RDO Blue

Operator's Manual

2023-01-04 | 0103202

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Instrument Overview

Stripped-And-Tinned Option

Use the stripped-and-tinned RDO Blue in PLC-controlled monitoring systems.

1 Stripped-And-Tinned Wires

Stripped-and-tinned wire allow you to connect the RDO Blue to a PLC or data logger.

2 Probe Body

3 Nose Guard/RDO Cap

The removable nose guard protects the RDO cap during deployment. The RDO cap is replaceable.

Twist-Lock Option

The twist-lock RDO Blue works with any Bluetooth-enabled mobile device and the VuSitu mobile app.

1 Twist-Lock Connector

The Twist-lock connector allows your RDO Blue to communicate with the VuSitu mobile. Just plug the connector into a Wireless TROLL Com and launch VuSitu.

2 Probe Body

3 RDO Nose Guard and Cap

The removable nose guard protects the RDO cap during deployment. The RDO cap is replaceable.

Applications

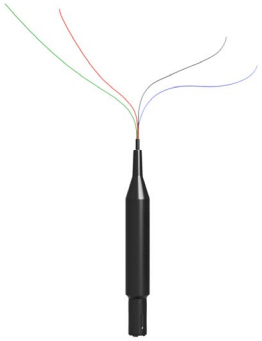
The RDO Blue is ideal for dissolved oxygen measurement in a variety of situations.

General Aquaculture

Inland Pond Aquaculture

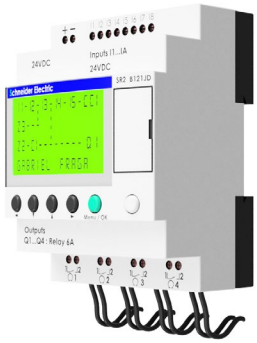
Recirculating Aquaculture Systems

Required Components (Stripped-and-Tinned Option)



Probe

Stripped-and-tinned wires are ideal for integration with a PLC and monitoring network.

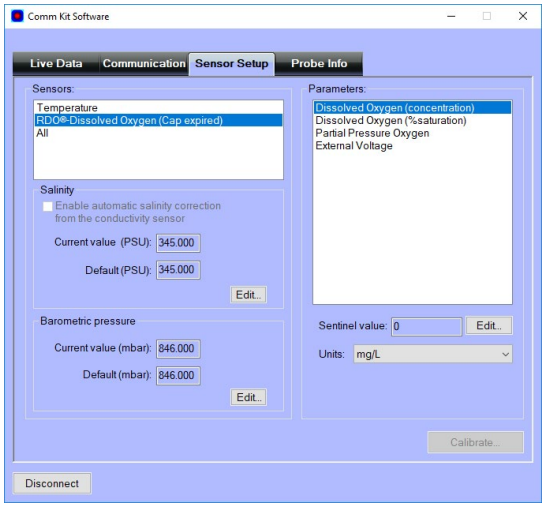


PLC

The RDO Blue communicates via the Modbus protocol.

Comm Kit

Connect your RDO Blue to Comm Kit for calibration and programming. Attach the probe's stripped-and-tinned wires to the Comm Kit. Plug the Comm Kit into your PC's USB port.



Laptop with Comm Kit Software

Calibrate the RDO Blue and view live readings with Comm Kit software.

Required Components (Twist-Lock Option)

You need these components to configure and deploy the RDO Blue.

RDO Blue

The RDO Blue's twist-lock connector attaches to a Wireless TROLL Com for communication with a Bluetooth-enabled mobile device.

Wireless TROLL Com

The Wireless TROLL Com enables communication between the instrument and your mobile device.

Bluetooth-Enabled Mobile Device with Vusitu

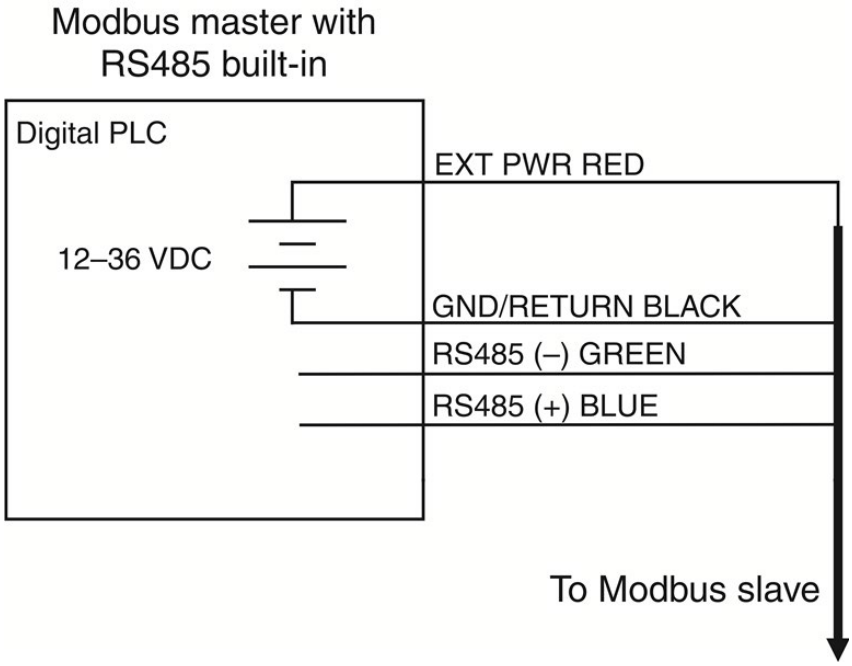
Install the VuSitu app on any Bluetooth-enabled mobile device. Calibrate, configure, and deploy the RDO Blue on Android or iOS.

Controller Requirements and Connection

Wiring Overview

Signal	Color
Ground/Return	Black
External Power	Red
RS485 (-)	Green
RS485 (+)	Blue

Keep the inside of the controller free of moisture and humidity. Condensed moisture can move through the wiring and cause the probe to fail. Install desiccant in the controller and replace it on a regular basis.

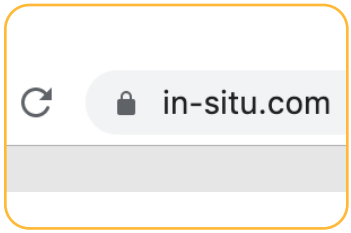


Stripped-and-Tinned Instruments: First Steps

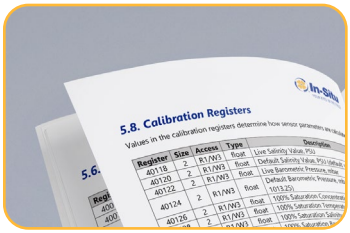
You can calibrate the RDO Blue and see live readings with In-Situ's Comm Kit software, available from www.-in-situ.com.

Connect With a PLC

Connect the RDO Blue to your PLC.

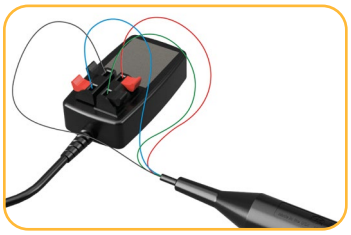


Download the RDO Blue Interface Spec from www.in-situ.com.

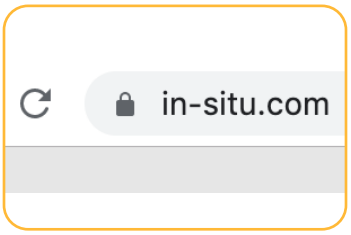


Refer to the Interface Spec for further instructions.

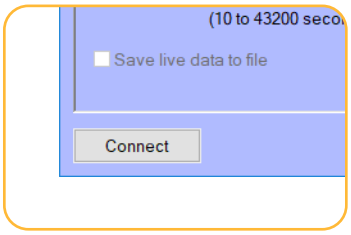
Connect With Comm Kit



Connect the RDO Blue to the comm box.



Download and install Comm Kit software from www.in-situ.com.



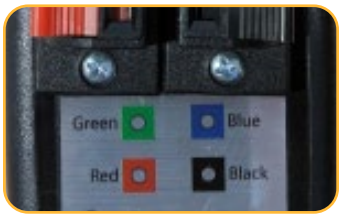
Launch the software and click **Calibration**.

Comm Kit Instructions

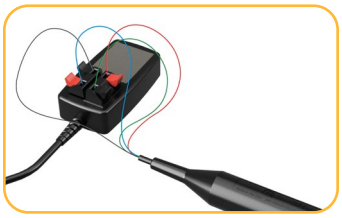
1 Install the software.

2 Connect the instrument to a computer.

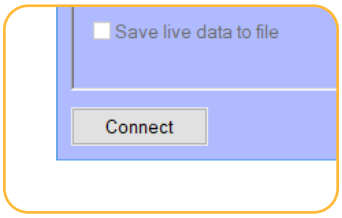
The communication device connects a stripped-and-tinned RDO or Aqua TROLL 400 to a computer via a USB port.



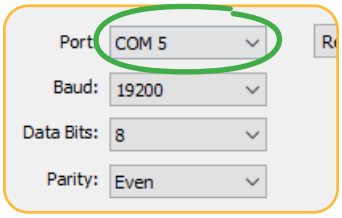
The communication device includes an electrical connection diagram label.



To attach the sensor to the communication device, depress a lever and insert the appropriate wire in the location specified by the diagram.



