

# Operator's Manual

## *SMAR TROLL™ MP Handheld Instrument for Android*

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

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## **Introduction**

This manual is intended to describe the characteristics, operation, calibration, and maintenance of the SmarTROLL™ MP Instrument.

### **Serial Number Location**

The probe serial number is on the product label affixed to the probe body.

The Power Pack serial number is under the flap that protects the USB charging connector.

## **Safety**

- Do not submerge the Power Pack or the mobile display device in liquid.
- Ensure that the pH/ORP sensor is completely inserted into the port, so that no liquid can enter the instrument. The storage plug is not intended to be used when the instrument is deployed in water.
- 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.

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## General Specifications

Operating temperature	-5 to 50° C (23 to 122° F)
Storage temperature	-40 to 65° C (-40 to 149° F)
Dimensions	4.7 cm (1.85 in.) OD x 26.9 cm (10.6 in.) with restrictor installed (does not include connector)
Weight	694 g (1.53 lbs)
Wetted materials	PVC, 316 stainless steel, titanium, Acetal, Viton <sup>®</sup> , 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 mobile device.
Power	5 VDC from Power Pack
Interface	Android™ platform 4.4 (requires <i>Bluetooth</i> <sup>®</sup> 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, 30.5 m, 76.2 m (5 ft, 15 ft, 30 ft, 100 ft, 250 ft)
Warranty	2-years
Notes	Specifications are subject to change without notice. Bluetooth is a registered trademark of Bluetooth SIG, Inc. Viton is a registered trademark of DuPont Performance Elastomers L.L.C.

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## Sensor Specifications

### Level, Depth, Pressure Sensor Specifications

Accuracy	Typical $\pm 0.1\%$ FS @ 15° C; $\pm 0.3\%$ FS max. from 0 to 50° C
Range	76 m (250 ft); absolute (non-vented)
Resolution	$\pm 0.01\%$ FS or better
Sensor Type	Fixed
Response Time	Instantaneous in thermal equilibrium
Units of Measure	Pressure: psi, kPa, bar, mbar, mmHg, inHg Level: mm, cm, m, in, ft
Methodology	Piezoresistive; ceramic

### Barometric Pressure Sensor Specifications (Power Pack)

Accuracy	$\pm 3$ mbar max.
Range	300 to 1100 mbar
Resolution	0.01 mbar
Sensor Type	Fixed
Response Time	Instantaneous in thermal equilibrium
Units of Measure	psi, kPa, bar, mbar, mmHg, inHg, Torr, atm
Methodology	Piezoresistive pressure sensor

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## Conductivity Sensor Specifications

Accuracy	Typical $\pm 0.5\%$ + 1 $\mu\text{S/cm}$ ; $\pm 1\%$ max.
Range	5 to 100,000 $\mu\text{S/cm}$
Resolution	0.1 $\mu\text{S/cm}$
Sensor Type	Fixed
Response Time	Instantaneous in thermal equilibrium
Units of Measure	Actual conductivity ( $\mu\text{S/cm}$ , $\text{mS/cm}$ ) Specific conductivity ( $\mu\text{S/cm}$ , $\text{mS/cm}$ ) Salinity (PSU) Total dissolved solids (ppt, ppm) Resistivity (Ohms-cm) Density ( $\text{g/cm}^3$ )
Methodology	Std. Methods 2510 EPA 120.1

## Dissolved Oxygen RDO Fast Cap (Optical Sensor) Specifications

Accuracy	$\pm 0.1$ mg/L; $\pm 0.2$ mg/L; $\pm 10\%$ 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

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## ORP Sensor Specifications

Accuracy	±5.0 mV
Range	±1400 mV
Resolution	0.1 mV
Sensor Type	Replaceable pH/ORP combo sensor
Response Time	<15 sec.
Units of Measure	mV
Methodology	Std. Methods 2580

## pH Sensor Specifications

Accuracy	±0.1 pH unit from 0 to 12 pH units
Range	0 to 14 pH units
Resolution	0.01 pH unit
Sensor Type	Replaceable pH/ORP combo sensor
Response Time	<15 sec., pH 7 to pH 4
Units of Measure	pH units
Methodology	Std. Methods 4500-H+ EPA 150.2

