen calibration solution.



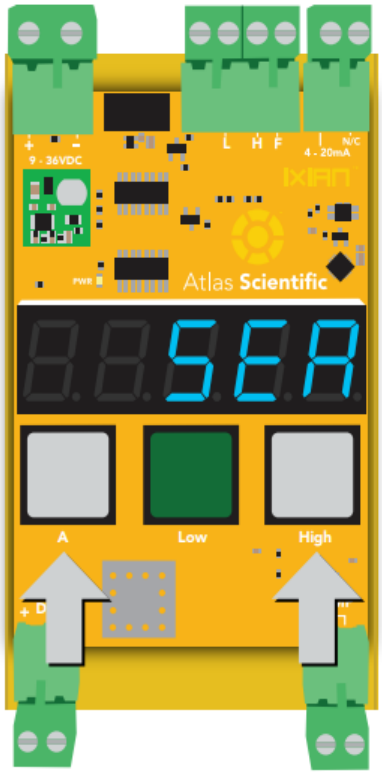
5. **Seawater / freshwater setting:** Freshwater holds more dissolved oxygen than seawater. The Atlas Scientific Industrial Dissolved Oxygen Transmitter is set to freshwater mode by default. If the D.O. probe is going to be used in seawater, the transmitter should be set to seawater mode.

   Press A to see what mode the transmitter is set to.

Freshwater mode

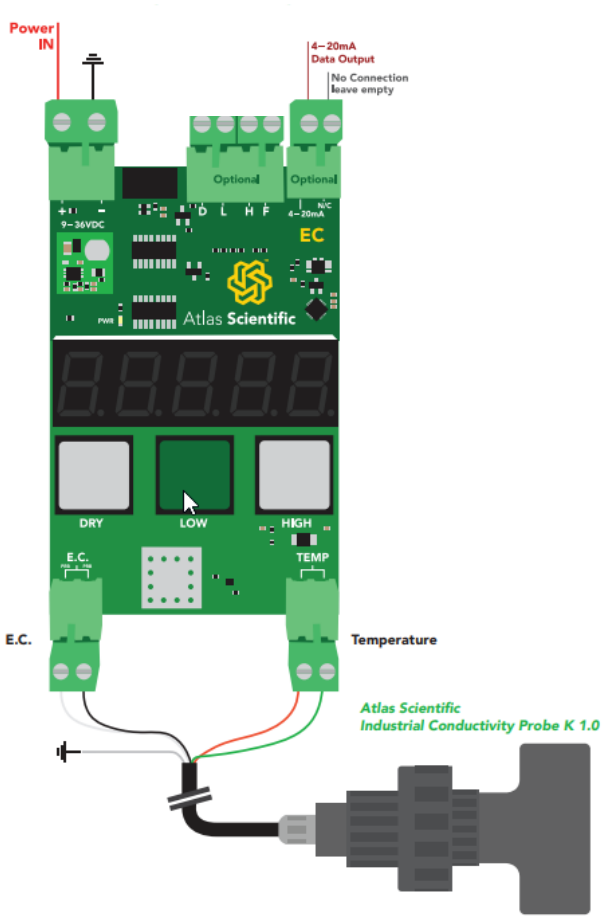
Seawater mode

To change the setting press and hold **A** and **High** buttons for 1.5 seconds. The screen will flash "SEA" twice, indicating the setting has been changed.



