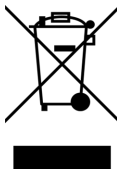
Innovations in Water Monitoring

Operator's Manual

SMARTROLL™ RDO® for Android

0099612 | Rev. 001 | 02/2016

Mailing and Shipping Address:	Phone:	970-498-1500 (international & domestic)
In-Situ 221 East Lincoln Avenue Fort Collins, CO 80524 U.S.A.	Fax:	970-498-1598
	Internet:	*www.in-situ.com*
	Support:	800-446-7488 (U.S.A. & Canada)



The presence of the Waste Electrical and Electronic Equipment (WEEE) marking on the product indicates that the device is not to be disposed via the municipal waste collection system of any member state of the European Union.

For products under the requirement of WEEE directive, please contact your distributor or local In-Situ office for the proper decontamination information and take back program, which will facilitate the proper collection, treatment, recovery, recycling, and safe disposal of the device.

0099612 | Rev. 001

Table of Contents

Introduction

This manual is intended to describe the characteristics, operation, calibration, and maintenance of the smarTROLL RDO Handheld Instrument.

Serial Number Location

The probe serial number is engraved on the probe body.

The Power Pack serial number is on a sticker affixed to the battery pack casing.

Safety

Do not submerge the Power Pack or the mobile display device in liquid.

⚠ Ensure that the RDO Sensor Cap is pressed firmly over the sensor lens and is flush with the instrument before submerging in liquid.

Replace the cable if insulation or connectors are damaged.

Make sure the probe and sensor O-rings are clean and free of damage.

General Specifications

Operating temperature	-5 to 50° C (23 to 122° F)
Storage temperature	-40 to 65° C (-40 to 149° F)
Diameter	2.61 cm (1.03 in.) 2.84 cm (1.12 in.) with guard installed
Dimensions	2.8 cm x 16.76 cm (1.12 in. x 6.60 in.) D x L with guard installed
Weight	255 g (0.56 lbs)
Wetted materials	Acetal, Titanium, 316SS, Viton, PC/PMMA
Environmental rating	IP68 with all sensors and cable attached. IP67 with sensors removed and cable detached.
Reading rate	1 reading every 10 seconds; data logged to Android device.
Power	5 VDC from Power Pack
Output Options	Modbus RS-485 to Power Pack
Max pressure rating	150 psi from 0-50° C
Interface	Android™ platform 4.4 (requires *Bluetooth®* 2.0) Download VuSitu for free on the Google Play store. Used with Android Power Pack
Cable	Black polyurethane. Standard lengths available: 1.5 m, 4.6 m, 9.1 m (5 ft, 15 ft, 30 ft)
Warranty	2-years
Certifications	CE, FCC, WEEE
Notes	Bluetooth is a registered trademark of Bluetooth SIG, Inc. Viton is a registered trademark of DuPont Performance Elastomers L.L.C.

Sensor Specifications

Dissolved Oxygen RDO Fast Cap (Optical Sensor) Specifications

Accuracy	±0.1 mg/L; ±0.2 mg/L; ±10% of reading
Range	0 to 8 mg/L; 8 to 20 mg/L; 20 to 50 mg/L; Full operating range: 0 to 50 mg/L
Resolution	0.01 mg/L
Sensor Type	Fixed with replaceable RDO Fast Cap (life: 1 year typical)
Response Time	T90: <30 sec. T95: <45 sec.
Units of Measure	mg/L, % saturation, ppm
Methodology	EPA-approved In-Situ Methods 1002-8-2009 1003-8-2009 1004-8-2009

Temperature Sensor Specifications (Probe)

Accuracy	±0.1° C
Range	-5 to 50° C (23 to 122° F)
Resolution	0.01° C or better
Sensor Type	Fixed
Response Time	<30 sec.; temperature sensor only
Units of Measure	Celsius, Fahrenheit
Methodology	EPA 170.1

Fixed Salinity Correction

Fixed Salinity Correction	User-set value to match the salinity of water sample Value appears in data log