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## Air Temperature Sensor Specifications (Power Pack)

Accuracy	±2° C
Range	-20 to 70° C (-4 to 158° F)
Resolution	0.1° C
Sensor Type	Fixed
Response Time	<30 sec.
Units of Measure	Celsius, Fahrenheit
Methodology	EPA 170.1

## 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

## 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 <sup>®</sup> , Polyethylene, Versapor <sup>®</sup> , Titanium, PEEK, Viton <sup>®</sup>

Environmental rating	IP67
Output options	<b>Bluetooth®</b> , 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

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## Instrument Overview

### Instrument Description

The smarTROLL MP Handheld Instrument is comprised of a mobile display, Power Pack, cable, and multiparameter water quality probe. The optical Rugged Dissolved Oxygen (RDO<sup>®</sup>), conductivity, pressure, and temperature sensors are integrated into the probe. The pH/ORP and the RDO Sensor Cap are replaceable.

### System Components

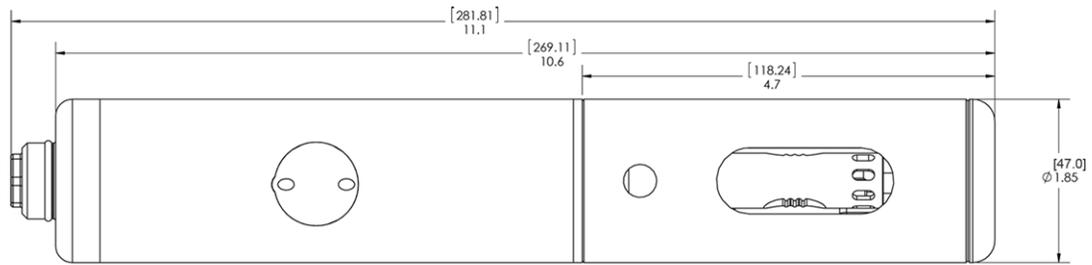
The system includes the following components.

- Integrated sensors: RDO, conductivity, pressure, and temperature
- Plug-in pH/ORP sensor
- RDO Fast Sensor Cap
- Stainless steel restrictor
- Calibration and storage cup
- Power Pack and cable

Accessories purchased separately

- Replacement RDO Fast Sensor Cap
- Replacement pH/ORP sensor
- 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), 30.5 m (100 ft), 76.2 m (250 ft).
- Maintenance kit (instrument and Power Pack)
- Replacement Power Pack
- Storage/Calibration cup
- Android platform 4.4 (requires Bluetooth 2.0). Download VuSitu for free on the Google Play™ store. Used with Power Pack
- Universal wall charger and cable
- Replacement wall charger and cable

## Probe Dimensions with Restrictor On



Total length with connector	281.81 mm (11.1 in.)
Total length without connector	269.11 mm (10.6 in.)
Restrictor length	118.24 mm (4.7 in.)
Diameter	47 mm (1.85 in.)

## Probe Dimensions with Restrictor Off

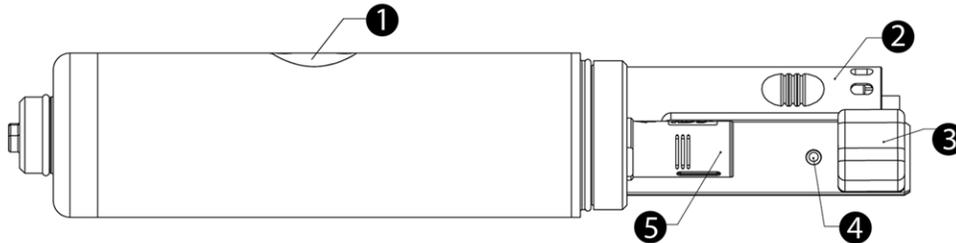


Sensor length | 81.09 mm (3.2 in.)

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## Sensors

Sensors include optical RDO (Rugged Dissolved Oxygen), pH/ORP, conductivity, pressure, and temperature.