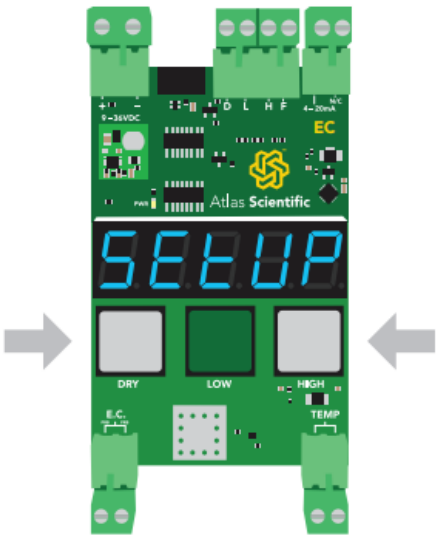
Conductivity Transmitter Sensor Calibration

1. Connect the probe by following the picture below,



2. **Selecting a probe type:** Any brand of K 0.1 or K 1.0 conductivity probe can be used with the Industrial Conductivity Transmitter. The Industrial Conductivity Transmitter defaults to a K 1.0 probe.

   To change the probe type, press and hold the two gray buttons marked DRY and HIGH simultaneously for 1.5 seconds.



1.5 seconds

This will open the setup menu.
In the setup menu there are only 3 options.

PrObE
4-20 H
4-20 L

The first option is "PrObE". Press the **green LOW (up)** or gray HIGH (down) buttons to select you probe type. Press the gray DRY (save) button when the correct probe type has been selected. The probe type selection is now complete.

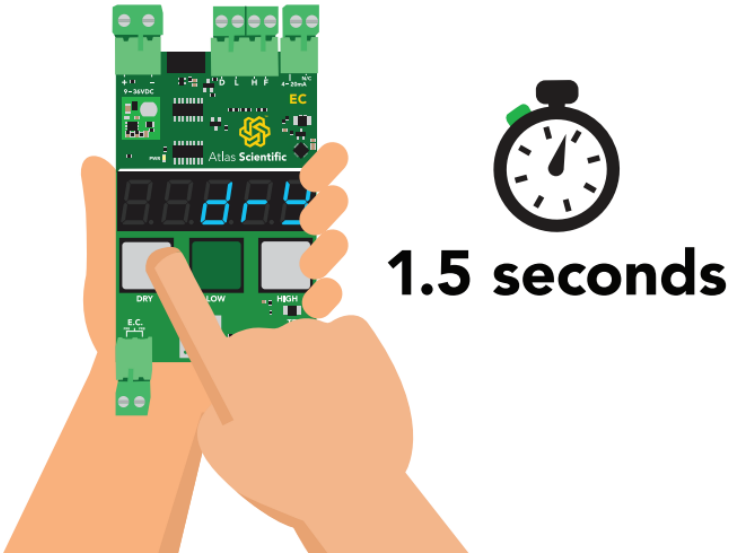
1.00
0.1L
0.01

3. **Calibration:** The Industrial Conductivity Transmitter uses 3-point calibration: "dry", "low", and "high". The first calibration point is "dry". The dry calibration only needs to be done when a new probe is connected for the first time to the transmitter. The other two calibration points have been preset to specific industry standard calibration values. The calibration values are dependent on what probe type the transmitter is connected to. The calibration data is stored in the EEPROM and will be retained even if the Transmitter is powered off.

Probe type	Low point calibration	High point calibration
K 0.1L	84µs	1,413µs
K 0.1	1,413µs	12,880µs
K 1.0	12,880µs	80,000µs

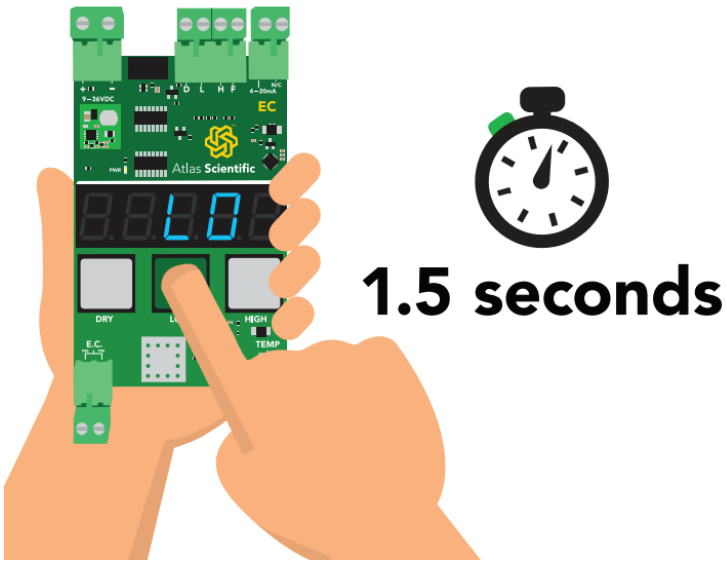
4. **Dry calibration**: This step is only done when a new probe is first connected to the device. Dry probe calibration is similar to the tare function on a scale. After dry calibration the displayed conductivity should be 0.