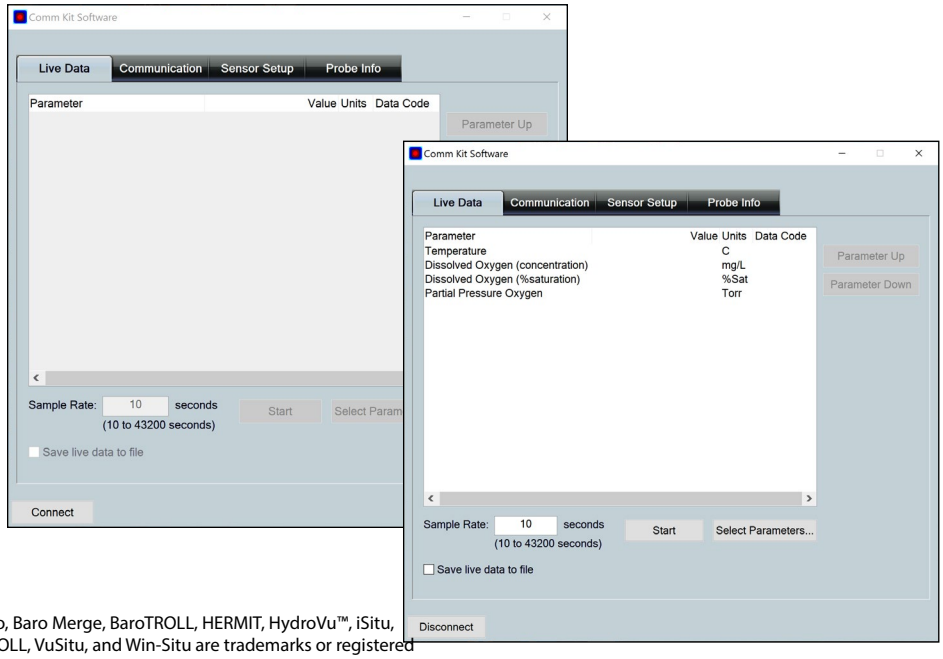
Wait for the computer to recognize the USB device, and then click the Connect button.



If the software does not connect to the software, you can find the COM port your computer has assigned in Windows Device Manager > Ports.

About Comm Kit

Comm Kit software allows you to configure and calibrate your dissolved oxygen probe on a Windows PC.



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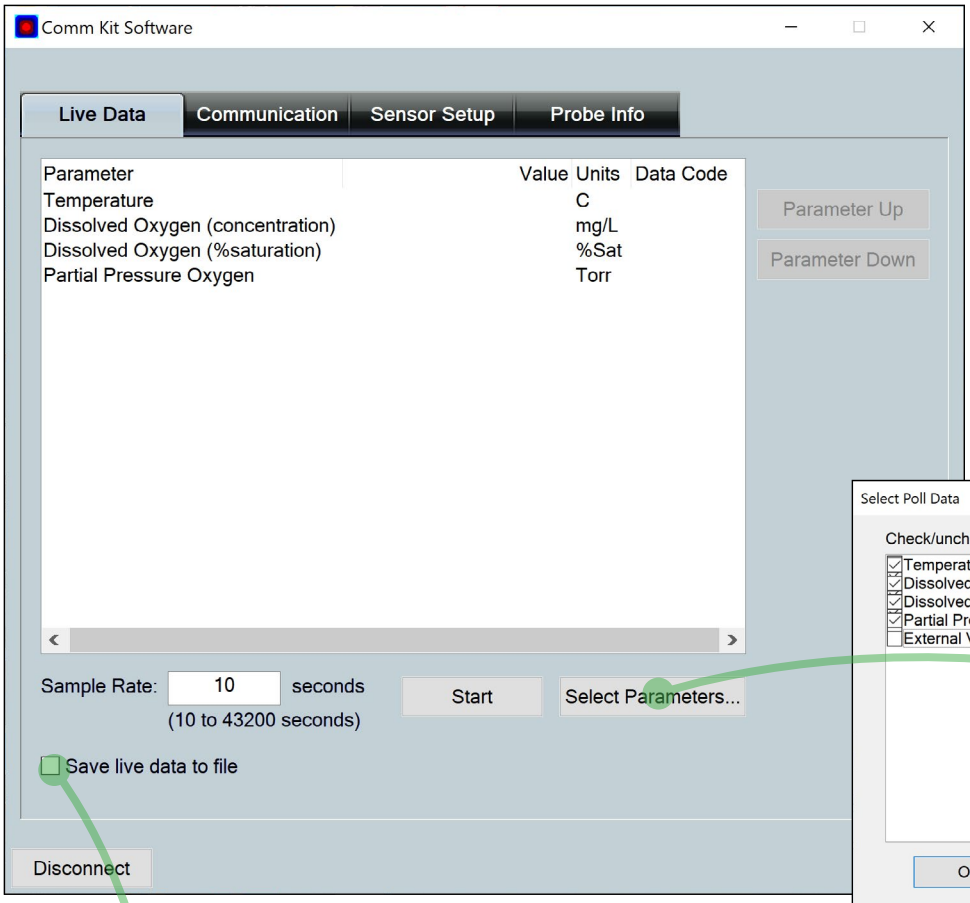
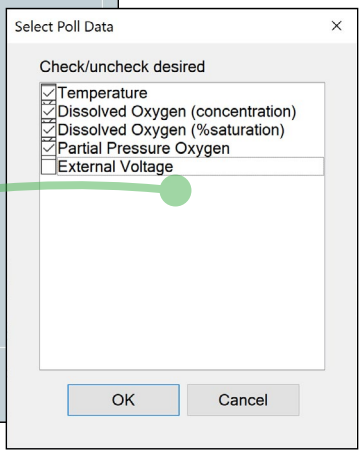
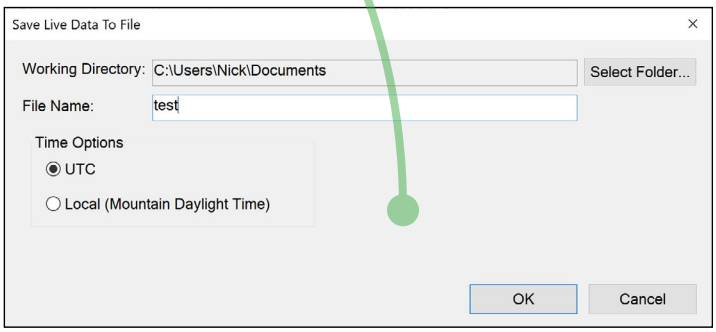
Data Tab

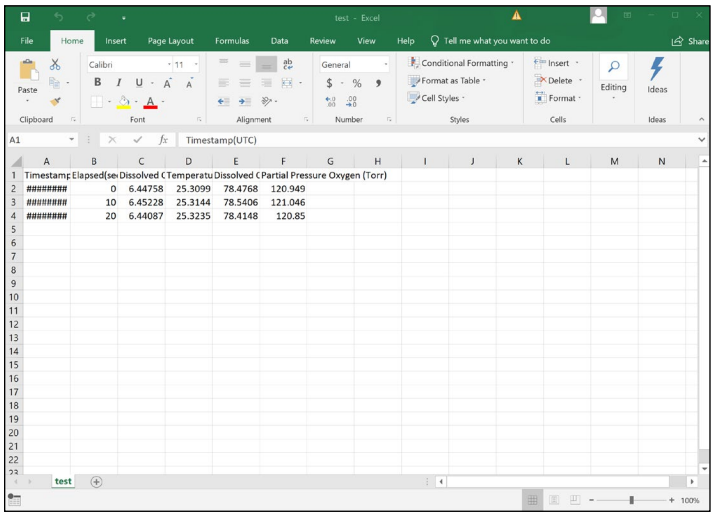




Choose the parameters Comm Kit saves to a data file with the **Select Parameters** button.



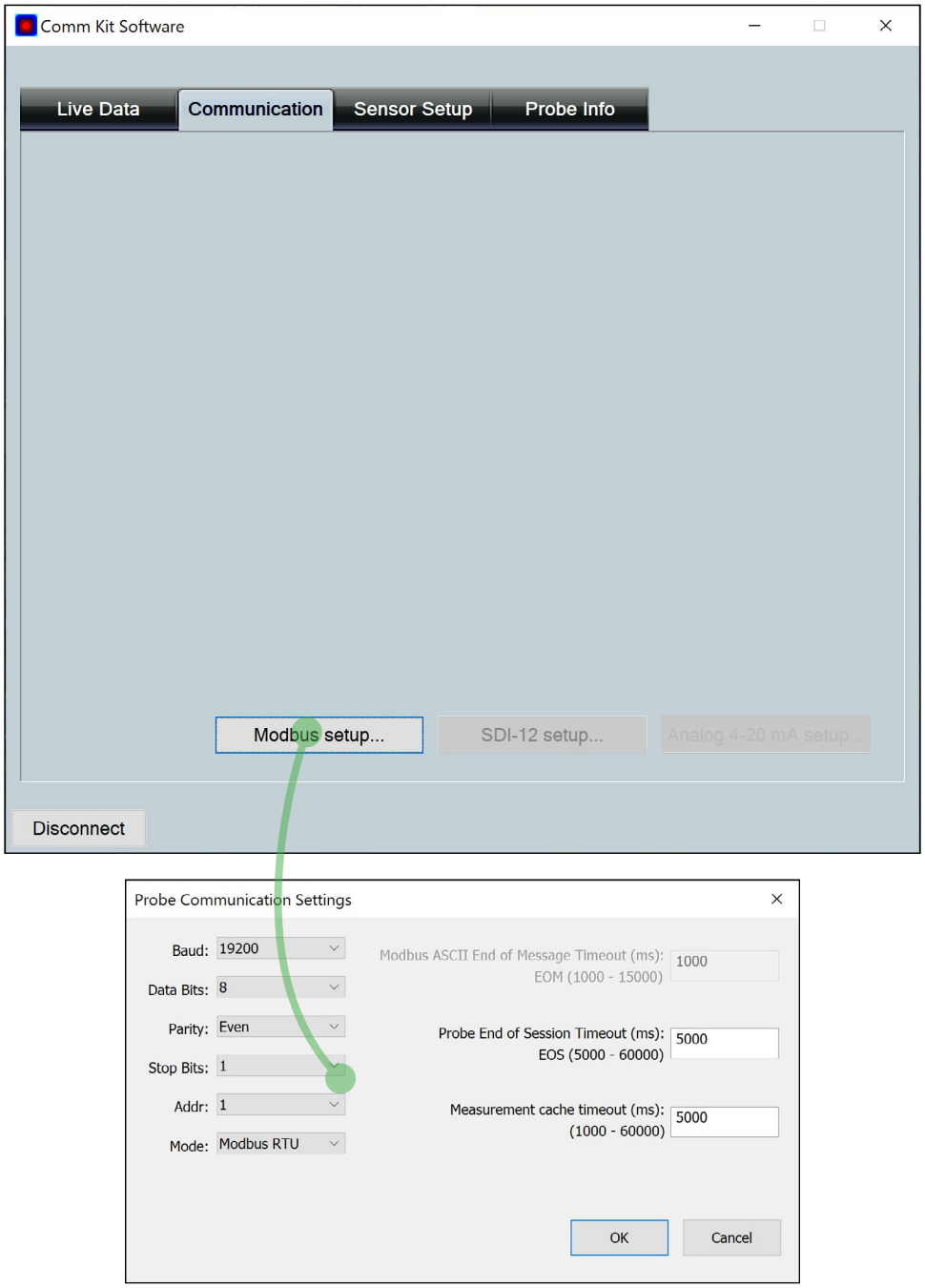
1. To save live readings to a spreadsheet, click the **Save live data to file** checkbox.
2. Click **Select Folder** and choose a destination for the file.
3. Name the file and press **OK**.
4. Enter a sample rate between 10 and 43200 seconds.
5. When you're ready to begin recording data, press the **Start** button.