Power Pack Specifications

Operating temperature	-5 to 50° C (23 to 122° F); 95% relative humidity, non-condensing
Storage temperature	-20 to 50° C (-4 to 122° F); 95% relative humidity, non-condensing
Dimensions	14.4 x 4.3 x 3 cm (5.7 x 1.7 x 1.2 in.)
Weight	145 g (0.32 lb)
Materials	PC / ABS blend, Silicon, Urethane, Stainless steel, Brass, Santoprene, Poron®, Polyethylene, Versapor®, Titanium, PEEK, Viton®
Environmental rating	IP67
Output options	***Bluetooth***®, USB
Communication protocol	Android®: SPP Windows®: SPP or USB
Battery type	3.7 V 8600 MWh Lithium rechargeable cell (UBBL19-FL)
Charging requirements	5 VDC USB charger (1 A or 500 mA)
Warranty	1 year
Certifications	CE, FCC (SSSBC127-X), WEEE

Sensor	**Temperature**	**Barometric Pressure**
Accuracy	±2° C max	±3 mbar max
Range	-20 to 70° C (-4 to 158° F)	300 to 1100 mbar
Resolution	0.1° C	0.01 mbar
Sensor type	Fixed	Fixed
Response time	< 30 seconds	Instantaneous in thermal equilibrium
Units of measure	Celsius or Fahrenheit	psi, kPa, bar, mbar, mmHg, inHg, Torr, atm
Method	EPA 170.1	Piezoresistive

Instrument Overview

Instrument Description

The SmarTROLL RDO Handheld Instrument is comprised of a mobile display, Power Pack, cable, and an integrated optical Rugged Dissolved Oxygen (RDO®) Sensor. The RDO Sensor Cap is replaceable.

System Components

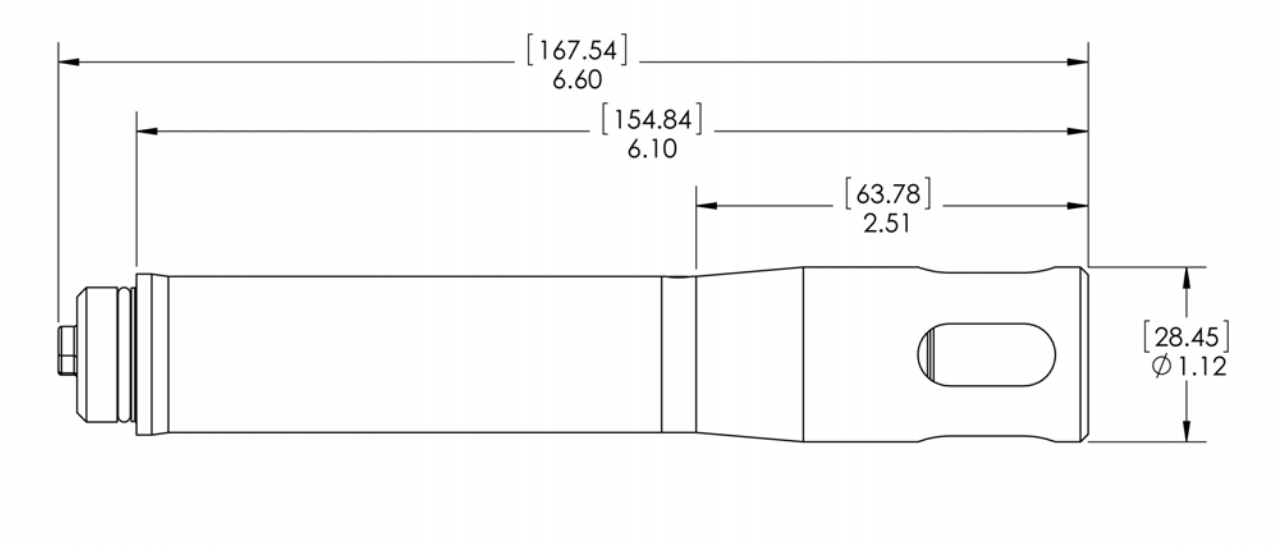
The system includes the following components.

