RDO Blue

Operator's Manual

2021-04-23

Table of Contents

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 measuremnet in a variety of situations.

General Aquaculture

Inland Pond Aquaculture

Recirculating Aquaculture Systems

Probe

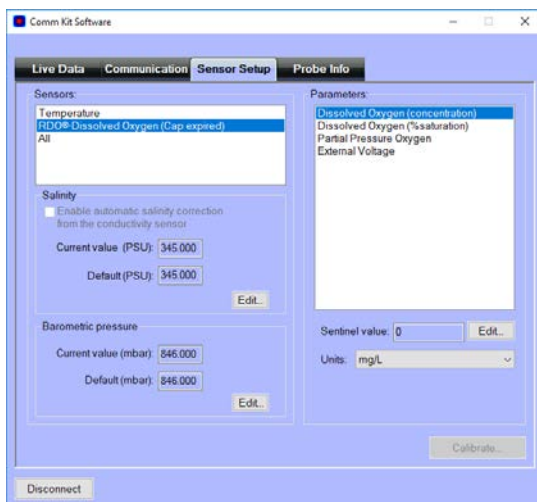Stripped-and-tinned wires are ideal for integration with a PLC and monitoring network.

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.
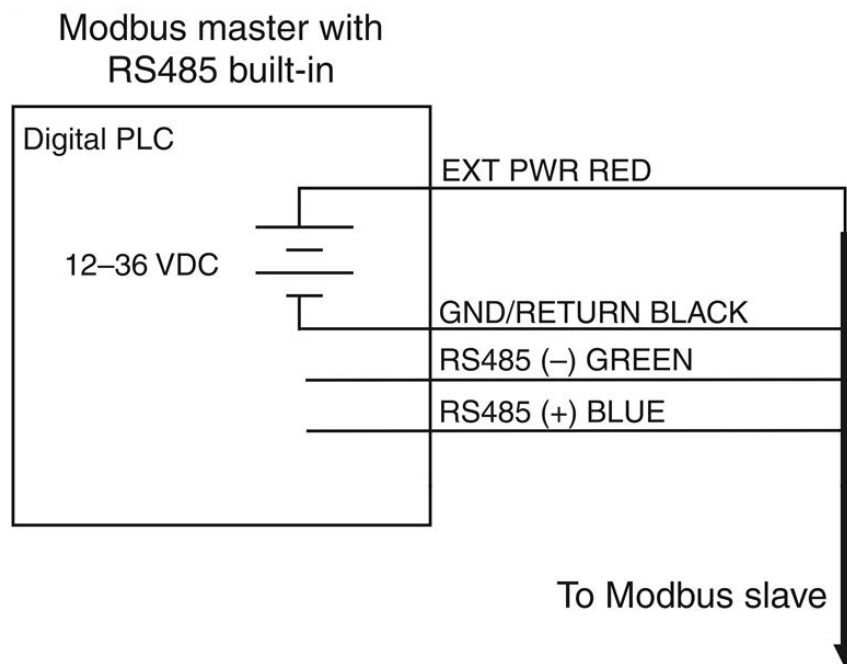
Controller Requirements and Connection

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.

Modbus master with RS485 built-in

Digital PLC

12–36 VDC

EXT PWR RED

GND/RETURN BLACK

RS485 (–) GREEN

RS485 (+) BLUE

To Modbus slave

Stripped-and-Tinned Instruments: First Steps

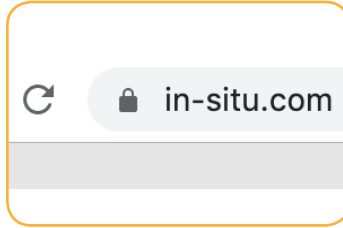✓ You can calibrate the RDO Blue and see live readings with In-Situ's Comm Kit software, available from www.-in-situ.com.
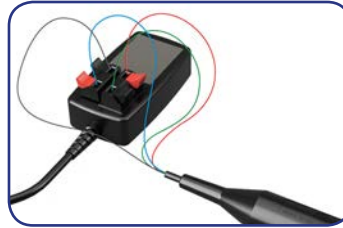
With a PLC

With Comm Kit

 in-situ.com

Connect the RDO Blue to your PLC.

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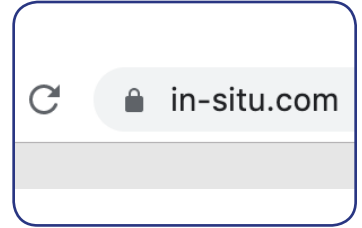

Refer to the Interface Spec for further instructions.

 in-situ.com

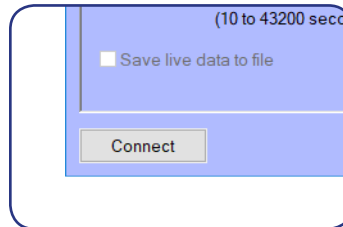Connect the RDO Blue to the comm box.

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

(10 to 43200 seco[...]
☐ Save live data to file

Connect

Launch the software and click **Calibration**.

![In-Situ logo — YOUR EYES IN THE FIELD]

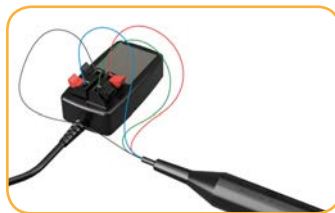## Comm Kit Instructions

1 **Install the software.**

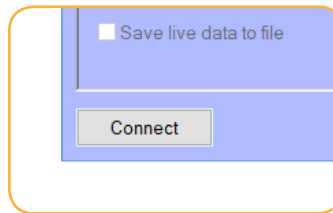**2** **Connect the instrument to a computer.**

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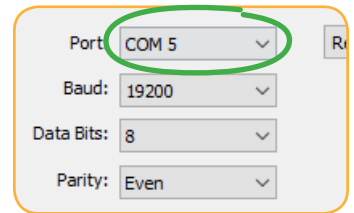

The communication device includes an electrical connection diagram label.