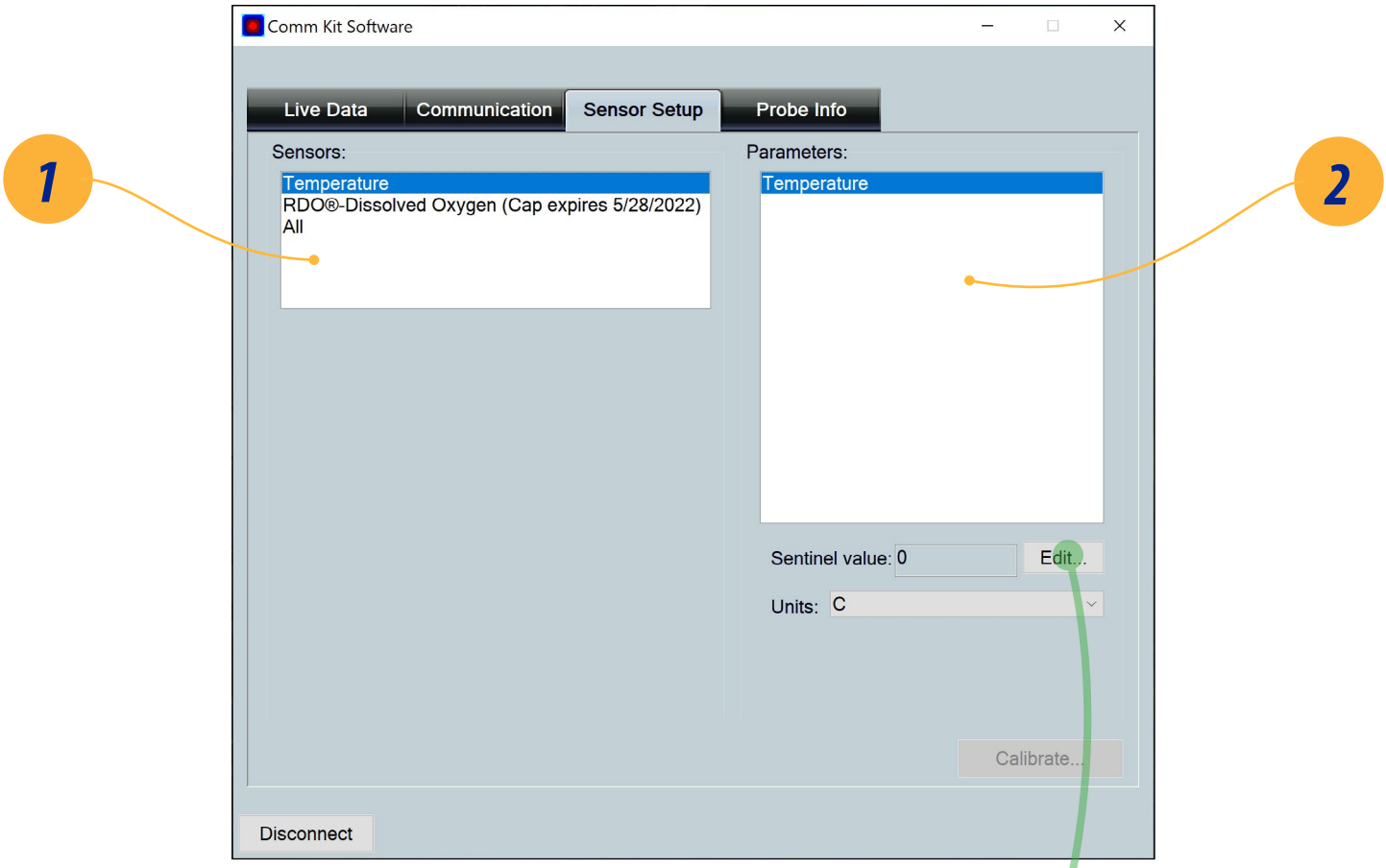
Comm Kit creates a spreadsheet file with one row for each reading.

Communication Tab

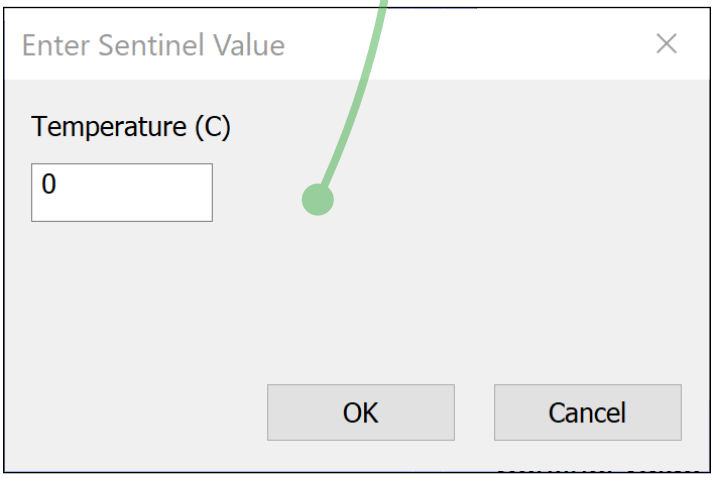
Visit the Communication tab to change Modbus settings.



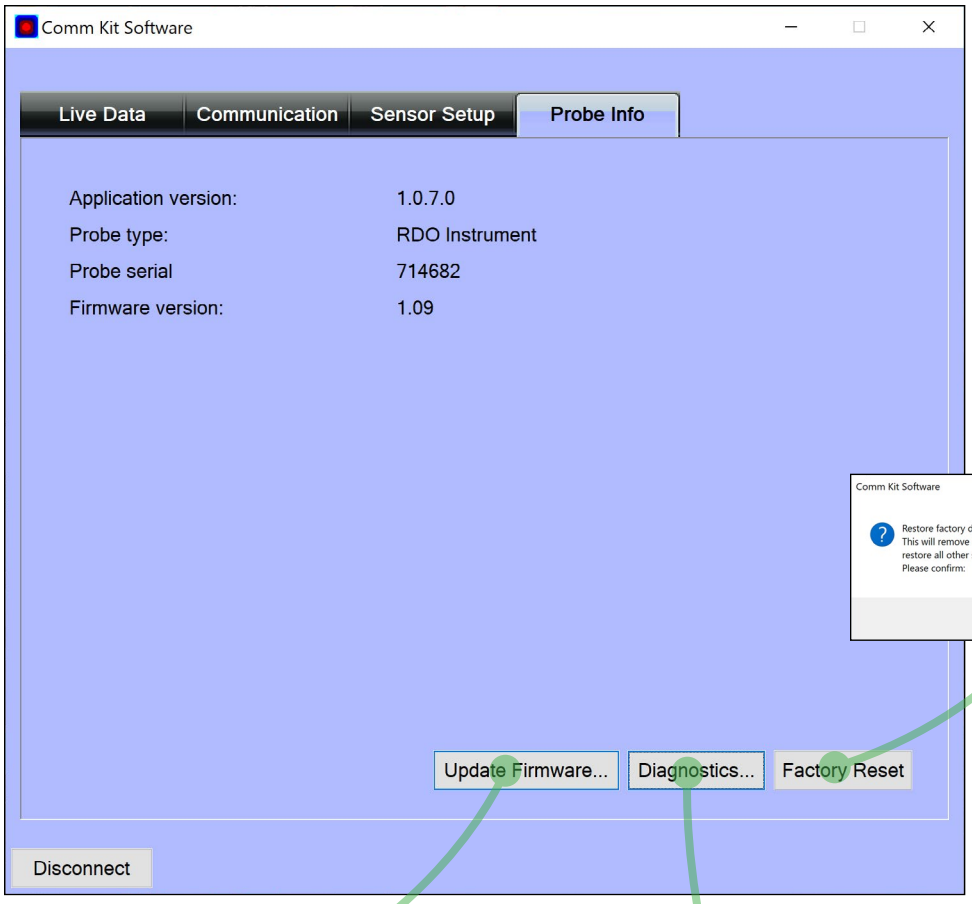
Sensor Setup Tab

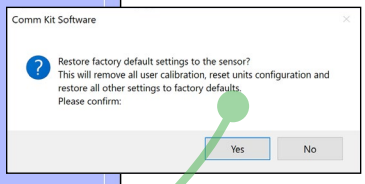


1. Use the tabs to navigate between functions.
2. Scroll through the parameters in the Live Data tab with the **Up** and **Down** buttons.