- Integrated RDO Sensor
- RDO Fast Sensor Cap
- Stainless steel restrictor
- Calibration cup
- Power Pack and cable

Accessories Purchased Separately

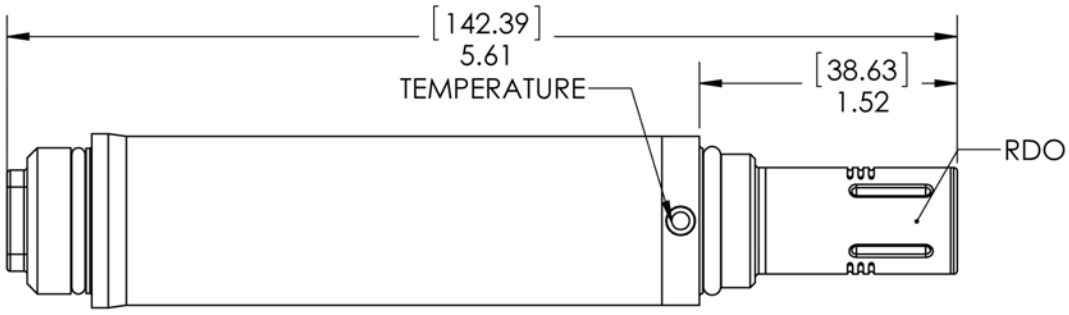
- Replacement RDO Fast Sensor Cap
- Calibration Kit (includes calibration cup, 3 sponge wafers, vented cap, and storage cap)
- Cable 1.5 m (5 ft), 4.6 m (15 ft), 9.1 m (30 ft) and 30.5 m (100 ft.)
- Maintenance kit
- Replacement Power Pack
- Android™ platform 4.4 (requires Bluetooth® 2.0) Download VuSitu for free on the Google Play store. Used with Android Power Pack
- Universal wall charger and cable
- Replacement wall charger and cable

Probe Dimensions with Restrictor On



Total length with connector	167.54 mm (6.60 in.)
Total length without connector	154.84 mm (6.10 in.)
Restrictor length	63.78 mm (2.51 in.)
Diameter with restrictor	28.45 mm (1.12 in.)

Probe Dimensions with Restrictor Off



Total length with restrictor off	142.39 mm (5.61 in.)
Sensor length	38.63 mm (1.52 in.)