To attach the sensor to the communication device, depress a lever and insert the appropriate wire in the location specified by the diagram.
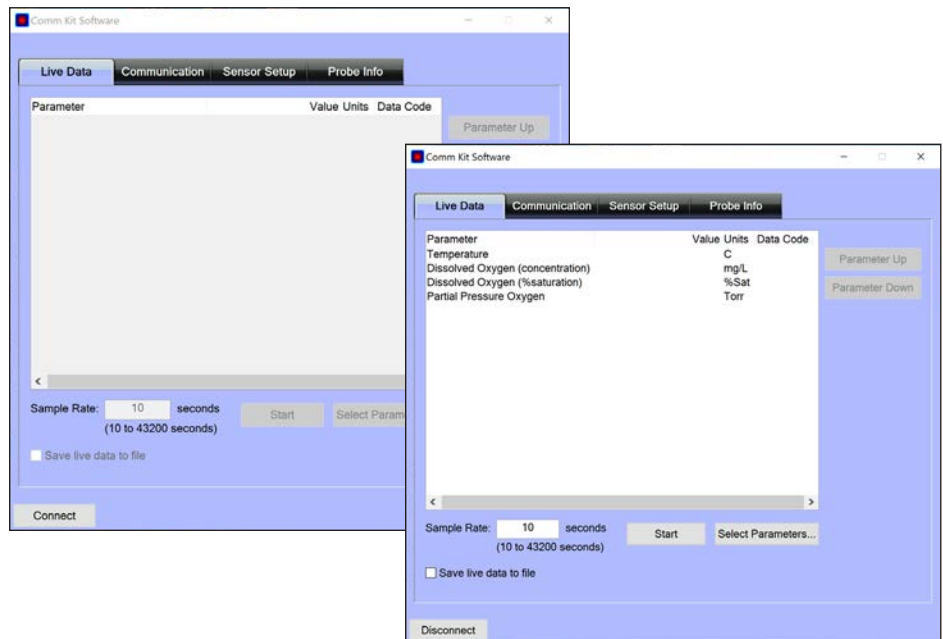
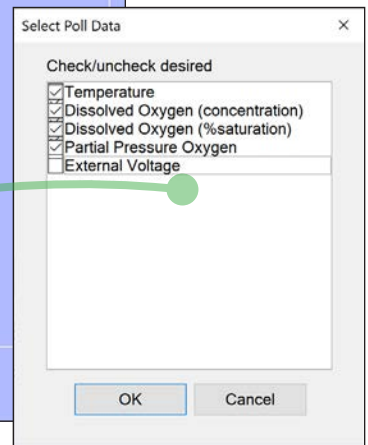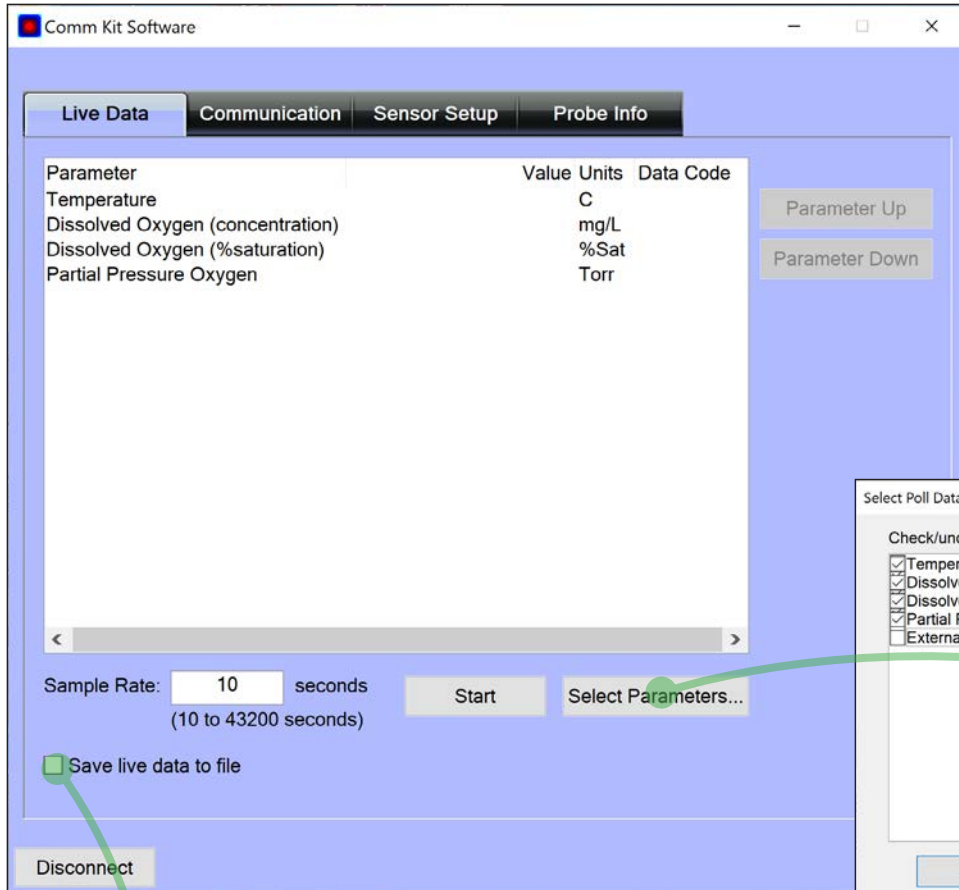Wait for the computer to recognize the USB device, and then click the Connect button.

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.

