

Multiparameter Water Quality Probe (Sonde) Calibration and Maintenance

April 2024

Prepared by: Travis West Date: 4/25/2024
Title: Environmental Compliance Specialist

Approved by: Reid Jackson Date: 5/7/2024
Title: Unit Manager

Approved by: Dr. Elizabeth Booth Date:
Title: Program Manager

Annual Reviewer				
Date				

Table of Contents

A. Procedural Steps.....	3
1. Calibration of YSI Pro DSS.....	3
2. Post Calibration of YSI Pro DSS.....	6
B. Maintenance.....	8

A. Procedural Steps

YSI Pro DSS Calibration

Make sure you have the following ready prior to calibration:

- Conductivity Calibration Solution (the conductance of solution used will vary based on the region of GA you are sampling: 500 $\mu\text{S}/\text{cm}$ standard should be used if you are going to be sampling a freshwater stream, and 20,000 $\mu\text{S}/\text{cm}$ standard should be used if you are going to be sampling a saltwater stream)
- pH 4, 7, and 10 Buffer Solutions in 500 or 1000 mL containers, equilibrated to room temperature
- Calibration cup
- Plastic sonde screw cap

Connect the handheld Surveyor to the Pro DSS Sonde. Press the power button bringing the surveyor to the main live reading screen.

NOTE: Always calibrate the Conductivity sensor before the LDO sensor. The LDO is dependent on the conductivity sensor readings.

Calibrating:

1. Loosen the plastic collar and take the sonde out of the calibration cup and remove the weighted guard cap for easier calibration. Return the sonde back into the calibration cup, tighten the collar, and remove the calibration cap. This is where you will be adding the calibration standards.
2. **Specific Conductivity:** Always start calibrating with Specific Conductivity. Use a 500 $\mu\text{S}/\text{cm}$ standard if you are going to be sampling in a freshwater stream and use a 20,000 $\mu\text{s}/\text{cm}$ standard if you are going to be sampling in a saltwater stream.
 - a. Pour a small amount of the conductivity standard into the calibration cup. Secure the calibration cap and invert the solution enough times to fully coat all the sensors. Discard the liquid and repeat this process two (2) more times. You will be rinsing the sensors a total of three (3) times.
 - b. Fill the calibration cup up a fourth time, this time filling the calibration cup all the way with fresh solution from the brown bottle until the conductivity standard covers all the sensors.
 - c. Record the conductivity value displayed on the surveyor on the calibration sheet along with the temperature.
 - d. Press the Cal button on the surveyor and select Specific Conductivity for calibration. You will manually enter either 500 or 20,000 depending on what sites you are visiting on that day (Freshwater or Saltwater). Once you've entered the proper standard value, use the graph at the bottom of the screen to ensure that the sonde has stabilized.
 - e. Once stabilized you can select accept calibration.

- f. Use the Esc button to return to the main live reading screen once the calibration is successful and record the post calibration value on the calibration sheet.
3. **pH:** Next calibrate pH, which will be a three-point calibration. Make sure to note the millivolt values for each pH standard as you are calibrating. If the millivolts (mV) are reading outside of the acceptable outputs for any of the standards, this could indicate a bad sensor. Please refer to the millivolts guide at the end of this section.
 - a. Pour a small amount of pH 7 standard into the calibration cup. Secure the calibration cap and invert the solution enough times to fully coat all the sensors. Discard the liquid and repeat this process a total of three (3) times.
 - b. Fill the calibration cup up a fourth time, this time filling the calibration cup all the way with fresh solution until all the sensors are covered.
 - c. Record the pH value displayed on the surveyor on the calibration sheet along with the temperature.
 - d. Press the Cal button on the surveyor and select pH for calibration. The ProDSS automatically recognizes the standard and compensates for temperature, so the value that is displayed will be what you should use to calibrate your instrument. Use the graph at the bottom of the screen to ensure that the sonde has stabilized. Once stabilized you can select accept calibration.
 - e. Since this is a three-point calibration, the surveyor will prompt you to add the next pH standard. Choose pH 4 standard first. Repeat steps a and b with the pH 4 standard; this should automatically change the calibration units on the surveyor for the calibration of the next standard.
 - f. Once stabilized, record the results on the calibration sheet along with the temperature and accept the calibration.
 - g. Next choose pH 10 standard. Repeat steps a and b with the pH 10 standard; this should automatically change the calibration units on the surveyor for the calibration of the next standard.
 - h. Once it has stabilized, record the results on the calibration sheet along with the temperature and accept the calibration.