Power Pack Description

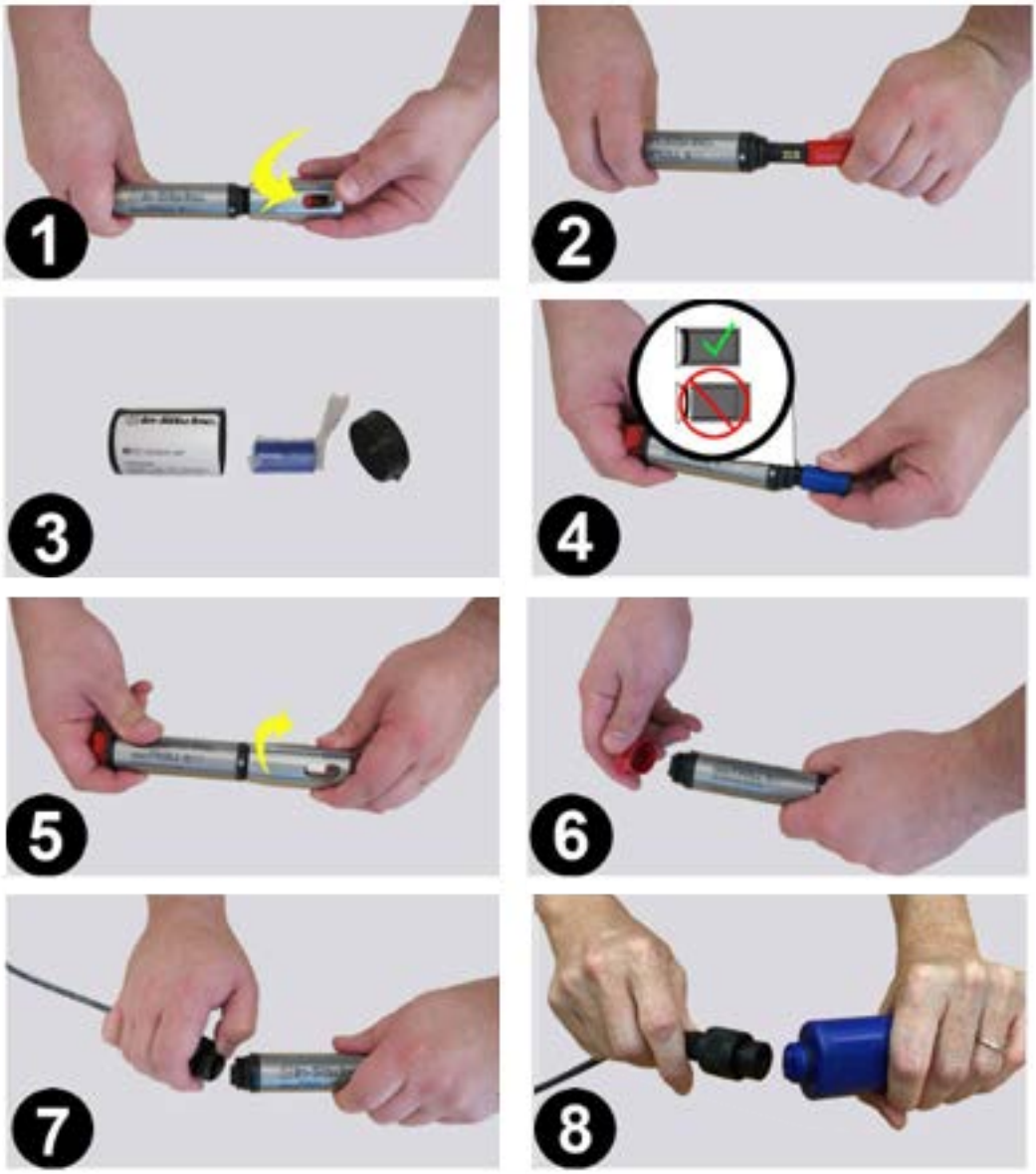
The Power Pack enables wireless communication between the Android device and the probe and supplies power to the probe. The Power Pack provides a barometric pressure measurement that is used to compensate depth and dissolved oxygen measurements. The ambient temperature measurement is also provided by the Power Pack.

A fully-charged Power Pack will run for approximately 40 continuous hours.

1	Dust cover for the USB connection
2	Connection status **Red (flashing)** = The communication device, instrument, and Bluetooth-enabled device are not connected. **Red (continuous)** = The communication device and instrument are connected, but the communication device is not connected to the Bluetooth-enabled device. -OR- The communication device is connected via USB cable. **Green (flashing)** = The communication device is connected to the Bluetooth-enabled device, but is not connected to the instrument. **Green (continuous)** = The communication device, instrument, and Bluetooth-enabled device are connected.
3	On/Off button

4	Battery charge status:  100% -90%  90% - 75%  75% - 50%  50% - 25%  Less than 25%
5	Cable connector to the instrument
6	Lanyard connector
7	USB connection to a power source for charging the internal battery

Installing the Sensor and Cable



1. Twist the restrictor off the probe.
2. Remove the dust cap from the sensor lens.
3. Locate the RDO Sensor Cap container and remove the cap from the packaging.

> ⚠ Important: Avoid touching the sensor lens and the sensing material on top of the cap.

