



TECHNICAL NOTE

Water Quality

RDO[®] Sensor—Frequently Asked Questions

Answers to common questions about the second generation In-Situ[®] RDO sensor

Revised November 2009

Calibration

Q. What are the criteria for a good calibration?

A. A calibration slope between 0.9 and 1.1 is ideal. A calibration slope between 0.8 and 1.2 is acceptable. (For example, 100% saturation should read between 80 and 120%. A 0% saturation point should read between -0.2 and 0.2 ppm.) Values outside these ranges can indicate problems with a sensor or foil and will cause a calibration error warning.

Q. What if I accept the readings outside the recommended calibration ranges?

A. The sensor will calibrate, but the software will ask the user to accept a calibration outside the recommended ranges. The sensor slope, offset, and calibration values will be displayed in the calibration report.

Q. If I swap out caps, should I recalibrate or just restore factory defaults in the calibration sequence?

A. In-Situ recommends that you recalibrate when a new cap is installed on the sensor. However, the new cap should be within 3% of expected readings when using factory defaults. To achieve specified accuracy of the sensor, a user calibration should be performed to remove any initial offset.

Q. Why am I receiving negative ppm readings?

A. A bad 0-point calibration can cause negative readings to appear. More specifically, the sodium sulfite solution could be old/bad or the nitrogen bubbling was not completely saturated prior to calibration.

Sensor design

Q. What is the purpose of the red LED?

A. The red LED is a reference LED for sensor diagnostics.

Q. What kind of service can be done on the RDO sensor?

A. Other than cleaning, the RDO sensor does not contain user-serviceable parts, other than general cleaning of the body and yearly sensor cap replacement. The RDO sensor has a 3-year warranty against defects. In-Situ will replace or repair any sensor that fails due to poor workmanship during its warranty period. The cable on the sensor can be repaired if it is damaged.

Hydration effects

Q. Does the sensor show any hydration effects?

A. All optical dissolved oxygen (DO) sensors show some effects of hydration on the sensing foil—some to a much larger degree than others. The In-Situ RDO sensor shows an extremely small hydration effect. This effect is less than the accuracy specification of the sensor and negligible across the majority of the testing range.

Q. How much drift does it actually show if the sensor cap becomes dehydrated?

A. It depends on the conditions it was subjected to, for example:

- 60° C at 0% humidity for 60 days in a test chamber results in less than 2% drift
 - 30° C at 0% humidity for 60 days in a test chamber results in less than 1% drift
 - Ambient conditions on a lab bench for 60 days results in less than 1% drift
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Q. What if the sensor dries out when deployed and then becomes moist again?

A. The sensor will continue to perform to its accuracy specifications.

Q. Can I post-correct the data if the drift stabilizes after the sensor rehydrates?

A. Sensor drift is extremely minimal. However, if necessary, drift can be post-corrected by the same method that drift or fouling of any other sensor is post-corrected.

Q. Is the percent drift stable over time after sensor rehydration?

A. Drift of a hydrated sensor is negligible over its operational life. Drift can be corrected by sensor recalibration.

Sensor storage

Q. How should I store the sensor and cap when I am not using them?

A. Prior to installation, store the cap in its factory packaging until ready to install. Sensor conditioning is not required prior to use.

After installation, store the cap and other sensors (e.g. pH or pH/ORP) as required. A rehydration process is not required if the sensor dries out during deployment. Storage options are available as required:

- Disposable/recyclable calibration and storage bags
- Sensor storage and calibration chamber for instruments with turbidity sensors
- Sensor storage and calibration chamber for instruments without turbidity sensors

Response time

Q. What do the T90 and T95 times represent?

A. These represent the time that the sensor will take to span 90% or 95% of the change in reading. For example, moving a sensor from 0% saturation to 100% saturation, T90 is the time to get to 90% saturation.

Q. How does the system (sonde) response time differ from the T90 or T95 time?

A. The response time specification is based on actual field conditions; not just based on laboratory conditions. It takes into account the time for the entire system to come to equilibrium when temperature and DO concentrations are changing. This is a more accurate estimation of a “wait time” in the field and is highly dependent on the design of the sonde. The In-Situ® RDO® sensor and TROLL® 9500 instruments have a very fast response to changing field conditions compared to competitive instruments.