Millivolts guide:

The acceptable mV outputs for each buffer are shown below:

pH 7 mV value = 0 mV +/- 50 mV

pH 4 mV value = +165 to +180 from pH 7 buffer mV value

pH 10 mV value = -165 to -180 from pH 7 buffer mV value

- A value of +50 or -50 mV in buffer 7 does not indicate a bad sensor.
- The mV span between pH 4 and 7 and between pH 7 and 10 mV values should be \approx 165 to 180 mV. 177 is the ideal distance. The slope can be 55 to 60 mV per pH unit with an ideal of 59 mV per pH unit.
- If the mV span between pH 4 and 7 or 7 and 10 drops below 160, clean the sensor and try to recalibrate.

All these parameters can be viewed by accessing the corresponding calibration log. To access after calibration, press File, View Calibration Record, find the date corresponding to the calibration, and view the information for the different calibration parameters.

4. **Dissolved Oxygen:** Next calibrate Dissolved Oxygen using the air saturated water technique. Make sure to record the barometric pressure on the calibration sheet before starting.
 - a. Start by placing a small amount of water into the calibration cup and partially tighten the lid to create a humid environment. The DO sensor should not be submerged in any water.
 - b. Set a timer for 5 to 10 minutes for the calibration cup to become humidified.
 - c. Record the LDO% value displayed on the home screen.
 - d. Next, use the Cal button and select ODO, then select the option for LDO%. The calibration value for LDO% is 100%. Use the graph at the bottom of the surveyor to ensure that the values are stabilized and that the value you are calibrating for is 100% saturation before accepting the calibration.
 - e. Use the Esc button to return to the main menu once the calibration is successful and record the post calibration value on the calibration sheet.
 - f. Record the LDO mg/L value and temperature onto the calibration sheet with the LDO% value at 100%.
 - g. Like before, use the Cal button and select ODO, but this time select the option for LDO mg/L.
 - i. The calibration value on the screen should match the value you recorded on the calibration sheet.
 - h. Use the graph at the bottom of the surveyor screen to ensure that the sonde value is stabilized and then accept the calibration.
 - i. Use the Esc button to return to the main menu once the calibration is successful and record the post calibration value on the calibration sheet.
5. Replace the weighted guard cap and store sonde probes in water in the calibration cup. Remember to always keep the sensors wet with solution.
6. **Depth:** Depth calibration should be completed every time the instrument is used to take depth profile measurements on lakes.
 - a. A depth offset can be used to compensate for the distance of the depth sensor from the other sensors. Press the probe button, select setup, depth, then offset. Enter the offset value as 0.272 meters.
 - b. Ensure that the depth sensor is clean and in air, not immersed in any solution.
 - c. Place the sonde partially into the lake with the depth sensor just above the surface of the water.
 - d. Press the Cal button and select depth. The calibration value for depth will always be automatically set to Zero. There is no need to change this.
 - e. Allow for the calibration to stabilize and press enter to accept the calibration.
 - f. Press the Esc button to return to the main screen. There is no need to record this value.

YSI Pro DSS Post Calibration

1. All sondes utilized in the field must be post-calibrated upon returning to the office. This important step allows for the detection and documentation of any sensor drift or malfunction that may have occurred throughout the course of the day. If the sonde is to be used on concurrent sampling days, then the following morning's pre-calibration may be utilized as the post-calibration for the previous days' activities.
 - a. **Specific Conductivity:** Always start the post-check with Specific Conductivity. Use a 500 µS/cm standard if you sampled a freshwater stream and use a 20,000 µS/cm standard if you sampled a saltwater stream.
 - i. Pour a small amount of the conductivity standard into the calibration cup. Secure the calibration cap and invert the solution enough times to fully coat all the sensors. Discard the liquid and repeat this process two (2) more times. You will be rinsing the sensors a total of three (3) times.
 - ii. Fill the calibration cup up a fourth time, this time filling the calibration cup all the way with fresh solution from the brown bottle until the conductivity standard covers all the sensors.
 - iii. Record the conductivity value displayed on the surveyor on the post-calibration form in the initial reading column along with the temperature.
 - iv. If there is a concurrent sampling on the following day, the above steps can be performed during that next day's pre-calibration and transcribed from the initial reading column of that day's pre-calibration form onto the previous day's post-calibration form.
 - v. If there is no concurrent sampling the next day and this check is performed the same day after returning from a route, there is no need to calibrate after the check is completed as this is only to post-check this parameter.
 - vi. **If the stabilized reading falls within +/- .2 units of the solution value, the sensor is still functioning correctly; if the readings fall outside of this margin, indicate this on data collected and contact your assigned equipment manager.**
 - b. **pH:** Next post-check pH. Once again make sure to note the millivolt values for each pH standard as you are post-checking. If the millivolts (mV) are reading outside of the acceptable outputs for any of the standards this could indicate a bad sensor. Please refer to the millivolts guide at the end of the pH calibration section (page 5).
 - i. Pour a small amount of pH 10 standard into the calibration cup. Secure the calibration cap and invert the solution enough times to fully coat all the sensors. Discard the liquid and repeat this process a total of three (3) times.
 - ii. Fill the calibration cup up a fourth time, this time filling the calibration cup all the way with fresh solution until all the sensors are covered.