   If the probe is not dry, dry it off. Press and hold the DRY calibration button for 1.5 seconds. The screen will display “dry” then “dONE”. Dry probe calibration has been completed.



5. **Low point calibration:** The probe should be put in the correct low point calibration solution. Wait until the conductivity readings stabilize. Press and hold the LOW calibration button for 1.5 seconds. The screen will display “Lo” then “dONE”. The low point calibration has been completed.

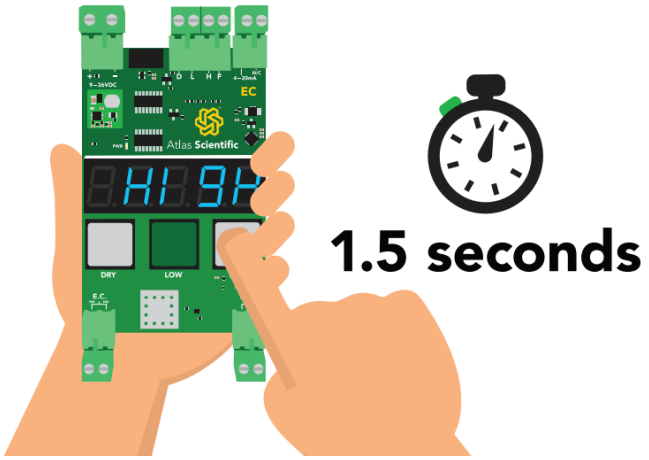
Probe type	Low point calibration
K 0.1L	84µs
K 0.1	1,413µs
K 1.0	12,880µs



The conductivity readings will not change after low point calibration. The readings will change only when both high and low point calibration has been completed.

6. **High point calibration:** The probe should be put in the correct high point calibration solution. Wait until the conductivity readings stabilize. Press and hold the HIGH calibration button for 1.5 seconds. The screen will display “HigH” then “dONE”. The High point calibration has been completed.

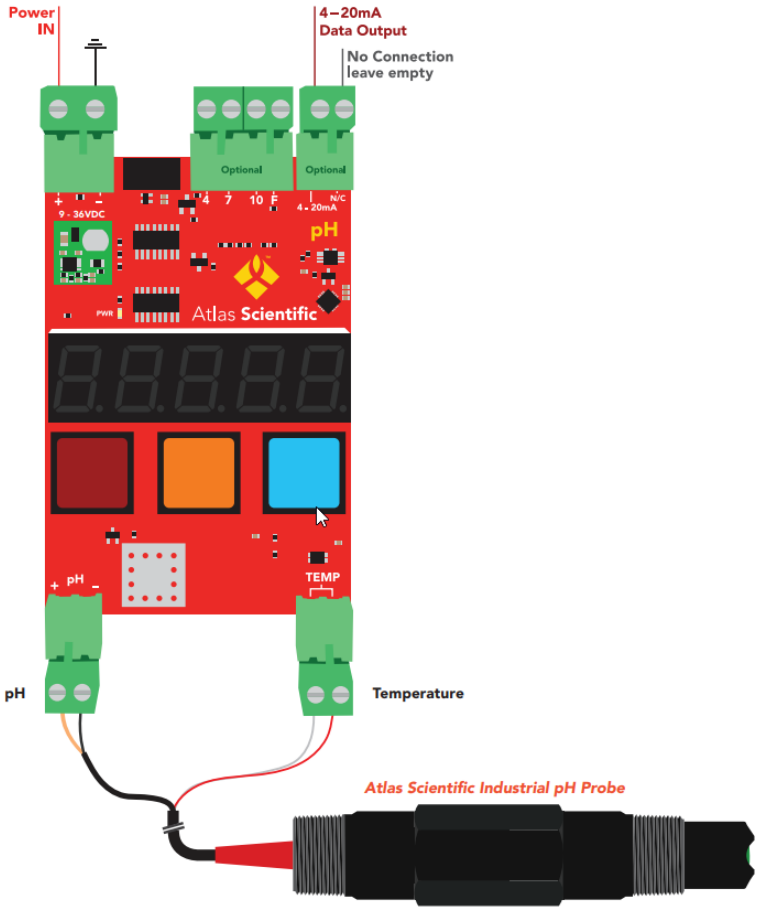
Probe type	High point calibration
K 0.1L	1,413µs
K 0.1	12,880µs
K 1.0	80,000µs