1	Pressure sensor 76 m (250 ft)
2	pH/ORP sensor
3	Conductivity sensor
4	Temperature sensor
5	RDO Sensor

## Probe Setup

The probe is shipped with a storage plug and protective dust caps in place.



1	Dust cap protector on the RDO Sensor. (Install the RDO Cap before deploying the instrument.)
2	pH/ORP storage plug. (Remove the storage plug and install the pH/ORP sensor before deploying the instrument.)

## 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.

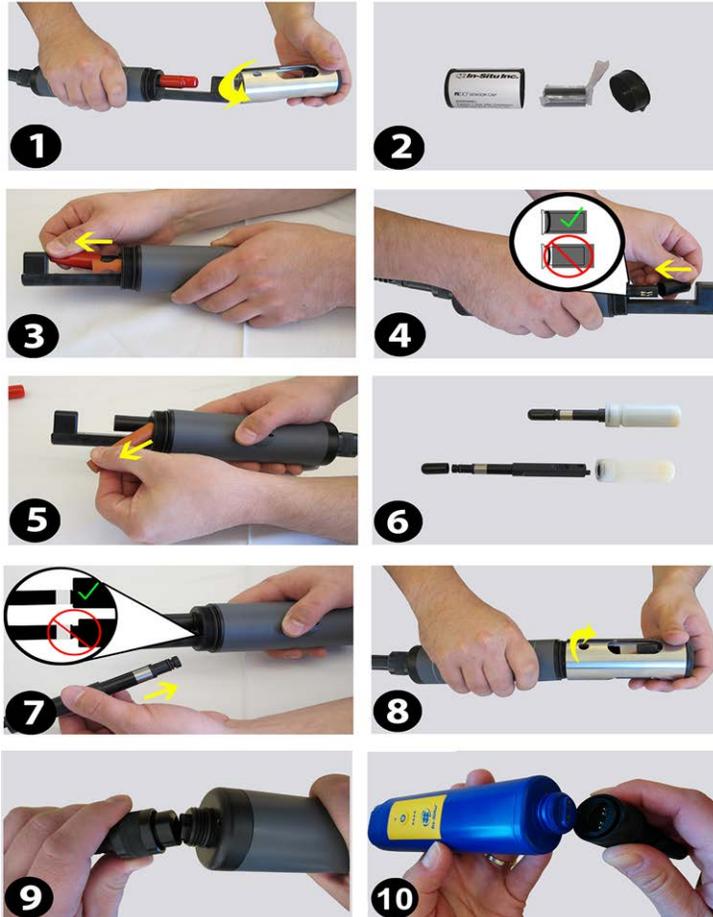


A fully-charged Power Pack will run for approximately 40 continuous hours.

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

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

## Installing the Sensors



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



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

5. Remove the orange plug from the pH/ORP port.
6. Remove the pH/ORP sensor from the storage bottle. Keep the bottle for future sensor storage.
7. Use the alignment marks to properly align the pH/ORP sensor with the port connection, and press firmly into place. Push until the sensor is completely inserted into the port.
8. Twist the restrictor onto the probe.

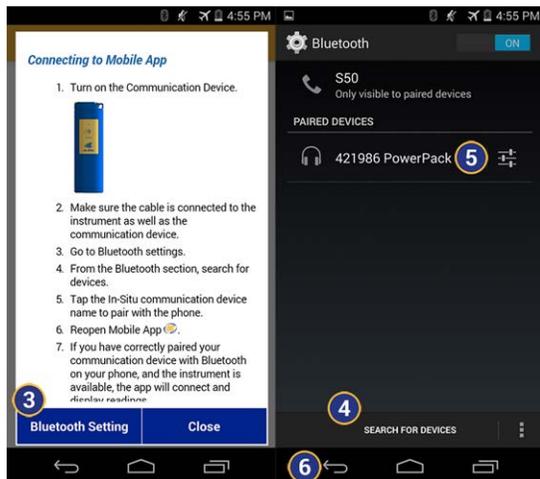
- Align the pins on the cable with the pins on the probe, then twist the outer portion of the connector until the connection is secure.
- Align the pins on the cable with the pins on the Power Pack, then twist the outer portion of the connector until the connection is secure.