- iii. Record the pH value displayed on the surveyor on the post-calibration form in the initial reading column along with the temperature.
 - iv. Repeat steps i and ii with pH 4 standard and then pH 7 standard. Ending with pH 7 allows for you to keep this buffer solution in the calibration cup for calibrating, if this is being completed the following day along with the next day's pre-calibration.
 - v. If there is a concurrent sampling on the following day, the above steps can be performed during that next day's pre-calibration and transcribed from the initial reading column of that day's pre-calibration form onto the previous day's post-calibration form.
 - vi. If there is no concurrent sampling the next day and this check is performed the same day after returning from a route, there is no need to calibrate after the check is completed as this is only to post-check this parameter.
 - vii. **If the stabilized reading falls within +/- .2 units of the pH standard buffer value, the sensor is still functioning correctly; if the readings fall outside of this margin, indicate this on data collected and contact your assigned equipment manager.**
- c. **Dissolved Oxygen:** Next post-check Dissolved Oxygen using the air saturated water technique. Make sure to record the barometric pressure on the post-calibration form before starting.
 - i. Start by placing a small amount of water into the calibration cup and partially tighten the lid to create a humid environment. The DO sensor is not submerged in any water.
 - ii. Set a timer for 5 to 10 minutes for the calibration cup to become humidified.
 - iii. Record the LDO% value displayed on the home screen on the post-calibration form in the initial reading column along with the temperature.
 - iv. If there is a concurrent sampling on the following day, the above steps can be performed during that next day's pre-calibration and transcribed from the initial reading column of that day's pre-calibration form onto the previous day's post-calibration form.
 - v. If there is no concurrent sampling the next day and this check is performed the same day after returning from a route, there is no need to calibrate after the check is completed as this is only to post-check this parameter.
 - vi. **If the stabilized reading falls within +/- .2 units of the LDO% value, the sensor is still functioning correctly; if the readings fall outside of this margin, indicate this on data collected and contact your assigned equipment manager.**
- 2. Make sure to always store the sonde in water or pH 7 overnight and with daily use. If stored for long periods of time the sensors should be stored submerged in pH 4 buffer solution.

B. YSI Pro DSS Maintenance

1. **Storing:** All sensors should be stored submerged in pH 7 overnight and with daily use. If stored for long periods of time the sensors should be stored submerged in pH 4 buffer solution.
2. **ODO Sensor Cap:** The sensor cap should be replaced about once per year for those with a 1-year warranty, but the cap may last longer. It should also be replaced if it is cracked or damaged.
 - a. The sensor cap should be kept clean since some types of fouling may consume oxygen that could affect the dissolved oxygen measurements. To clean the sensor cap, gently wipe away any fouling with a lens cleaning tissue that has been moistened with water.

NOTE: Do not use organic solvents to clean the sensor cap. Using an organic solvent to clean the sensor cap may cause permanent damage to the cap. For example, alcohol will dissolve the outer paint layer and other organic solvents will likely dissolve the dye in the cap.

3. **Cleaning a Sensor Port:** If you suspect port contamination, you can clean the port on the cable by filling the port with Isopropyl Alcohol for 30 seconds and then dumping it out.
 - a. Allow the port to air dry completely or blow it out with compressed air. Installing a sensor into a port that is not completely dry is likely to cause erratic and erroneous readings.
4. **Resetting a Sensor to Factory Default:** Occasionally, it may be necessary to reset the instrument to its factory calibration default values. To reset the calibration values, press the Cal key, highlight Restore Default Cal and press Enter. Highlight the parameter you wish to reset to default and press Enter. Next, you will be asked to confirm the operation. Highlight Yes and press Enter to confirm.