Choose the parameters Comm Kit saves to a data file with the **Select Parameters** button.
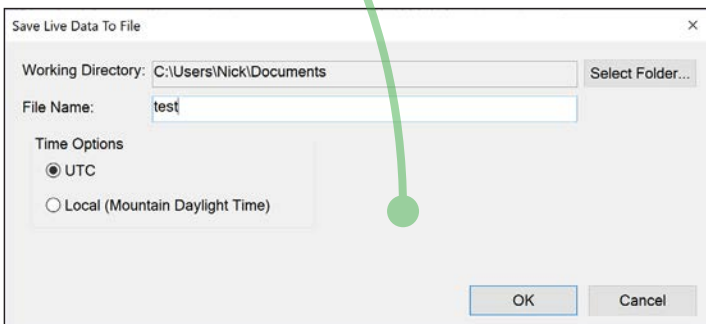
1   To save live readings to a spreadsheet, click the **Save live data to file** checkbox.

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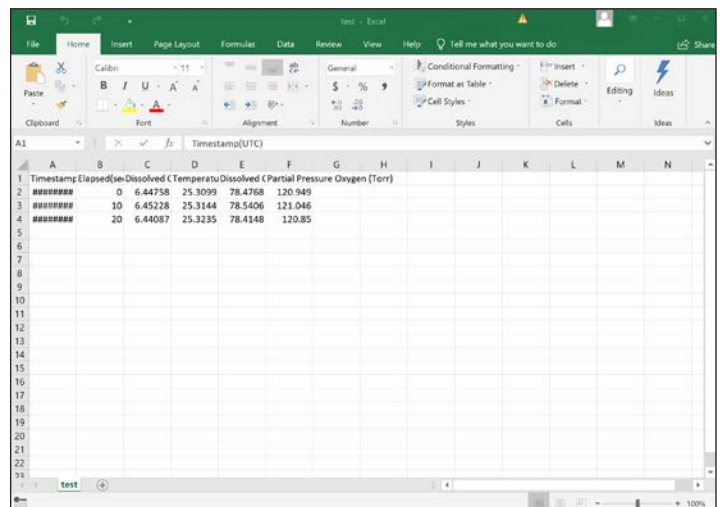
Comm Kit creates a spreadsheet file with one row for each reading.

Communication Tab

✓ Visit the Communication tab to change Modbus settings.
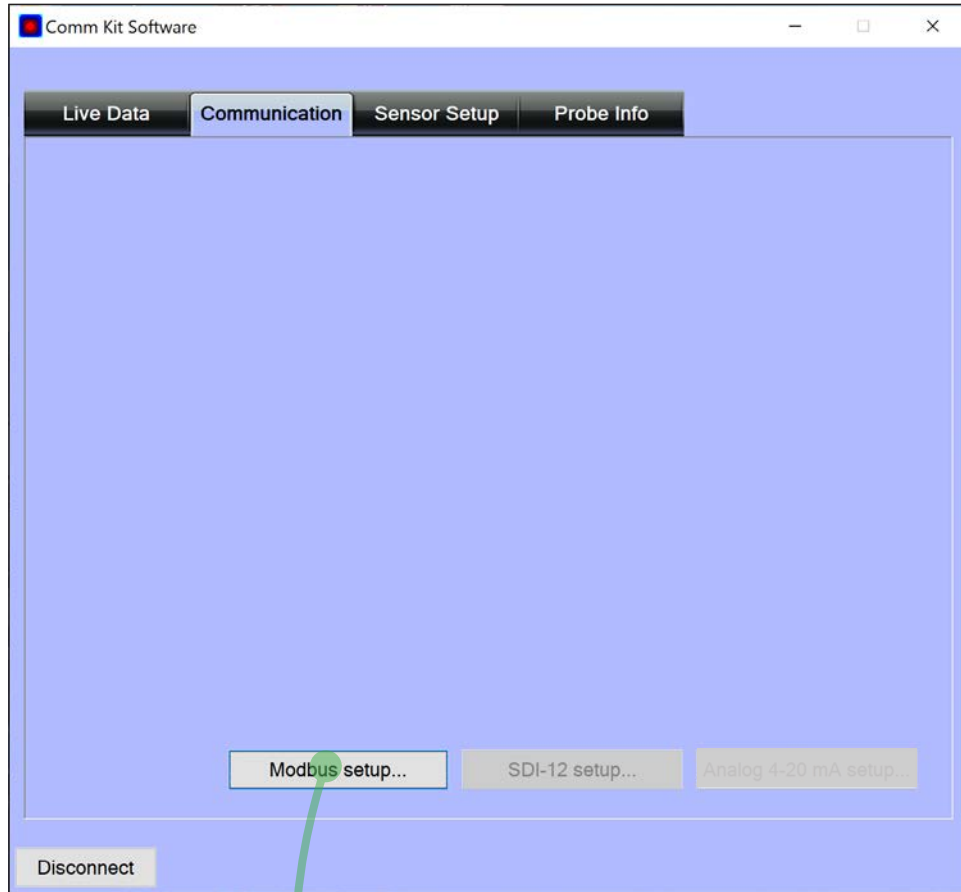
Sensor Setup Tab
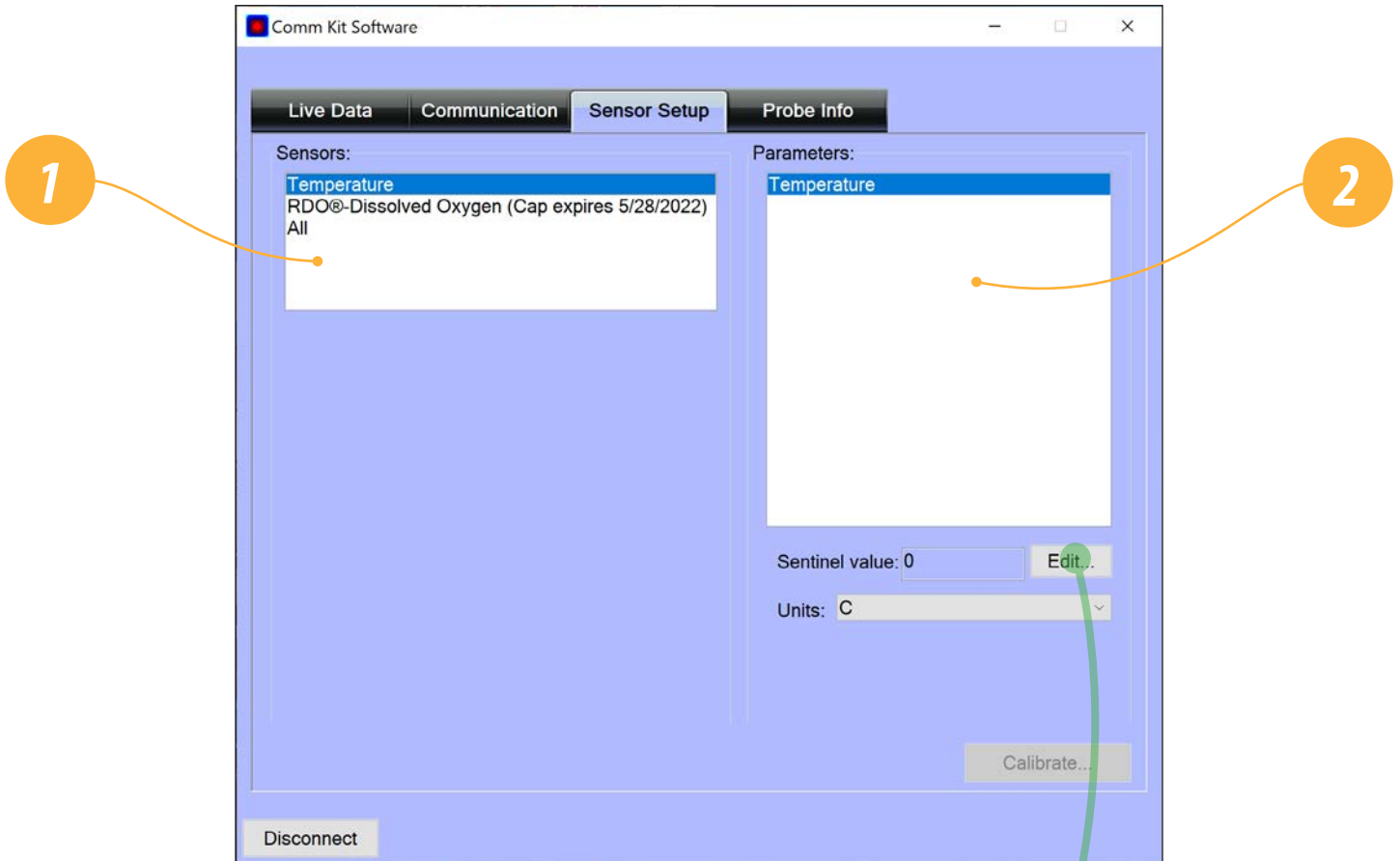
1 Use the tabs to navigate between functions.