Important: The RDO Sensor Cap and pH/ORP sensor must be installed firmly in place to prevent water from entering the instrument.

## Connecting to VuSitu

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



- From the Bluetooth section, search for devices.
- Tap the In-Situ Power PackWireless TROLL Com name to pair with the phone.
- Tap the back arrow to return to the app.
- 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.

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## 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.

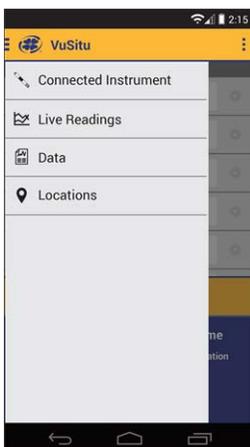
- View live readings that update every 10 seconds.
- Change parameters and units.
- Set up a data log.
- Record data.
- Email data in spreadsheet format.
- Download data to mobile device.
- Transfer data from mobile device to a computer.
- Organize data by Location.
- Calibrate Sensors and View Reports

### 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

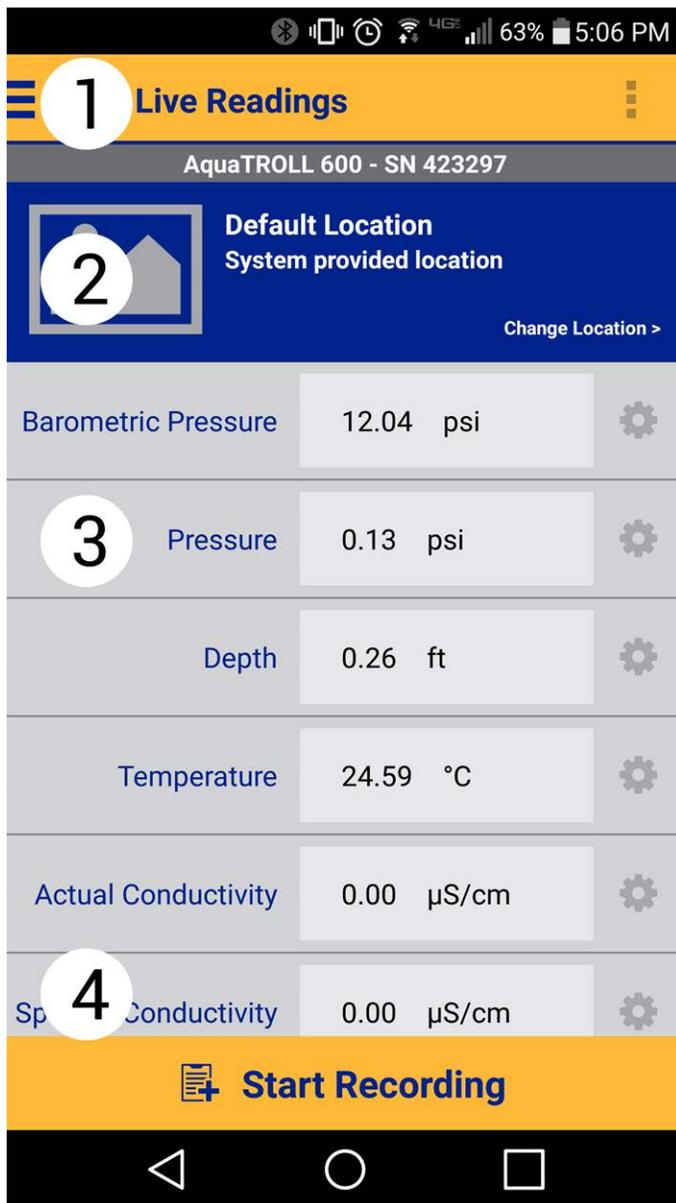
Some features, such as sensor calibration, are not available when you are not connected to an instrument.



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## 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.