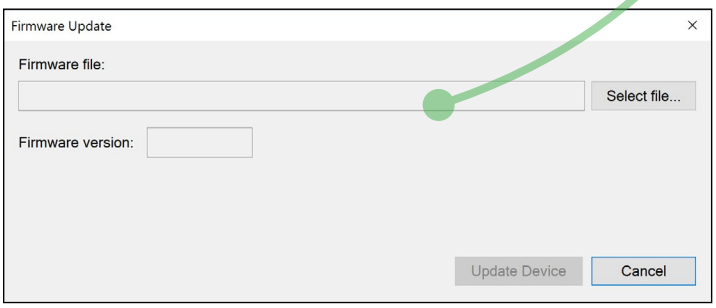


Probe Info Tab

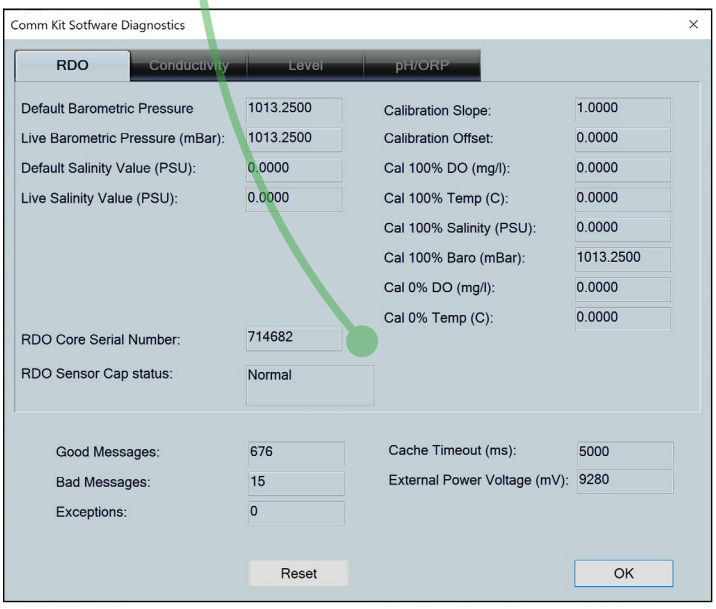




Comm Kit will ask for confirmation before resetting.



1. Click **Update Firmware** to install the latest firmware.
2. Then click **Select file** and choose your firmware.
3. The version number will appear in the Firmware version box.



The diagnostics tabs display critical sensor, sensor cap, calibration, and power supply info.

Handheld Operation

To configure and deploy the RDO Blue, use a Wireless TROLL Com and a Bluetooth-enabled mobile device with the VuSitu app.

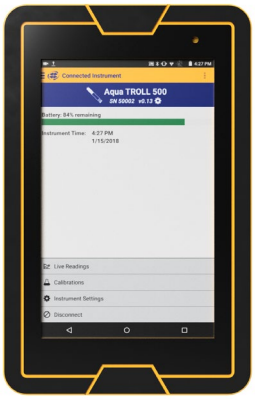
1. Wireless TROLL Com
2. Integrated Twist-Lock cable
3. RDO Blue
4. Bluetooth-enabled mobile device

RDO Blue Quickstart Guide

Set up and deploy your RDO instrument in four simple steps. Read the overview below, and then see the following pages for detailed instructions.

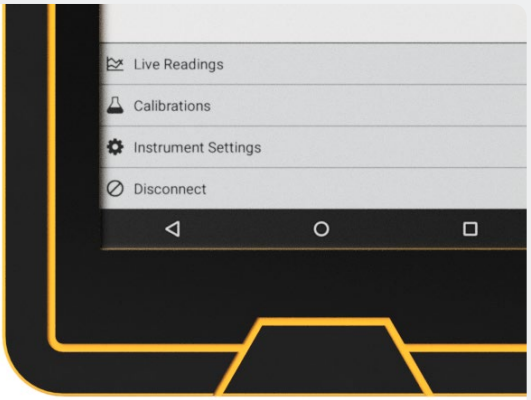
1 Connect

Install the RDO cap and attach the instrument to a Wireless Rugged TROLL Com.



2 Pair

Use the VuSitu mobile app to pair your Wireless TROLL Com with your mobile device.



3 Calibrate (optional)

The RDO Blue is factory calibrated, but you can perform a calibration at any time with VuSitu. Select **Calibrations** from VuSitu's menu. Follow the on-screen instructions.

4 Deploy

Select **Live Readings** to view real-time readings from the instrument.

2023-01-04

Part Numbers

Kit #0103190

1. RDO Blue with **10 meter** cable
2. Wireless TROLL Com
3. Lanyard for Wireless TROLL Com

Kit #0103210

1. RDO Blue with **3 meter** cable
2. Wireless TROLL Com
3. Lanyard for Wireless TROLL Com

#0038640

- RDO Blue with **10 meter** cable

#0103200

- RDO Blue with **3 meter** cable

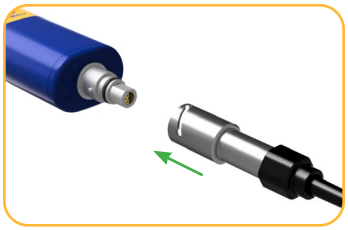
The Wireless TROLL Com's lanyard is not a weight-bearing part.

1 Install the RDO cap.

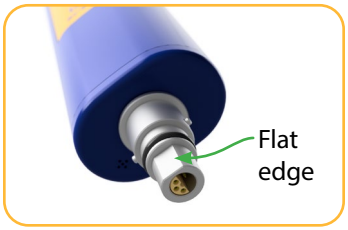
Align the RDO cap so the flat edge on the inside matches up with the flat edge on the sensor. Slide the RDO cap into place.

Slide the nose guard into place and thread it clockwise to install.

2 Connect the instrument to a Wireless TROLL Com.



Attach the RDO Blue's twist-lock connector to the end of the Wireless TROLL Com.



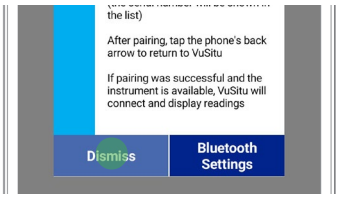
Make sure the flat edges of the connectors align, and then push and twist.

You will hear a click when the cable is connected properly.

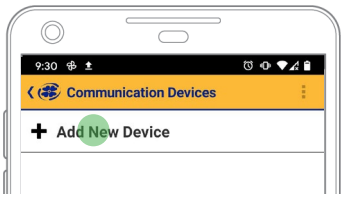
Press the power button on the Wireless TROLL Com.

3 Pair the Wireless TROLL Com with your mobile device.

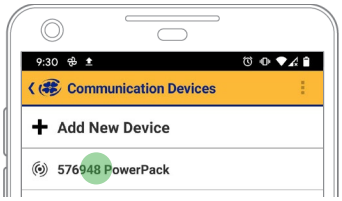
You must have the VuSitu mobile app to use the RDO Blue with a mobile device. Download VuSitu from the Google Play Store or the Apple App Store.



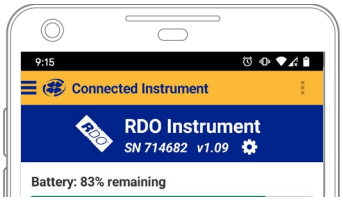
Make sure your mobile device's Bluetooth is turned on. Launch VuSitu and tap **Dismiss**.



Tap **Add New Device** and select the Wireless TROLL Com from the list of available devices.



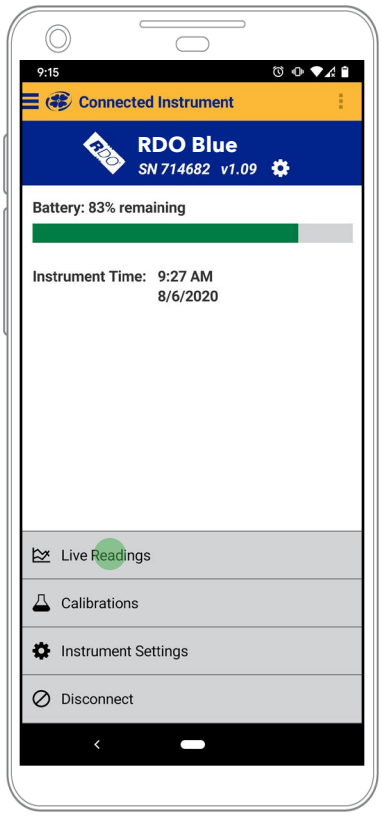
Tap your mobile device's back button. In VuSitu, tap the serial number of your Wireless TROLL Com.



VuSitu displays the Connected Instrument screen when pairing is complete.