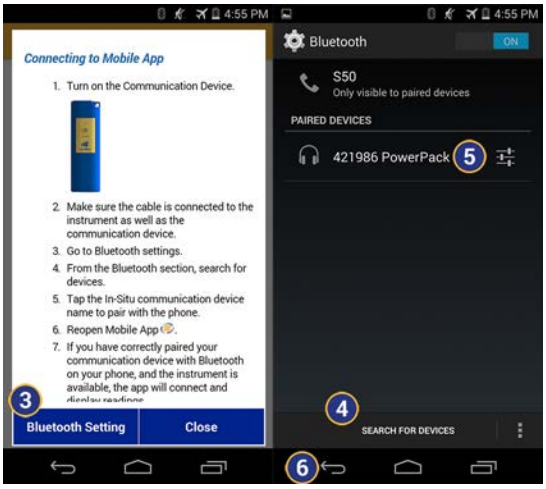
4. Align the flat edge of the RDO Sensor with the slotted edge of the RDO Cap and press the cap into position. Push until the cap is firmly in place.
5. Twist the restrictor onto the probe.
6. Remove the dust cap from the cable connector.

7. Align the pins on the cable with the pins on the probe, then twist the outer portion of the connector until the connection is secure.
8. Align the pins on the cable with the pins on the Power Pack, then twist the outer portion of the connector until the connection is secure.

> ⚠ Important: The RDO Sensor Cap must be installed firmly in place to prevent water from entering the instrument.

Connecting to VuSitu

1. Turn on the Power PackWireless TROLL Com.
2. Make sure the cable is connected to the instrument as well as the communication device.
3. Go to Bluetooth settings on the phone.



4. From the Bluetooth section, search for devices.
5. Tap the In-Situ Power PackWireless TROLL Com name to pair with the phone.
6. Tap the back arrow to return to the app.
7. If you have correctly paired your communication device with Bluetooth on your phone, and the instrument is available, the app will connect and display readings.

> ✓ In general, it is necessary to pair the devices only the first time you use them. After you have paired the first time, turn on the communication device and open the app for direct communication with the instrument.

VuSitu Overview

About VuSitu

The VuSitu Mobile App is the user interface and control application for In-Situ water quality instruments. You can use VuSitu on mobile devices that use Android operating system 4.4, *Bluetooth* 2.0, and newer.

VuSitu allows you to accomplish the following tasks.

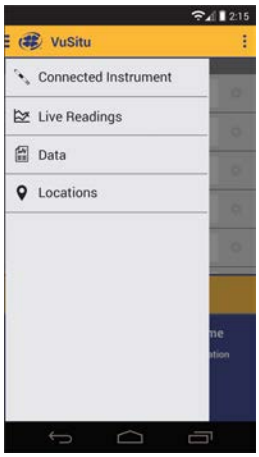
- View live readings that update every 10 seconds.
- Change parameters and units.
- Set up a data log.
- Record data.
- Email data in spreadsheet format.
- Download data to mobile device.
- Transfer data from mobile device to a computer.
- Organize data by Location.
- Calibrate Sensors and View Reports

VuSitu Menu Options

The features available in the VuSitu Mobile App vary slightly depending on the instrument with which it is connected. Tap the menu icon in the upper left portion of the screen to view the features included in VuSitu. Tap the menu icon again to close the menu.