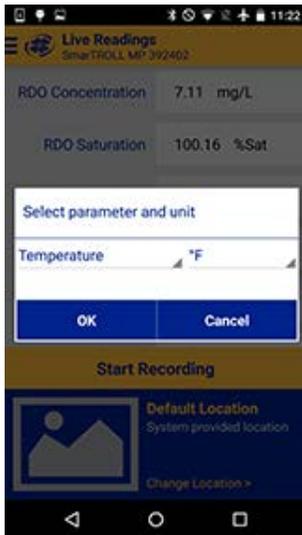


1	Main Menu
2	Selected Location (Tap to change Location.)
3	Live Readings (scrollable) Tap the settings wheel next to each to change parameters and units.
4	Tap to record readings (Readings refresh every 10 seconds.)

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## 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.



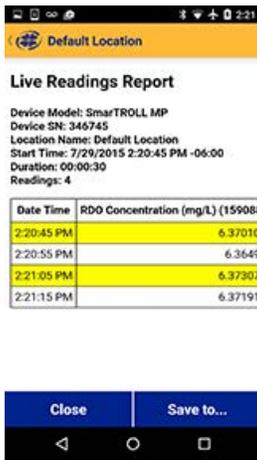
2. Tap the parameter drop-down arrow and tap the parameter you want to display.
3. Tap the units drop-down arrow and tap the unit you want to display.
4. Tap the OK button to set the options and return to the Live Readings screen.

## Record Data

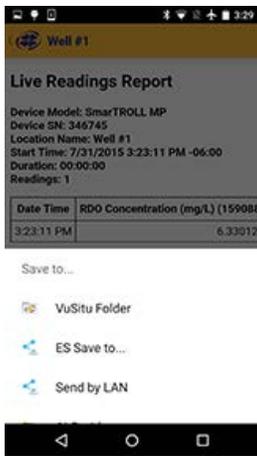
1. From the Live Readings screen, tap Start Recording. A new set of readings is updated every 10 seconds and a counter of readings is displayed in the Stop button.
2. It is optional to mark a set of readings by tapping the Mark button.



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.



- 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.)
- 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.

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## 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.

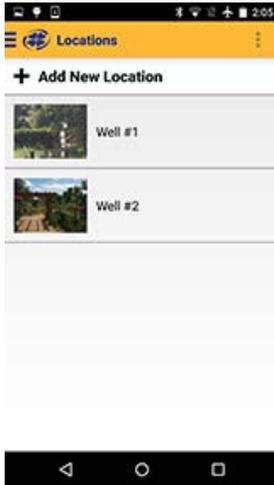
10. Tap Save.

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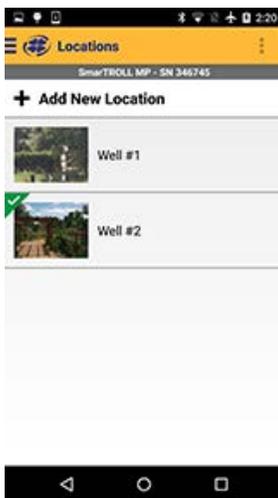
## Select a Location

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.

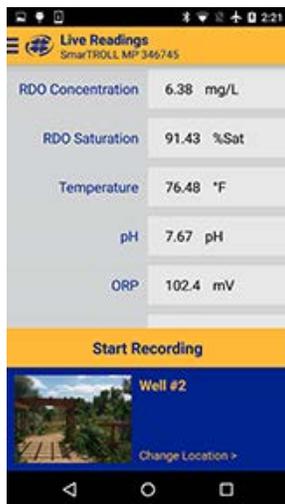
1. To Select a Location, tap the current Location displayed on the Live Readings screen. The list of Locations appears.



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.