The conductivity readings will not change after low point calibration. The readings will change only when both high and low point calibration has been completed.

pH Transmitter Sensor Calibration

1. Connect the pH transmitter probe with the board by following the picture below,



2. **Calibration**: The Atlas Scientific Industrial pH Transmitter has a flexible calibration protocol, allowing for single point, two points, or three-point calibration. The calibration data is stored in the EEPROM and will be retained even if the Transmitter is powered off.

   The calibration values are 4.00, 7.00, and 10.00

Note

The first calibration point must be pH 7.00
Calibrating to pH 7.00 will reset the stored calibration. If two, or three point calibration has been done in the past, it must now be redone.

There is no correct order when calibrating to **4.00** and/or **10.00**. Recalibrating these two points will not have any effect on the other stored calibration points. Calibrating the Industrial pH Transmitter to **4.00** and/or **10.00** can be done at any time.

No calibration

Single point calibration

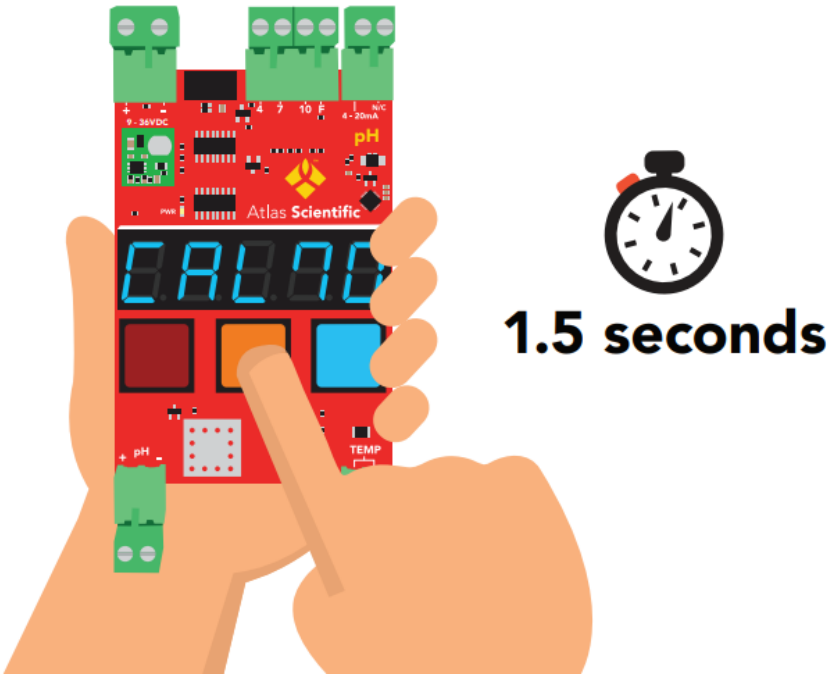
Two point calibration

Two point calibration will provide high accuracy between **7.00** and the second point calibrated against, such as a **4.00**.