Fouling and Cleaning

Q. How quickly will my sensor foul?

A. Fouling is extremely site dependant. Some sites will show significant fouling within a week; other sites have minimal fouling and little to no impact on the readings. The user may need to evaluate each site to determine how long it takes the sensor to foul. Then the user can determine a site-specific maintenance schedule.

Q. Is there a difference in how the old RDO fouled compared to the new RDO?

A. The old RDO sensor has a side-facing sensor, which fouls differently than the new downward-facing sensor. The old RDO was more prone to sediment build-up in the recessed sensing window. The new sensor can become buried in sediment more easily than the old model due to the downward facing sensing foil and closer proximity to the end of the sensor.

Q. How do I clean my sensor and sensor cap?

A. Please refer to the RDO Sensor instruction sheet for detailed cleaning instructions.

Q. Do you need to plug the RDO cap for cleaning?

A. We recommend cleaning the cap while it is still attached to the RDO sensor. If you must remove the cap from the sensor, plug the back end of the sensor cap with a rubber stopper so that no moisture enters the inside of the cap. Promptly install another cap on the sensor or replace the red rubber dust cap to protect the lens.

Q. How do I clean the lens?

A. In most cases, the sensor cap should remain on the sensor, and therefore lens cleaning is not necessary on a regular basis. If the sensor cap is being replaced, clean the lens only with the lens cloth that is included in the sensor cap replacement kit. Additional lens cloths are available from In-Situ Inc.

Chemical compatibility and interferences

Q. Is there a chemical compatibility guide available?

A. In-Situ has done extensive chemical testing on the RDO sensor and sensing foil, please contact In-Situ Technical Support for questions on specific chemicals not addressed below.

Q. Will strong oxidizers such as sodium permanganate or potassium permanganate used in bioremediation damage the foil?

A. All oxidizers will give false high readings, however, based on laboratory testing, they do not appear to damage the sensing foil.

Q. Will bleach damage the sensor or the sensing foil?

A. A 12% bleach solution will cause severe damage to the sensing foil. More dilute concentrations (2-6%) cause short-term damage, however readings appear to come back to within 2% of initial readings after a 100-hour soak in deionized water. Commercial bleach solution diluted 10:1 with tap water for disinfecting purposes does not cause damage to the sensor or sensing foil. In addition, there is no visible damage to the surface of the foil.

Q. Will hydrogen peroxide damage the sensing foil?

A. Hydrogen peroxide causes false high readings. When exposed to a commercial 3% solution of hydrogen peroxide, there was irreversible damage to the sensing foil causing high readings even after a 100-hour deionized water soak. The foil damage was not visible, however.

Cap usage life

Q. Why does the cap only last for 12 months?

A. A 12-month working life ensures results that are within the specified accuracy range for the usable life of the cap.

Q. When does the 12-month clock start ticking?

A. As soon as the cap is installed and the TROLL® 9500 is powered up.

Q. How can the cap have a 24-month warranty, but only a 12-month working life?

A. The RDO® sensing cap has a life of 24 months from the date of manufacture, or 12 months from the first reading, whichever comes first. After this point, the cap will not be recognized by the sensor. This ensures that with proper care and calibration, the cap will deliver accurate results for the duration of its usable life. To guarantee accuracy and a full 12-month working life, the customer should store the cap in its factory packaging prior to use, and install by the date printed on the label.

Q. Should I stock some replacement caps and keep them with my instrument?

A. The RDO sensor cap is very robust and resistant to damage. A maximum storage time of 12 months prior to installation is recommended so that a full 12 months of cap usage is achieved. Under typical circumstances, we do not recommend stocking a large quantity of replacement caps.

Q. How long will it take to receive a replacement cap?

A. Caps are made-to-order. Typically, the cap will be delivered within 5-7 days from its manufacture date.

Q. How will I know when I need a new cap?

A. Win-Situ® 5 software will begin warning the user when 90 days of sensor cap life remain. The user can then choose to be reminded again in a certain number of days (e.g., 30 days, 5 days, etc.).