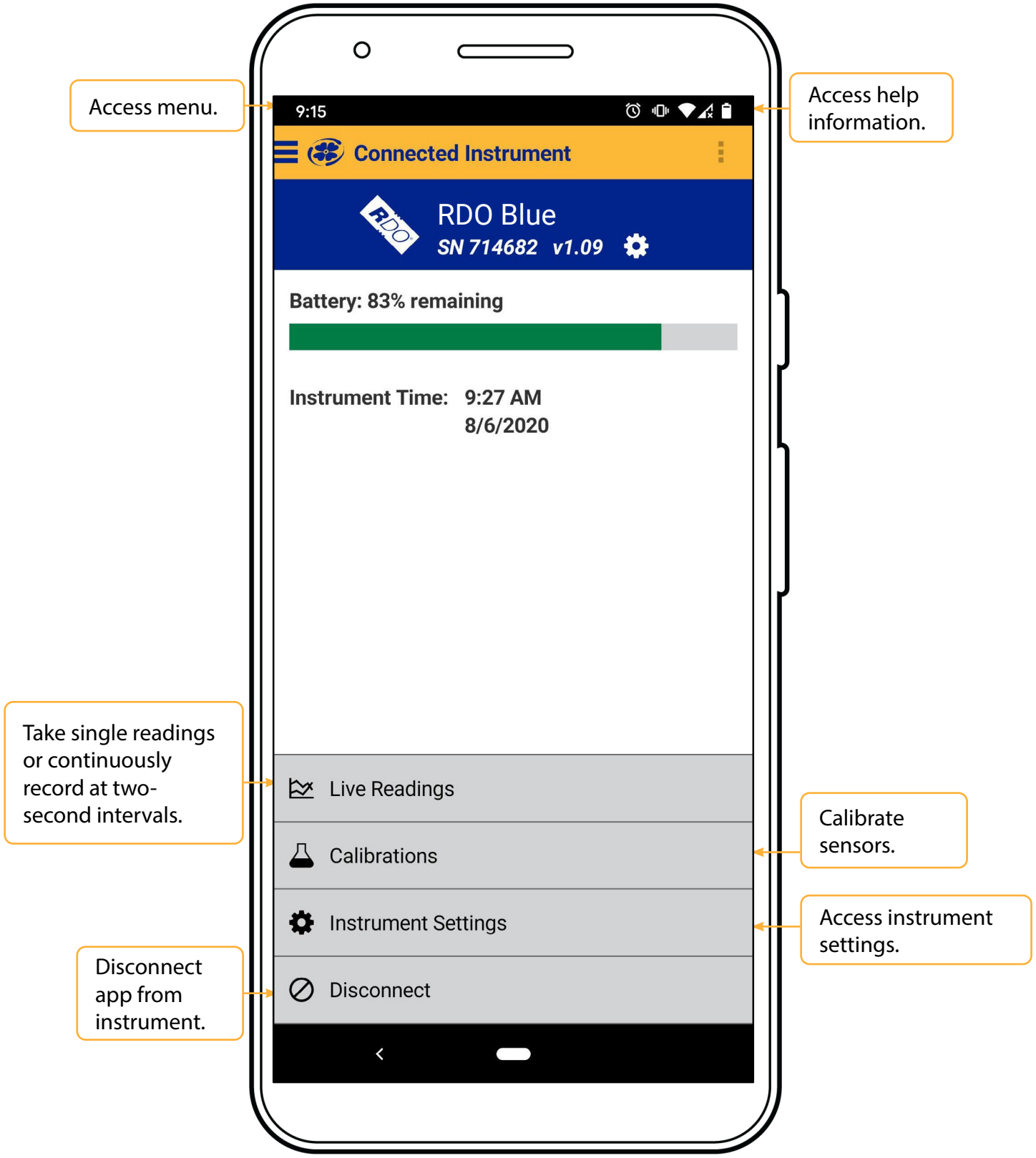
4 Configure and deploy the RDO Blue.

VuSitu will guide you through configuration, calibration, and other tasks. Choose an option from the menu to get started.



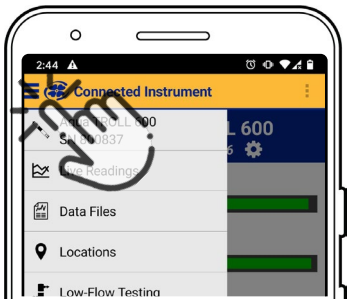
About VuSitu

After pairing a Wireless TROLL Com with VuSitu, the app will always display the Connected Instrument screen at launch. You can access all features of the app from this screen.

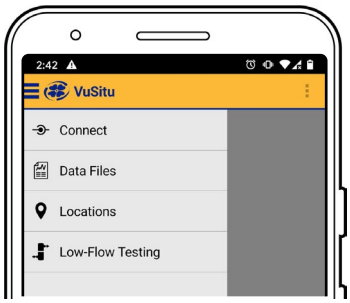


VuSitu Menu Options

The features available in the VuSitu mobile app vary slightly depending on the instrument to which it is connected.



Tap the menu icon in the upper left portion of the screen to view options.

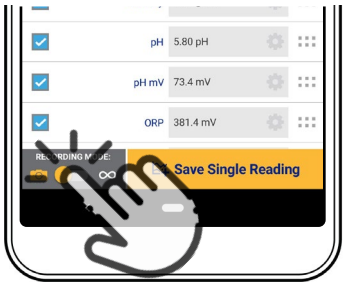


Some features aren't available when VuSitu isn't connected to an instrument.

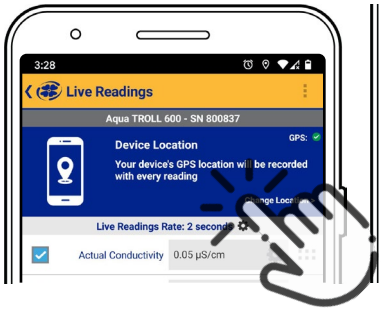
Live Readings in VuSitu

The live readings screen displays measurements taken from the instrument every two seconds. You can save these readings and share them via email or cloud storage.

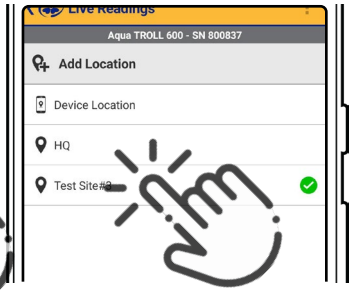
Snapshot Mode



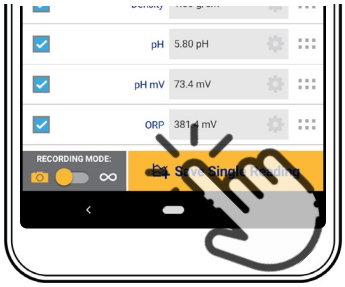
Tap the button on the bottom left to toggle between snapshot and live readings modes.



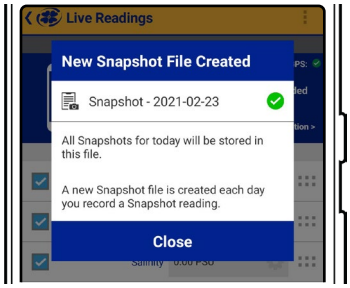
Tap **Change Location** in the top right corner to associate this data with a different location.



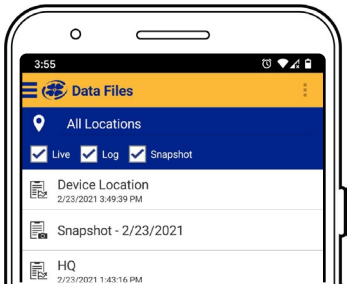
Choose the desired location and press **Save** in the bottom right corner of the screen.



Tap **Save Single Reading** to create a snapshot.

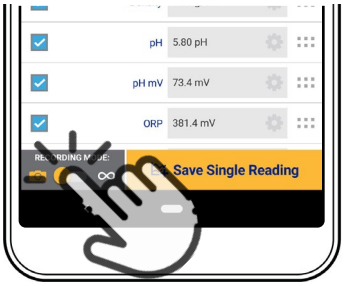


VuSitu confirms the new snapshot file.

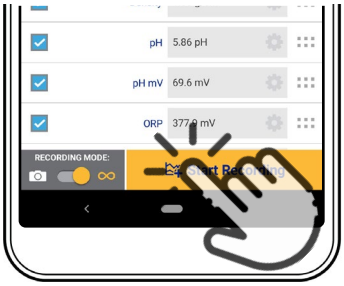


View the file from the Data Files screen.

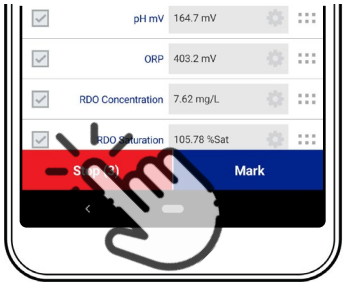
Live Readings Mode



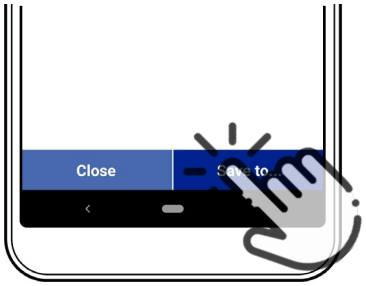
Tap the button on the bottom left to switch from snapshot mode to live readings mode.



Tap **Start Recording**. The instrument takes a reading every two seconds.



Tap **Stop** to end the recording. VuSitu displays a summary of the live readings data.

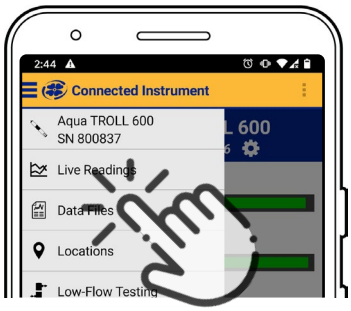


Tap **Save to** if you wish to share the Live Readings file via email or cloud storage.