Three point calibration

Three point calibration will provide high accuracy over the full pH range. Three point calibration at **4.00**, **7.00** and **10.00** should be considered the standard.

3. **On board Calibration:** To begin the on-board calibration process, press and hold the middle orange button for 1.5 seconds to calibrate to a pH of 7.00



Note

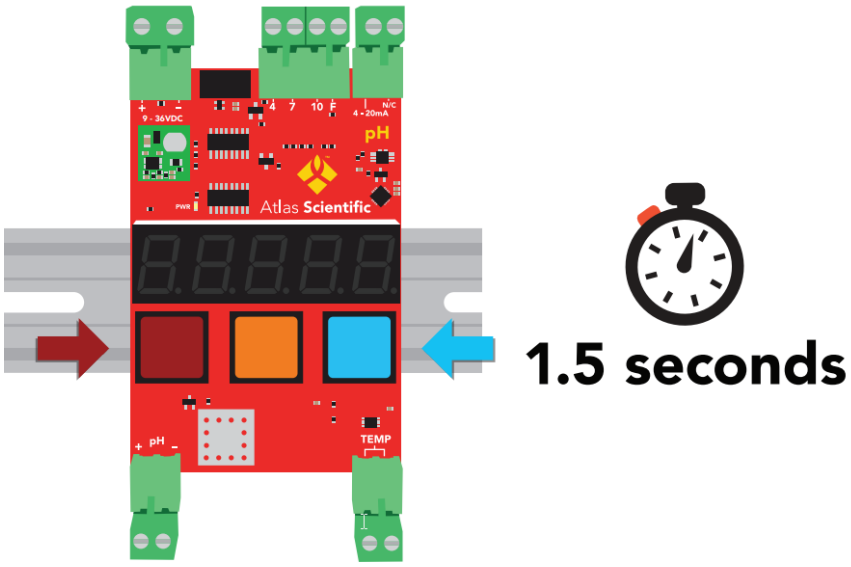
The first calibration point must be pH 7.00
Calibrating to pH 7.00 will reset the stored calibration. If two, or three point calibration has been done in the past, it must now be redone.

The display will flash: CAL7.0, after a few seconds the display will then flash: donE

If two point or three-point calibration is required, repeat this process to calibrate for pH 4.00 (left red button) and pH 10.00 (right blue button).