2 Scroll through the parameters in the Live Data tab with the **Up** and **Down** buttons.
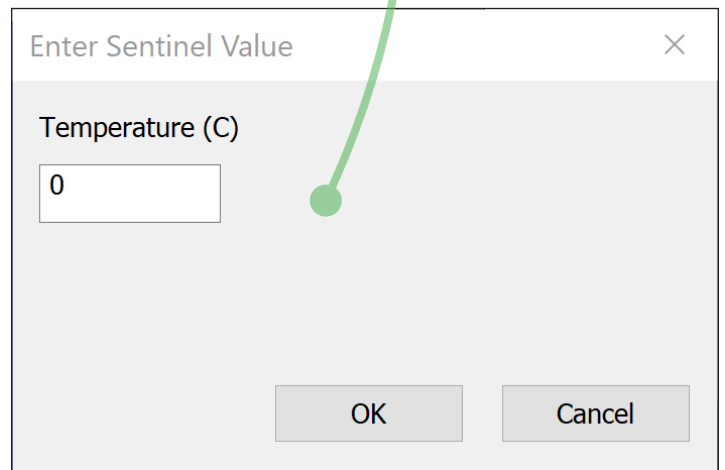
Probe Info Tab
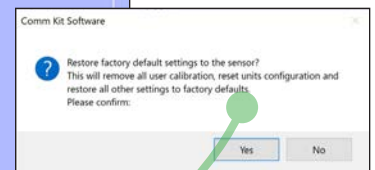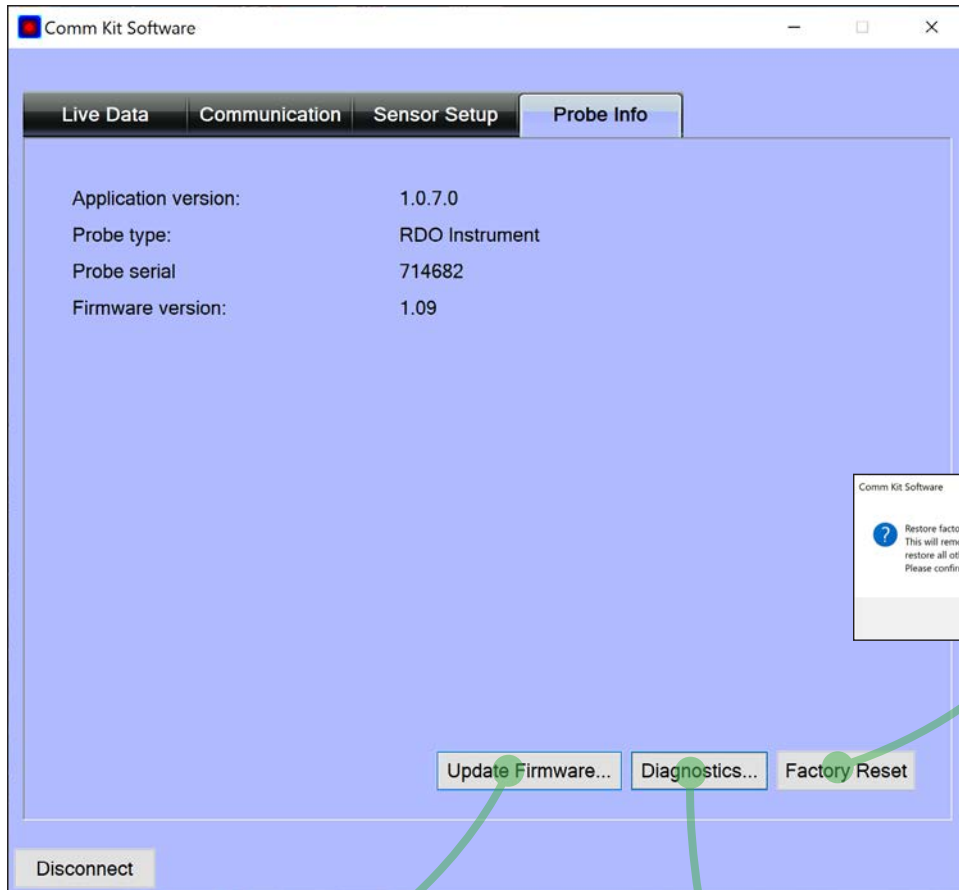
Comm Kit will ask for confirmation before resetting.
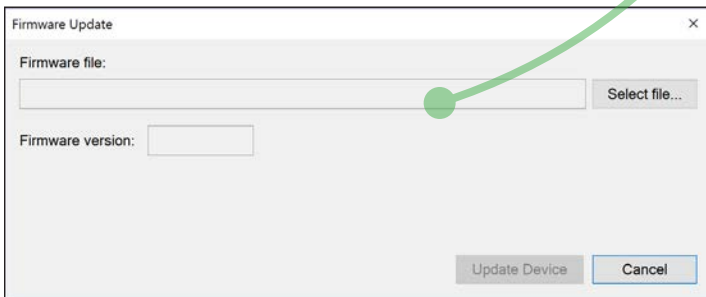
1   Click **Update Firmware** to install the latest firmware.