Sensing foil

Q. Do I need to enter a long string of coefficients when I install a new cap?

A. No. Although optical DO sensing foils typically show a high degree of response variability batch to batch, each In-Situ cap comes pre-loaded with its specific calibration coefficients. These calibration coefficients are determined at the time of manufacturing and are lot-specific. The user simply installs a new cap on the sensor and all coefficients unique to that foil are automatically uploaded to the sensor. This eliminates any potential user error and allows caps to be switched from instrument to instrument without having to track foil coefficients or enter unwieldy coefficient strings.

TROLL® 9500 instrument

Q. How do I upgrade from a Clark Cell DO sensor to a new RDO sensor?

A. This requires a firmware upgrade to the TROLL 9500 (done through the latest version of Win-Situ® 4 software) and the correct RDO sensor based on your existing instrument's installed sensors. See the guide below.

TROLL 9500—Sub-2 inch version

Q. I need a sub-2 in instrument. What parameters can I install?

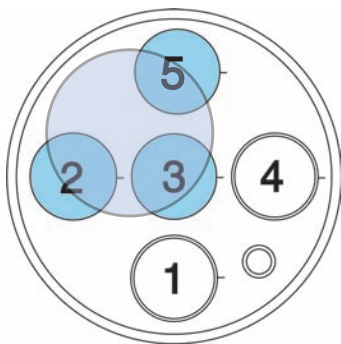
A. In the sub-2 in configuration, the TROLL® 9500 can have, at most, the following sensors installed (see guide below):

- RDO direct connect
- pH, pH/ORP or one Ion Selective Electrode (ISE)
- Conductivity (low or high)

You may remove the RDO sensor and add two additional ISE sensors for different applications at different times.

For a sub-2 in configuration, turbidity and/or pressure cannot be selected.

- Port 1 = pH, pH/ORP, ISE (XP units)
- Port 2 = RDO
- Port 3 = RDO
- Port 4 = Conductivity (high or low)
- Port 5 = Plugged/not available



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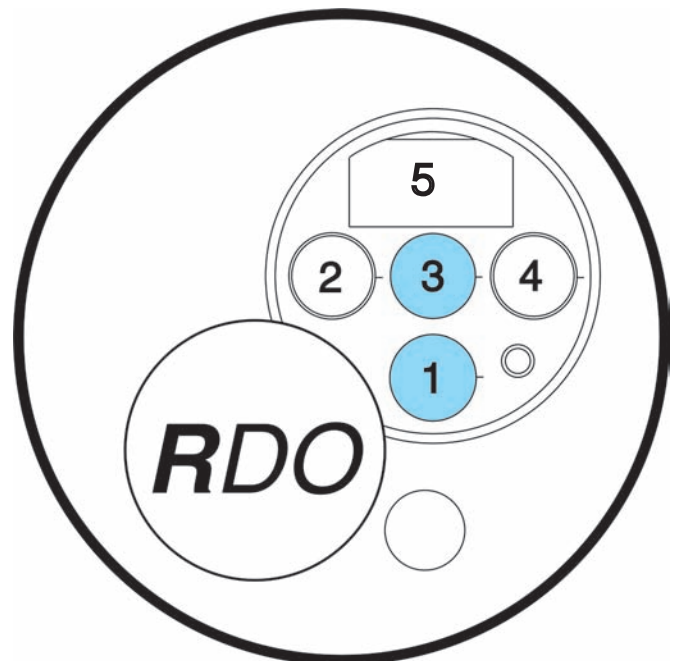
TROLL 9500—Sub-4 inch version

Q. Why can't I get turbidity, depth or the combination turbidity/depth sensor with RDO in a sub-2 inch instrument?

A. The sub-2 inch configuration of the TROLL 9500 cannot accommodate all these sensors. For RDO with turbidity and/or depth, choose the sub-4 inch version with the RDO cable connect sensor.

Any unit with turbidity, pressure or both must be a sub-4 inch configuration with adapter.

- Port 1 = pH, pH/ORP, RDO, ISE (XP units)
- Port 2 = ISE (XP units)
- Port 3 = pH, RDO, wiper
- Port 4 = Conductivity (high or low)
- Port 5 = Turbidity (XP units), pressure or both



Additional references

For additional information about user validation of the RDO sensor, see In-Situ Inc.'s Technical Note, *Performance Validation of the RDO® Dissolved Oxygen (DO) Sensor Using the TROLL® 9500 Sonde.*