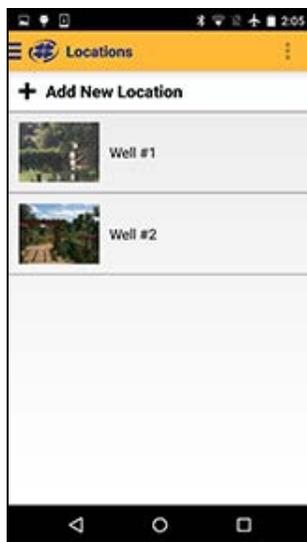


4. The Live Readings screen appears with the site selected.



## 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.



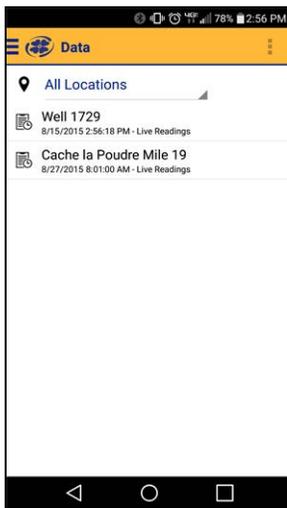
Archived Locations can be restored at any time by tapping the Location, accessing the Overflow Menu  and tapping Restore Location.

## 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 Calibration & 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.

### Quick-Cal Multiple Sensor Calibration

Quick-Cal allows you to perform a one-point calibration on up to three sensors with one setup and stabilization process.

1. From the main menu, select **Connected Instrument**.
2. Select **Calibrations**.
3. From the Calibration Menu, select **Quick-Cal (multi-sensor)**.



4. All of the sensors available for the Quick-Cal calibration are selected by default. Tap the checked box if you want to exclude a sensor from the calibration.



5. Select **Next**.



If one or more sensors is not installed, an error message will pop up.

6. Make sure the vent is open on the cal cup.



7. Fill the cup to the fill line with Quick-Cal standard. Place the instrument in the calibration cup and select **Next**.
8. After the calibration is stable, select **Accept**.
9. 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.
10. Rinse the sensors and restrictor with DI water.

### **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**.

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

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## Calibrate the Conductivity Sensor

1. From the main menu, select **Connected Instrument**.
2. Select **Calibrations**.
3. From the Calibration Menu, select **Conductivity**.



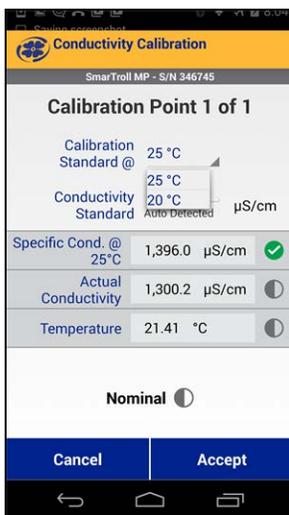
4. Make sure the vent is open on the cal cup.



5. Fill the cup to the fill line with calibration standard. Place the instrument in the calibration cup and select **Next**.
6. The app attempts to automatically detect the calibration solution and stabilize the measurements.

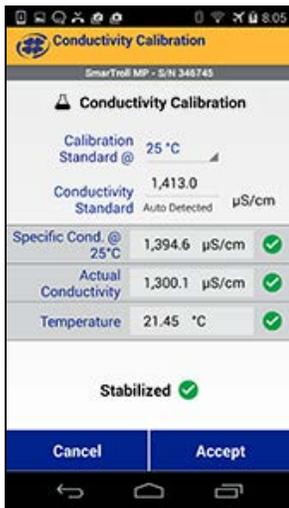


7. Check your bottle of calibration standard to determine the reference temperature. If necessary, tap the drop down list and select the appropriate reference temperature for the calibration.



If you are using a custom standard, the app will not automatically detect it. Instead, a field will appear in which you can enter the appropriate value. Select **Set User Defined** to begin calibrating with the new value. If you are not using a custom standard and the app does not automatically detect the standard, perform the sensor cleaning and maintenance procedure, then select **Retry Auto Detect**.

8. After the calibration is stable, select **Accept**.



9. 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.
10. Rinse the sensors and restrictor with DI water.

## Calibrate the Level Sensor

The factory calibration of the level sensor is very accurate. In-Situ does not recommend calibrating the Level sensor unless your SOP specifically requires you to do so.