2   Then click **Select file** and choose your firmware.

3   The version number will appear in the Firmware version box.
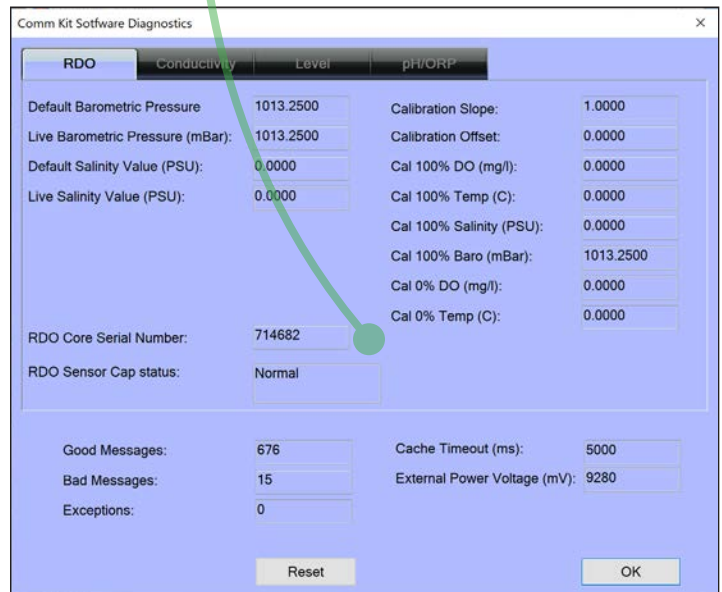
The diagnostics tabs display critical sensor, sensor cap, calibration, and power supply info.

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

In-Situ
YOUR EYES IN THE FIELD

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

A *Connect*

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

B *Pair*

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

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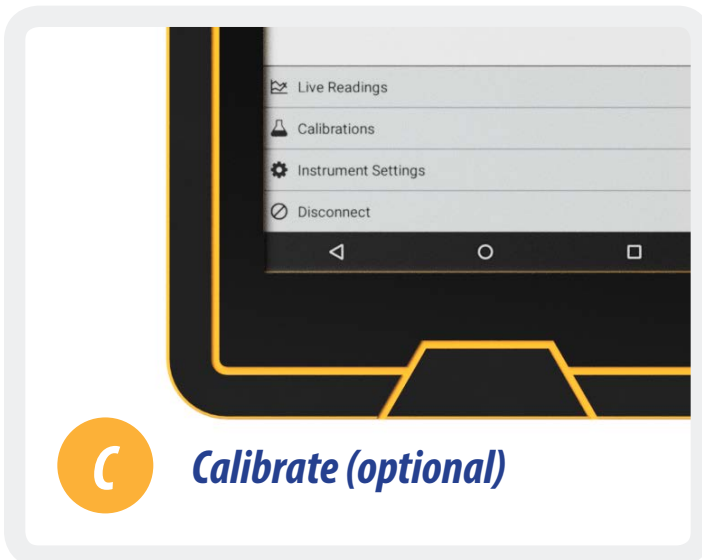
The RDO Blue is factory calibrated, but you can perform a calibration at any time with VuSitu. Select **Calibrations** from VuSitu's menu. Follow the on-screen instructions.

D *Deploy*

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

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.

Getting Started

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.
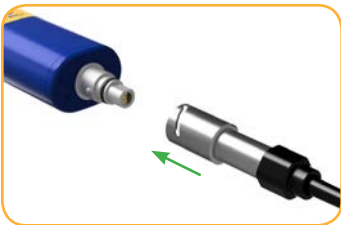
Flat edge

click

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.
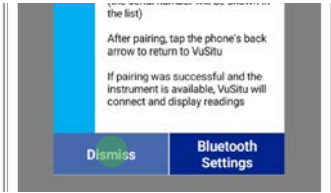
Make sure your mobile device's Bluetooth is turned on. Launch VuSitu and tap **Dismiss**.
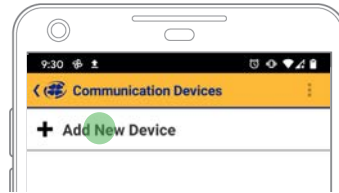
Tap **Add New Device** and select the Wireless TROLL Com from the list of available devices.
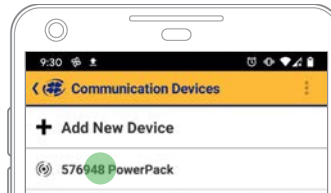
Tap your mobile device's back button. In VuSitu, tap the serial number of your Wireless TROLL Com.
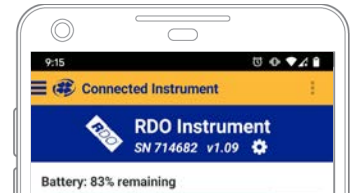
VuSitu displays the Connected Instrument screen when pairing is complete.