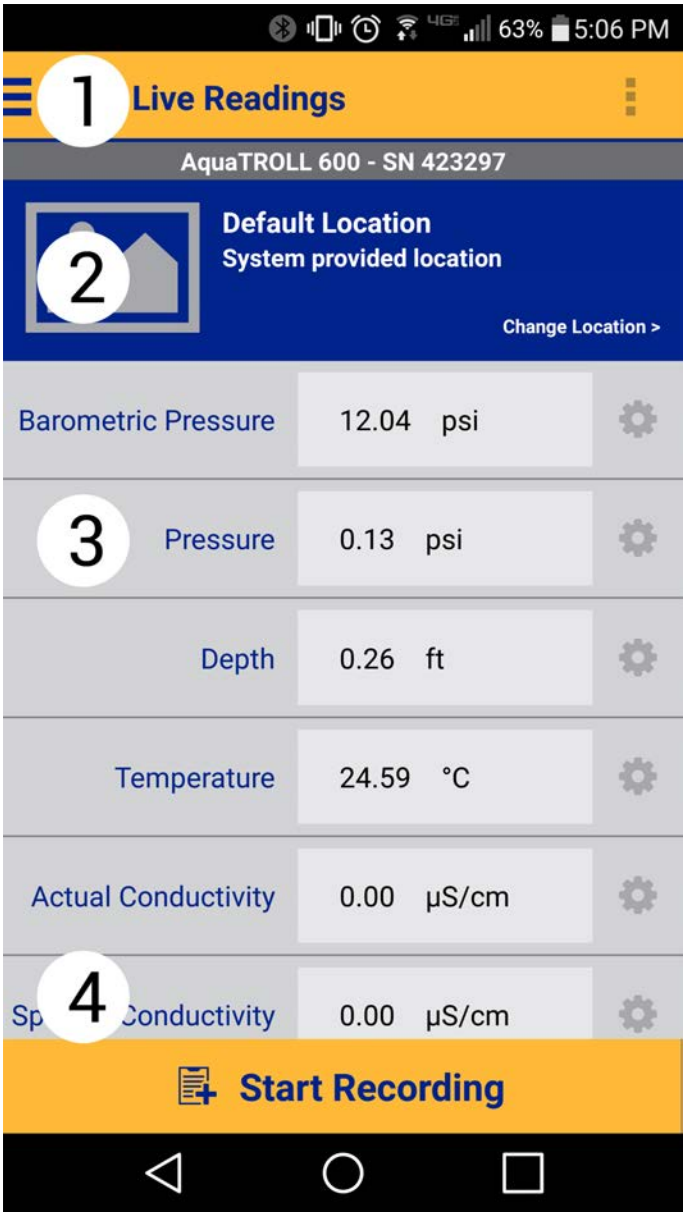
Menu Options when Connected to Instrument

Some features, such as sensor calibration, are not available when you are not connected to an instrument.



Live Readings Screen

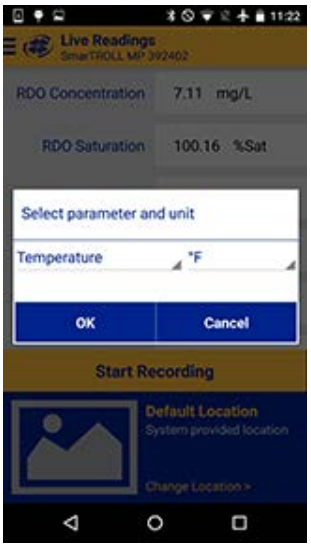
The live readings screen displays instrument readings when the app is connected to the communication device and/or to the instrument via Bluetooth.



1	Main Menu
2	Selected Location (Tap to change Location.)
3	Live Readings (scrollable) Tap the settings wheel next to each to change parameters and units.
4	Tap to record readings (Readings refresh every 10 seconds.)

Changing Parameters and Units

1. From the Live Readings screen, tap the settings wheel next to the field that contains the measurement value. When you release, the Parameter and Unit menu appears.

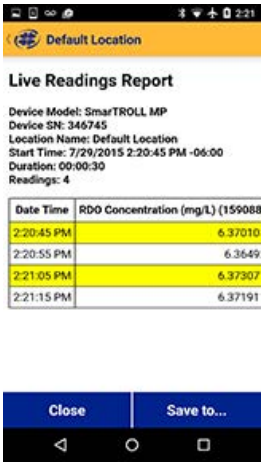


2. Tap the parameter drop-down arrow and tap the parameter you want to display.
3. Tap the units drop-down arrow and tap the unit you want to display.
4. Tap the OK button to set the options and return to the Live Readings screen.

Record Data

1. From the Live Readings screen, tap Start Recording. A new set of readings is updated every 10 seconds and a counter of readings is displayed in the Stop button.
2. It is optional to mark a set of readings by tapping the Mark button.