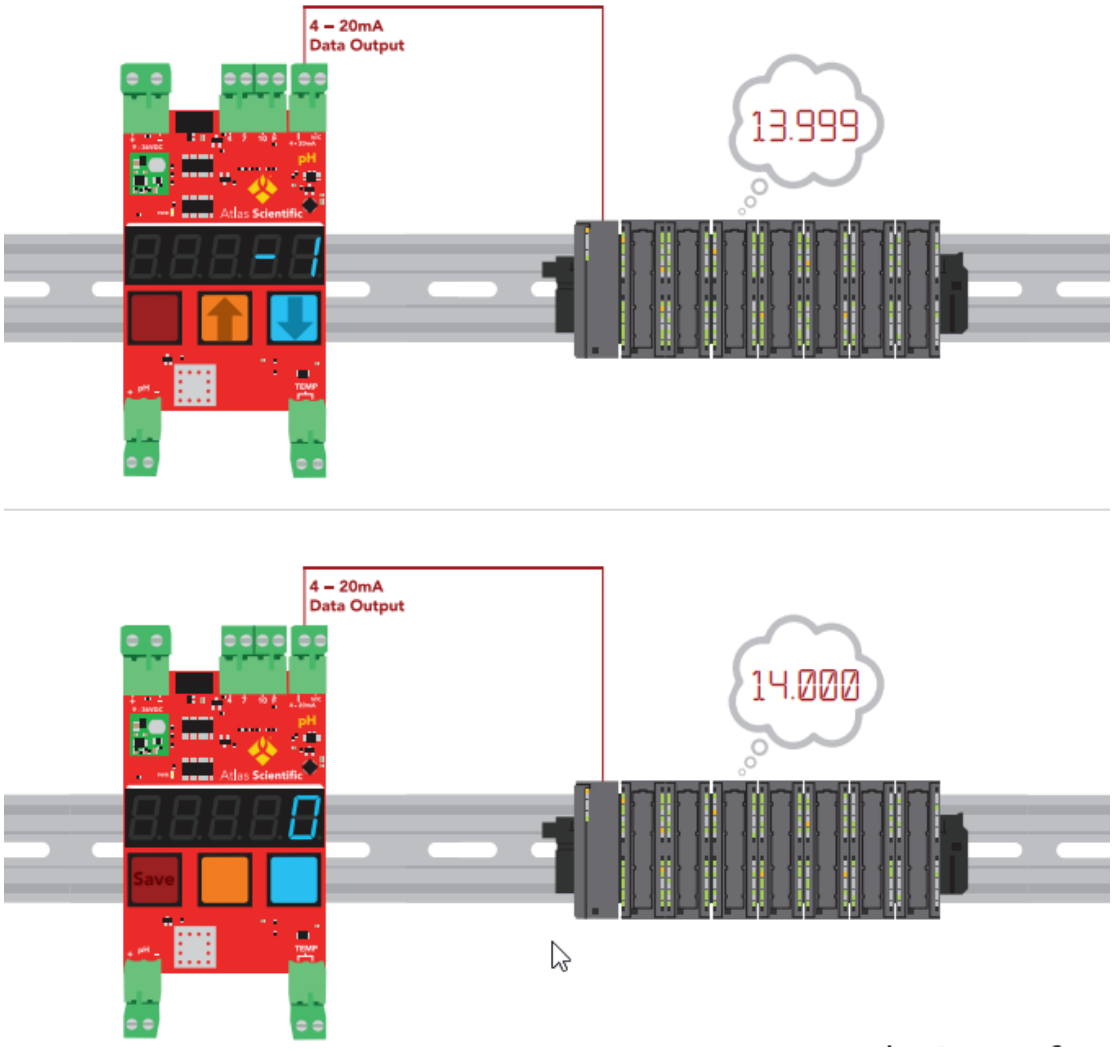
4. **4 – 20mA calibration**: To ensure that the PLC is receiving the most accurate 4 – 20mA signal, the current output from the Industrial pH Transmitter can be adjusted. The 4mA signal and the 20mA signal can both be adjusted independently.

   To enter the 4 – 20mA calibration mode press and hold the red and blue buttons simultaneously for 1.5 seconds.