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.
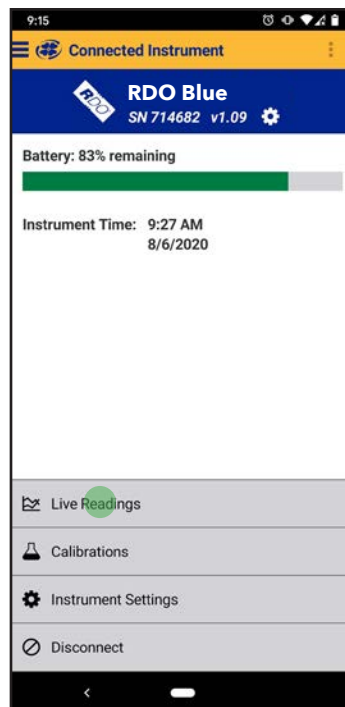
Navigating VuSitu

After Bluetooth pairing, VuSitu displays the Connected Instrument screen. You can access all features of the app from this screen.

Connected Instrument Screen

Access menu.

Access help information.

9:15

Connected Instrument

RDO Blue
SN 714682 v1.09

Battery: 83% remaining

Instrument Time: 9:27 AM
8/6/2020

Take single readings or continuously record at two-second intervals.

Live Readings

Calibrate sensors.

Calibrations

Access instrument clock and telemetry settings.

Instrument Settings

Disconnect app from instrument.

Disconnect

Selecting With Long-Press And Swipe

Long-press	**Swipe left**	**Swipe right**
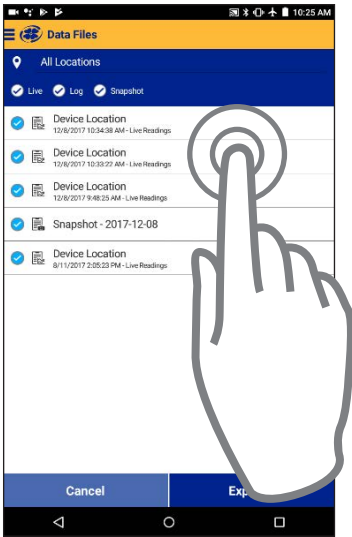
Press and hold any of the items in a list of files.

You can now select two or more items.
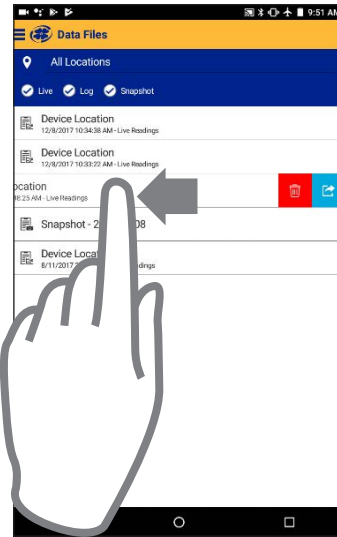
Press an item and swipe left to reveal the delete and sharing icons.
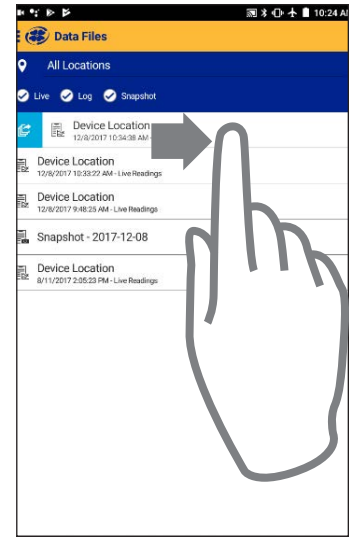
Press any item in a list and swipe right to reveal the sharing icon.

Calibrating Your RDO Instrument

✓ VuSitu guides you through calibrations. To get started, use the app to choose a calibration type as shown below.
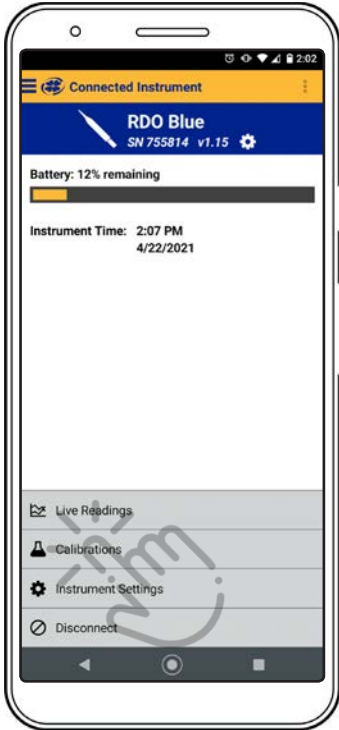
Select **Calibrations** from the menu.

Choose the type of calibration you wish to do.
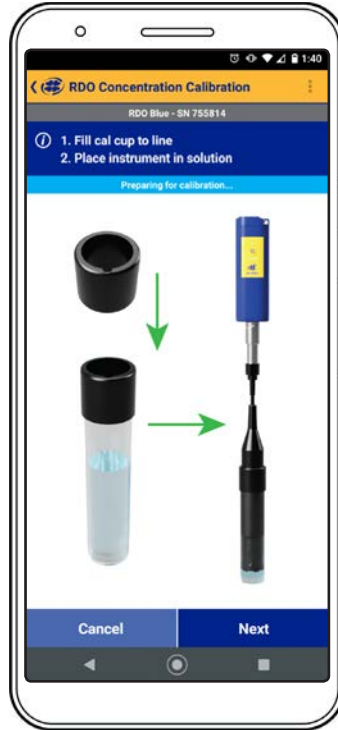
Follow the instructions in VuSitu.