3. When you have gathered enough data, tap the Stop button.
4. The recorded data appears on screen. If you have marked data it will appear as a highlighted row.



5. If you want to return to the Live Readings screen, tap the Close button. (Your data can be accessed later in the Data section of the app.)
6. If you want to send your data, tap the Send To... button.

- Select the VuSitu Folder to later download your data to a computer via USB connection.

  or

- Select your email application to email the data.

VuSitu Locations

About VuSitu Locations

A Location represents the physical location at which an instrument collects data. For example, you can create a Location to represent a lake, gauging station, well, tank, number, or nearby landmark. If you do not set up a Location, your data will be associated with Default Location. The Location name is displayed on the Live Readings screen. You can access Locations through the Main Menu or by tapping the Location displayed in the lower portion of the Live Readings screen.

Create a New Location

1. You can create a new Location with which to associate your data by selecting Locations from the main menu, or by tapping the location shown on the Live Readings screen.
2. Tap Add New Location.
3. Enter a name for the Location.
4. It is optional to add a photo to the Location. Tap the camera icon, take a photo and select the check mark to select the photo.
5. It is optional to add notes to the Location. Tap the Notes field to enter additional information about the Location.
6. It is optional to associate latitude and longitude coordinates with the Location. Tap the map to activate the mapping feature.

7. Tap the GPS icon in the upper-right portion of the screen to navigate to your current physical location.
8. Tap the Location icon to select the point on the map as the Location.
9. To manually set a Location, tap and hold to drop a pin on a specific area of the map. This associates latitude and longitude with your Location.

> ✔ As an alternative, you can manually enter latitude and longitude values and tap Apply.

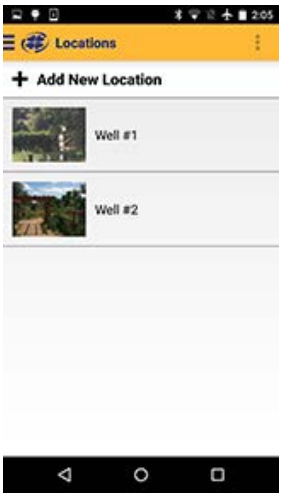
10. Tap Save.

Select a Location

Data is associated with the Location that is displayed on the Live readings screen.

After you have created a Location, you must select it in order for your data to be associated with the Location.

1. To Select a Location, tap the current Location displayed on the Live Readings screen. The list of Locations appears.



2. The active Location is marked with a green check mark. If no Location has been selected data will be associated with the Default Location.
3. Tap the desired location in the list.

4. The Live Readings screen appears with the site selected.

Edit or Delete a Location

1. From the Main Menu, tap Locations.
2. Tap the Location you want to edit.

3. Tap the Overflow Menu ⋮ in the upper-right portion of the screen.
4. Select Edit Location to make changes, or Archive Location to remove it from the list.

> ✔ Archived Locations can be restored at any time by tapping the Location, accessing the Overflow Menu ⋮ and tapping Restore Location.

VuSitu Reports

About Data

Recorded data from the Live Readings screen is stored in the VuSitu Data section of the app. Data is organized by the Location that was active when the data was recorded.

You can view data on the device, delete the data, send the data through email, or save the data to the VuSitu Folder so that it can be downloaded to your computer via USB connection.

View, Send, Delete Data

1. From the Main Menu, select Data.

> ✔ It is optional to filter results by Location. Tap the drop-down list and select a Location.

2. Tap the desired data.

- Tap Delete to remove the data from the data list.
- Tap View to see the data on the mobile device.
- Tap Send CSV to send an Excel-compatible file to email or the VuSitu Folder. (When you send the report to the VuSitu Folder, you can later download the data to a computer via USB cable.)

VuSitu Calibrations & Settings

About Calibration and Settings

You can perform sensor calibrations, view a calibration report, or restore factory calibration defaults when the instrument is connected to VuSitu.