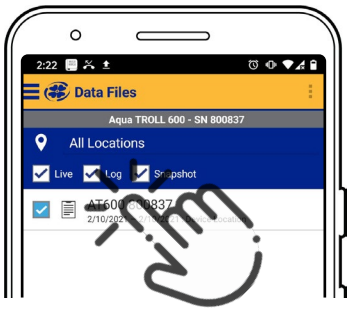
VuSitu Data

You can transfer a data file from your mobile device to a PC via Bluetooth, email it to yourself or any valid email address, or upload it to Google Drive.

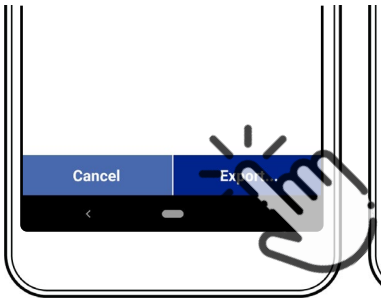
Sharing Data



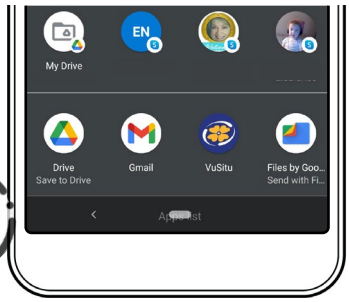
Select **Data Files** from the menu at the top left corner of the screen.



Tap and hold the name of the log you want to share.



Select **Export**.



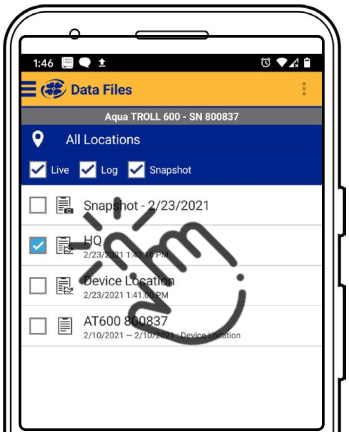
Choose email, cloud storage, or another sharing option.

To save data locally on your mobile device, export to a third-party file management app.

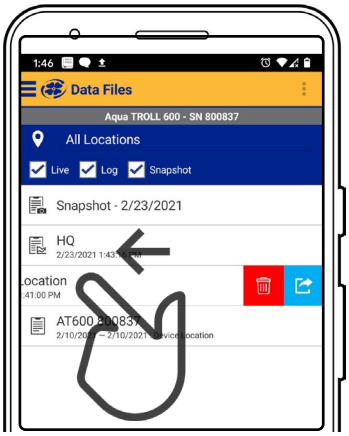
Viewing Data on a Mac or PC

You'll need to extract your files to view them. To do that on a Mac, double-click the Zip folder. On a PC, right-click on the folder and choose **Extract**. Then open your files in Excel.

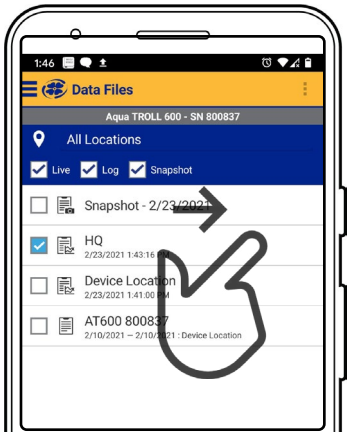
Selecting with Long-press and Swipe



Press and hold any item in a list of files. You can now select multiple files.



Press and swipe left to reveal the delete and share icons.



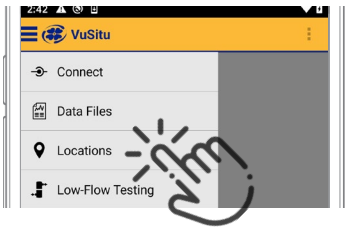
Press and swipe right to reveal the sharing icon.

VuSitu Locations

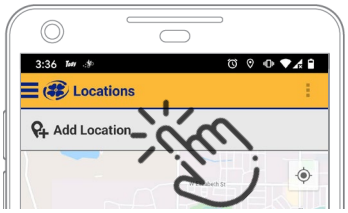
About VuSitu Locations

A VuSitu location represents the physical spot where an instrument collects data. You can create a VuSitu location for any monitoring site. If you don't create a location, your data defaults to "Device Location." Location names appear on the live readings screen, in snapshot files, and in log files.

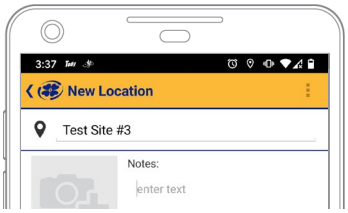
How to Create a Location



Select **Locations** from the main menu.

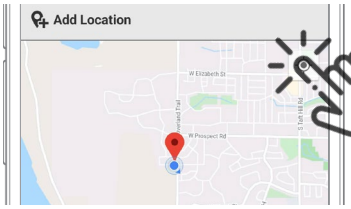


Tap **Add Location**.

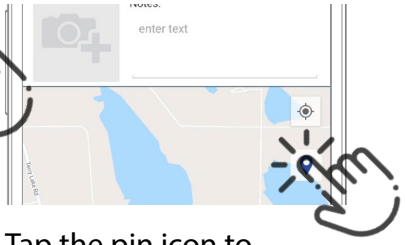


Enter a name for the location. You can also add notes.

If desired, tap the camera icon to take a photo of the new location.



To home in on your mobile device's current location, tap the button on the top right.

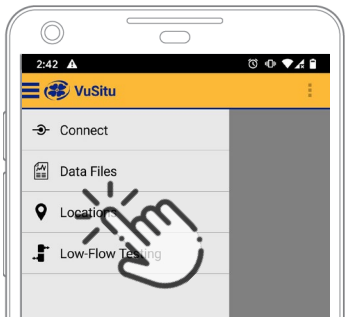


Tap the pin icon to establish the location on the map.

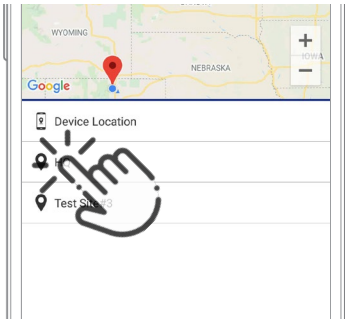
As an alternative, you can manually enter latitude and longitude values and tap **Apply**. Or, tap and hold a specific point on the map to drop a pin there.

How to Select a Location

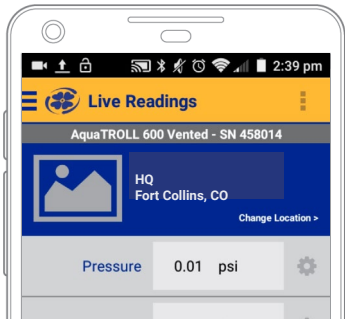
Data is associated with the Location that is displayed on the Live readings screen. After you have created a Location, you must select it in order for your data to be associated with the Location.



Select **Locations** from the app menu.

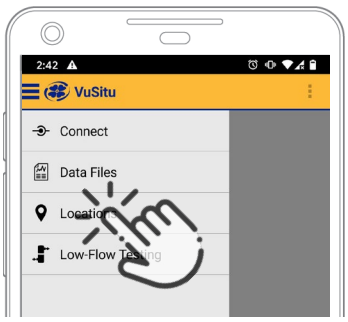


Tap a location to select it.



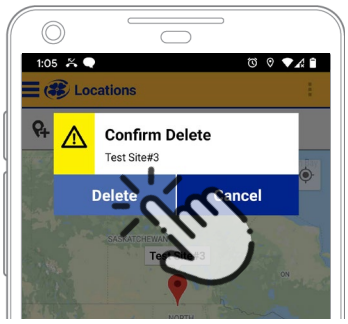
New live readings data will be associated with this location until you select another.

How to Edit or Delete a Location



Select **Locations** from the app menu.

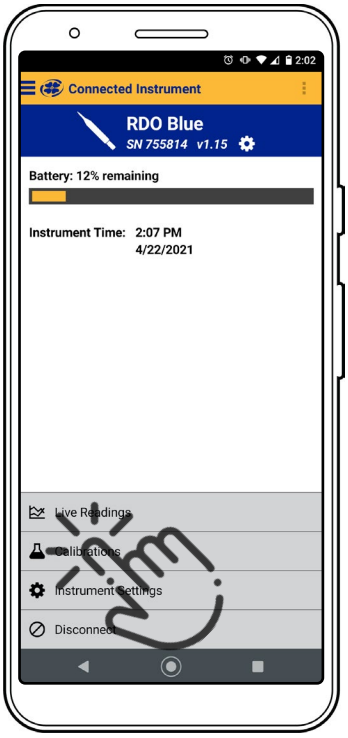
Tap the location you wish to delete and swipe left. Tap the trash icon.



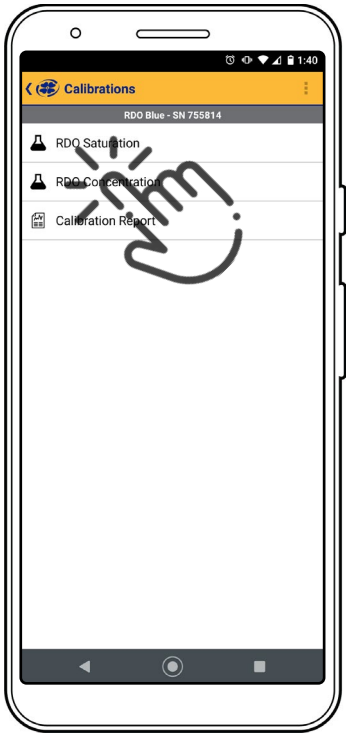
Confirm by tapping **Delete**.