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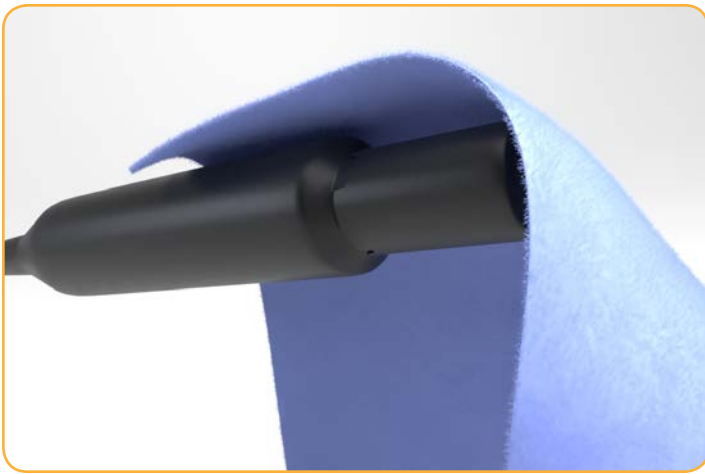
Gently dry the probe and sensing element with a paper towel.

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
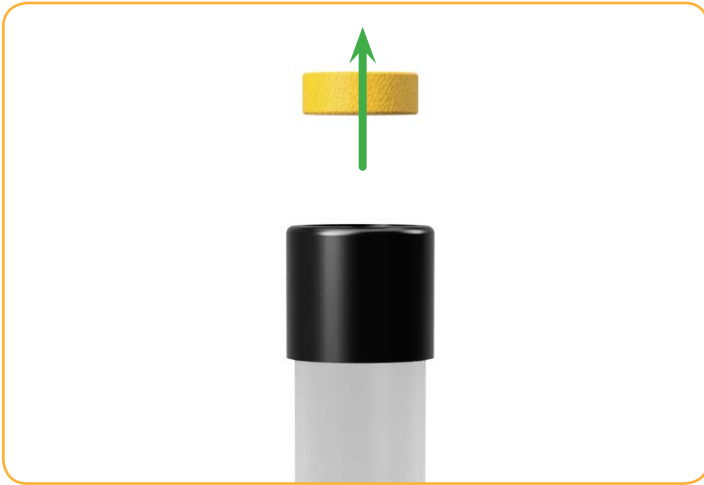
Remove the sponge from the calibration cup

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

1 Create a HydroVu account.
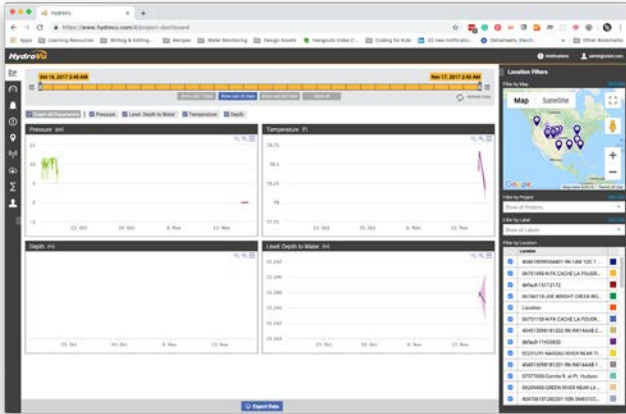
Visit hydrovu.com and create an account.

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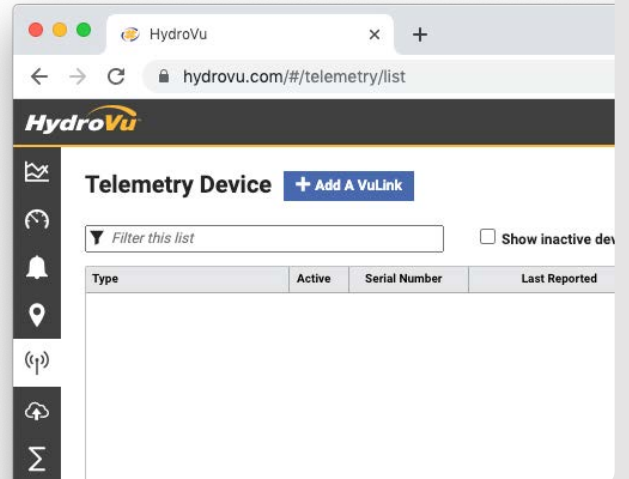
Click the telemetry page link in the menu on the left side of the page. Then click **Add a VuLink**.

3 Scan the QR code on your VuLink.

VuLink Satellite (SI)
P/N: **0094840**   S/N: **123456**
IMEI: **12 345678 901234 5**
Contains FCC ID: **R17ME910C1WW** and **QOQBGM113**
IC: **5131A-ME910C1WW** and **5123A-BGM113**
Registration Code: **T5S MPX NBM 572 K**

or

Add New Device
Registration Code: [   ]
📷 Open Camera
Cancel   Register Device

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.