1. From the main menu, select **Connected Instrument**.
2. Select **Calibrations**.
3. From the Calibrations menu select **Level**.
4. Make sure that the pressure sensor is open to air and not submersed in water.
5. Select **Next**.
6. After the calibration is stable, select **Accept**.

## Calibrate the pH Sensor

You can calibrate the pH sensor with either a 1-point, 2-point, or 3-point process.

1. From the main menu, select **Connected Instrument**.
2. Select **Calibrations**.
3. From the Calibrations menu select **pH**.



4. Select a 1-, 2-, or 3-point calibration.
5. Make sure the vent is open on the cal cup.



6. Fill the calibration cup to the fill line with calibration standard. Place the instrument in the calibration cup and select **Next**.
7. The app attempts to automatically detect the calibration solution and stabilize the measurements.
8. If you are using a custom standard, the app will not automatically detect it. Instead, a field will appear in which you can enter the appropriate value. Select **Set User Defined** to begin calibrating with the new value. If you are not using a custom standard and the app does not automatically detect the standard, perform the sensor cleaning and maintenance procedure, then select **Retry Auto Detect**.
9. After the calibration is stable, select **Accept**.

## Calibrate the ORP Sensor

The ORP sensor can be calibrated using Zobell's standard, Quick-Cal or a custom ORP solution.

1. From the main menu, select **Connected Instrument**.
2. Select **Calibrations**.
3. From the Calibrations menu select **ORP**.



4. Make sure the vent is open on the cal cup.



5. Fill the calibration cup to the fill line with calibration standard. Place the instrument in the calibration cup and select **Next**.
6. The app attempts to automatically detect the calibration solution and stabilize the measurements.



If you are using a custom standard, the app will not automatically detect it. Instead, a field will appear in which you can enter the appropriate value. Select **Set User Defined** to begin calibrating with the new value. If you are not using a custom standard and the app does not automatically detect the standard, perform the

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sensor cleaning and maintenance procedure, then select **Retry**  
**Auto Detect**.

7. After the calibration is stable, select **Accept**.
8. 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.
9. Rinse the sensors and restrictor with DI water.

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## Care and Maintenance

### Maintenance Schedule

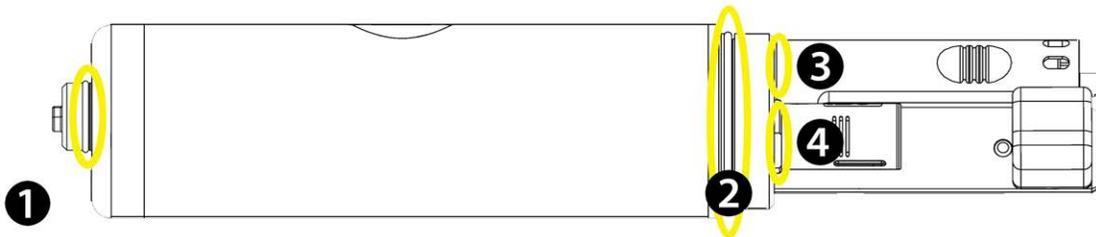
For best results, send the instrument to the manufacturer for factory calibration every 12 to 18 months.

### User-Serviceable Parts

The user-serviceable parts on the instrument include the O-rings, the pH/ORP sensor, 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
2	Instrument housing
3	pH sensor
4	RDO Sensor

### 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.

### pH/ORP Sensor Replacement

To replace the pH/ORP sensor or to refill the reference junction, follow the instructions in the pH/ORP Sensor Instruction Sheet that is included with the replacement sensor.

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## Instrument Storage

To store the probe for a week or less, place the probe in the calibration cup with at least 10 mL of clean water to maintain a moist storage environment.

To store the probe for more than a week, perform the following procedure.

1. Remove the pH/ORP sensor and place the orange pH port plug into the empty pH/ORP port to prevent any humidity from entering the probe.
2. Locate the sensor storage bottle in which the pH sensor was originally shipped.
3. Open the bottle and remove the O-ring.
4. Add enough pH storage solution or pH 4 solution to cover the sensor bulb (about 10 mL).
5. Slide the O-ring onto the sensor, and then slide the bottle cap over the sensor as shown.