Calibrating Your RDO Instrument

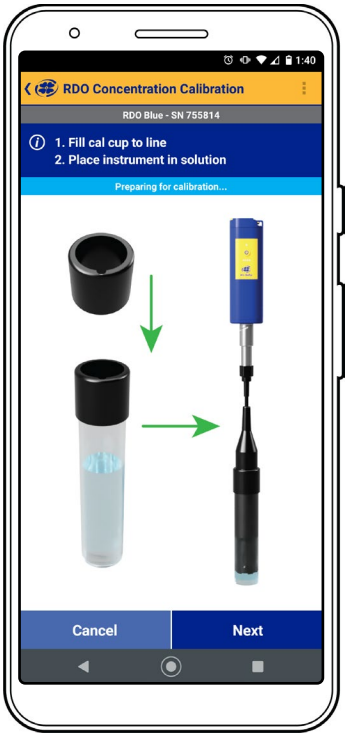
VuSitu guides you through calibrations. To get started, use the app to choose a calibration type as shown below.



Select **Calibrations** from the menu.



Choose the type of calibration you wish to do.



Follow the instrument's instructions in VuSitu.

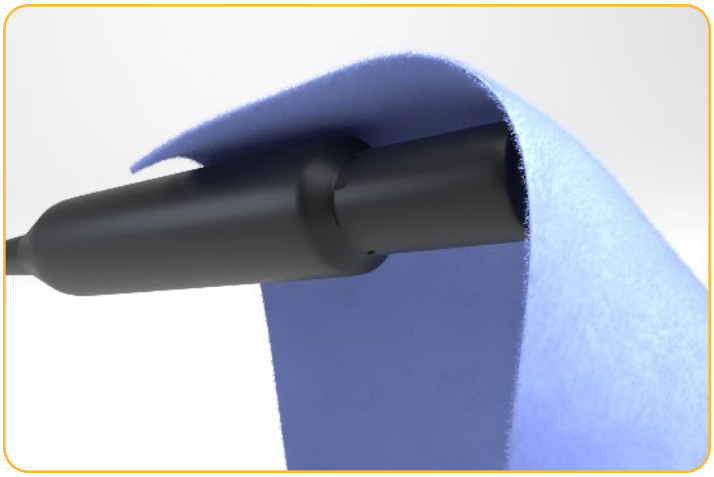
One-Point Calibration

Water-Saturated Air Calibration

Vented cap

Remove the storage cap from the top of the calibration chamber and replace it with the vented calibration cap.

Saturate the sponge wafer (use approximately 10 mL of water) and place it in the bottom of the calibration chamber.



Gently dry the probe and sensing element with a paper towel.

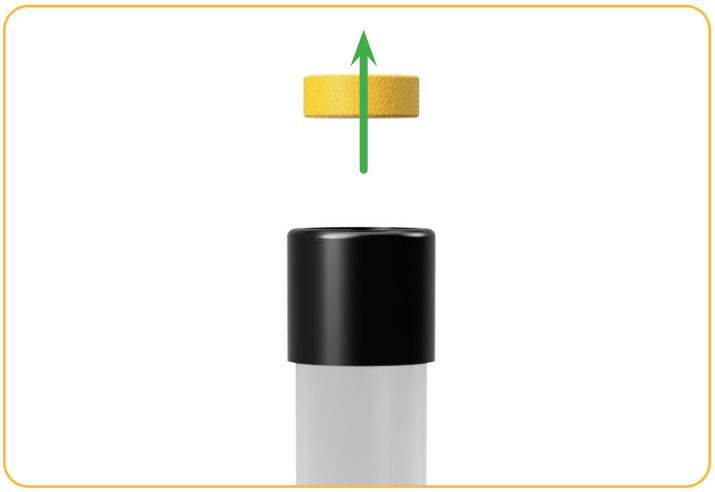
Place the probe in the calibration chamber so that the sensing element is about 2.5 cm (1 inch) above the water-saturated sponge.

Be sure the sensor surface is dry when you place the probe into the calibration chamber.

Two-Point Calibration

Remove the water-saturated sponge from the calibration chamber. Fill the chamber to the fill line with approximately 60 mL of fresh sodium sulfite.

Concentration-Based Calibration



Remove the sponge from the calibration cup

Fill the cup to the fill line with approximately 60 mL of fresh solution.

Place the probe into the solution. Leave at least 13 mm (0.5”) between the surface of the sensing element and the bottom of the calibration cup.

Remote Setup

1 Carabiner

The carabiner allows a VuLink to attach to the top of a well via a well dock.

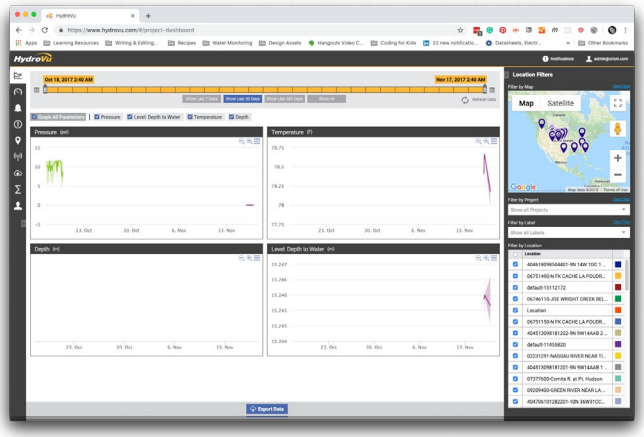
2 VuLink telemetry device

VuLink powers the RDO Blue and transmits data to HydroVu or another FTP server.

3 RDO Blue

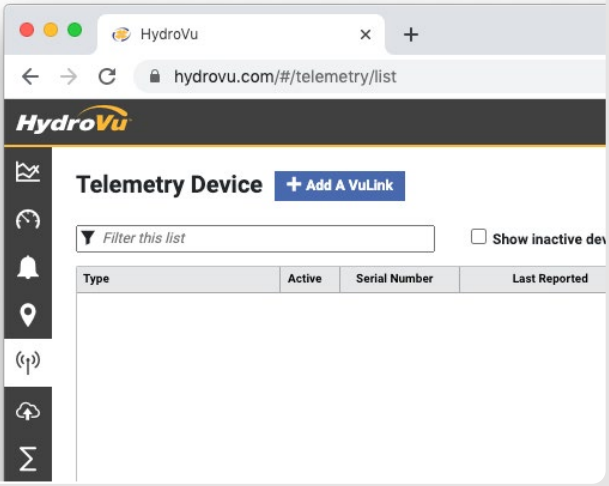
VuLink Quickstart Guide

1 Create a HydroVu account.



Visit hydrovu.com and create an account.

2 Go to the telemetry page.



Click the telemetry page link in the menu on the left side of the page. Then click **Add a VuLink**.

3 Scan the QR code on your VuLink.

or

Open your web camera and scan the QR code on your device, or type the registration code into the provided field.

4 Attach the antenna and connect an instrument.

After connecting the external or on-board antenna and instrument, follow the instructions on the next pages of this quickstart guide.

Maintenance & Service

Cleaning the Sensor Cap

Keep the cap on the probe during cleaning.

Rinse the sensor with clean water from a squirt bottle or spray bottle.

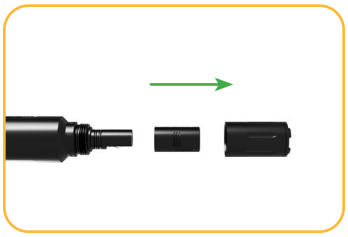
Gently wipe with a soft-bristled brush or soft cloth to remove bio-fouling.

To remove extensive mineral build-up, soak the probe cap-down in vinegar for 15 minutes. Then soak in deionized water for 15 minutes.

Do not use organic solvents to clean the sensor or probe; they will damage the sensing element.

Cleaning the Optical Window

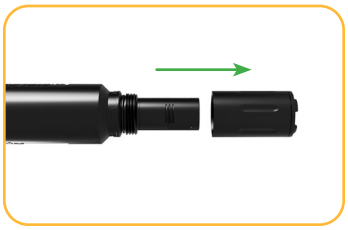
Clean the optical window only when you change the cap.



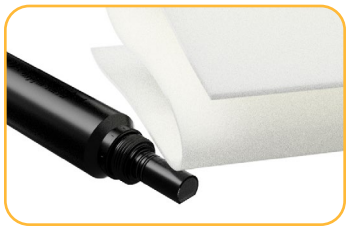
Remove the cap and gently wipe the lens with the supplied lens cloth.

Do not use water or any kind of solution to clean the optical window.

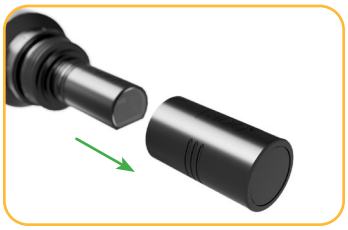
Cleaning the Probe



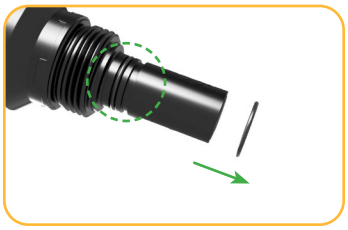
Remove the nose guard.



Use a lint-free cloth to dry the probe.



Pull the used RDO cap off of the sensor, without twisting.



Remove the existing O-rings from the sensor.

Use your finger to apply a light layer of silicone-based lubricant around the O-ring grooves.

Place the O-rings on the sensor. Apply another thin layer of lubricant to the O-rings and grooves.

Align the flat edge inside the RDO cap with the flat edge and metal contacts on the probe. Slide the cap in place.

Thread the nose guard onto the probe.

Warranty Information

In-Situ provides a 2-year, limited warranty on the RDO Blue instrument. To make a return, visit www.in-situ.com and fill out a return material authorization (RMA) form.