1. Tap the VuSitu menu icon, and select Connected Instrument from the list.
2. Tap Calibrations.
3. The available calibrations and sensor settings appear.

4. Tap the calibration you want to perform.

> ✔ You can also access the full Calibration Report from this menu.

Calibrate the Rugged Dissolved Oxygen Sensor (1-Point)

The optical Rugged Dissolved Oxygen sensor is very stable. The factory calibration should produce readings within 3% accuracy. If you require readings with greater accuracy we recommend that you perform a 1-point, 100% water-saturated air calibration as described below.

100% Water-saturated Air Calibration

1. From the main menu, select **Calibration & Settings**.
2. From the Calibrations menu select **RDO Saturation**.
3. For a 1-point calibration, select **100% Saturation**.
4. Make sure the vented cap is installed on the calibration cup and a water-saturated sponge is placed in the bottom of the cup.

5. After the calibration is stable, select **Accept**.
6. The calibration values are applied to the sensor and appear on screen. You can view a full calibration report for all sensors, or select **Done** to return to the Calibration Menu.
7. Remove the sponge from the calibration cup.

Calibrate the Rugged Dissolved Oxygen Sensor (2-Point)

We recommend that you perform the 0 % oxygen calibration only if you intend to measure dissolved oxygen at a concentration of less than 4 mg/L.

100% Water-saturated Air Calibration

1. From the main menu, select **Calibration & Settings**.
2. From the Calibrations menu select **RDO Saturation**.
3. For a 2-point calibration, select **100% and 0% Saturation**.
4. Make sure the vented cap is installed on the calibration cup and a water-saturated sponge is placed in the bottom of the cup.
5. After the calibration is stable, a prompt to prepare for the next calibration point appears.

0-point Calibration

1. Remove the sponge from the calibration cup.
2. Fill the calibration cup to the fill line with sodium sulfite. Place the instrument in the calibration cup.

3. Select **Next**.
4. After the calibration is stable, select **Accept**.
5. The calibration values are applied to the sensor and appear on screen. You can view a full calibration report for all sensors, or select **Done** to return to the Calibration Menu.
6. Rinse the sensors and restrictor with DI water.

Calibrating the Rugged Dissolved Oxygen Sensor Using Concentration

The preferred method of calibrating the RDO sensor is using the 1-point 100% Saturation calibration. However, you can also calibrate the sensor using a concentration method.

1. From the main menu, select **Connected Instrument**.
2. Select **Calibrations**.
3. Tap **RDO Concentration**.
4. Place the instrument in reference solution and tap **Next**.
5. Enter the value of the reference solution.
6. After the calibration is stable, select **Accept**.
7. The calibration values are applied to the sensor and appear on screen. You can view a full calibration report for all sensors, or select **Done** to return to the Calibration Menu.

RDO Salinity Setting

The SmarTROLL RDO does not include automatic salinity compensation, so you must set it manually.

1. From the main menu, select **Connected Instrument**.
2. Select **Instrument Settings**.

3. From the Instrument Settings menu select **Salinity Setting**.
4. Select the appropriate setting for your sampling environment.

Care and Maintenance

Maintenance Schedule

For best results, send the instrument to the manufacturer for factory calibration every 12 to 18 months.

User-Serviceable Parts

The user-serviceable parts on the instrument include the O-rings, and the RDO Sensor Cap.

O-rings

The instrument has several O-rings that can be maintained by the user in order to keep moisture from entering the instrument and damaging the electronics. Apply a very thin layer of vacuum grease to new O-rings upon installation. The O-rings are located in the following areas.

1	Connector (1)
2	Instrument housing (1)
3	RDO Sensor Cap (2)

RDO Fast Sensor Cap Replacement

The RDO Fast Sensor Cap has a 1-year typical life (15 months of total usage) after the sensor takes its first reading, or 36 months from the date of manufacture. Follow the instructions included in the RDO Sensor Cap Replacement Kit. Replacement caps are available from In-Situ Inc. or your authorized In-Situ distributor.