6. Place the sensor tip in the buffer and tighten the cap to prevent the glass bulb from drying.

## Cleaning the pH/ORP Sensor

Begin with the gentlest cleaning method and continue to the other methods only if necessary. Do not directly touch or wipe the glass bulb.

To clean the pH sensor, gently rinse with cold water. If further cleaning is required, consider the nature of the debris to determine the appropriate method.

### Remove Crystalline Deposits

1. Clean the sensor with warm water and mild soap.
2. Soak the sensor in 5% HCl solution for 10 to 30 minutes.
3. If deposits persist, alternate soaking in 5% HCl and 5% NaOH solutions.

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## Remove Oily or Greasy Residue

1. Clean the sensor with warm water and mild soap.
2. Methanol or isopropyl alcohol may be used for short soaking periods, up to 1 hour.
3. Do not soak the sensor in strong solvents, such as chlorinated solvents, ethers, or ketones, including acetone.

## Remove Protein-Like Material or Slimy Film

1. Clean the sensor with warm water and mild soap.
2. Soak the sensor in 0.1M HCl solution for 10 minutes and then rinse with deionized water.



Note: After performing any of these cleaning methods, rinse the sensor with water and then soak overnight in pH 4 buffer.

## Cleaning the RDO Sensor

### Clean the Sensor Cap

1. Leave the cap on the sensor.
2. Rinse the sensor with clean water from a squirt bottle or spray bottle.
3. Gently wipe with a soft cloth or brush if biofouling is present.
4. If extensive fouling or mineral build-up is present, soak the RDO Cap end (while the cap is still installed on the sensor) in commercially available household vinegar for 15 minutes, then soak in deionized water for 15 minutes.



Note: Vinegar is safe for all of the sensors on the probe including the RDO Sensor if the sensor cap is on.

5. Do not use organic solvents because they will damage the sensing material. Do not remove the cap from the sensor prior to wiping.
6. After cleaning the sensor cap, perform a 2-point calibration.

### Clean the Optical Window

1. Perform this task only once per year when you replace the sensor cap.
2. Pull to remove the sensor cap.
3. Gently wipe the optical window with the supplied lens wipe.



Important: Do not wet the interior lens area with water or any solution.

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## Cleaning the Conductivity Sensor

1. Before you begin, ensure that the RDO Cap and any removable sensors are in place. Rinse the conductivity sensor under running water to remove loose material.
2. Follow Cleaning Procedure 1. If debris is still present, progress to the next cleaning procedure. If the debris is removed, skip to the last step.

### Cleaning Procedure 1

Avoid damaging the plastic material of the conductivity cell. Gently scrub the conductivity cell with a soft swab and mild soap such as a dilute solution of dish detergent. The probe is shipped with polyurethane foam swabs for this purpose. You can also achieve good results using a gentle back-and-forth motion with a thin cotton pipe cleaner. If debris is still present, continue to Cleaning Procedure 2. If the sensor is clean, skip to the last step.

### Cleaning Procedure 2

Avoid damaging the plastic material of the conductivity cell. Gently scrub the conductivity cell with a foam swab and an aggressive soap such as Alconox cleaner. If debris is still present, continue to Cleaning Procedure 3. If the sensor is clean, skip to the last step.

### Cleaning Procedure 3

Soak the sensor with dilute acetic acid (10:1 solution) or commercially available household vinegar to pre-soften calcium deposits. Follow this with Cleaning Procedure 1 or Cleaning Procedure 2, depending on the degree of residual contamination. The probe can soak for any length of time in household vinegar. If debris is still present, continue to Cleaning Procedure 4. If the sensor is clean, skip to the last step.

### Cleaning Procedure 4

Typically apply dilute phosphoric acid (< 27 %) or the consumer product LIME-A-WAY with a soft swab to remove iron or calcium deposits that remain after using Process 3. Do not allow the cleaner to be in contact with the sensor for more than 10 minutes. Rinse well with clean water and continue to the last step.

Check the sensor calibration before redeployment. Recalibrate the sensor when necessary.