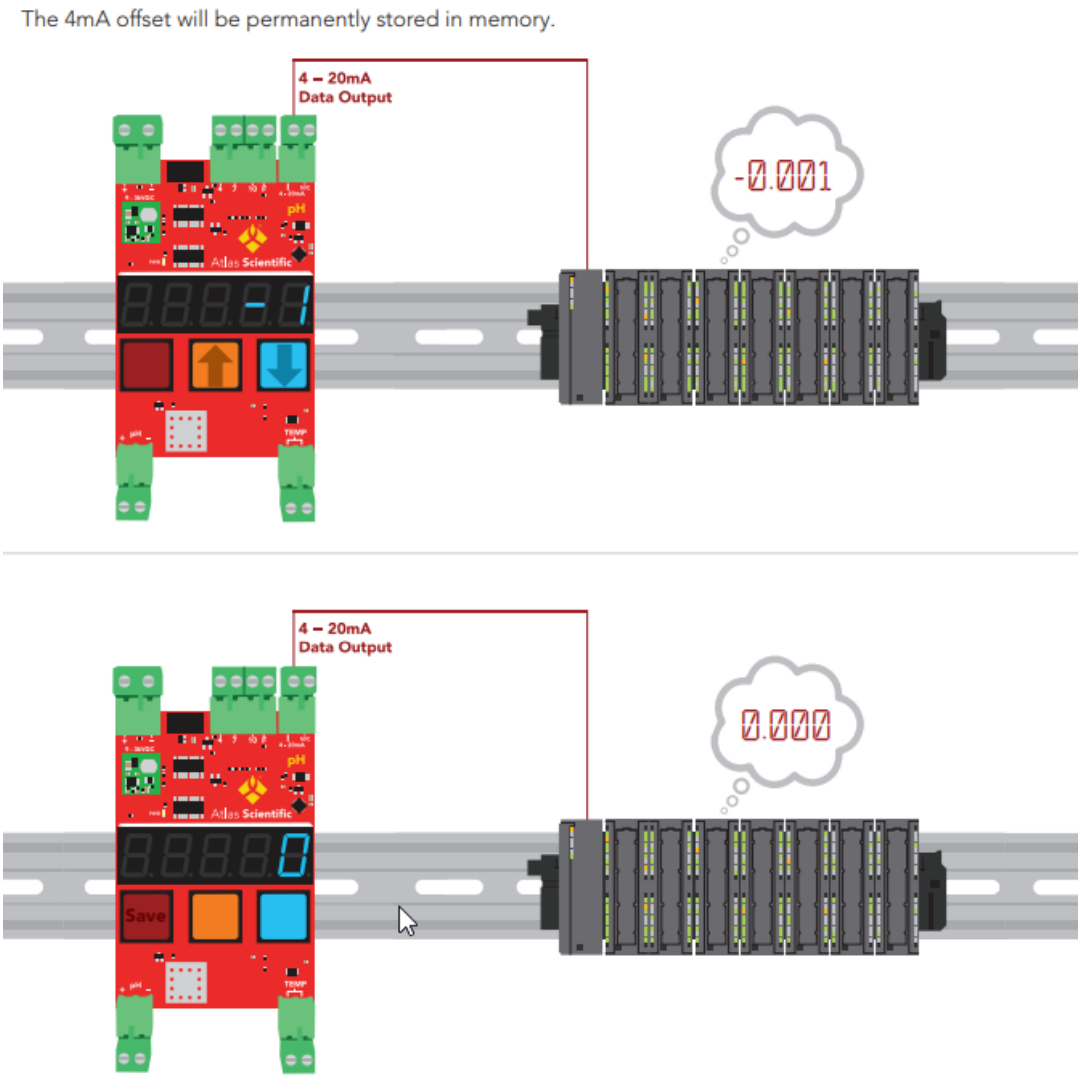


- **4 – 20mA High Calibration:** The display will flash: 4-20H (the “H” stands for high) The Industrial pH Transmitter will now output exactly 20mA, and your PLC should show a pH of 14.000. Use the orange (up) and blue (down) buttons to adjust the 20mA output so the pH moves to 13.999, then move it back up, so it is just hits pH 14. When you have finished making adjustments, press the red (save) button to confirm.

The 20mA offset will be permanently stored in memory.



- **4 – 20mA Low Calibration:** The display will flash: 4-20L (the “L” stands for low) The Industrial pH Transmitter will now output exactly 4mA, and your PLC should show a pH of 0.000 Use the orange (up) and blue (down) buttons to adjust the 4mA output so the pH moves to -0.001, then move it back up, so it is just hits pH 0.000 When you have finished making adjustments, press the red (save) button to confirm.



Read the following documents for more details,

- https://files.atlas-scientific.com/DO_transmitter.pdf
- https://files.atlas-scientific.com/EC_transmitter.pdf
- https://files.atlas-scientific.com/pH_transmitter.pdf
- https://docs.arduino.cc/resources/datasheets/AFX00001-AFX00002-AFX00003-datasheet.pdf