Instrument Specifications

Sensor Ratings

Sensor Type	Optical Dissolved Oxygen Sensor
Range, DO	0-60 mg/L; 0-600% Saturation
Accuracy, DO	+/- 0.1 mg/L (0-20 mg/L) +/-2% (20-60 mg/L)
Resolution, DO	0.01 mg/L
Response Time, Cap	T63<5s, T90<45s, T95<60s (RDO-X cap)
Units, DO	mg/L, ppm, % saturation
Range, Temp.	-5°C to 50°C (23°F to 122°F)
Accuracy, Temp.	+/- 0.1°C
Resolution, Temp.	0.01°C
Units, Temp.	Celsius, Fahrenheit
Salinity Comp.	Fixed or real-time capable
Barometric Comp.	Fixed or real-time capable
Methods	EPA-approved In-Situ® RDO methods 1002-8-2009, 1003-8-2009, 1004-8-2009 Standard Methods 4500-O

Environmental Ratings

Pressure	150 psi from 0° to 50°C
Depth	100m (328ft) @ 25°C
Operating Temp. (Non-Freezing)	-5.0°C to + 50.0°C (23°F to 122°F)
Storage Temp.	-40°C to + 65°C (-40°F to 149°F)
Compliance	EMC 2014/30/EU IEC 61000-6-2:2005 EN 55011:2009
Ip Rating	IP-67 with sensor cap off; IP-68 with sensor cap installed

Chemical Ratings

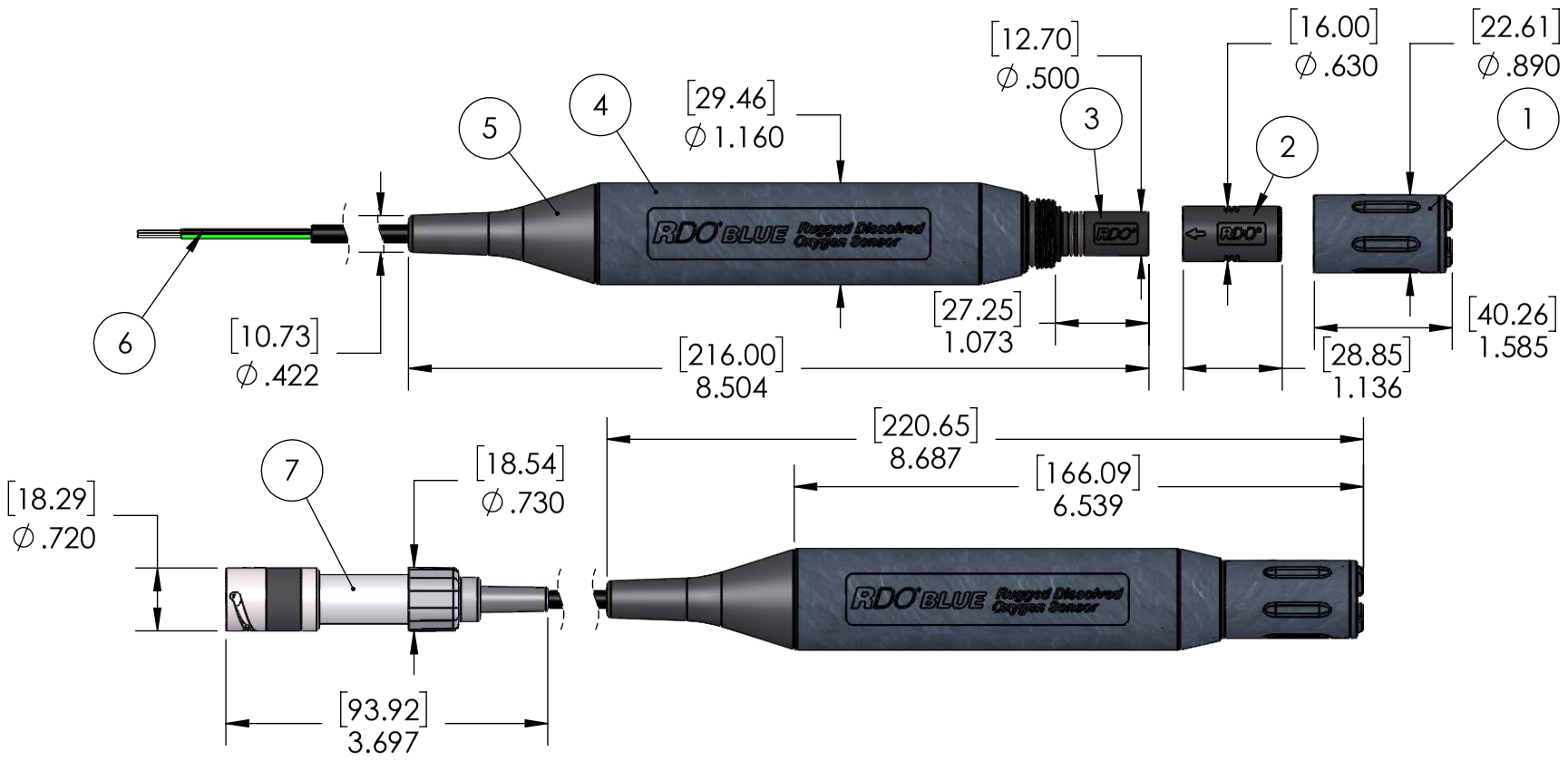
INTERFERENCES	Alcohols >5%; hydrogen peroxide > 3%; sodium hypochlorite (commercial bleach) > 3%; gaseous sulfur dioxide; gaseous chlorine. Do not use in organic solvents (e.g., acetone, chloroform, methylene chloride, etc.), which may swell the sensing element (foil matrix) and destroy it.

General Ratings

Dimensions	L 22.06 cm (8.69 in) x D 2.95 cm (1.16 in)
Weight	205 g (0.5 lb) (without cable)
Wetted Materials	Ryton® (PPS), Cycoloy® (PC/ABS), PC/PMMA
Communication Output	Modbus/RS485
Reading Rate	1 reading every 1 second
Power Requirements	8 to 36 VDC
Power Consumption	Maximum (measurement): 50 mA at 12 VDC Idle (communication only): 2 mA at 12 VDC
Warranty	2 years from date of shipment

NOTES: Ryton is a registered trademark of Solvay SA.; Cycoloy is a registered trademark of SABIC GLOBAL Technologies B.V.

REV	CR#	CR NOTES	REVISED BY	DATE
001	-	INITIAL RELEASE	JMc	3/26/2021



CONDUCTORS	
COLOR	SIGNAL
BLACK	GROUND/RETURN
RED	EXTERNAL POWER
GREEN	RS485(-)
BLUE	RES485(+)

SILVER IS SHIELDED WIRE FOR CHASSIS OR EARTH GROUND

PART NAMES		
NUMBER	DESCRIPTION	WETTED MATERIAL
1	STANDARD GUARD	PPS
2	RDO SENSOR CAP	PC/PMMA
3	SENSOR NOSE	PC/ABS
4	MAIN HOUSING	PPS
5	CABLE STRAIN RELIEF	POLYURETHANE
6	STRIPPED AND TINNED WIRES	N/A
7	TWIST-LOCK CONNECTOR	TITANIUM

In-Situ

221 E. LINCOLN AVE, FORT COLLINS, CO, 80524
PH 970-498-1500 FAX: 970-498-1519

DESCRIPTION: RDO BLUE PUBLISHED DIMENSIONS

DRAWN BY/DATE: JMc-3/26/2021

MATERIAL: SEE TABLE ABOVE

SHT # 1 OF 1

TOLERANCES IN [mm]
X° ± 1° .X ± .02 [0.5]
.XX ± .01 [0.2]
.XXX ± .005 [0.1]

APPROVED BY/DATE: EB-3/29/2021

FINISH: N/A

SCALE 1:2

SIZE A

PART NUMBER 0096360

In-Situ

Innovations in Water Monitoring

CE Declaration of Similarity

Manufacturer: In-Situ, Inc.
221 East Lincoln Avenue, Fort Collins, CO 80524, USA

Declares that performance of each of the following products is equivalent to the RDO Core Analog:
Product name: **RDO Blue**
Model: **RDO Blue**
Part Number: **0038630**
Product Description: The RDO Blue is a dissolved oxygen sensor designed to be used in both environmental water applications (rivers, lakes, oceans, wells) and in process applications.

This is in compliance with the following Directives:

- 2014/30/EU EMC Directive
- Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) Directive, 2011/65/EU and Commission Delegated Directive, (EU) 2015/863

and meets or exceeds the following international requirements and compliance standards:

EMC Standard:
EN 61326-1:2021

RoHS Standard:
EN 63000:2018

The CE mark is affixed accordingly.

David A. Bossie
Regulatory Compliance Manager
In-Situ, Inc.
July 20, 2022

CE FC

UKCA Declaration of Similarity

Manufacturer: In-Situ, Inc.
221 East Lincoln Avenue, Fort Collins, CO 80524, USA

Declares that performance of each of the following products is equivalent to the RDO Core Analog:
Product name: **RDO Blue**
Model: **RDO Blue**
Part Number: **0038630**
Product Description: The RDO Blue is a dissolved oxygen sensor designed to be used in both environmental water applications (rivers, lakes, oceans, wells) and in process applications.

These products are in compliance with the following Regulations:

- EMC Regulation 2016
- Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) Regulation (S.I. 2012:3032)

and meet or exceed the following British requirements and compliance standards:

- **EMC Standard:** BS 61326:2021
- **RoHS:** BS 63000:2018

The UKCA mark is affixed accordingly.

David A. Bossie
Regulatory Compliance Manager
In-Situ, Inc.
July 14, 2022