click

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

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.	+/- 0.1ºC
Resolution, Temp.	0.01ºC
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
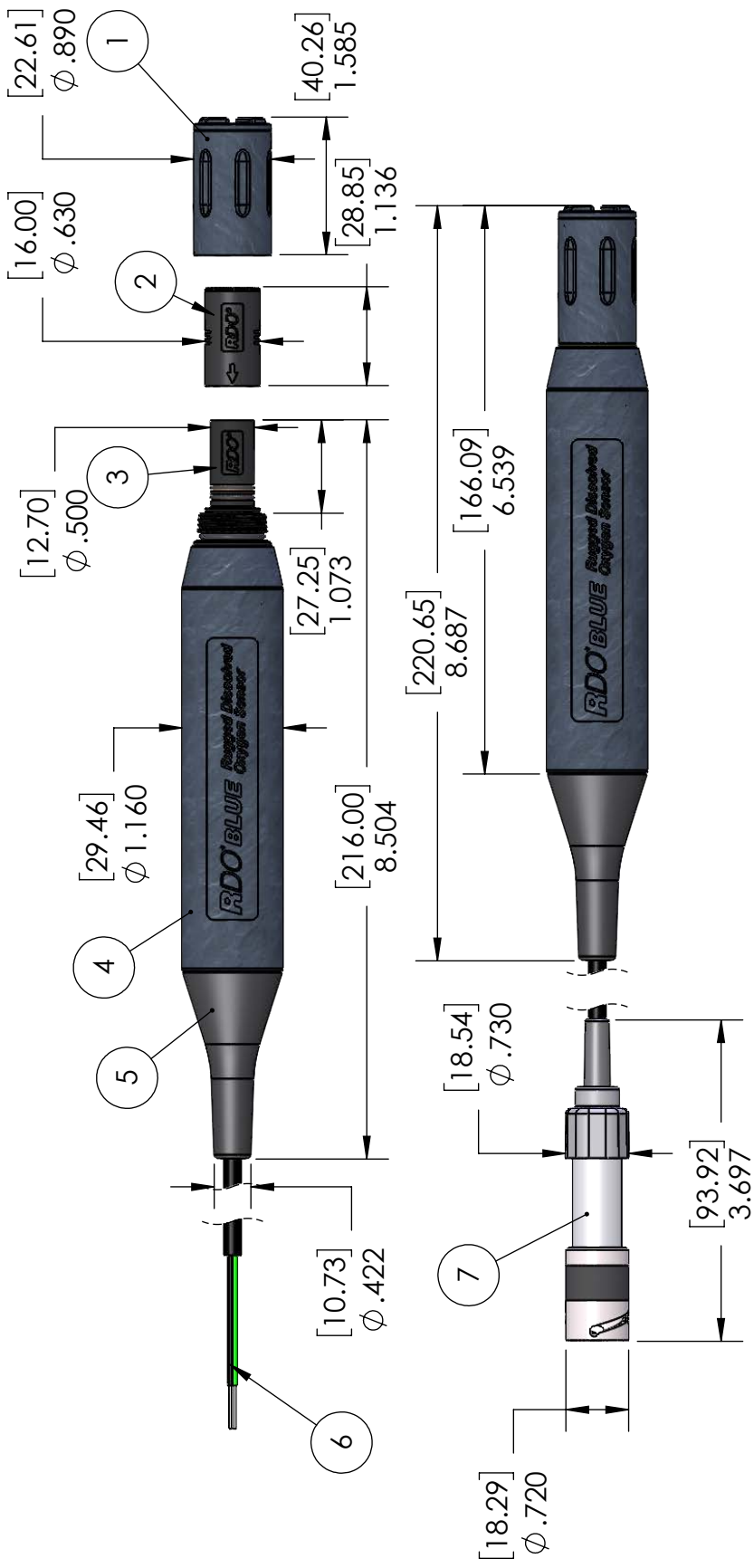
PART NAMES

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

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

SILVER IS SHIELDED WIRE FOR CHASSIS OR EARTH GROUND

DESCRIPTION: RDO BLUE PUBLISHED DIMENSIONS

MATERIAL: SEE TABLE ABOVE

FINISH: N/A

DRAWN BY/DATE JMc-3/26/2021
APPROVED BY/DATE EB-3/29/2021
PART NUMBER 0096360

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

SIZE A

SHT # 1 OF 1

SCALE 1:2

Dimensions:
[22.61] Ø.890
[40.26] 1.585
[16.00] Ø.630
[28.85] 1.136
[12.70] Ø.500
[27.25] 1.073
[29.46] Ø1.160
[220.65] 8.687
[216.00] 8.504
[166.09] 6.539
[18.54] Ø.730
[93.92] 3.697
[10.73] Ø.422
[18.29] Ø.720

Declaration of Similarity

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

Declares that the performance of the following product is equivalent to the **RDO® Core Analog Dissolved Oxygen Sensor Module**

Product name: **RDO® Blue**
Model: **RDO® Blue Twist-Lock Termination, Stripped/Tinned Termination**
Product Description: Optical Dissolved Oxygen and Temperature Measurement Probe

is in compliance with the following Directives

- Electromagnetic Compatibility (EMC) Directive, 2014/30/EU
- 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:

- **Immunity**
  IEC 61000-6-2:2016 (EN 61000-6-2, KN 61000-6-2)
  Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments

- **Emissions**
  EN 55011:2009 + A1:2010, KN32: 2015-12, FCC Part 15 Subpart B
  Radio disturbance characteristics for scientific and medical equipment

The CE mark is affixed accordingly.

Ben Kimbell
VP of R&D
In-Situ, Inc.
October 28, 2020

CE FCC

WWW.IN-SITU.COM

221 East Lincoln Avenue, Fort Collins, CO 80524 USA
Toll Free: 800.446.7488   **Tel:** 970.498.1500   **Fax:** 970.498.1598

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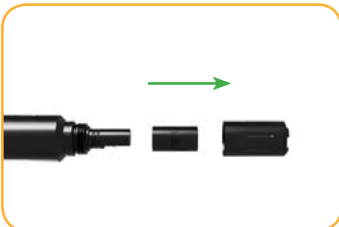
⚠️ Do not use organic solvents to clean the sensor or probe; they will damage the sensing element.

Cleaning the Optical Window

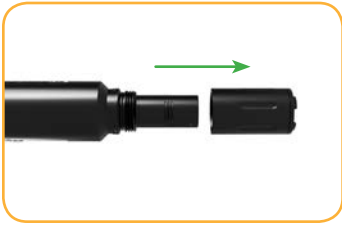✓ Clean the optical window only when you change the cap.

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.

O-ring grooves

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.